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High Speed Rail

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Despite the severity of the fiscal crisis politicians of all parties are backing High Speed Rail (HSR), but the evidence suggests that there is no robust financial or economic case for the project. HSR will not solve the key practical problems of lack of capacity on commuter road and rail. Instead it is a hugely expensive vanity project that requires extensive work on unnecessary new lines.

The key findings of this research are:

- The line between London and Birmingham will cost £17 billion, and is expected to reduce journey times to Birmingham, Manchester and Liverpool by around 30 minutes. This means it will cost over £500 million per minute saved.
- Rebalancing regional economies is now used as a major justification for HSR. However, HS2 Ltd only project £2 billion of lifetime "agglomeration benefits" and the evidence for those benefits is weak.
- HS2 will never produce a financial return. The value of the net operating profit once it has been built only covers 42 per cent of the capital costs over a 60 year project life.
- The project will not cut greenhouse gas emissions. According to HS2 Ltd it will be carbon neutral
- Forecasts for growth in demand for HS2 are almost certainly overstated and do not take existing evidence or past experience into account. The business case relies on a 267 per cent rise in demand.
- The static economic analysis used to support the case for HS2 is based on flawed assumptions such as average passenger income of £70,000 and zero passenger productivity during a journey.
- Nearly half (47 per cent) of long distance rail trips are made by people from households in the top quintile by income. HS2 is a railway for the rich, but paid for by everyone.

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About the Author

Chris Stokes has held a range of senior posts in the rail industry, Government and management consultancy. He worked for British Rail until 1993, and was Deputy Director for Network SouthEast, British Rail's largest business sector, from 1988 to 1993.

He was Deputy Franchising Director from 1993 to 1999, with responsibility for the sales process for the first phase of the initial franchising programme, delivering a complex, highly sensitive programme to a tight timescale.

Chris has subsequently worked widely as a consultant, including advising on a number of winning franchise bids, and advising the Association of Train Operating Companies (ATOC) on the case for network electrification

He was a Non-executive Board Member at the Office of Rail Regulation (ORR) from 2004 to 2006, and non-executive Chairman of Agility Trains from 2008 to 2009

1. History

The previous Government was originally opposed to High Speed Rail (HSR). The 2006 Eddington Transport Study argued against constructing new high speed routes, as journey times between major UK cities compared favourably with those in other European countries. The 2007 White Paper *Delivering a Sustainable Railway* [1] also rejected new high speed routes as inappropriate and unnecessary.

That began to change over time, with pressure from lobbying groups like Greengauge21. The Liberal Democrats were the first party to support the idea of HSR. The Conservatives were next, committed to a policy of building a high speed rail line linking London to the Midlands and the North. They saw this as a crucial step in developing environmentally friendly transport and providing the additional capacity needed to meet ever growing transport demand. They argued it would eliminate the need for domestic air travel, and with links to the existing high speed line from St Pancras to the channel tunnel, it would reduce short haul flights to Europe too, avoiding the need for a third runway at Heathrow.

The former Secretary of State for Transport Lord Adonis set up a Government owned company, HS2 Ltd, completing the consensus between the three main parties. It had a remit to prepare plans for a high speed route from London to the West Midlands, to report by the end of 2009. By the election in May 2010, all three parties were committed to construction of a new high speed line, and this was formalised in the Coalition Agreement:

> *"We will establish a high speed network as part of our programme of measures for creating a low carbon economy. Our vision is of a truly national high speed rail network for the whole of Britain. Given financial constraints, we will have to achieve this in phases".*

Research for the RAC Foundation by Ipsos MORI into the transport priorities of ordinary people found fixing pot holes was their highest priority; high speed rail barely registered as a concern: 70 per cent of respondents prioritised spending on road and pavement maintenance, while only 8 per cent wanted to protect expenditure on high speed rail.[2] But politicians have so far pressed ahead with HS2 regardless.

The HS2 Ltd report – and the accompanying white paper – was published shortly before the election.[3] The new Secretary of State, Philip Hammond, then asked HS2 Ltd for further work, to evaluate the best options for going further North to Manchester and Leeds. And on 20 December 2010, he confirmed that the project had expanded. It is now a £30 billion

[1] http://www.dft.gov.uk/pgr/rail/whitepapercm7176/
[2] http://www.racfoundation.org/media-centre/holes-over-high-speed-rail
[3] http://www.dft.gov.uk/pgr/rail/pi/highspeedrail/hs2ltd/hs2report/

scheme for a new route from Euston via a West London interchange station at Old Oak Common to an interchange station near the existing Birmingham International station and Birmingham Airport. The line divides North of the interchange station, with a spur to the centre of Birmingham, a route to Manchester, and a second route via the East Midlands and Sheffield to Leeds.

The plans now also include a link between HS2 and HS1 (the Channel Tunnel Rail Link), and, in the longer term, a direct link to Heathrow. Both these two additions are extraordinary, as they fly in the face of the analysis carried out by HS2 Ltd for the previous Government. In its evaluation of linking with HS1, HS2 Ltd stated:

> *"Running direct services to Paris or Brussels….would bring Birmingham within three hours and attract a significant market share, but the market would not be big enough to fill a 400 metre train a day in 2033. Direct services to destinations North of Birmingham would attract a smaller market share but are competing in a bigger market and might fill another train a day" (Para 3.8.12)*

In other words, the Government is proposing to build a long, expensive tunnel in West London for two trains a day each way.

HS2 Ltd was no more enthusiastic about a direct link to Heathrow:

> *"….the total market for accessing Heathrow from the West Midlands, North West, North and Scotland is currently around 3.7 million trips. Our modelling suggests relatively little of this would shift to HS2, with the rail share increasing by less than 1 percentage point (about 2000 passengers per day, or just over one train load each way)" (Para 3.3.10)*

On the same day as Philip Hammond's announcement, Greengauge21 – the main lobby group supporting the construction of high speed rail in Britain – published an extraordinary report "HS2 – why the critics are wrong".[4]

Despite its title, the report is solely an attack on my article in the October edition of "Modern Railways",[5] which is surprising, as I am far from being HS2's only serious critic.

This paper sets out the flaws in the HS2 business case and rebuts the Greengauge21 arguments.

[4] http://www.greengauge21.net/publications/hs2-why-the-critics-are-wrong/
[5] http://www.wendoverhs2.org/documents/chrisstokes_modernrailways.pdf

2. Business Case

The table below sets out the summary business case published by HS2 Ltd (HS2 Ltd report March 2010, page 185):

Table 1: Summary of HS2 Ltd business case

		Business	Other
(1)	Transport User Benefits	£17.6bn	£11.1bn
(2)	Other Benefits (excl. Carbon)	less than £0.1bn	
(3)	Net Transport Benefits (PVB) = (1) + (2)	£28.7bn	
(4)	Wider Economic Impacts (WEIs)	£3.6bn	
(5)	Net Benefits incl WEIs = (3) + (4)	£32.3bn	
(6)	Capital Costs	£17.8bn	
(7)	Operating Costs	£7.6bn	
(8)	Total Costs = (6) + (7)	£25.5bn	
(9)	Revenues	£15bn	
(10)	Indirect Taxes	-1.5bn	
(11)	Net Costs to Government (PVC) = (8) - (9) - (10)	£11.9bn	
(12)	**NATA BCR = (3)/(11)**	**2.4**	
(13)	**BCR with WEIs = (5)/(9)**	**2.7**	

There are a number of problems with that business case, which mean it significantly overstates the returns to the project.

2.1 Financial returns

The overall business case is extremely weak. HS2 claim a benefit cost ratio of 2.7 – not good for transport projects, and way below the cut-off point for road schemes, even though 80 per cent of travel in Britain is by road. But the project is light years away from paying for itself, as only 32 per cent of the total claimed benefits are captured through fares. The value of the net revenues once it has been built – fares (£15 billion) less operating costs (£7.6 billion) estimated over a 60 year project life – only cover 42 per cent of the capital costs. And that assumes the revenue forecasts are realistic, but there is compelling evidence that they are overstated.

2.2 Time saved

The majority of the transport user benefits relate to the time saved by passengers using the new service. In principle, this is conventional transport economic analysis, but the values used are an order of magnitude too high. The value of time for business travellers assume both an implied average salary of £70,000 pa, and that all time spent on the train is

wasted: are all the passengers who read reports or work on laptops wholly unproductive? This is a key issue – the time saving benefits make up £19.4 billion out of the total of £32.3 billion economic benefits claimed for the project.

So there are clearly major problems with the current assumptions which significantly overstate the value of the time savings and need to be seriously revised in order to reflect reality. It appears that the DfT themselves may recognise this, but we will see whether they adjust their assumptions in the next version of the business case

Greengauge21 promise that "this is a complex area and Greengauge21 will be publishing some work on it in due course". But hopefully the Government's case will be based on proper independent academic work and not material prepared by this lobby group.

2.3 Economic regeneration and other economic benefits

Regenerating the Midlands and the North is becoming the Government's central argument for high speed rail – it sounds good, and it's very difficult to quantify. To understand the issue in quite a straightforward way: Manchester to London already has a train every twenty minutes, taking just less than two hours ten minutes. Will improving this to, for example, a train every 15 minutes taking an hour and twenty minutes transform Manchester's economy?

It's not clear that everyone in Manchester really believes it will. The Manchester Independent Economic Review (2008) states:[6]

> *"For additional investments within the North of England as a whole, including Leeds – Manchester, the case is stronger than for additional investments on the route to London"*

This may reflect the current poor services in the North West: for example, train services between Manchester and Liverpool are slightly slower and no more frequent than a hundred years ago.[7]

Some economists have argued that HS2 is likely to exacerbate the North-South divide rather than reduce it. It would be even quicker for those living outside of London to make the journey in to the prosperous capital. Professor Henry Overman from the LSE gave cautious evidence to the Transport Select Committee:

[6] http://www.red.mmu.ac.uk/documents/ent_files/strategies/mier_Review.pdf
[7] Bradshaw's April 1910 Railway Guide

"[...] claims about the transformational nature of transport investments for particular areas should be greatly discounted.....because they have no convincing evidence to support them".

His fellow witnesses in the same session echoed these sentiments. One young PhD put it to me rather more brutally: "the best way to reduce the North South divide would be to lengthen the journey times to London".

HS2 Ltd's own analysis supports their conclusions. Their estimate of the present value of "wider economic impacts" is £3.6 billion, much lower than the £17.8 billion capital costs, and just 11 per cent of the total £32.3 billion benefits.

Some of the economic benefits arise from use of the spare capacity created on the existing network. Greengauge21 imply that I have argued that those benefits are not a result of HS2. I haven't, but everyone should be clear that most of the extra services that generate these will require further subsidy, and it is unclear whether the cost of this is included in the HS2 business case. Greengauge21 flag the aspirations of Centro (the Passenger Transport Authority for the West Midlands) for additional services, but are silent on the need for additional long term subsidies.

In this respect, HS2 represents a trap for the taxpayer: every time a new high speed station is built, there will be demands for major investment, and ongoing subsidy, to deliver the promised regeneration or provide the transport links needed for passengers to access the new service. Euston is the most dramatic case: the Victoria Line is already full – how long before the Mayor explains to the Secretary of State that the additional passengers forecast for HS2 mean that Crossrail 2 has to be built, at a cost of another £10-15 billion. "A billion here, a billion there, pretty soon it adds up to real money".[8]

I also quoted work carried out by Imperial College commissioned by HS2 Ltd and published with the HS2 report, which found that the wider economic benefits directly resulting from the reduced journey times on HS2 were very limited. Greengauge21 says quite correctly that the authors of the report note "it should certainly not be taken as a definitive or exact statement on the possible wider benefits of high speed rail". This area is of course very far from being an exact science, and the caveats are clearly appropriate. But they should also quote the total to which the caveat applied, at only around £8 million a year, which is tiny compared to the total costs and benefits of the project. Yet Greengauge21 accuse me of "misleading the unwary" on this.

It is also clear that there will be mounting opposition to HS2 across the country as the downsides in the regeneration case are understood. For example, Coventry City Council is

[8] Senator Dirksen 1896 - 1969

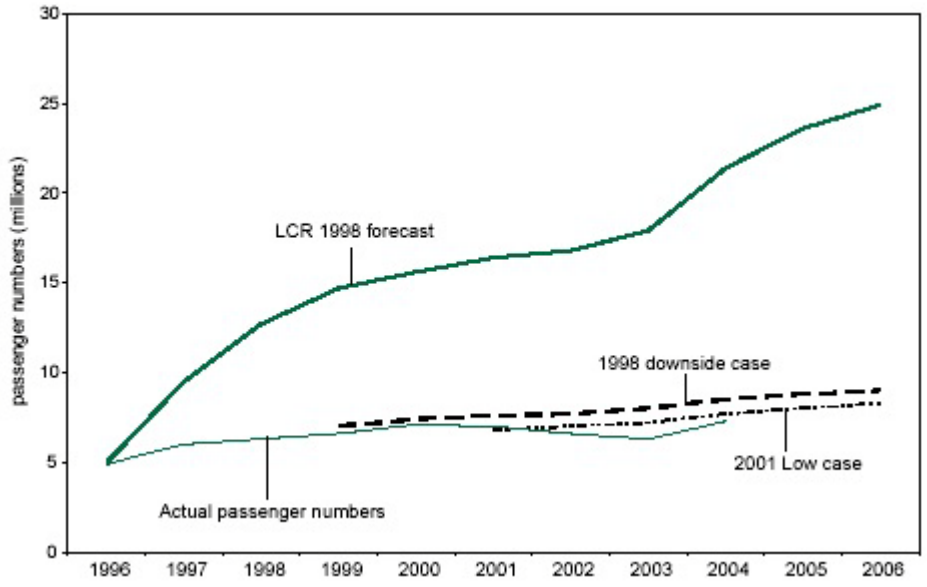
already formally opposed to HS2. Coventry is by-passed by the route, and HS2 Ltd's documentation shows that its InterCity services will be less frequent, and have more stops hence longer journey times, with an adverse impact on the city. The many "losers" will become clearer across the country when further details of the full proposed HS2 routes are published.

3. Overarching issues

3.1 Growth in demand

The case is based on extraordinary estimates of demand growth. HS2 is forecast to deliver growth of 267 per cent. That is over three and a half times more passengers than carried on the existing InterCity services out of Euston. However, the Department for Transport (DfT)'s own National Travel Survey shows that overall transport demand is no longer growing with GDP; the average distance travelled per person slightly declined over the period 1995-97 to 2007-08, before the start of the current recession.
Many major rail projects in the past have been based on forecasts that prove to be wildly optimistic. Eurostar's passenger numbers in 2009 only reached 37 per cent of the level forecast for 2006 when the project to build the existing high speed route to the Channel Tunnel began.

The Public Accounts Committee reviewed the results and produced the following graph, showing the extent that demand projections were inaccurate:[9]



They reported that:

> *"The Department told us that it has now learned from all this experience, and that the next time it considered undertaking a major transport project, it would factor more severe downside assumptions into its business case analysis".*

[9] http://www.publications.parliament.uk/pa/cm200506/cmselect/cmpubacc/727/72705.htm

Unfortunately, the HS2 business case shows that lessons from those past instances of overly optimistic demand projections have not been learned.

In my article for Modern Railways I noted that the 267 per cent growth forecast from HS2 Ltd appeared over-optimistic, for the reasons discussed above. At the same time, I acknowledged there has been strong growth in rail demand in recent years.

Greengauge21 respond by making lots of arguments that don't address the central point. They argue that I didn't mention population growth in the article – 5.8 per cent between 1995 and 2008. That is important but obviously won't come close to driving 267 per cent growth.

They also assert the stalled growth was a temporary pause (since 1995) in rising demand, because "visible" motoring costs have risen sharply with fuel prices over the period. Cars have steadily become more fuel efficient though. And are they expecting prices at the pumps to drop in the years to come?

Then they claim that I attributed the drop in growth to the internet and mobile technology. I didn't, I offered this as a possible hypothesis to explain a trend clearly evident in the data, and urged that serious work be done on the overall drivers of transport demand, and the relationship between travel and GDP, before government invests our money in HS2 on the basis of demand forecasts that appear extremely optimistic.

Greengauge21 ignore the key issue: are HS2's growth forecasts are credible? They are certainly at the top of the range of serious forecasts, as shown in the table below: While HS2 expect background growth of 133 per cent by 2033, Network Rail, for example, forecast growth in the West Coast corridor of a much lower range of 45 to 89 per cent by 2036, three years later. And Network Rail has no incentive to deliberately produce low forecasts.

Table 2: Forecasts of long distance rail travel demand

Source	Date	Period	Increase	Annual rate
DfT[10] all DfT[11] all	2007 (July) 2007 (July)	2006-2027 2006-2030	65% 73%	2.4% (1.8% from 2017) 2.3%
Network Rail	2010 (August)	2008-2034	70%	2.1%
Network Rail (WCML)	2009 (June)	2007-2036	45-89%	
Prof J Dargay (for Independent Transport Commission)	2010 (January)	2005-2030	35%	1.2%
HS2 Ltd (Atkins) – WCML	2010 (February)	2008-2033	133%	3.4%

[10] 'Delivering a Sustainable Railway: Summary of key research and analysis' July 2007, slide 27
[11] 'Delivering a Sustainable Railway', Cm 7176, Dft, July 2007, paragraph 6.6, page 60

I believe there will be significant growth in rail demand, but if it's half the level forecast by HS2 – still more than double present levels – the business case for HS2 would collapse, as the scale of the benefits delivered directly relates to passenger volumes.

3.2 Comparison with other countries

As Eddington identified, most countries that have invested in high speed rail have done so for journeys which are much longer than in Britain. They also started off with rail services which were significantly slower. InterCity rail services from London are already fast and frequent, and now increasingly reliable. Rail has captured the great majority of city centre travel between London and Manchester, for example.

In contrast, Madrid to Barcelona took seven hours by rail before the high speed line was built, so almost everyone flew; now it takes less than three hours, and most people go by train. Distances in Britain are simply not long enough for high speed rail to deliver an equivalent step change, except for journeys between Southern England and Scotland, which make up a relatively small proportion of total long distance travel.

I had made the point in Modern Railways that Britain's InterCity services to and from London are already quite fast and very frequent. Greengauge21 acknowledge this, but then make an extraordinary statement that "journey times across today's rail network are slower than they were 15 years ago, and are gradually being further degraded as the network fills up with additional services. This is a trend that will continue". They present no evidence to support this.

Whilst there was limited deceleration on some routes a few years ago as the network struggled to cope with poor performance, this is not happening now, and punctuality is overall at very high levels historically. And all the key InterCity routes have or are planned to have reduced, not increased, journey times:

- Cross Country – major improvements in journey times and frequency as a result of the introduction of new rolling stock.
- West Coast Main Line – dramatic improvements in journey times and frequency following completion of the upgrade of the route.
- East Coast Main Line – frequency improvements including a half hourly Leeds – London service, an all day service to Hull and new services to Sunderland and Bradford. The new timetable planned for May 2011 has further additional trains and reduced journey times.
- Midland Main Line – improved frequencies and reduced journey times from December 2010.

- Great Western Main Line – comprehensive improvements are planned following the reconstruction at Reading and potential electrification.
- Chiltern Railways is investing in an upgrade of its London – Birmingham route which will deliver 90 minute journey times from Birmingham to London from May.

We will see whether Steer Davies Gleave – the transport consultancy that Jim Steer (the founding Director of Greengauge21) started – will be advising bidders for the upcoming competitions for the West and East Coast franchises that they should offer slower journey times. It doesn't seem very likely.

3.3 Capacity

Greengauge21 state that "the work carried out on alternatives has been comprehensive and shows that the better investment is in a new line, not more upgrades, and that the new line has most value if it is built for high speed". This simply isn't true.

Rail Package 2,[12] prepared by DfT in its review of alternatives, would cost less and can be delivered faster, has a much better benefit cost ratio and provides for 15 to 16 InterCity trains an hour from Euston. This is clearly effectively the limit on what can be achieved on the existing route, but at present there are only 9 to 10 trains an hour from Euston so it does represent a major increase.

At the same time, additional vehicles are already under construction to lengthen most trains from 9 to 11 cars, giving 150 extra standard class seats – an increase of 50 per cent. And the existing load factor for the route – the percentage of seats occupied – is probably less than 50 per cent. The economics of rail would be transformed if the industry achieved airline load factors, but let's not get too ambitious. If, say, the average load factor is increased to 75 per cent through more effective yield management, train capacity is increased by 50 per cent and the number of trains operated by 50 per cent, then the existing route would be able to cope with growth of 237 per cent – almost the HS2 number, and way above the likely actual level of growth.

There are of course some trains with standing passengers now, before the extra vehicles already on order are introduced, but the scale of this shouldn't be overstated. Network Rail recently published its draft "Route Utilisation Strategy" for the West Coast Main Line,[13] as part of the key rail industry planning process. This shows there is currently one Virgin West Coast train a day which has standing passengers, out of a total of 287; there are nine on

[12] http://www.dft.gov.uk/pgr/rail/pi/highspeedrail/alternativestudy/pdf/railintervention.pdf
[13] Published December 2010 http://www.networkrail.co.uk/browse%20documents/rus%20documents/route%20utilisation%20strategies/west%20coast%20main%20line/westcoastmainline_rus.pdf

Fridays. A combination of the already committed extra capacity, and smarter yield management to reduce the artificial peaks caused by time restrictions for regulated "saver" fares, could resolve this problem for quite a few years.

3.4 The Opportunity Cost

Greengauge21 argue that rail investment only fell by 11 per cent in the Spending Review, not 25 per cent, so I'm wrong and there is no need to balance the HS2 project against other opportunities that have to be neglected because of the cost. But as I set out in my article, there are other priorities to consider, in rail and in other public services, and resources are scarce:

> *"Most Government department budgets are expected to be cut by 25 per cent in the current spending review, with transport clearly not an exception. Spending cuts will impact on all of us, from reduced benefits to fewer police and ageing school buildings. There is an opportunity cost here, both in relation to other public services and rail itself.*
>
> *While construction expenditure on HS2 will not start for at least five years, even before then the development costs will be considerable, and will undoubtedly represent an opportunity cost for the industry. Forget smaller scale improvements, projects like East West Rail and additional rolling stock. Some cuts have already taken place, like the £50million 'Better Stations' fund and the uncommitted HLOS1 additional rolling stock, and HLOS2 is likely to be steady state at best, with the risk of route closures looming over the horizon. In this context, and given the downsides to the business case, HS2 potentially looks like a vanity project, and I would argue the case needs to be rigorously challenged."*

Greengauge21 also laud the recent HS1 concession as "an investment model for future British Governments to savour". The reality is the opposite: this is a thirty year concession, largely underwritten by guaranteed access charges, a big proportion of which are for the HS1 domestic services which almost certainly lose money. The concession has been won by a Canadian pension fund, so is unlikely to represent an entrepreneurial valuation of the upsides of the business. And the concession was sold for £2.1 billion, against HS1's capital cost of £5.8 billion. Of course, HS1 reverts to Government at the end of the concession, but the present value of this is rather low – will Jim Steer lend me £1,000 if I promise to pay it back to him, without interest, in 2040?

3.5 Environmental benefits

HS2 themselves say that the project is at best neutral in terms of carbon emissions. Most of the passengers it is forecast to carry are either transferred from existing rail services – where faster trains inevitably increase carbon emissions – or are additional journeys as a result of the faster trains, which also increases emissions. There will also be an environmental impact from the construction work. Modest forecast transfers from road and air are positive, but at best just about balance out the negatives – HS2 Ltd evaluate that the new railway will reduce congestion on the M1 by only 2 per cent.

Greengauge21 claimed that I understated the environmental benefits of transfer from air, as domestic air traffic at Heathrow has declined because of slot constraints. This is certainly true, but overall domestic air volumes to all London's airports declined by 8 per cent between 2000 and 2009 – yet HS2 Ltd's business case assumes an implausible growth of 178 per cent by 2033.

Similarly, Greengauge21 argue I have got my facts wrong on the energy consumption of high speed trains, as new high speed trains will be more efficient than the existing InterCity rolling stock. But let's compare like with like. The laws of physics are quite clear: the same train travelling at 300kph will consume more energy than if it was only travelling at 200kph.

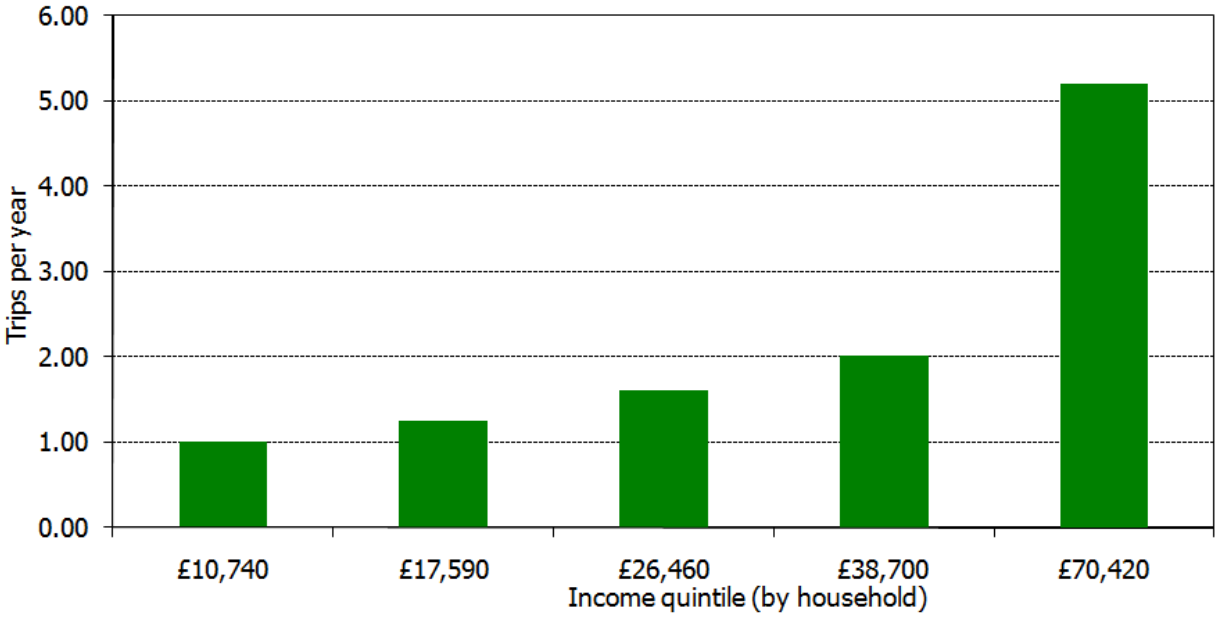
And the Greengauge21 note gives the impression that I was attacking HS2 Ltd's conclusions on the environmental benefits. In fact I was reporting that HS2 Ltd themselves had concluded that the impact of the project was broadly carbon neutral, and explaining in simple terms why this was the case.

If the Government wanted to reduce the carbon impact of transport, Ministers would be working out how to reduce travel by all modes or make more environmentally friendly modes cheaper, not encouraging growth and expensive alternatives.

3.6 Passenger profile

Research shows that nearly half (47 per cent) of long distance rail journeys in Britain are made by people from households in the top income quintile:

Long distance rail trips by income (source NTS)



Source: 'Modelling Long-Distance Travel in the UK', Charlene Rohr, James Fox, Andrew Daly, Bhanu Patruni, Sunil Patil, Flavia Tsang. RAND Europe, NTS 2002/5, income data 2005/6 ONS

Expenditure on HS2 therefore represents regressive taxation, as the people likely to use it are typically much wealthier than the average for the whole population.

This is likely to become even more marked, as given the dreadful financial case for the route, it's likely that the government of the day will increase fares for flows on HS2 well above inflation, and potentially also seek to prevent franchisees operating parallel services on the existing network from offering cheaper alternatives, as they do now; for example, both Chiltern and London Midland currently offer cheaper fares for Birmingham – London journeys than Virgin.

Greengauge21 certainly think competition should be suppressed:

> *".....there is not to be (and should not be) a free ride provided to open access operators to soak up released capacity on the West Coast Main Line and offer slower but cheaper trains that wastefully rival HS2 services...."*

This will be a railway for the rich, with no cheaper alternatives, but paid for by everyone.

4. Conclusion

The closing sentence of Greengauge21's paper reads "the case against HS2 has not been made". Surely the onus on Government, and HS2's supporters, should be to show that the case for HS2 is made before they ask taxpayers to pay for a new project with no financial return, and costing broadly the same as Trident?