



Llywodraeth Cymru
Welsh Government

The Rail Network in Wales

The Case for Investment

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Mae'r ddogfen yma hefyd ar gael yn Gymraeg.
This document is also available in Welsh.

This study was led by Prof Mark Barry of Cardiff University and undertaken by a combined team of: M&G Barry Consulting, Arup, Mott MacDonald, Cogitamus and SDG. Support and contributions from WG/TfW, NR and a wide range of stakeholders was also secured. This public facing “summary” document is supported by two more detailed Programme Strategic Outline Cases; one for north Wales and one for south Wales

Credit/copyright of some of the demographics and employment activity maps to: Duncan Smith, at the Centre for Advanced Spatial Analysis, University College London ([Lumino City](#))

Foreword

I'd like to thank all those who have worked so diligently over the last six months to undertake this study and to rigorously examine whether there is a case for investment in Wales' rail infrastructure.

The supporting detail is comprehensive and thorough in its analysis. The emerging reality is that although new improved rail rolling stock will be delivered across the UK over the next few years, disappointingly, these vehicles will only be able to operate in "2nd gear" at best in Wales.

For example, the new Intercity Express Trains (IET) being rolled out for GWR services between Swansea and London are capable of 140mph and whilst they operate at 125mph between Bristol and London, they will only be able to operate at typically 90mph or less between the Severn Tunnel and Swansea.

This is related to the fact that the Welsh rail network has not received an equitable proportion of UK rail investment over many years. The Wales Route, which represents 11% of the UK rail network, has received just over 1% of rail enhancements (which are typically focussed on improving network capability, reliability and capacity) in recent years.

The result is a less efficient railway with lower capacity versus the UK as a whole, leading to lower demand and higher subsidies per passenger; more worryingly it is also having a detrimental impact on the Welsh economy.

Our conclusions, which are consistent with the findings of both the Welsh Affairs and Transport Parliamentary Select Committees at Westminster, is that investment is needed, is justified and can deliver economic benefits; the proposals set out in this study could contribute at least £2Bn to the Welsh economy.

Our economy needs faster and more frequent services between Wales' major towns and cities and to other key UK commercial centres such as Bristol, London, Manchester, Birmingham, Glasgow, Edinburgh, Leeds and Liverpool as well as to major international gateways like Heathrow and Manchester airports. Our ambition is to see journey times of: Cardiff to Paddington in 90 minutes, Swansea to Cardiff in 30 minutes, Cardiff to Bristol Temple Meads in 30 minutes, Holyhead to Chester in 60 minutes and Llandudno to Crewe in 60 minutes. To achieve this ambition, the main lines in north and south Wales should both be capable of 100 mph and have sufficient capacity to operate faster long distance and additional local all-stop services.

More than that, given our shared environmental responsibilities and the need to address issues of road congestion, especially air quality impacts, we need to develop a viable and affordable alternative to the car. Whilst rail does not currently serve all parts of Wales it does cover a large and growing proportion of our population. Therefore, investment in rail infrastructure aligned to future innovations in traction power will enable us to travel when required, more sustainably in future and at the same time provide essential enhancements to a key part of our country's economic infrastructure. The vital role of bus services and active travel modes have not been overlooked; whilst not a focus of this study, they are vital elements an integrated public transport network for communities all over Wales and often provide an important part of the total end-to-end journey alongside rail travel.

I look forward to working with both the UK and Welsh Governments to progress the schemes set out in this initial study.

Prof Mark Barry, September 2018.

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1 SUMMARY

1.1 Background

Following the July 2017 cancellation of electrification on the Great Western Main Line (GWML) between Cardiff and Swansea, the Secretary of State for Transport announced the development of business cases for rail enhancement schemes across Wales. To support this work, the Cabinet Secretary for Economy and Transport Ken Skates announced in May this year that Professor Mark Barry of Cardiff University would lead a programme to establish the strategic and economic case for investment in Wales' rail infrastructure. This executive summary – ‘*The Case for Investment*’ – and Programme Strategic Outline Cases (PSOC) are the outputs of that work.

We have developed a positive and compelling case for major rail investment that addresses both the Welsh Government's (WG) economic ambitions and our broader environmental and well-being objectives. This is even more important given the scale and potential economic impact of rail schemes being developed elsewhere in the UK and the need to respond to the cancellation of the electrification of the GWML to Swansea.

The analysis is clear that a programme of investment in rail infrastructure in Wales is required to support a stronger, inclusive and more equitable economy, delivering prosperity for all by connecting people, communities and businesses to jobs, services and markets. Improved rail infrastructure and services will help to deliver a range of overarching social and economic needs, as set out in the Cabinet Secretary's announcement:

“...improving connectivity and reducing journey time between cities in Wales; expanding the city region areas across Wales; growing cross-border economies; enhancing connectivity from Wales to London; improving access to airports; maximising the potential benefits and offset negative consequences of High Speed 2 (HS2); providing compelling journey choices to users of the congested M4 at Swansea; and meeting trans-European network standards.”¹

This analysis supports the case for change and sets out the key findings and recommendations of the work undertaken since the announcement through two Programme Strategic Outline Cases. The work also reflects extensive discussions with stakeholders in both north and south Wales from business, education, local government and the rail industry.

In doing so, an initial vision, objectives, and some potential interventions have been set out that will be developed through more detailed business cases. These include measures to maximise the potential positive economic impacts of HS2 in north Wales, and to address its potential negative economic impacts in south Wales. Equally important, are the opportunities that these proposals present for more of us to travel more efficiently and sustainably.

This work also supports and informs the more detailed Strategic Outline Cases that the Department for Transport (DfT) has asked Network Rail to undertake in respect of specific schemes in Wales including improvements to the infrastructure on the North Wales Coast mainline, the Wrexham to Bidston line, and between the Severn Tunnel and Cardiff.

1.2 Long term under investment in Wales' rail infrastructure

A key finding of this work is the identification and quantification of a long-term and systematic under-investment in Welsh rail infrastructure compared to the UK as a whole. For example, the Office of Road and Rail data² for 2011-2016 shows that the Wales Route, which covers 11% of the UK network, has only received just over 1% of the enhancement budget (£198m out of an England and Wales total of £12.2bn). These choices and priorities are made and set by the UK Government on behalf of Wales. Wales has been underfunded, if one uses the Wales Route as a basis, by more than £1bn over that period. This at a time when the UK is committing £56bn to High Speed 2, and potentially £30bn to Crossrail 2 in the south-east, and £70bn to Transport for the North³ over the next 30 years to deliver major schemes like Northern Powerhouse Rail (NPR).

¹ Extract from a Statement by the Cabinet Secretary for Economy and Transport: Ambitions for Great Western and North Wales Main Lines, 08 May 2018 <http://record.assembly.wales/Plenary/4981#A43301>

² ORR Annual Efficiency and Finance Assessment 2014-15 | Network Rail - Wales Route Plan 2014-2019

³ https://transportforthenorth.com/wp-content/uploads/TfN-Strategic-Plan_draft_lr.pdf

Enhancements improve the capability, capacity and reliability of the rail network, and so the limited investment in Wales contributes to fewer and less attractive services, resulting in a lower modal share for rail and higher subsidies per passenger.

This analysis is consistent with recent reports published by both the Welsh Affairs and Transport Parliamentary Select Committees at Westminster. The House of Commons Transport Committee has recently concluded that the Department for Transport's current decision-making processes and existing systems of scheme appraisal work against regions outside the south-east as they are weighted heavily towards the reduction of existing congestion while disadvantaging areas in need of economic regeneration. In developing plans for new rail schemes, we cannot be constrained by a process that has historically disadvantaged Wales and must instead focus on progressing schemes that deliver on our wider objectives.

1.3 Vision for rail in Wales

Our overarching vision for rail in Wales is shown below (*Figure 1*). To frame more detailed scheme and business case development we have developed with stakeholders overarching visions and a set of objectives for rail enhancements across four key workstreams as follows:

- North Wales
 - North Wales Main Line
 - Wrexham-Merseyside (Borderlands line)
- South Wales
 - South Wales Main Line
 - Swansea Bay Urban Area

This initial focus will support the Department for Transport's development of the business cases for these areas. Further Programme Strategic Outline Case schemes can be developed as the work is progressed.

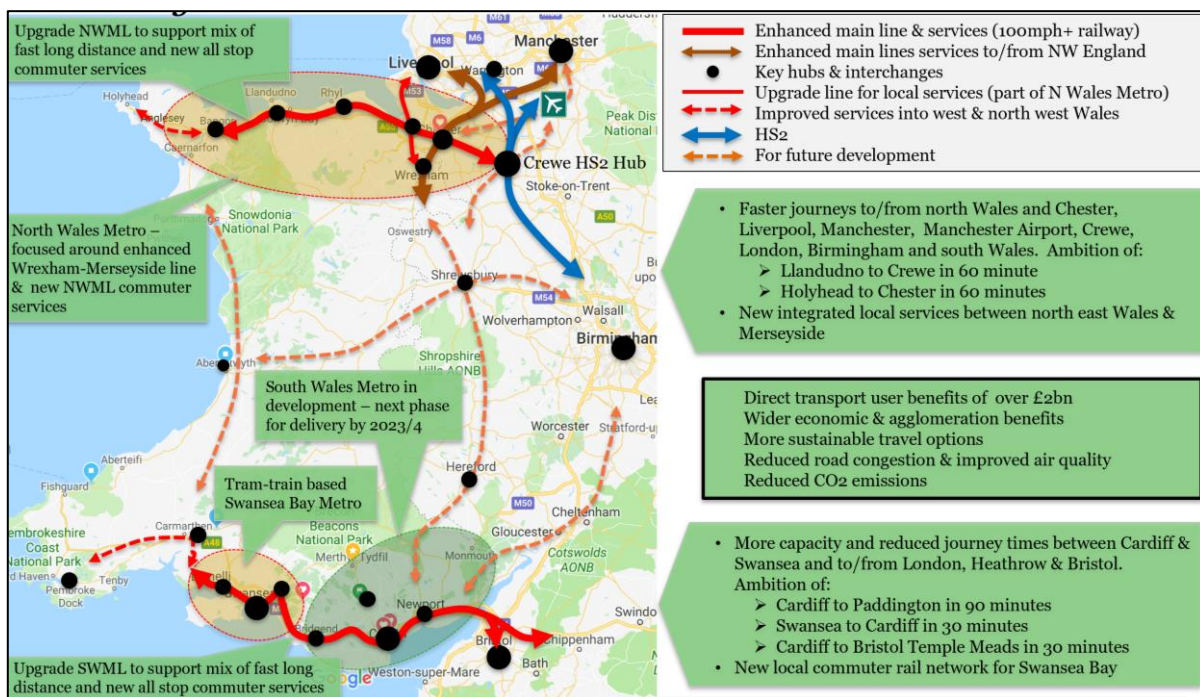


Figure 1 All Wales view of Vision and overarching objectives

1.3.1 North Wales Main Line (NWML)

Vision: Building upon the work of Growth Track 360 to support inclusive and balanced economic growth in Wales and north west England, by providing faster and more frequent services through investment in the north Wales coast line and by maximising the benefits of HS2.

Objectives: To deliver on this vision for north Wales interventions will need to:

1. Widen access to employment across north Wales, Cheshire and Liverpool by improving rail services.
2. Develop a service pattern (journey time and frequency) that supports Growth Track 360's ambitions:
 - a. Journey times of less than one hour between the main centres of Holyhead and Chester; and Llandudno and Crewe
 - b. Frequency doubling between Holyhead and London; and Holyhead to Cardiff/Birmingham
 - c. Frequency doubling between the north Wales coast and Manchester Airport
 - d. At least one train per hour from the north Wales coast and Wrexham to Liverpool
3. Enhance rail connectivity from north Wales to international gateways at Manchester and Liverpool airports.
4. Promote social inclusion by improving local access to employment, services & key centres.
5. Provide a viable public transport alternative to private car journeys, for all journey purposes including tourism.
6. Provide sufficient capacity and improve rail network resilience in north Wales to accommodate future demand.
7. Promote interventions that integrate with HS2 and the major developments at Crewe and Chester stations to support cross-border passenger journey requirements
8. Reduce the environmental impact of transport, especially carbon emissions & air quality.
9. Improve rail network efficiency to allow a lower future subsidy requirement per passenger.

At this stage we anticipate the most likely interventions required to deliver this vision, include:

- Modernisation of the North Wales Main Line (NWML) from Crewe to Holyhead (including line speed improvements, re-signalling and electrification);
- Faster long-distance services from key hubs in north Wales to London, Manchester, Manchester Airport, Liverpool & Cardiff with fewer stops
- Hourly connectivity to London via Crewe (direct and/or via HS2)
- New local all-stop commuter services in north east and north west Wales
- Double track Wrexham-Chester to support additional services
- On-track capacity and operational enhancements at Chester station
- Selected new stations across the network

1.3.2 Wrexham-Merseyside (Borderlands line)

Vision: Supporting economic growth and improving connectivity across the north Wales and Merseyside area by enhancing the Borderlands rail line to deliver faster, more frequent, and better integrated services.

Objectives: To deliver on this vision for the Wrexham – Merseyside area interventions will need to:

1. Widen access to employment across north Wales, Cheshire, Liverpool and Manchester by improving rail services.
2. Provide a frequent and well-connected transport system that supports the economic aspirations of the north Wales and Mersey – Dee regions.
3. Promote social inclusion by improving local access to employment, services and key centres.
4. Maximise the potential for stations to accelerate urban regeneration and major development site delivery.
5. Increase the proportion of journeys in north east Wales undertaken by rail.
6. Contribute to developing a north Wales Metro including improvements to multi-modal interchanges.
7. Reduce the environmental impact of transport, especially carbon emissions & air quality.
8. Improve rail network efficiency to allow a lower future subsidy requirement per passenger.

At this stage we anticipate the most likely interventions required to begin to deliver this vision, include:

- Full operational integration of the Wrexham-Bidston service with Merseyrail permitting faster through running to central Liverpool operating at 4 trains per hour (tph)
- A new station at Deeside Industrial Park with Park and Ride (P&R) and improved local bus links
- Major upgrade to Shotton station to improve interchange
- Park & ride facilities at selected stations with bus integration at several stations along the line

1.3.3 South Wales Main line (SWML)

Vision: Supporting inclusive and balanced economic growth in Wales and south west England by providing faster and more frequent services through investment in the Great Western rail corridor.

Objectives: To deliver on this vision for the South Wales Main Line interventions will need to:

1. Reduce rail journey times between West Wales and London, towards targets of:
 - a. 90 minutes between Cardiff and London Paddington
 - b. 30 minutes between Cardiff and Bristol Temple Meads
 - c. 30 minutes between Swansea and Cardiff
2. Increase service frequencies between south west Wales and London; Cardiff and Bristol Temple Meads; and Swansea and Cardiff.
3. Provide sufficient capacity and improve rail network resilience between Cardiff and Bristol to accommodate future passenger and freight demand.
4. Enhance rail connectivity to international gateways/airports and Enterprise Zones
5. Improve Park and Ride provision for accessing the South Wales Main Line and reduce reliance on the M4 corridor
6. Improve integration between main line rail and the wider transport network, especially the developing south Wales and Bristol Metro systems.
7. Maximise the potential for stations to accelerate urban regeneration and major development site delivery.
8. Increase the number of trips made by public transport, focusing on commuter trips.
9. Reduce the environmental impact of transport, especially carbon emissions & air quality.
10. Improve rail network efficiency to allow a lower future subsidy requirement per passenger.

At this stage, the most likely interventions required to begin to deliver this vision, include:

- Line speed improvements from Severn Tunnel Junction to Swansea and beyond that enable the benefits of new trains to be realised (including consideration of electrification and more capacity)
- New services operating on a balanced pattern of fast and stopping services (4tph from Cardiff to London and 2 tph from Swansea; 4 tph Bristol Temple Meads to Cardiff and 2tph from Swansea).
- Potential for new stations at Magor, Llanwern, Cardiff Parkway, Rover Way, Miskin-Junction 34, Brackla, Cockett and St Clears.
- Enhanced transport interchange and Park and Ride near the M4 in Swansea Bay.

1.3.4 Swansea Bay (Urban Area) Metro (Figure 2Error! Reference source not found.)

Vision: Accelerating economic growth across the Swansea Bay City Region, expanding labour market catchments, and encouraging investment by transforming the region's rail network.

Objectives: To deliver on this vision for Swansea Bay interventions will need to:

1. Reduce journey times between key population centres including Swansea, Neath, Port Talbot, Llanelli, Carmarthen, Pembroke and Milford Haven.
2. Increase service frequencies
 - a. for local stations on the main line between Carmarthen and Port Talbot, especially during peak periods
 - b. on the Heart of Wales line to serve commuters into Swansea and beyond
 - c. across south west Wales to improve suitability for daily commuting
3. Improve regional transport accessibility through widening the spatial reach of the rail network and services.
4. Improve Park and Ride provision for access to the Swansea Bay region.
5. Provide a viable public transport alternative to the congested M4/A48 corridor
6. Contribute to developing a Swansea Bay Urban Area Metro including improvements to multi-modal interchanges.
7. Maximise the potential for stations to accelerate urban regeneration and major development site delivery.
8. Increase the number of trips made by public transport, focusing particularly on commuter trips.
9. Reduce the environmental impact of transport, especially carbon emissions & air quality
10. Improve rail network efficiency to allow a lower future subsidy requirement per passenger

At this stage we anticipate the most likely interventions required to begin to deliver this vision, include:

- A new dedicated Swansea Bay commuter rail network serving a range of new and existing stations (for example, Landore, Felindre and Winch Wen)
- Subject to operational feasibility, two initial routes (including some new infrastructure) could be operated using the rolling stock based on the tram-train that will be procured for the South Wales Metro.
 - A Llanelli – Pontarddulais – Swansea 'Metro' service
 - A Port Talbot – Neath - Swansea 'Metro' service.
- Tram-train capability to give more affordable and flexible extension options in later phases
- Park and Ride provision at key stations
- Integration measures for active travel and bus routes to maximise the rail network's reach

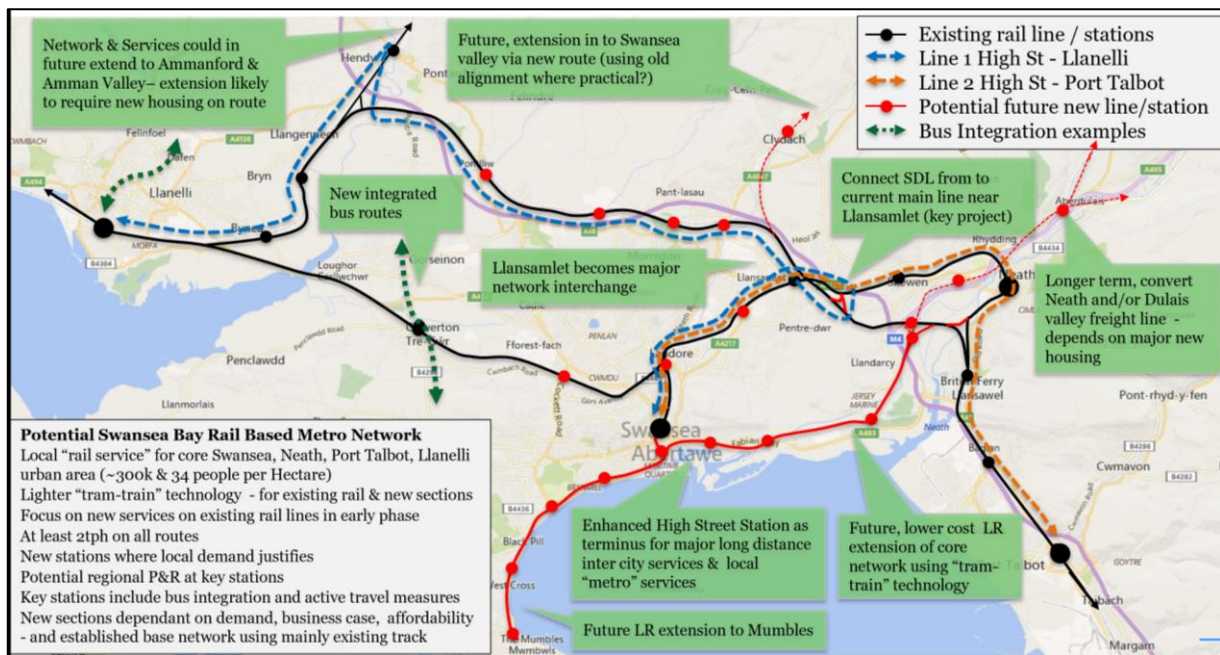


Figure 2 Illustration of a potential rail foundation for a Swansea Bay Metro

1.4 Economic benefits of over £2Bn

The work undertaken to date makes the case for further investment in Wales' rail infrastructure and has identified direct transport user benefits ranging from £1.8Bn to £2.4bn in present value terms (using 2010 prices) over a 60-year period. In strategic case terms this equates to approximately £50m annually of regional GVA impact (using 2015 prices) or over 1100 jobs. In addition, an initial assessment of intra-city agglomeration benefits identified a further £200M of benefits (using 2010 prices). This assessment is deliberately conservative in nature – especially in respect of agglomeration benefits – recognising that further and more granular analysis as part of more detailed business case development will be required. The baseline analysis was based on:

- A package of measures to increase frequencies to 4 trains per hour along the North Wales Main Line, a one-hour journey between Chester and Holyhead, additional stations, and integration with HS2;
- A Wrexham to Merseyside package to deliver 4 direct trains per hour from Wrexham to Liverpool via Bidston, with additional stations;
- Enhancements to the South Wales Main Line to deliver lower journey times and improved frequencies including 4 trains per hour between South Wales and London (of which 2 would originate from Swansea or further west), 4 trains per hour between Cardiff and Bristol, and at least 4 trains per hour between Swansea and Cardiff.
- A dedicated Swansea Bay commuter rail network using rolling stock based on the tram-train that will be procured for the South Wales Metro. In the first instance two new services linking Swansea High Street and Port Talbot to the east and Llanelli via Llanamlet and the Swansea District Line

These benefits are generated by reducing journey times for rail passengers, with significant benefits to business users. Additional benefits also arise from reduced road congestion, environmental benefits (especially improved air quality and reduced CO₂ emissions), and safety improvements through reductions in car use.

This analysis will be expanded and refined in subsequent and more detailed business case development to: assess benefits on a more granular basis; to baseline those benefits and costs at the same point in time; to better model intercity agglomeration benefits; and to determine where the maximum benefits can be associated with the most affordable capital programme.

1.5 Key decisions

These proposals present major opportunities, challenges and decisions, and highlight some key options - with advantages and disadvantages – which include:

- How best to operate rail services on the South Wales Main Line from London/Bristol to west Wales and in particular the balancing of the benefits of fast journeys between major stations and the role of rail services in enabling local journeys. This trade-off is particularly apparent for services between Port Talbot and Llanelli where there is significant demand for local travel but stopping all trains at local stations would significantly impact journey times. Deciding on the optimal solution will require further stakeholder discussion and will be especially important where new infrastructure may be required.
- The extension of the scope of Network Rail's work to enhance the relief lines to develop and deliver interventions along a greater extent of the South Wales Main Line and to Bristol Temple Meads in order to increase capacity, improve reliability and reduce journey times.
- The development of a new dedicated Swansea Bay Urban Area commuter rail network potentially using rolling stock similar to the tram-train technology being deployed for the South Wales Metro.
- The potential integration of Wrexham-Bidston with the Merseyrail network and the future role of Shotton Station as a Metro Hub.
- The orientation of the Crewe HS2 hub and the need to ensure ease of connectivity between HS2 and north Wales services, its impact on direct London to north Wales services, and the routing of Cardiff-Manchester services.
- The approval for the full extent of the signalling enhancements originally proposed for the North Wales Main Line.
- The development of further measures at Chester station to enhance operational capacity and reliability in order to support the proposals we have set out.
- The early completion of the Western Rail Link to Heathrow – with the potential to support direct services from south Wales and south west England into Heathrow.
- To test options in partnership with third parties, of interventions that deliver faster services and more capacity between north Wales, Chester, Manchester, Manchester airport, Liverpool and Leeds. *In doing so, development of Northern Powerhouse Rail (NPR), HS2 Phase 2b and the potential Manchester western rail access should reflect this requirement.*

An ongoing process that engages with relevant stakeholders and industry partners will be essential to secure support for preferred interventions. We have already and will continue to engage with organisations such as Merseytravel, Transport for the North, DfT, Network Rail (NR), local authorities as well as business-led groups like Growth Track 360, the CBI and the Chambers of Commerce.

1.6 Next Steps for Scheme Development

Work will continue to develop and consult on the proposed enhancements to the rail network which the UK Government must make if it is to fulfil its promise to rebalance the UK economy. The current form of programme cases will be made available to Network Rail and the Department for Transport to frame the development of their specific scheme business cases.

A commitment is now needed from the UK Government to fund the development and delivery of an ambitious, realistic, and equitable rail investment programme for Wales.

The priority items identified for North and South Wales which should be subject to further formal development are as follows:

- North Wales
 - Introduction of all stop commuter services on the North Wales Main Line (NWML) to enable limited stop faster long-distance services
 - Line speed and capacity upgrade of the NWML; electrification to be considered in this context
 - Wrexham-Bidston-Liverpool upgrade, integration with Merseyrail services, upgrade of Shotton interchange & development of Deeside Parkway
 - NWML new stations
 - Chester Station enhancements
 - Crewe Hub and interface with NWML services
- South Wales
 - Introduction of additional services on the South Wales Main Line (SWML) from Bristol and London
 - Line speed and capacity upgrade of the SWML from Bristol to West Wales; electrification and new infrastructure to be considered in this context
 - Swansea Bay Metro (rail-based component)
 - Swansea Bay/ West Wales Parkway (linked to last two items)
 - SWML new stations
 - Western Rail Link to Heathrow (being progressed by DfT/NR)

2 POLICY CONTEXT AND MAJOR UK RAIL SCHEMES

Both the UK⁴ and Welsh Governments recognise the importance of infrastructure to the economy. For example, the Department of Transport's (DfT) 2017, "Transport Investment Strategy" highlighted the need to, "*build a stronger, more balanced economy by enhancing productivity and responding to local growth priorities.*" Welsh Government's (WG) "Programme for Government" sets out ambitions for a "*united and connected country*"; plans for the South Wales Metro to help support economic development right across South East Wales; and those in development for North Wales exemplify these commitments.

Taken together these analyses and policy statements confirm the importance to both the Welsh and UK economies of:

- Improving the efficiency of transport networks – both within and between major city regions
- Enabling more efficient labour markets by providing
 - people with more choices of, and easier access to, places of work (also recognising changing work patterns and opportunities to work from multiple locations)
 - employers with access to larger pools of labour and more options of where to locate their operations;
- Creating more efficient transport networks which:
 - help to reduce CO2 emissions and air quality issues
 - support more sustainable forms of transport
 - enable economic development; especially, to help support new employment and housing in areas that have struggled to do so - partly because of issues related to current transport provision

2.1 Approach

This work was undertaken using Welsh Government's updated WelTAG guidance (stage one) and also complies with the DfT's WebTAG guidance, Strategic Case Guidelines and Rebalancing Toolkit. The business cases also demonstrate how investment will help meet the broader aims of Welsh Government as set out in its Well-being of Future Generations Act, Environment Act and its economic strategy, Prosperity for All, as well as meeting the UK Government's aspirations for a more productive and balanced economy. At this early stage the focus has been on making the case for investment.

2.2 High Speed 2 (HS2) and Northern Powerhouse Rail (NPR)

The DfT via HS2 Ltd, is currently delivering the £56bn HS2⁵ project to increase rail capacity and reduce journey times between London and the North of England. In work commissioned by the DfT, KPMG have estimated⁶ that HS2 will boost the UK economy by £15Bn every year. Similarly, Transport for the North (TfN) has recently announced⁷ an ambitious £70bn 30-year plan, which includes 'Northern Powerhouse Rail (NPR)', to transform rail connectivity across the north of England, which is claimed will deliver benefits of £150bn by 2050⁸.

Whilst HS2 delivers much needed capacity on the UK rail network, the impact on journey times (*Figure 5*) will be even more significant. Following GWML electrification, whilst Cardiff-London journey times will still be at best 1hr 45min (a journey time achieved in the 1980s) and Swansea-London 2hr 45min, HS2 will enable London to Manchester journeys of 1hr 5 mins. Whilst there are different commercial, technical and demand profiles on these routes, these differences materially matter and have an economic impact – for example on individual investment decisions pertaining to business activity and location.

⁴ <https://www.gov.uk/government/publications/transport-investment-strategy>

⁵ <https://www.gov.uk/government/policies/hs2-high-speed-rail>

⁶ http://news.bbc.co.uk/2/shared/bsp/hi/pdfs/18_10_13_newsnight_hs2.pdf

<http://assets.hs2.org.uk/sites/default/files/inserts/HS2%20Regional%20Economic%20Impacts.pdf>

⁷ <https://transportforthenorth.com/northern-powerhouse-rail/>

⁸ <https://transportforthenorth.com/wp-content/uploads/Northern-Powerhouse-Rail-booklet-FINAL.pdf>

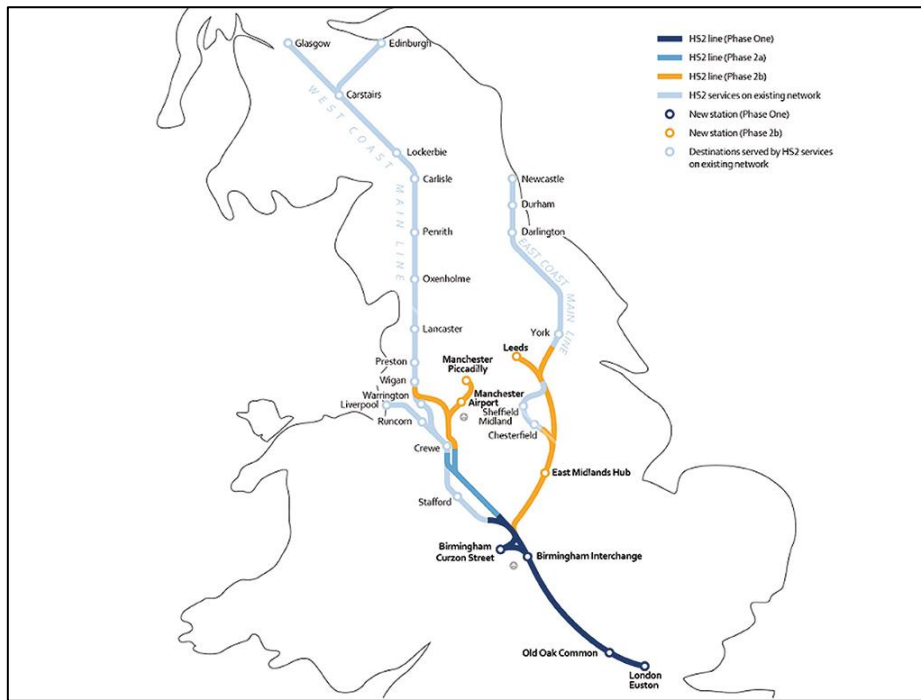


Figure 3 DfT Plans for HS2

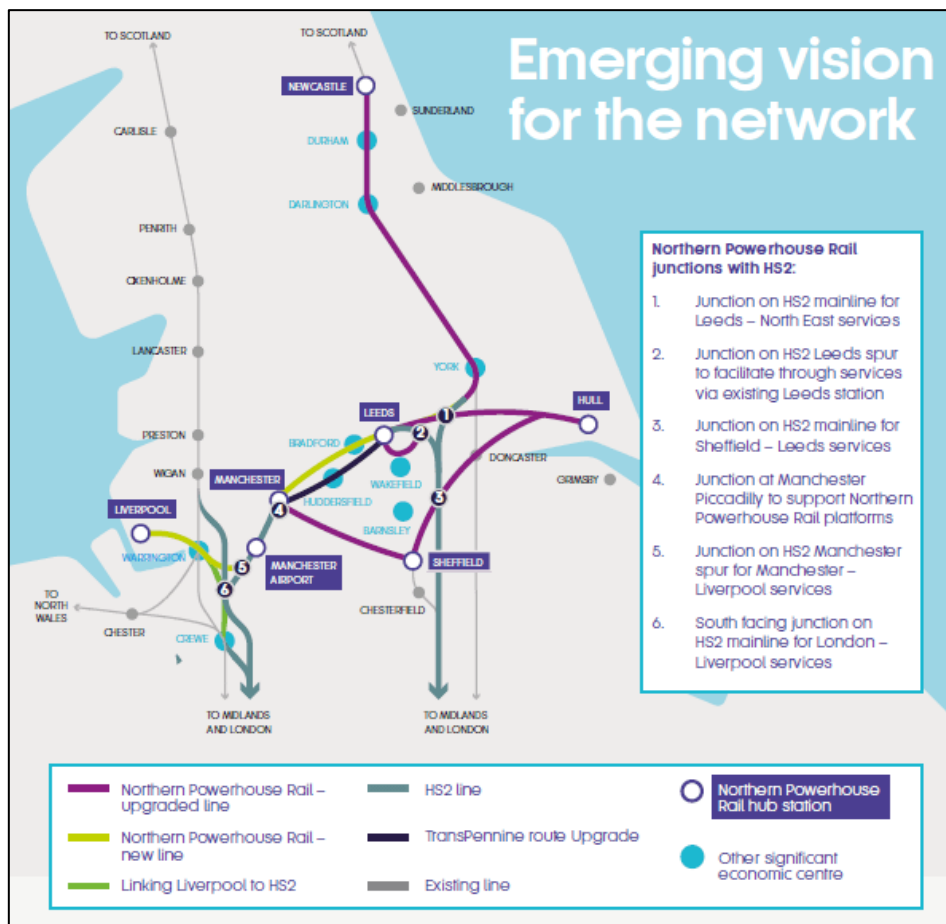


Figure 4 Emerging proposal for Northern Powerhouse Rail

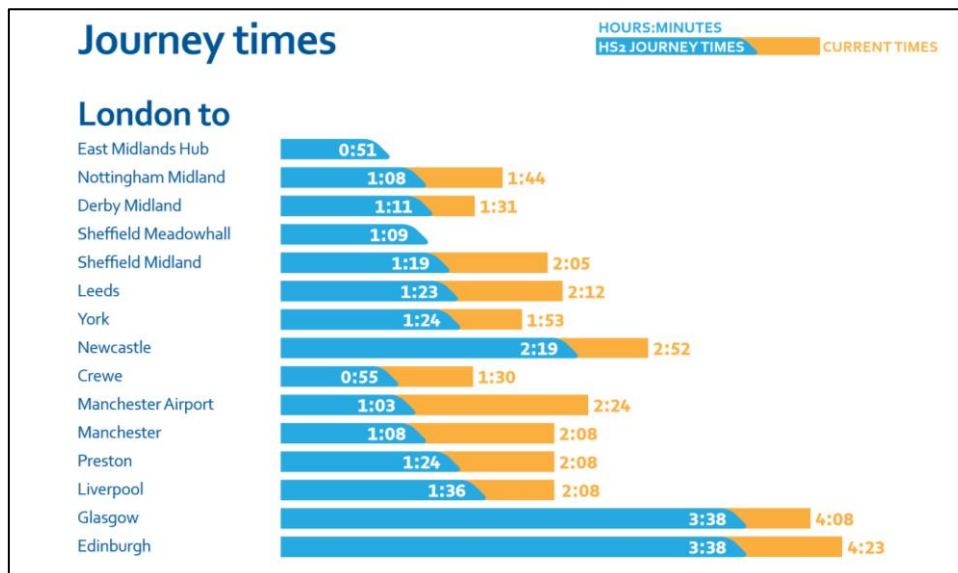


Figure 5 DfT estimated journey times to London using HS2

Whilst we welcome the scale and ambition of HS2 and NPR, we are also mindful of the potential impact on Wales, even when one takes account of the current Great Western electrification and Inter City Express Train (IET) programme. The DfT-commissioned KPMG analysis estimated that whilst North Wales GDP could benefit £50M per annum from HS2, South Wales GDP could be reduced by £200M per annum.

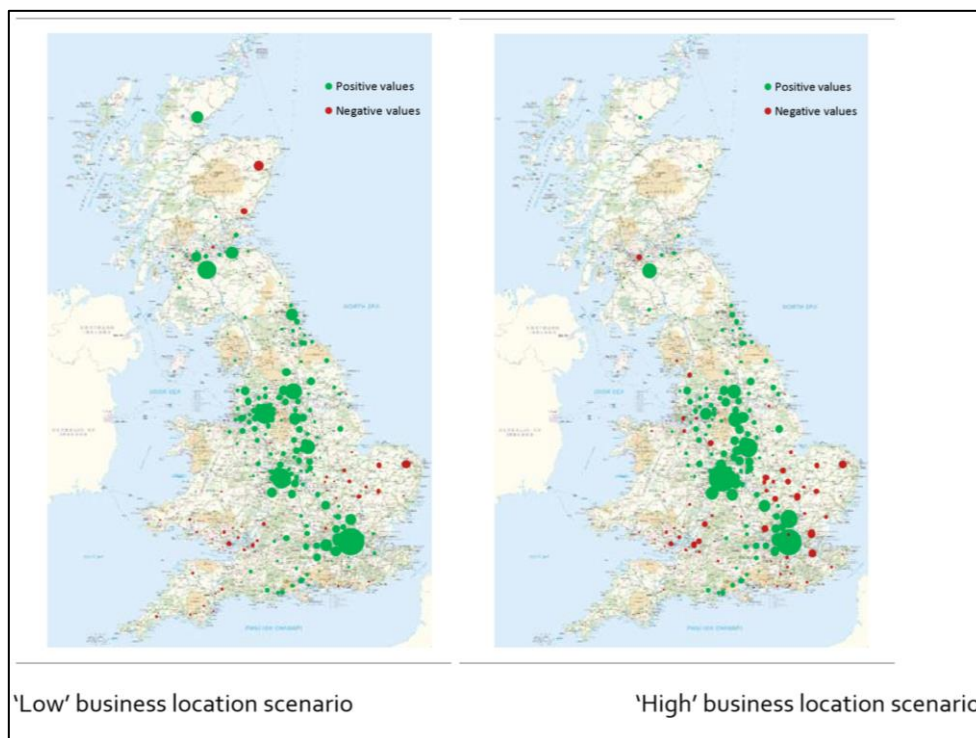


Figure 6 From DfT Study: Potential distribution of economic output in 2037 after investment in HS2

Furthermore, in developing both HS2 Phase 2b, NPR and a potential western rail link to Manchester airport, opportunities to integrate and provide services through Chester to north Wales must be considered.

2.3 Wider evidence supporting the case for investment in the Welsh rail network

The recent Greengauge 21 report, “Beyond HS2”⁹, assessed rail connectivity between Wales and the rest of the UK to be poor. For example, Cardiff has the worst rail connectivity of all the UK’s major cities (Figure 7).

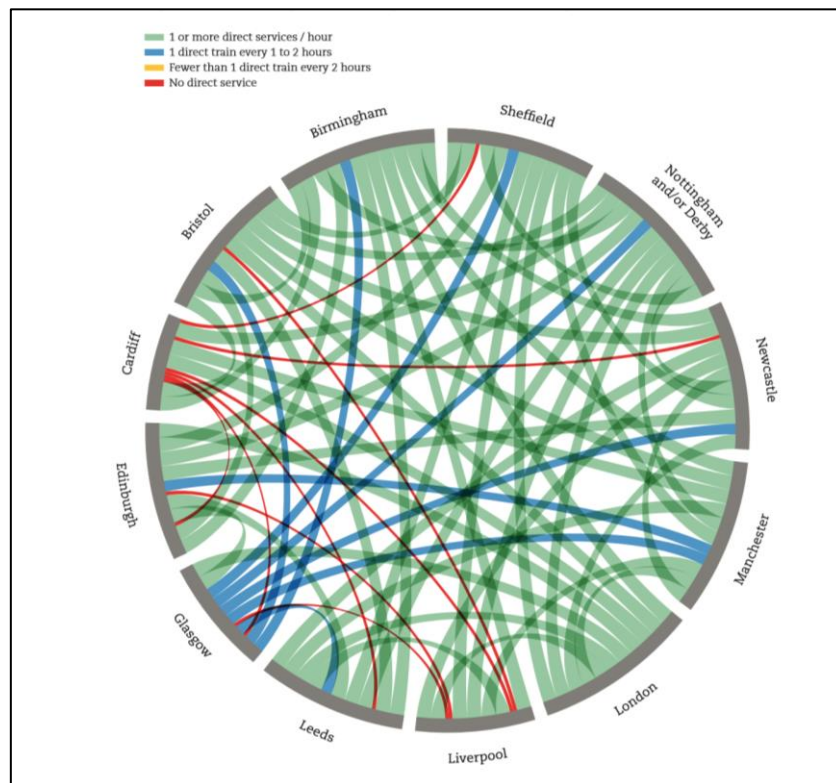


Figure 7 Cardiff rail connectivity vs major UK cities (from Greengauge 21 - Beyond HS2, May 2018)

That same report also made the case for further investment in the UK rail network to support more balanced economic growth across the UK and identified schemes that could benefit the Welsh economy. Whilst not explored in this study, these included the conversion of the Y shaped HS2 network into an “X” network and the further upgrade of the GWML to Swansea (Figure 8). However, we also see the importance of connecting north Wales to this concept network, especially services from north Wales via Chester to the HS2 hub at Crewe which will be only 55 minutes from London once HS2 is operating.

The report also identified schemes that would improve connectivity to and from Wales. These include the Manchester Western Airport rail link which provides the potential to route Trans Pennine rail services from Manchester and the airport to the mid-Cheshire line via Chester and on to north Wales

In respect of the GWML/SWML a 2013 study¹⁰ commissioned by the Great Western Partnership (and which itself sourced earlier quantitative analysis), also found a clear link between economic productivity and travel time from London along the GWML. It also found that beyond a two-hour London journey time, there is a marked reduction in business activity and productivity.

A study¹¹ by the University of the West of England and the University of Bath, estimated that the productivity gap experienced in south west England and which can’t be attributed to other factors, is explained by two travel time variables: the average travel time to London and to the next four largest conurbations (Birmingham, Manchester, Leeds and Glasgow). It is also noted that the journey time variable also has a significant bearing on the relative productivity of the Welsh economy (along with some other English regions). A 10% change in journey times is associated with a 0.6% change in annual business productivity

⁹ http://www.greengauge21.net/wp-content/uploads/Beyond_HS2WEB.pdf

¹⁰ Greengauge 21, 2012, [Great Western Conditional Output Statement](#), for The Great Western Partnership

¹¹ University of the West of England and University of Bath (2006), Meeting the Productivity Challenge 2: Update, 2006 - Report of a study carried out for the South West of England Regional Development Agency.

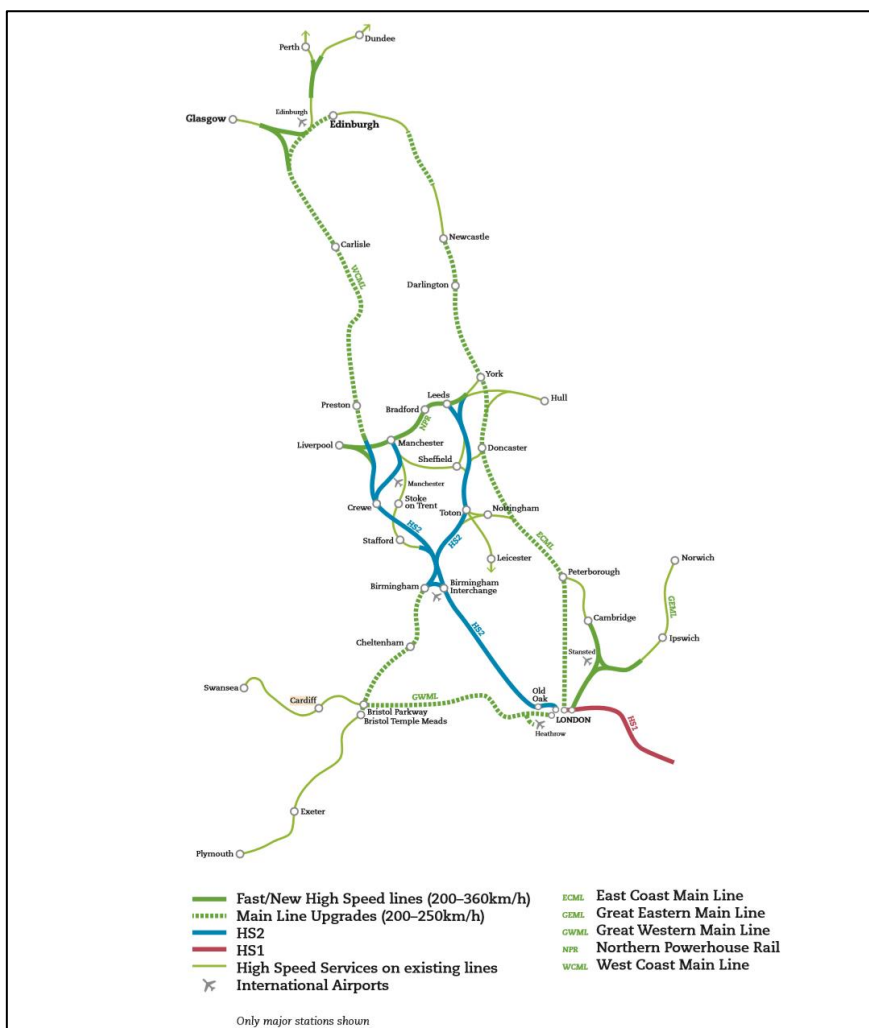


Figure 8 Potential UK HSR “X” network (from Greengauge 21, “Beyond HS2”, May 2018)

The importance of investing in transport to support greater productivity was also recently restated in a report by the CBI¹², “Unlocking Regional Growth, Understanding the Drivers of Productivity Across the UK’s Regions and Nations”.

There is, therefore, a pressing need to develop the primary rail routes in Wales – the North Wales mainline and the South Wales and Great Western mainlines – to enable benefits commensurate with HS2 and NPR, and so complement these major schemes in England to help build, as the DfT set out in its “Transport Investment Strategy”¹³, “a stronger and more balanced economy” (p7).

This objective is also consistent with the findings of the widely respected, 2006 DfT commissioned, Eddington Transport Study¹⁴, the first of which was, “There is clear evidence that a comprehensive and high-performing transport system is an important enabler of sustained economic prosperity.”

2.4 The European TEN-T Network

The European TEN-T network is comprised of roads, railway lines, inland waterways, inland and maritime ports, airports and rail-road terminals throughout the 28 Member States of the European Union and some joining countries. Building on existing and planned infrastructure, the network aims to provide seamless transport corridors for passengers and freight. The TEN-T consists of two planning layers: a comprehensive network and a core network.

In Network Rail’s Wales Route area, the North Wales Coast Main Line between Crewe and Holyhead is defined as a core passenger network, and the route between Bristol Parkway and Cardiff Central is defined as a core passenger network, and a core freight network between Bristol Parkway and

¹² <http://www.cbi.org.uk/index.cfm/?method=inline&fileID=FC18E9C9-C854-4578-AE0D9A1C9367ABC6>

¹³ <https://www.gov.uk/government/publications/transport-investment-strategy>

¹⁴ <http://webarchive.nationalarchives.gov.uk/20090115123436/http://www.dft.gov.uk/162259/187604/206711/volume1.pdf>

Milford Haven. These are also included within the comprehensive rail network, along with other principal rail routes in Network Rail's Wales Route area such as the Marches Line and the Cambrian Line.

There is a legal requirement for member states to realise the core network's alignment according to the technical and operational characteristics by 2030, and the comprehensive network's alignment by 2050, unless the European Commission accepts that investment in infrastructure cannot be justified in socio-economic terms.

The TEN-T network across Wales would be broadly compliant in most areas except for railway infrastructure for which minimum standards cover electrification, line speeds, and electronic signalling (ERTMS). In respect of Network Rail's Wales Route area, for core routes the following compliance requirements and associated gaps in compliance were identified in the Wales Route Study:

Table 1 TEN-T Compliance status of core rail routes in Wales

<p>Electrification</p> <p>Requirement: The entirety of the Passenger and Freight Core Networks should be electrified by 2030.</p> <p>Gap: The following sections of the Core Networks within Network Rail's Wales Route area are not at present, electrified or funded for electrification by committed schemes:</p> <ul style="list-style-type: none"> • Crewe – Holyhead • Cardiff – Milford Haven <p>The majority of other sections of the UK's Core network have already been electrified.</p>
<p>Route Availability</p> <p>Requirement: The entirety of the Core Freight Network to be able to accommodate 22.5 tonne axle loads at 100kph by 2030.</p> <p>Gap: The current infrastructure in Wales is currently incompliant with the TEN-T requirement in the following area:</p> <ul style="list-style-type: none"> • Swansea – Llanelli (There are not currently, any funded schemes to upgrade the Route Availability on this line)
<p>Train Length</p> <p>Requirement: The entirety of the Core Freight Network to be able to accommodate 740m trains by 2030.</p> <p>Gap: The UK rail network is largely non-compliant with the train length requirements of the TEN-T Core Freight Network, even following the implementation of funded schemes in CP5.</p>
<p>European Railway Traffic Management System (ERTMS)</p> <p>Requirement: The entirety of both the Core Passenger and Freight networks should have ERTMS installed and operational by 2030.</p> <p>Gap: The UK's ERTMS implementation programme has not been developed with the aim of meeting the TEN-T requirements.</p>

2.5 Rail investment in Wales Versus the UK

The Office of Road and Rail (ORR) and Network Rail (NR) data in respect of investment in rail maintenance, renewals and enhancements also presents a case that Wales (and specifically the Wales Route) has not received levels of investment commensurate with the rest of the UK rail network since 2011 (when disaggregated data was first published by the ORR).

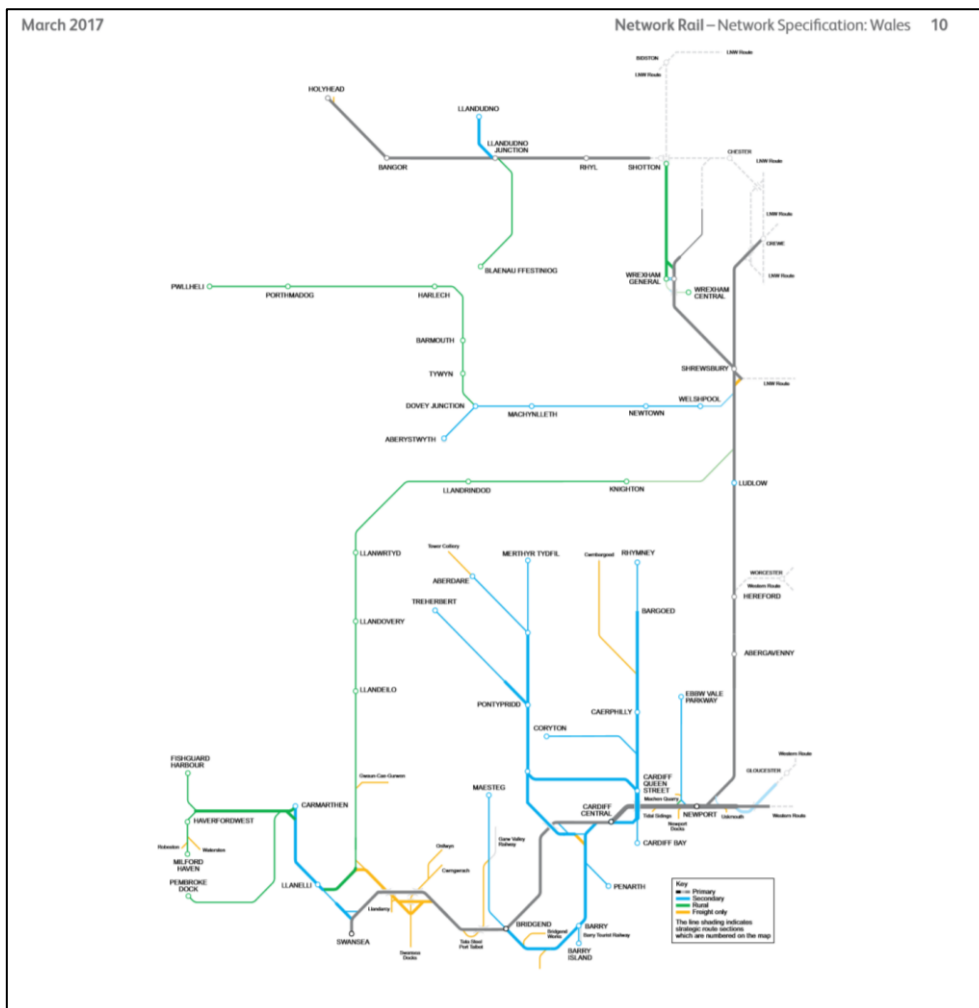


Figure 9 Wales Route from NR Network Specification 2017

Our analysis suggests that of the total England/Wales rail infrastructure, the Wales Route represents¹⁵ about 11% of the route length (1490km) and 9 % of the track length (2,458km).

Since its inception in 2011 until 2015-16, as a proportion of UK Government investment the Wales Route has received¹⁶, in cash terms, £1.99bn (~4.37%) out of an England/Wales total of £44bn. This is broken down as:

- £940m on Maintenance/Operations, categorised as non-capex (5.15%)
England / Wales total = £18.3bn
- £861m on Renewals (6.32%)
England / Wales total – £13.6bn
- £198m on Enhancements (1.63%)
England / Wales total = £12.2bn

¹⁵ ORR Annual Efficiency and Finance Assessment 2014-15 | Network Rail - Wales Route Plan 2014-2019

¹⁶ Network Rail Regulatory Accounts – 2011-2016

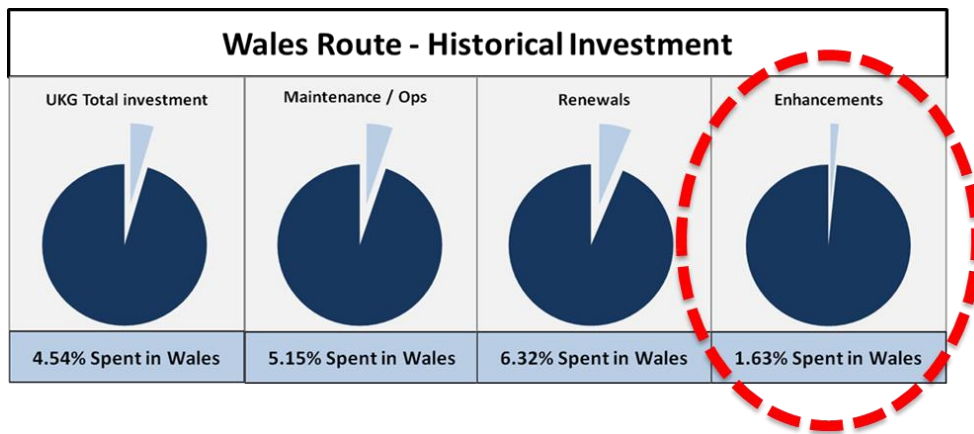


Figure 10 ORR Figures - Wales Route historical investment since 2011

There is a clear disparity between the levels of investment, particularly in enhancements, across the wider UK rail network versus the Wales Route. Given such investment impacts the capacity and reliability of the rail network, it is no surprise that there are network limitations;

- Slow journey times, for example:
 - Bangor to Chester (60 track miles) – 1 hour, 10 minutes (55mph)
 - Bangor to Manchester (100 track miles) – 2 hours, 40 minutes (42mph)
 - Bangor to Cardiff (208 track miles) – 5-6 hours (41 - 35mph)
 - Carmarthen to Cardiff (67 track miles) – 2 hours (34mph)
- Insufficient passenger and train capacity, for example:
 - Single lines (e.g. between Wrexham and Chester which has prevented direct services from Manchester and Liverpool operating to Wrexham)
 - Insufficient platforms at Cardiff Central, leading to passenger delays and constraining growth.
 - The current need to combine long distance and commuter services on much of the Welsh rail network

Collectively this contributes to fewer, less reliable and less attractive services resulting in a lower modal share for rail versus the UK as a whole. For example, rail is used for only 2.2% of journeys to work in Wales (versus 5.4 % in England and 4.6% in Scotland) and about 5% of passenger Kms.

The fact the metrics for funding per passenger km are higher in Wales than anywhere else in the UK (£0.43 per passenger Km in Wales versus, for example, £0.31 for London North East)¹⁷ is no surprise as many years of under investment has led to lower levels of passenger demand per track km and higher operational costs and subsidy per passenger versus the UK as a whole. This is a drain on both Welsh and UK governments' resources. Capital investment to enhance the capacity and reliability of the rail network, as has been demonstrated elsewhere in the UK, is the only way to improve this position.

For example, as a result of the £9bn West Coast Line upgrade in the early 2000s, Manchester is today just 2hrs 7mins from London (versus over 2hr 30mins previously) – just a few minutes slower than the current London to Cardiff journey (even though Manchester is 50 kms further away from London than Cardiff). This investment directly led to more demand for services between London and Manchester (an estimated tripling of passengers carried between 1997 and 2013) and precipitated capacity issues which have contributed to the case for HS2.

¹⁷ [ORR Rail Industry Financial Information 2016-2017](#), p19

A report by the Passenger Transport Executive Group (PTEG) in 2014, "A Heavy Load to Bear"¹⁸ also made the case for reviewing how Network Rail's track access fees are allocated based on its assessment that the regions of the UK outside London are disadvantaged by carrying costs that should be allocated to the south east of England, main intercity routes or freight.

Anecdotal evidence and that from earlier Welsh Government¹⁹ committees, suggests the underfunding of Welsh rail goes back to the 1990s. For example, in the 2011, the Enterprise and Learning Committee at the Welsh Assembly, concluded:

'This inquiry has left us with the distinct impression that Wales is not getting its fair share of investment in rail infrastructure, or getting it fast enough: programmes to electrify track, to improve stations and to upgrade rolling stock seem destined to reach Wales well behind other parts of the UK.'

This assessment has been recently validated by a report from the House of Commons Parliamentary Transport Select Committee in to UK rail investment²⁰. In their report, MPs say current transport scheme appraisal methods will always favour London as they are weighed heavily towards the reduction of congestion and journey time savings. This actively disadvantages less economically buoyant regions and works against the Government's intention to "rebalance the economy". Furthermore, analysing the data presented in that report²¹ in respect of public spending on rail across the UK indicates that per capita expenditure on rail in Wales is two thirds of that in England.

The Welsh Affairs Select Committee concurred with this conclusion in their recent report²² which further requested the UK Government to engage closely with the Welsh Government to identify and scope out cost-effective transport projects on which the money saved from the cancellation of electrification could be spent.

There is very compelling evidence therefore, that Wales has been caught in a "feedback loop" as regards rail investment. The result is an under-funded and less efficient network serving fewer passengers and requiring higher subsidy per passenger than would be the case had the route received a more equitable share of UK investment in rail enhancements.

¹⁸ http://www.urbantransportgroup.org/system/files/general-docs/A%20heavy%20load%20to%20bear_July%202014_FINAL.pdf

¹⁹ [National Assembly, Enterprise and Learning Committee, Future Rail infrastructure in Wales, January 2010](#)

²⁰ Transport Committee, June 2018, <https://www.parliament.uk/business/committees/committees-a-z/commons-select/transport-committee/inquiries/parliament-2017/rail-infrastructure-17-19/>

²¹ <https://publications.parliament.uk/pa/cm201719/cmselect/cmtrans/582/582.pdf>

²² [The Cancellation of Electrification in South Wales](#)

3 STAKEHOLDER FEEDBACK AND COMMENTS

At this early development stage, we have engaged formally and informally with a wide range of stakeholders to help determine the importance of a range of potential interventions and to gauge local economic concerns. These suggestions have been added to the interventions developed by the programme team and appraised accordingly.

Our study has built on the full body of work that has already been usefully carried out by our key stakeholders such as Growth Track 360 in North Wales, Network Rail (particularly its route studies), local authorities and city regions (plans and ambitions). The invisible Wales-England border for businesses and rail passengers means the north west of England makes a vital contribution to the north Wales economy; similarly, there are strong economic links between Cardiff, Newport and Bristol. Therefore, we have consulted widely amongst cross-border stakeholders.

As our work progresses, we will continue to widen our engagement with stakeholders to start to disseminate the findings of our high-level appraisal of options and build up a richer picture of views.

- Abertawe Bro Morgannwg University Hospital Board
- Arriva Trains Wales
- Bevan Foundation
- Blake Morgan
- Carmarthenshire County Council
- CBI
- Cardiff City Region Board – Transport Lead Authority
- Cardiff City Region Economic Growth Partnership
- Celtic Energy
- Cheshire East Council
- Cheshire & Warrington LEP
- Cheshire & North Wales Chamber of Commerce
- Chester Growth Partnership
- City & County of Swansea
- DB Cargo
- Greater Western Railway
- Growth Track 360
- JR Smart
- Mersey Dee Alliance Rail Task Force
- Merseytravel
- Neath Port Talbot Council.
- Network Rail (Wales Route & London North West)
- North Wales & North East Wales Metro Steering Group
- North Wales Business Council
- North Wales Economic Ambition Board
- North Wales Growth Board
- Pembrokeshire County Council
- POBL Group
- Swansea Bay City Region Board
- Swansea Bay City Region Economic Advisory Board
- South Wales Chamber of Commerce
- South West Wales Local Authority Transport Directors Group
- Swansea Economic Regeneration Partnership
- Swansea University
- TechHub Swansea
- The Urbanists
- Transport for the North
- Transport for Wales
- Veeqo
- Welsh Local Government Association

Summary of Key Stakeholder Feedback & Suggestions:

Jobs & Skills	To achieve a prosperous city economy, an efficient railway network is a necessity – it's as critical as a water system	Poor transport connectivity stifles skills base and the easy movement of people.	Infrastructure has huge effect on skills base. The lack of it, coupled with Brexit, means there's a large skills gap.
	Poor transport infrastructure and connectivity has a particularly negative effect on young people – lots of young people & young families leaving Wales.	Businesses consistently rate transport connectivity as critical for their business	Employment is negatively affected by poor service frequency
	There is a real 'opportunity cost' by not investing in rail infrastructure as inaction still costs tax payers money.	North east Wales and Deeside could continue to be strong in manufacturing with the right transport connectivity	Large amount of travel to work journeys in Swansea Bay are within the region so improved rail connectivity needs to focus on local not just strategic long-distance journeys
	Despite tourism being vital to the economy, the lack of connectivity means Wales punches below its weight in tourism terms	Rail fares are unaffordable along north Wales coast which is preventing rail-based commuting	Investment in Wrexham and Deeside would provide large dividends for jobs due to cross border employment patterns.
	It is not currently possible to reach Swansea between the hours of 08:00-09:00 from west Wales	Slow journey times from Swansea to London affects external perception of the region in investment terms	West Wales needs better connections to the jobs available in Cardiff
	Poor quality of rail service has negative effect on the roads network.	Rising congestion on A55 and M56. By 2025, M56 predicted to reach total gridlock for between five and six hours a day.	Serious congestion on M4 around Neath Port Talbot and West Wales causing significant air quality issues and negative impact on business.

Congestion	'Railheading' is common on South West Wales end of GWML whereby rail users drive to Neath or Port Talbot instead of their nearest station to catch London train. This causes local congestion for these areas.	Large number of business parks are not served by rail resulting in car-based congestion	
	North east Wales & Cheshire are at the margins of both Network Rail's Wales Route and London North West units. This results in the region falling through 'Institutional cracks' and a low prioritisation of needs.	Potential benefits from recent re-signalling work between Llandudno Junction and Chester are not being fully realised along whole line with manual signalling still in use from Llandudno Junction	Tracks west of Didcot reduce from 4 to 2 which makes gaining extra capacity difficult
Existing Operational and Infrastructure Challenges	Current passenger numbers on north Wales coast should not be used to determine future demand - current low passenger numbers are due to low service quality.	Capacity is limited beyond Chester. Resolving issues at Chester Station will release significant benefits.	Capacity constraints exist around the Severn Tunnel and Bridgend
	The Chester/N Wales route to Manchester via Warrington is of greater importance than the current services on the mid-Cheshire line which are slow and infrequent.	The Chester to Manchester commute is critical for our business community who want to access labour markets	
	Current HS2 design option for Crewe relegates Welsh services to independent lines away from hub	Slow line speeds mean that existing rail journey times cannot compete with car for those residing in west Wales	Very poor service provision between Cardiff and Bristol
New Operational &	Innovative technologies such as hydrogen and rolling stock such as tram	Local management of some non-mainline routes should be considered e.g.	Upgrading Shotton or Flint to a hub station could be key part of

Infrastructure Requirements	train may offer connectivity solutions for Swansea Bay and the Wrexham Bidston Line. Wales a sensible test bed for digital railway.	Wrexham-Bidston, Conwy, Cambrian lines etc	north Wales metro (car parking issue at Shotton needs resolving).
	Wrexham-Bidston services should be run through to Liverpool connecting with Merseyrail's network and frequencies increased to 4tph	Line speed increases needed along Wrexham-Bidston to unlock new service capabilities	4-track between Rhyl and Prestatyn needs reinstating
	New north Wales /north west England stations needed at Deeside Industrial Park, Shotton, Broughton, Wrexham Industrial Park, Chester Business Park (<i>North of A55 – and may require bus link to business park</i>), Chester Parkway	High rail fares on the north Wales coast supressing demand and a big disparity exists with South Wales fares.	Long distance strategic services along north Wales coast should become limited stop and de-coupled from local commuter service stopping at all stations
	Western access link to Manchester airport with services serving the airport and continuing north west is important	Creating Crewe as a hub is huge priority and essential for connecting Wales to HS2	Making the NWML a 125mph railway is achievable with new interventions
	New south Wales stations needed at St Clears, Coed Darcy, Cockett, Magor, eastern Cardiff		Seamless connectivity to NPR from Chester especially at Warrington is hugely important for our West-East routes

4 ECONOMIC AND TRANSPORT CONTEXT

4.1 Economic Status

The challenge for Wales as a whole is to increase both its levels of productivity to improve its Gross Value Add (GVA) per capita (which is only 73% of UK average²³) and to deliver its obligations on sustainability and well-being. This is especially important in urban centres but perhaps a more demanding challenge in addressing the legacy of economic isolation and decline that has afflicted some rural and post-industrial communities across Wales. For the former, better transport can certainly and directly address the challenge through agglomeration benefits; for the latter better transport can only be part of a solution that requires complementary measures focussed on communities and bespoke regeneration and economic development interventions.

In south and north Wales, the railways shaped the pattern of urban development. The main line in the south connects Newport with Cardiff, Bridgend, Port Talbot, Neath, Swansea, Llanelli and onwards to Carmarthen, Milford Haven, Fishguard and Pembroke in west Wales. The main line in the north connects Flint, Prestatyn, Rhyl, Colwyn Bay, Llandudno, Bangor and Holyhead.

4.2 North Wales

North Wales has a population of some 697,000 with the coastal strip towns east of Conwy (with a rail station) accounting for some 175,000. In comparison Cheshire West and Wirral have a combined population of 660,000 and have direct access to the major centres of Chester, Liverpool and Manchester and major employment areas. The Mersey Dee area comprises north east Wales, west Cheshire and the Wirral. Whilst spanning the Wales – England boundary, the Mersey Dee area has been recognised as a single economic sub-region, with a population close to 1 million.

In north Wales an industrial cluster focussed on automotive, energy, aerospace and advanced manufacturing spreads across the border from Wales towards Chester. The role of further education institutions like Coleg Cambria in supporting the regional economy in North east Wales should also be noted. In north west Wales, the development of the Wylfa Newydd nuclear power station on Anglesey and the marine energy economies are also important. The importance of the tourist economy in north Wales (relevant across all of Wales) also impacts rail services and presents opportunities for better access and further growth. With the exception of the border areas north Wales has struggled to attract and retain higher quality private sector jobs and relies more heavily on the public sector.

A number of studies of the Welsh economy have identified two spatial factors helping to explain lower GDP and wages in Wales:

- The lack of a major agglomeration – North Wales has no one large urban centre, with the main population concentration being distributed across the coastal strip in a series of smaller settlements, generally of less than 30,000 residents.
- Wales' relative peripherality – Controlling for other factors, a 10% increase in the minimum travel time to Greater Manchester / Merseyside (or London), leads to a 0.6% reduction in firm productivity.

The size of the local population may not change markedly over time and it is not suggested that spatial policy could be practically amended to create agglomeration, however relative peripherality may be addressed by transport improvements to reduce the lengthy travel times evident between north Wales and the major economic engines of north west England, alongside supporting investment in more local initiatives.

²³ Stats Wales Balanced GVA B Approach <https://statswales.gov.wales/Catalogue/Business-Economy-and-Labour-Market/Regional-Accounts/Gross-Value-Added-GDP/gva-by-welshnuts3areas-year>

Key economic considerations for North Wales Main Line (NWML)...

A major cross-border economy with strong interrelationships between north Wales and north west England.

Newly established organisations including the North Wales Economic Ambition Board and the English Local Economic Partnerships, have generated focus and impetus to economic development through the involvement of private sector businesses.

Development of the Northern Powerhouse concept in the north of England has captured imaginations and has become another expression of devolved thinking and action. As a concept and in strategy it includes north Wales.

Enhancing direct services to London and other key economic centres is essential

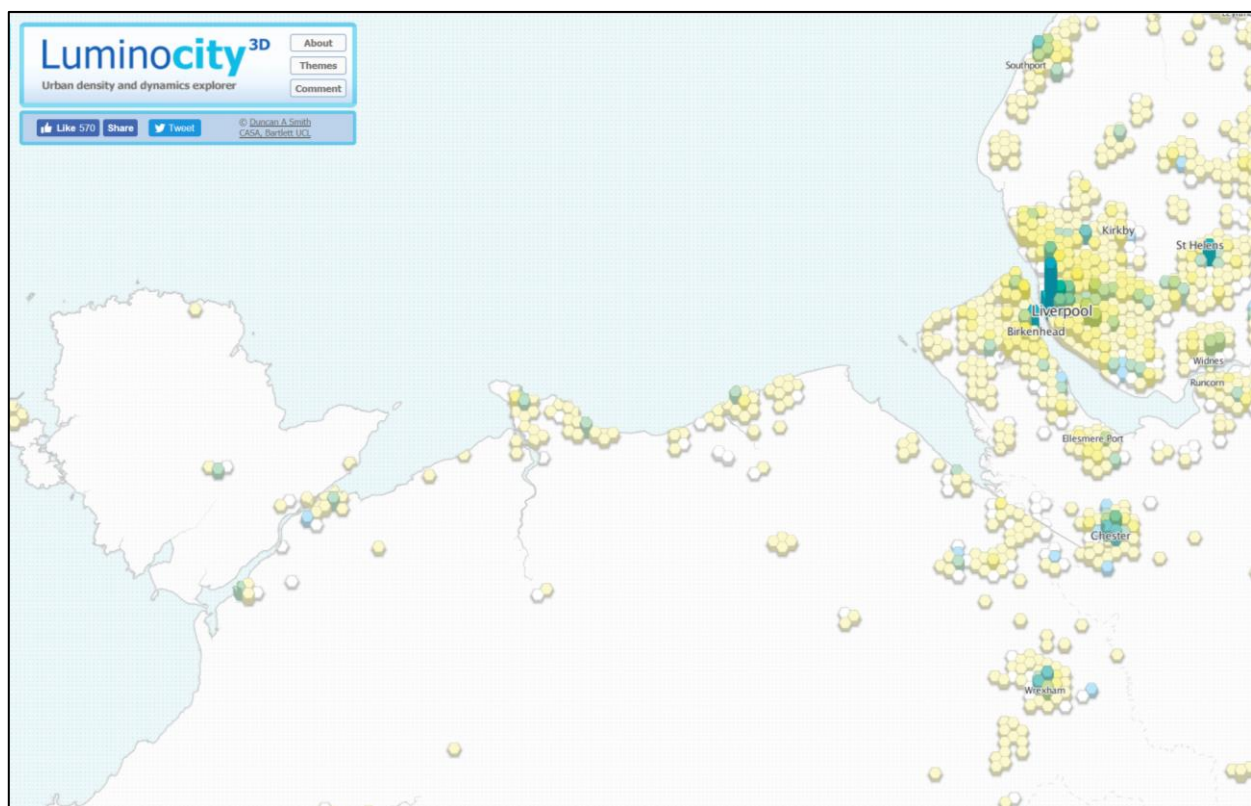


Figure 11 Activity (population & employment) density [across north Wales & north west England](#)

One of the issues raised by stakeholders in north Wales are the poor rail services and journey times from key centres in north Wales to Manchester, Liverpool and their airports. These rail journeys are all slower than the car leading to low levels of rail commuting and issues of road congestion and carbon emissions. This is a result of service and infrastructure constraints in both north Wales and north west England. The numbers commuting cross-border between north Wales and Merseyside and Cheshire are also significant and supports some of Wales major industries. However, these movements are complex with a wide range of origin and destination locations.

Key economic considerations for Wrexham – Merseyside...

Strong economic cross-border interrelationships between north Wales and North west England.

A history of local co-operation, particularly in the Mersey – Dee area between Flintshire, Cheshire West & Chester and Wirral.

Newly established organisations, the North Wales Economic Ambition Board and (in England) the Local Economic Partnerships have generated focus and impetus to economic development through the involvement of private sector businesses.

The main areas of deprivation are along the Flintshire coastline, villages surrounding Wrexham and Birkenhead indicating low levels of income and potentially high levels of economic inactivity.

Welsh Government development ambitions for Wrexham

There is a clear case for economic rebalancing as GVA per head in North Wales and The Wirral (2015) lags behind the adjacent area of Cheshire West and Chester.

Whilst the Halton curve is a welcome infrastructure investment which helps to deliver improved services to Liverpool we need to explore further measures to enhance connectivity right across north Wales and into north west England. This builds upon the work of Growth Track 360 and as recently presented in the Wales and West Rail prospectus²⁴ which represented the views of key stakeholders and businesses such as North Wales and Mersey Dee Alliance, Cheshire and Warrington LEP as well as local authorities in north east Wales and north west England.

Key transport issues along the North Wales Main Line (NWML)...

High car dependency for many journeys leading to congestion & resulting air quality issue

Low line speeds (LT 90mph) & modest frequencies impacting services to Manchester, Liverpool, London and South Wales; Victorian signalling in some places) Figure 13

Only 2tph Chester to Crewe – has to be addressed by Crewe HS2 hub

Limited integration with other modes - especially bus

Capacity & operational constraints at Chester Station

Aligning work of the Wales and LNW Network Rail routes

The need to better serve Bangor - as one of the busiest stations on the NWML (Figure 12)

The Welsh Government is also developing proposals for further economic development in Wrexham. For example, the Development Bank for Wales and Transport for Wales will both have a base in the town. In the private sector, both ICE and Indycube have bases in Wrexham.

²⁴ <http://www.GrowthTrack360.com/home/westandwalesrailprospectus/>

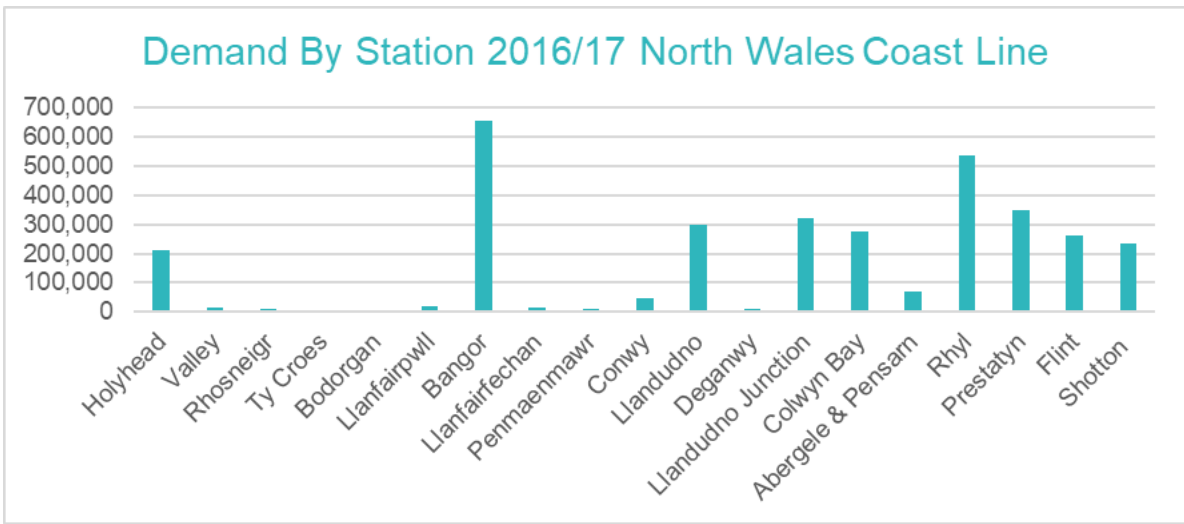
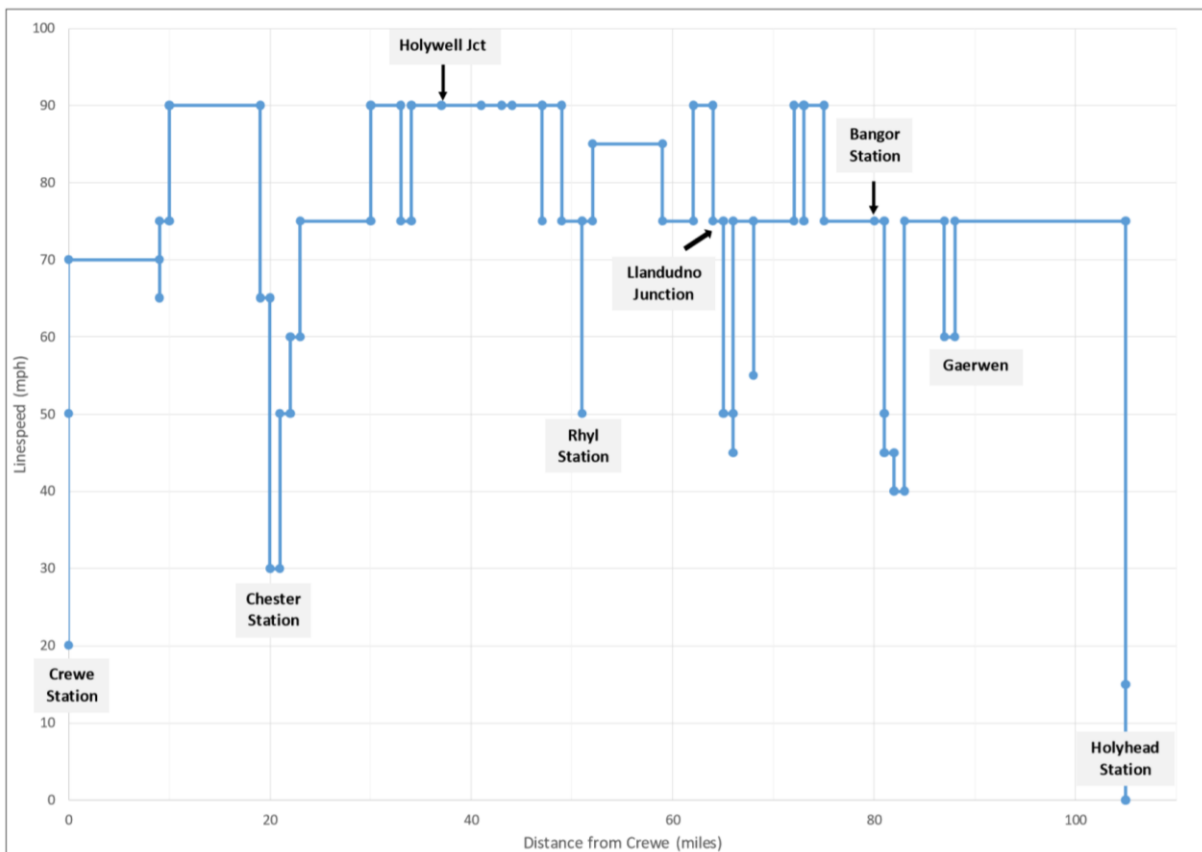


Figure 12 Demand by station on NWML 2016/17



Source: Mott MacDonald

Figure 13 NWML line speeds

Key transport issues for Wrexham – Merseyside...

High car dependency for many journeys leading to congestion and air quality issues

Borderlands line underutilised with low service frequency; an hourly service is operated during the day reducing to a 2 hourly evening and Sunday service)

Journey times are relatively poor and uncompetitive with car.

Operated with old poor-quality rolling stock.

Smaller stations, poor facilities with minimal car parking facilities.

High costs of Borderlands service vs the equivalent Merseyrail service

Does not serve potential Liverpool or commuter market well despite proximity.

Overall not an attractive offer for potential users – as a result passenger volumes are modest from many stations.

Post HS2 there are also issues and opportunities related to both the configuration of Crewe station and the service to London from North Wales. North Wales needs fast direct services to London as well as to Liverpool, Manchester, Birmingham and Cardiff. The treatment of Cardiff-Manchester service at Crewe is also important – there are some proposals which would deliver a sub-optimal interchange for such service with the bulk of intercity services at Crewe. The connection between Chester and Crewe also increases in importance as a result of HS2.

Growth Track 360²⁵ set out an economic argument and the need to deliver faster and more frequent services right across the network in north Wales and north west England. Much of that work was utilised in this study. This was further endorsed in the West and Wales Strategic Rail prospectus²⁶ launched in March 2018 by a broad alliance of stakeholder groups in north west England and north east Wales.

There are particular challenges at Chester station which acts as a network hub, receiving through and terminating passenger services from six lines, with destinations served across North and South Wales, the Midlands, North West England, and London Euston. Its current configuration is likely to constrain the ambition for more services through the region – especially the layout at Chester East Junction. Network Rail have set out some potential enhancements in their Route Study which merits further early consideration. It is also recognised that interventions elsewhere on the network as well as timetable modifications may be required to complement and/or enable these proposals.

²⁵ [Growth Track 360](#)

²⁶ [West and Wales Strategic Rail Prospectus](#)

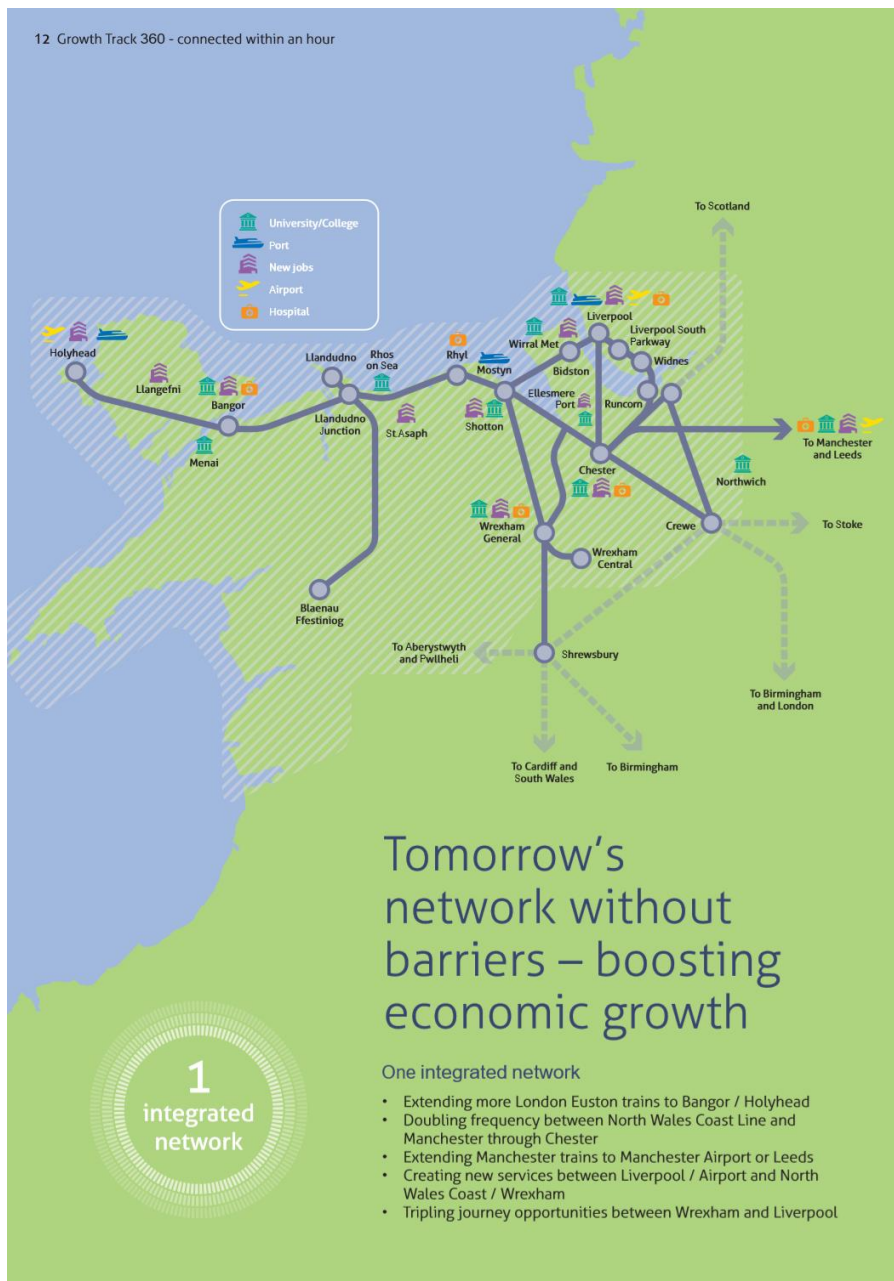


Figure 14 Growth Track 360 - Aspirations for PT Network

One major scheme that offers particular benefits to north Wales is the Manchester Airport western rail access link. This is a long-standing proposition with a protected alignment that could be implemented by 2030 and unlike HS2 Phase 2Bb could serve the airport directly. Besides delivering significant reduction in north Wales-Manchester Airport journey times, it provides a faster and more direct route from north Wales to Manchester city centre and onwards to Leeds via the Ordsall chord.

The development of interventions in this part of the region (airport western access, NPR, HS2 Phase 2b and variants thereof) need to consider the need to enhance connectivity between north Wales/Chester and Manchester airport, Manchester and onto Leeds.

4.3 South Wales

In the south, Cardiff, with its extensive rail links to surrounding towns, forms a substantial city region of 1.5M people as does Swansea to a lesser extent with a wider city region population of over 0.7M. When one considers the proximity of Bristol/Bath this creates a single economic 'Severnside' sub-region with a population of over 3 million people that has major agglomeration potential across multiple industries including financial & professional services, semiconductors, biotechnology, and TV/Film production.

Improving the links and reducing journey times between the Swansea Bay City Region, the Cardiff Capital City Region, Bristol, London and Heathrow, as set out by the Office of the Secretary of State for Wales²⁷, will support further economic development opportunities.

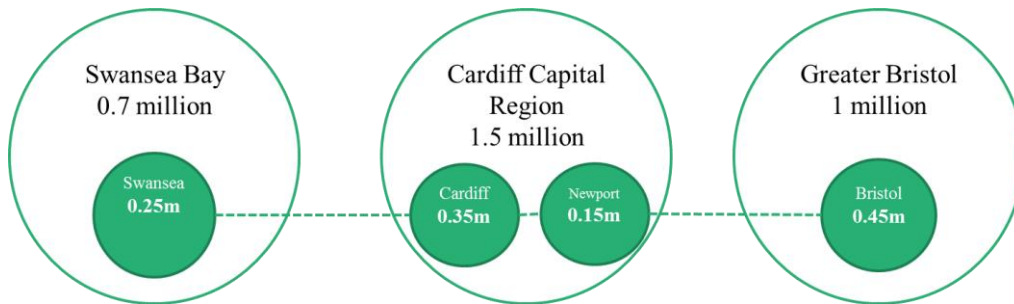


Figure 15 GWML/SWML serves over 3M from Bristol to Swansea

Key economic considerations for South Wales Main Line (SWML)...

Correlation between GVA/capita and travel time from London

Research has shown that spatial factors – both a lack of economic density and peripherality – are factors which constrain economic performance in south Wales.

Increasing economic integration of the city regions of Swansea, Cardiff and Bristol; with a population of over 3 million people

A string of developments along the corridor from Bristol to Swansea could be enhanced with improved rail connectivity; further population growth in these regions is also putting increasing pressure on the road network

The UK Government is investing in the economic infrastructure of the Swansea, Cardiff and Bristol City Regions but there are also benefits from achieving greater integration between the economies and Wales and south west England.

A number of strategic sites are closely aligned with the rail network and there are opportunities for new stations (notably Cardiff Parkway and Llanwern) to serve these sites, as well as regeneration opportunities at existing stations.

The role of Wales' leading higher education institutions and their impact on the national economy should also be noted; Cardiff University for example is one of the UKs leading research universities being ranked in the top five in the last formal research excellence assessment in 2014²⁸. Its role was crucial in the recent Cardiff Capital Region City Deal agreement to develop a compound semiconductor cluster²⁹ in the region.

The Swansea Bay City Region needs to nurture and grow hi-tech companies – something set out in the Swansea Bay City Deal³⁰ and its "internet coast" theme. Such companies often need to access

²⁷ <https://www.gov.uk/government/news/welsh-secretary-cross-border-working-can-be-the-catalyst-to-wales-future-prosperity>

²⁸ <https://www.cardiff.ac.uk/research/impact-and-innovation/quality-and-performance/ref-2014>

²⁹ <https://www.cardiff.ac.uk/news/view/744812-university-welcomes-38m-compound-semiconductor-deal>

³⁰ <http://www.swanseabaycitydeal.wales>

a wide range of venture capital funding and attract and retain executive expertise - with much of that sourced in London and the south east of England. Having Swansea 2hr 56 minutes from London when other major commercial centres are roughly one hour or less is a major disincentive and could result in companies relocating or not considering Swansea as a business base. There is anecdotal evidence that this is already happening.

Key economic considerations for Swansea Bay Urban Area...

The population of the Swansea Neath Built Up area is ~300k and the wider city region 700k

Poor connectivity within Swansea Bay city region is inhibiting its economic development

Economic issues in Swansea Bay are more acute than for areas to the east. The GVA/Capita of Swansea itself is only ~ 72% of the UK average

Swansea has struggled to create new private sector jobs and attracts fewer in-bound commuters than would be expected given its status as the largest urban area in South West Wales.

The transport network needs to facilitate local commuting movements as well as improving east-west links to from Cardiff, Bristol and beyond.

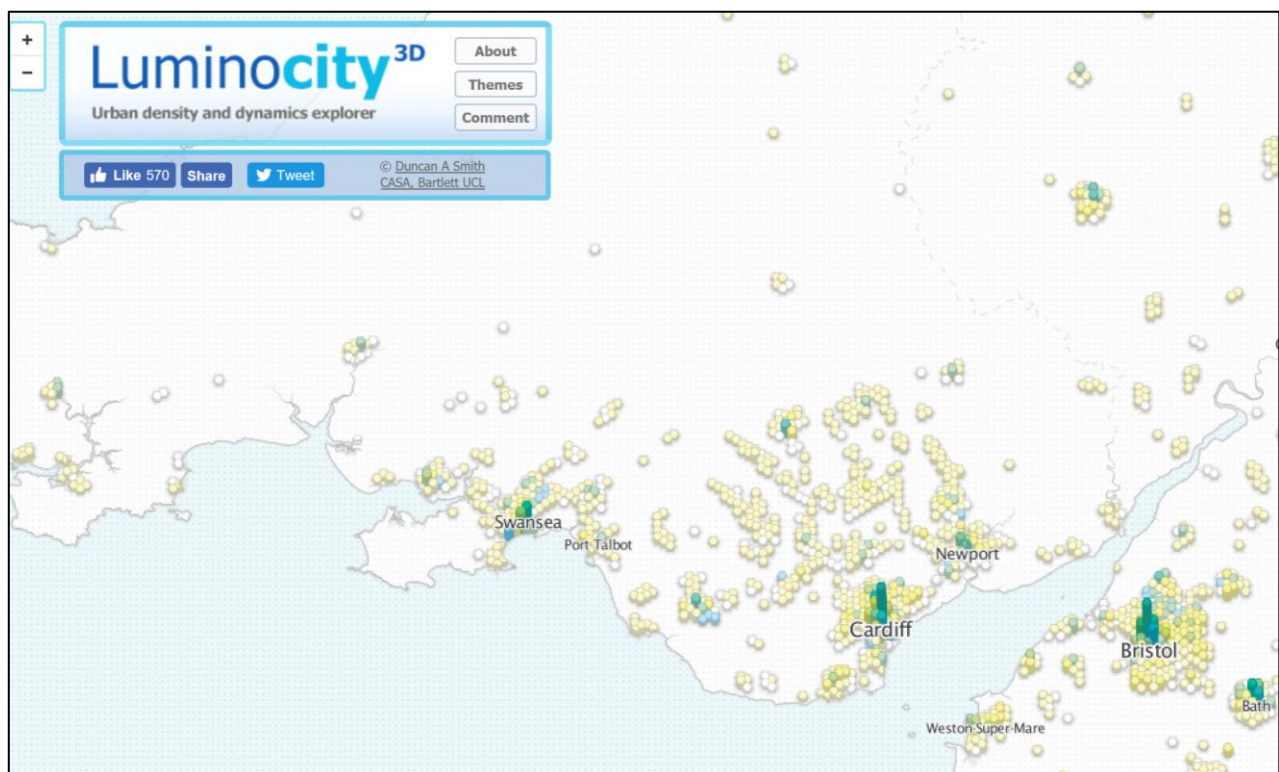


Figure 16 Activity (population and employment) density [across south Wales](#)

More broadly across the Swansea Bay urban area there are major new developments coming forward or in progress, that have or will have, an impact on transport provision. These include the continued impressive growth of Swansea University with its new Swansea Bay campus on Fabian Way, the regeneration project Coed Darcy, the potential rail test facility in the Dulais valley and now developments in the Swansea City Centre.

Key transport issues along South Wales Main Line (SWML)...

Rail journey times from west Wales to Bristol/London are relatively poor (Figure 17) ; much of the SWML is an 90mph railway or less versus a 125-mph railway east of Bristol; constrains demand & encourages more car usage on already congested roads, with consequential air quality impacts

The UK Government's investment in electrification to Cardiff and the introduction of IETs will improve journey times between south Wales and London but the full value of this investment will not be realised because of line speed and capacity constraints.

Low service frequency and overcrowding from Cardiff to Bristol Temple Meads – 2tph
Alignment of railway east of Swansea means that rail journey is relatively indirect when compared with road network.

Limited connectivity to airports (Cardiff and London Heathrow)

The Severn Tunnel is a constraint on both journey time reduction and increased service frequencies

Most revenue for services is to Cardiff and east of Cardiff and does not match actual passenger demand (Figure 20 & Figure 21)

Demand for rail has grown strongly over the last decade although growth may have started to plateau.

The quality of rolling stock on some shorter distance services is poor with an upcoming need to replace life expired diesel trains

Lack of park and ride opportunities for Cardiff, Newport and Swansea.

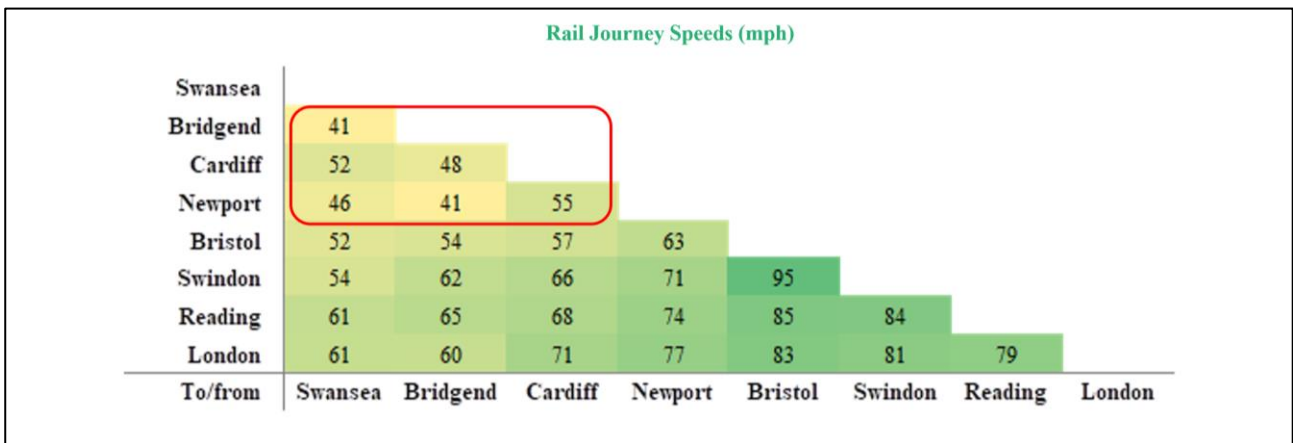


Figure 17 Rail journey speeds along the GWML

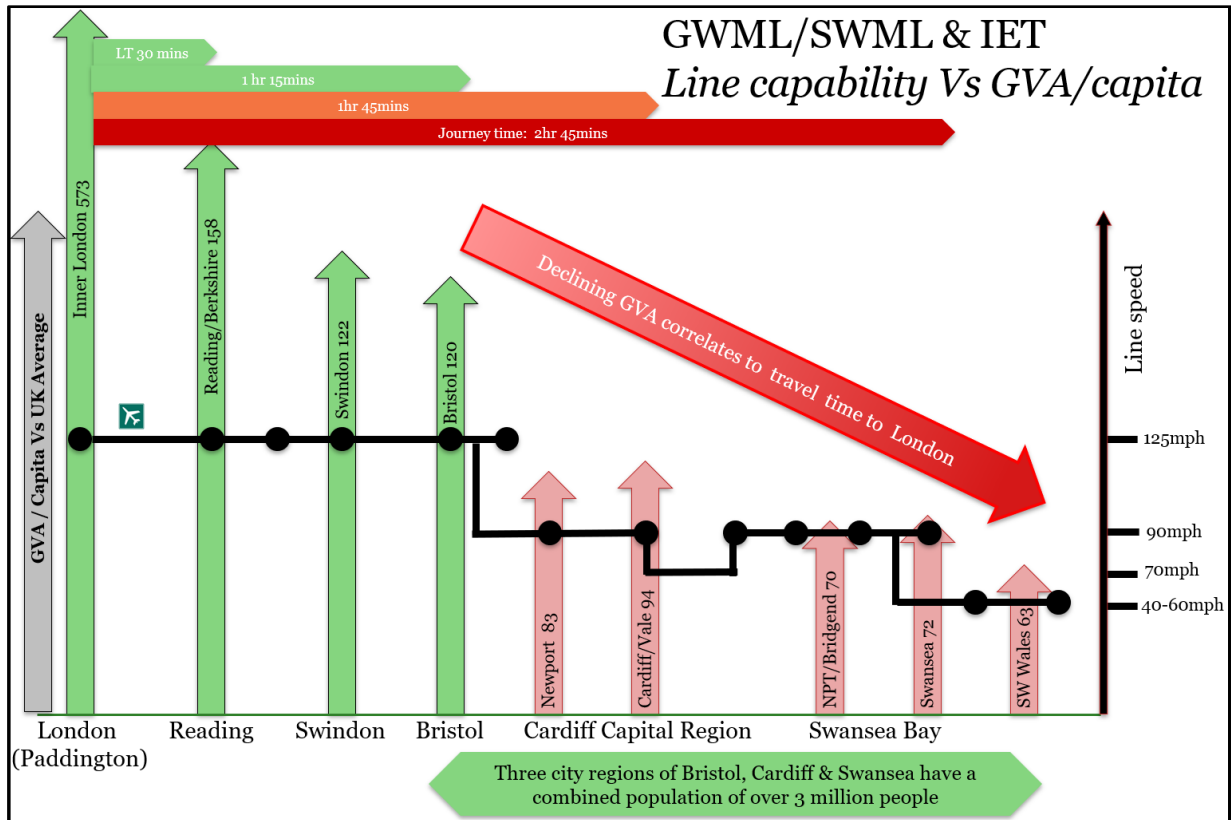


Figure 18 GWML/SWML links between GVA per capita and rail infrastructure

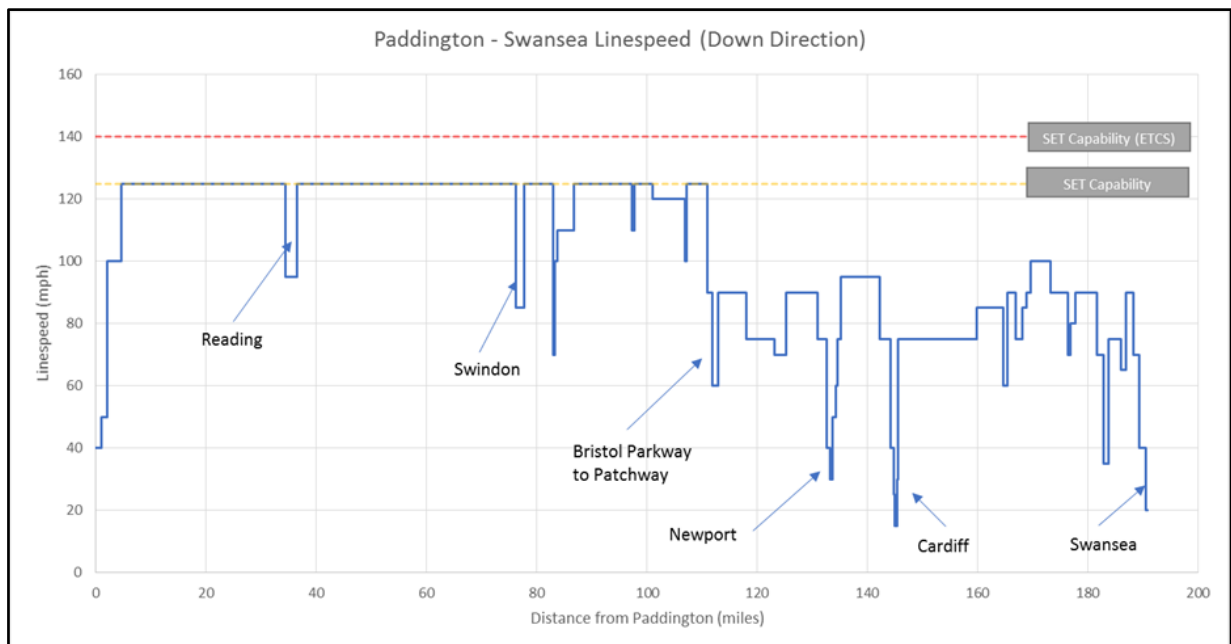


Figure 19 Line speeds on GWML between Paddington and Swansea

We also know from stakeholders that rail patronage from the west of the region (Milford Haven, Pembroke and Carmarthen) to the east of the region (Cardiff, Bristol and London) is low, partly because of the poor journey times. Reducing that journey time is therefore a key aspiration of Welsh Government not least to reduce the need to drive; which is increasingly important in the Swansea Bay City Region given the increasing issues of road congestion and its resulting air quality impacts, on the M4 across the region.

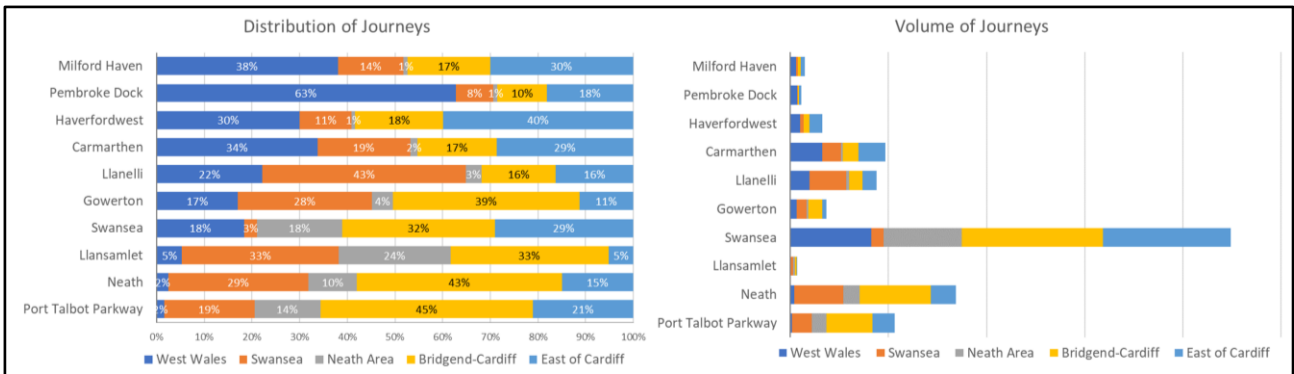


Figure 20 West Wales rail travel demand

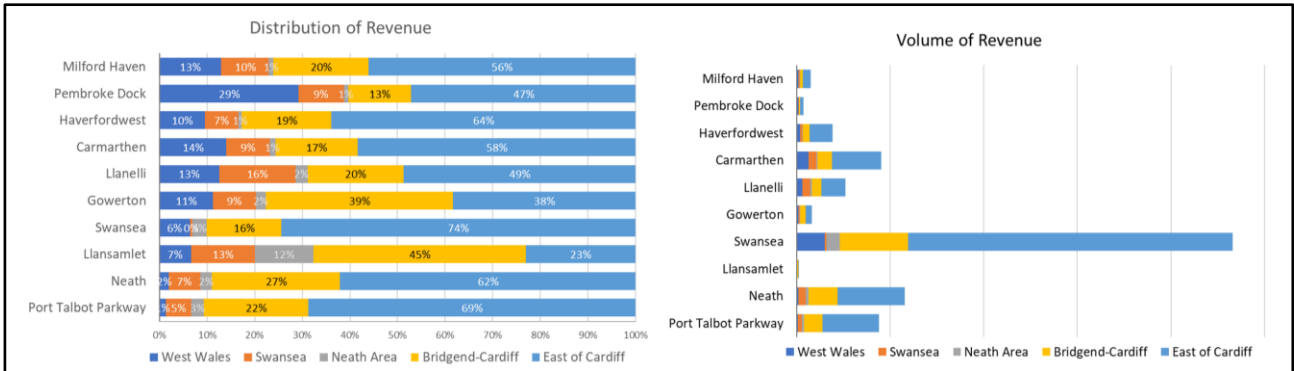


Figure 21 West Wales rail travel revenue

Key transport issues in Swansea Bay Urban Area...

Increasing road congestion across Swansea Bay urban area leading to air quality issues

No dedicated local commuter rail for Swansea Bay's urban area

Infrequent services at smaller stations that should be part of Swansea's commuter network, for example: Gowerton to Swansea – approximately 1 train per hour and Skewen/Llansamlet to Swansea – 1 train every 2 hours

Limited P&R provision across the region

The alignment and current form of the SDL serves neither Swansea or Neath and presents a challenge to develop a commercial case to support passenger services

Passenger volumes are modest from many stations; reflects limits of existing services & is a challenge to constructing a financial & economic case for upgrades

Access to major international gateways is important. So, whilst a focus on connecting Cardiff airport to support the Cardiff and Swansea city region economies is important, we recognise that to effectively engage and access international markets (which will increase in importance because of Brexit), better access to Heathrow - a gateway to the world - is required. The long overdue direct rail access from Reading to Heathrow is vitally important in that regard with the ability to operate direct services from south Wales and south west England.

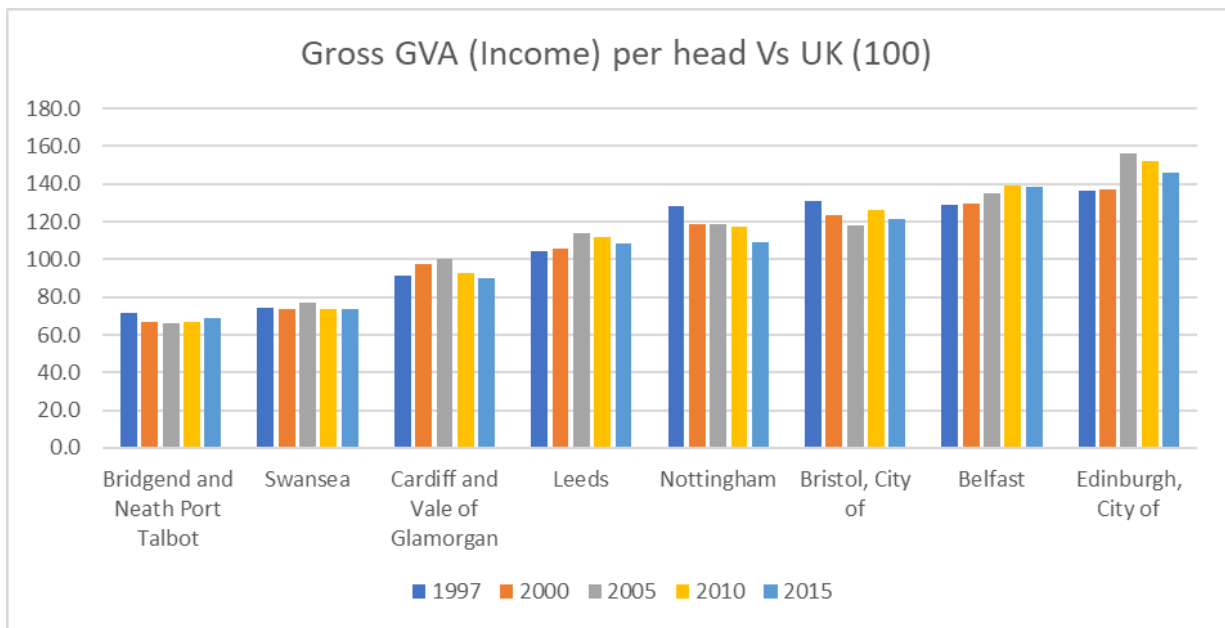


Figure 22 GVA per capita of selected UK cities

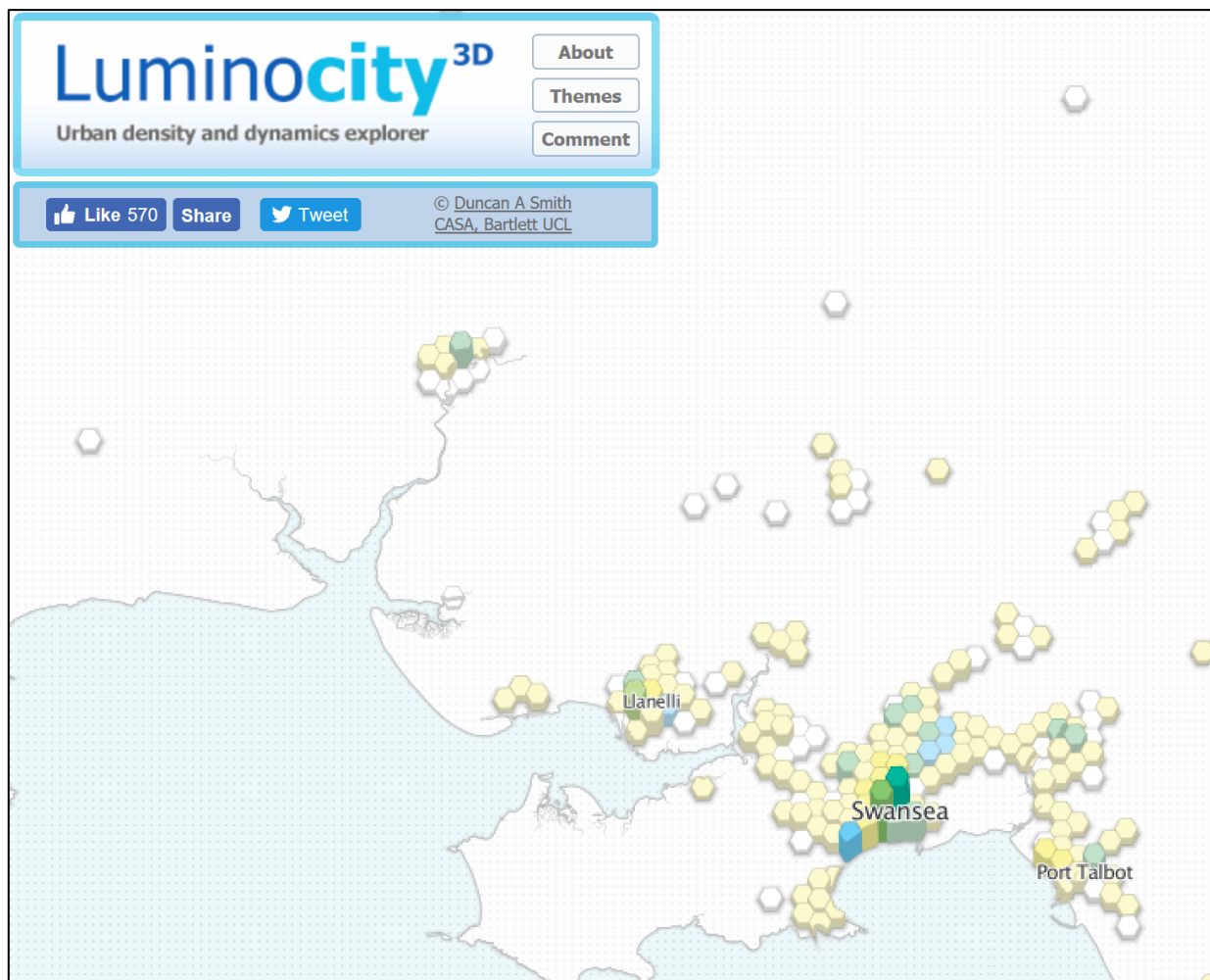


Figure 23 Activity (population and employment) density across Swansea Bay urban area³¹

Commuting between Bristol, Newport and Cardiff is also severely hampered by both the journey times and the lack of capacity. The demand for rail travel between Cardiff and Bristol estimated for

³¹ Credit: Duncan Smith, at the [Centre for Advanced Spatial Analysis, University College London](http://luminocity3d.org/indexRetina.html#population_density_2011/11/51.6998/-3.9579)
Lumino City http://luminocity3d.org/indexRetina.html#population_density_2011/11/51.6998/-3.9579

2043 in Network Rail's route studies, is similar to that between Manchester and Leeds which has 6tph, compared with only 2tph between Cardiff and Bristol. Leeds-Manchester connectivity will be further enhanced through the ongoing £3bn Trans Pennine Upgrade (TPU) programme; more ambitious £30bn plans have also recently been set out as part of Transport for the North (TfN)'s Northern Powerhouse Rail which will deliver high speed connectivity right across the north of England. Given the commensurate markets sizes for rail traffic the Cardiff-Bristol service appears to "underprovided" when compared to Leeds-Manchester.

4.4 Mid Wales

Mid Wales, with its university at Aberystwyth and important agricultural and tourist economy, shares the same overall requirements as north and south Wales. In addition, the importance of links to Birmingham and its airport via Shrewsbury and the services and capacity of the Marches line also justify further interventions. Similarly, the crucial role of the Cambrian coast line and Heart of Wales line in linking many smaller communities is important - especially given the expectations of the Well Being of Future Generations Act. Some specific proposals that need to be tested include:

- Ensuring Aberystwyth trains via Shrewsbury route to Birmingham airport
- Considering new services, for example Aberystwyth– Shrewsbury – Crewe (HS2 hub)
- Assessing further infrastructure to enhance timetable resilience; additional stations could be considered in that context
- Potential to operate through to London via West Coast Main Line (WCML) (with capacity freed up via HS2)
- Upgrades in line speeds on the north south, Newport – Crewe/Wrexham/Chester lines
- Options for enhancing connectivity between Swansea Bay and Aberystwyth

4.5 New Wales and Borders Railway Services

With the recent confirmation that KeolisAmey will operate the new Wales and Borders railway franchise and develop the new South Wales Metro, we can now identify new services that will be introduced in the next few years. This provides an improved baseline from which to make the case for further services and enhancements. The primary commitments to 2024 set out and relevant to this work, include:

- Chester – Liverpool Lime Street 1 tph (currently none)
- Cardiff – Bridgend – 4tph (currently 3tph)
- Faster Cardiff-Holyhead services (with additional loco-hauled services)
- Wrexham-Bidston (2tph, with 1 fast limited stop)
- Cardiff Liverpool 0.5tph
- New Bangor/Llandudno services to Manchester Airport and Liverpool
- The implementation of tram-train technology on the valley lines to Merthyr, Treherbert and Aberdare (*Figure 24*)



Figure 24 Tram-train for operation on valley lines north of Cardiff

4.6 Highways and Congestion

Major highways investment in the 1960s and 70s created the M4 across South Wales to England. In the 1980s, the A55 North Wales Expressway provided a high-quality connection into the national motorway network. Both routes are under pressure, with measures (including relief roads) to provide increased capacity and resilience under consideration. The combination of shorter distance peak period road-based commuting travel and longer distance movements of both people and freight results in increasing levels of congestion and longer and less predictable journey times.

The increasing issues of road congestion, with consequential economic, air quality and health impacts, is a particular challenge in the Swansea Bay City Region, especially the M4 around Swansea and Port Talbot. The Welsh Government recently trialled junction closures to address the low average speeds of 25-30 mph during peak periods around Port Talbot³². These challenges collectively require more imaginative and innovative multi-modal solutions.

Given increasing air quality and environmental concerns, and an increasing awareness that in some circumstances more road space generates more road traffic, we recognise that the strategic expansion of rail capacity now provides, in some cases, a more attractive and deliverable option to enhance accessibility.

4.7 Bus Integration

Whilst this work has focussed predominantly on investment in rail infrastructure, it is clear that to deliver the passenger a more effective, attractive and affordable end-to-end journey, the role of buses must be addressed. This includes integration of network planning, fares, customer information and ticketing together with improved bus infrastructure (e.g. bus priority) and to extend the reach of the rail network. This can be very challenging in a de-regulated market made up by a number of different operators who in some cases consider rail services as well as each other to be competitors. Fundamental to progressing this vitally important component is the need for appropriate governance arrangements and institutional capacity to make the changes necessary.

4.8 Active Travel

Similarly, whilst not a focus of this study, there is a recognition and policy expectation, that active travel will play an increasingly important role in end-to-end travel, especially in our key urban areas.

4.9 Rail Freight

Again, whilst not a focus for this study the important role of rail freight has not been overlooked. In developing options for new services and infrastructure the application of freight paths and capacity was considered and is consistent with requirements set out in NR's Route Studies.

³² <http://gov.wales/topics/transport/roads/schemes/m4/junction-41-port-talbot/?lang=en>

4.10 Emerging Technologies

We are also cognisant of new and developing mobility technologies; electric vehicles and autonomous vehicles (AV) being perhaps the highest profile. The latter especially has the potential to profoundly change the way we “move”, extending the potential of “mobility as a service” and in so doing have a major impact on the current model of car use and ownership. We are also mindful of historic predictions that new technology will replace current transport modes. The reality is that as new modes are developed they fit into (sometimes in a very disruptive way) the existing transport model. A potential future was set out in a report produced by the Association of German Transport Companies, (www.vdv.de) in 2015³³ which anticipated a scenario where autonomous vehicles could provide a last mile mobility service to augment existing mass transit public transport systems (bus and rail).

As regards transport planning, whatever the mode or technology, the most efficient means of moving many people on high demand corridors is in high quality, high capacity, multi-occupancy vehicles using segregated routes (bus, bus rapid transit, light rail or rail). The question of the power source and whether the vehicle has a driver, is a different question and has little bearing on the former. On the latter there are also emerging developments in battery and charging technologies that may well negate the need for thousands of inefficient low voltage charging points with the potential emergence of battery stations where modular batteries can be swapped in and out of vehicles in the time it takes to fill a tank of petrol. Sun Mobility in India³⁴ are pioneering this capability and this is a mobility market that will be disrupted more significantly by AV.

So, whilst we anticipate changes and will keep a watching brief on personal mobility options and technology over the next few years, evidence still supports mass transit options as being the most efficient and sustainable way of moving people around.

³³ [VDV, Scenarios for Autonomous Vehicles – Opportunities and Risks for Transport Companies, Nov 2015](#)

³⁴ Sun Mobility <http://www.sunmobility.co.in/>

5 PROPOSED INTERVENTIONS FOR NORTH AND SOUTH WALES

5.1 The Rail Opportunity

With such well-delineated corridors of travel demand across north and south Wales, rail offers excellent prospects to accommodate demand from the growth of town and city centres. Sufficient capacity is needed to accommodate commuter growth across city regions, and frequent services between city and town centres is needed if agglomeration benefits are to be captured. To a large extent, the path to economic prosperity in Wales is along an improved rail network and services.

These connectivity imperatives can benefit from investments such as electrification of the Cardiff-London line (and onto Swansea), and from HS2 that will put the north Wales gateway at Crewe within 55 minutes of London, but only if plans for service enhancement are established across the variable geography of rail franchises and Network Rail's devolved Routes.

Given this basis, and the Cabinet Secretary's statement setting out Welsh Government's overarching social and economic needs, the emerging strategic priorities for rail investment in Wales are:

- Address the legacy of underspend on rail infrastructure in Wales and the consequential limitations and performance problem of rail services in Wales.
- Ensure the success of the new Wales & Borders and other cross-border rail services.
- Frequent direct and faster longer-distance rail connections between the main Welsh towns and cities and Bristol, London, Manchester, Liverpool, Birmingham, Leeds, Glasgow– this is especially an issue for Cardiff which needs better connectivity with major urban areas in the east of England and Scotland. In particular a need to maximise the benefits of the delayed and curtailed Great Western electrification project and its new train fleet and maximising the potential benefits (via Phase 1 and 2a including Crewe Hub) and offset the negative consequences of HS2.
- Investment in city region rail services and infrastructure to support the growth of the major urban economies in Wales – and cross-border where the economic geography dictates.
- Rail connectivity to airports to support international trade and inward investment and tourism – Manchester and Liverpool for north Wales; Birmingham for mid Wales; Heathrow and Cardiff airport for south Wales.
- North-south connectivity for Wales, via the Chester - Wrexham – Shrewsbury – Newport railway in journey times that cannot be matched by road-based travel, including consideration of both longer distance services with fewer stops and local all-stop commuter services.
- Further testing of options for improving north-south links in the west of the country.
- Meeting trans-European network standards.
- Meeting the wider well-being, environmental and balanced economic development objectives of the Welsh and UK Governments

The rail interventions proposed begin to address these considerations. They are set out in summary below and explored in more detail in two PSOCs:

- North Wales
 - North Wales Main Line
 - Wrexham-Merseyside (Borderlands line)
- South Wales
 - South Wales Main Line
 - Swansea Bay Urban Area

Other Programme Strategic Outline Case schemes can be developed to extend this programme.

5.2 Estimated Economic Benefits

The following section sets out a range of interventions across the four workstreams. These have been developed using standard UK and Welsh Government major scheme transport appraisal guidelines; and subject to a methodology to estimate their direct user benefits and impact on the wider economy.

For the major schemes for the SWML and NWML a pragmatic analysis was undertaken to provide a baseline economic impact. In addition, a range of further and more ambitious interventions were also modelled and quantified separately.

In respect of agglomeration a more cautious approach has been taken. For example, the interventions set out are primarily about improving inter-city or inter-regional connectivity whereas the agglomeration methodology used only captures productivity benefits associated with intra-city or intra-regional agglomeration effects. There is therefore scope to identify and quantify further benefits.

Benefits identified range from £2.1~2.6bn as shown below (*as per guidelines the economic case L1 and agglomeration impacts are expressed in Present Value 2010 terms and in 2010 prices, strategic regional GVA impacts are annual impacts expressed in 2015 prices; the differences in totals are due to rounding subordinate values to nearest £10m*):

Table 2 Summary of economic benefits by workstream

	NWML	Wrexham-Mersey	SWML	Swansea Bay	Total
Transport User and other L1 Benefits/Disbenefits £m	£840	£110	£770	£190	£1,910
Agglomeration Effects £m	£80	£40	£50	£30	£210
Total	£930*	£150	£820	£220	£2,120
<i>Jobs</i>	<i>435</i>	<i>100</i>	<i>420</i>	<i>190</i>	<i>1,145</i>
<i>Regional GVA (per annum)</i>	<i>£23</i>	<i>£5</i>	<i>£18</i>	<i>£8</i>	<i>£54</i>
Further Potential Level 1 Impacts £m	£20	NA	£490	NA	£510
Further potential agglomeration benefits £m	<£10	NA	£30	NA	£40
Total	£20	NA	£520	NA	£540
<i>Further Jobs</i>	<i>125</i>	<i>NA</i>	<i>165</i>	<i>NA</i>	<i>290</i>
<i>Further Regional GVA</i>	<i>£4</i>	<i>NA</i>	<i>£7</i>	<i>NA</i>	<i>£11</i>

Note: "*" some totals don't match because of rounding to nearest £10m

The total capital cost estimates for all the schemes modelled is circa £2,000m (2018 prices); these estimates are high level at this stage and do not include items like land acquisition, planning, enabling works, etc. but do include optimisation bias.

Note that due to the absence of firm capital and revenue cost information at this stage of development, and the strategic focus of the PSOCs, it is not appropriate or practical to develop traditional benefit to cost ratio (BCR) outputs as measures of value for money. Further work is also required to disaggregate these high-level figures to assess and prioritise those interventions which maximise benefits and reduce costs.

The following section sets out the vision and interventions modelled for each PSOC workstream to calculate the economic benefits. Potential further interventions that could increase the benefits have also been set out.

5.3 North Wales Main Line

5.3.1 North Wales Main Line: Vision and Objectives

Vision: Building upon the work of Growth Track 360 to support inclusive and balanced economic growth in Wales and north west England, by providing faster and more frequent services through investment in the north Wales coast line and by maximising the benefits of HS2.

Objectives: To deliver on this vision for north Wales interventions will need to:

1. Widen access to employment across north Wales, Cheshire and Liverpool by improving rail services.
2. Develop a service pattern (journey time and frequency) that supports Growth Track 360's ambitions:
 - a. Journey times of less than one hour between the main centres of Holyhead and Chester; and Llandudno and Crewe
 - b. Frequency doubling between Holyhead and London; and Holyhead to Cardiff/Birmingham
 - c. Frequency doubling between the north Wales coast and Manchester Airport
 - d. At least one train per hour from the north Wales coast and Wrexham to Liverpool
3. Enhance rail connectivity from north Wales to international gateways at Manchester and Liverpool airports.
4. Promote social inclusion by improving local access to employment, services & key centres.
5. Provide a viable public transport alternative to private car journeys, for all journey purposes including tourism.
6. Provide sufficient capacity and improve rail network resilience in north Wales to accommodate future demand.
7. Promote interventions that integrate with HS2 and the major developments at Crewe and Chester stations to support cross-border passenger journey requirements
8. Reduce the environmental impact of transport, especially carbon emissions & air quality.
9. Improve rail network efficiency to allow a lower future subsidy requirement per passenger.

5.3.2 North Wales Main Line (NWML): Possible interventions (Figure 25)

The interventions modelled to estimate the transport and wider economic benefits are:

- Modernisation of the NWML from Crewe to Holyhead (inc. re-signalling, line speed upgrades and of electrification); retention of an hourly freight path along the whole route
- Faster long-distance services to Manchester, Manchester Airport, Liverpool & Cardiff and fewer stops offering best journey times for selected stop services of:
 - Llandudno to Crewe 60 mins
 - Holyhead to Chester 60 mins
- West Coast Main Line (WCML) to continue to serve Chester and north Wales
- New HS2 (hailed or bi-mode) to Bangor/Holyhead via Crewe and Chester
- New local all stop commuter services in north east and north west Wales (Figure 26)

- Double track Wrexham-Chester supporting hourly extension of Merseyrail services
- On-track capacity and operational enhancements at Chester station
- Selected new stations across the network (for example at Gaerwen, Holywell Junction and South Cheshire Parkway)
- An increase in headline frequency to five per hour east of Rhyl
- Sufficient capacity in central Liverpool and Manchester to support these enhancements
- In parallel further bus integration measures

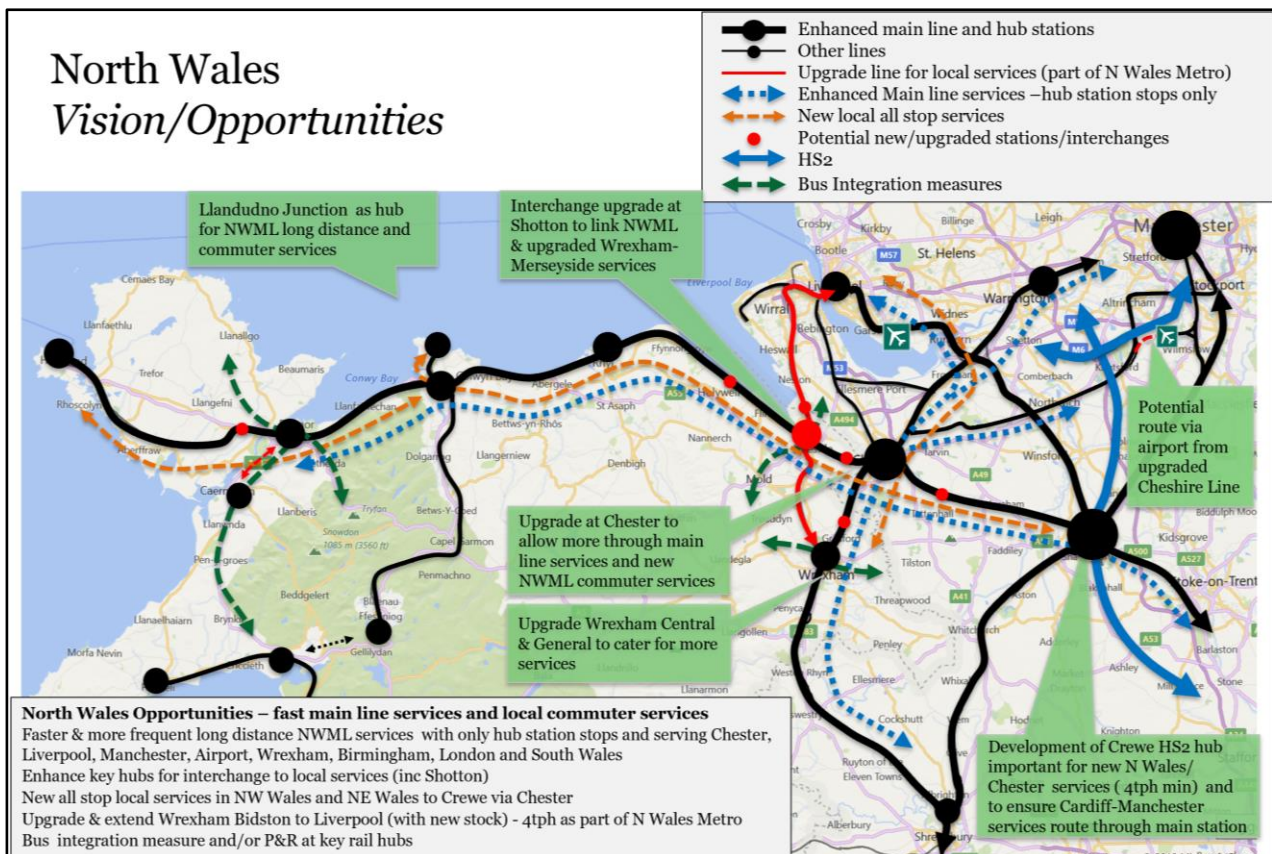


Figure 25 Illustration of North Wales Rail Vision

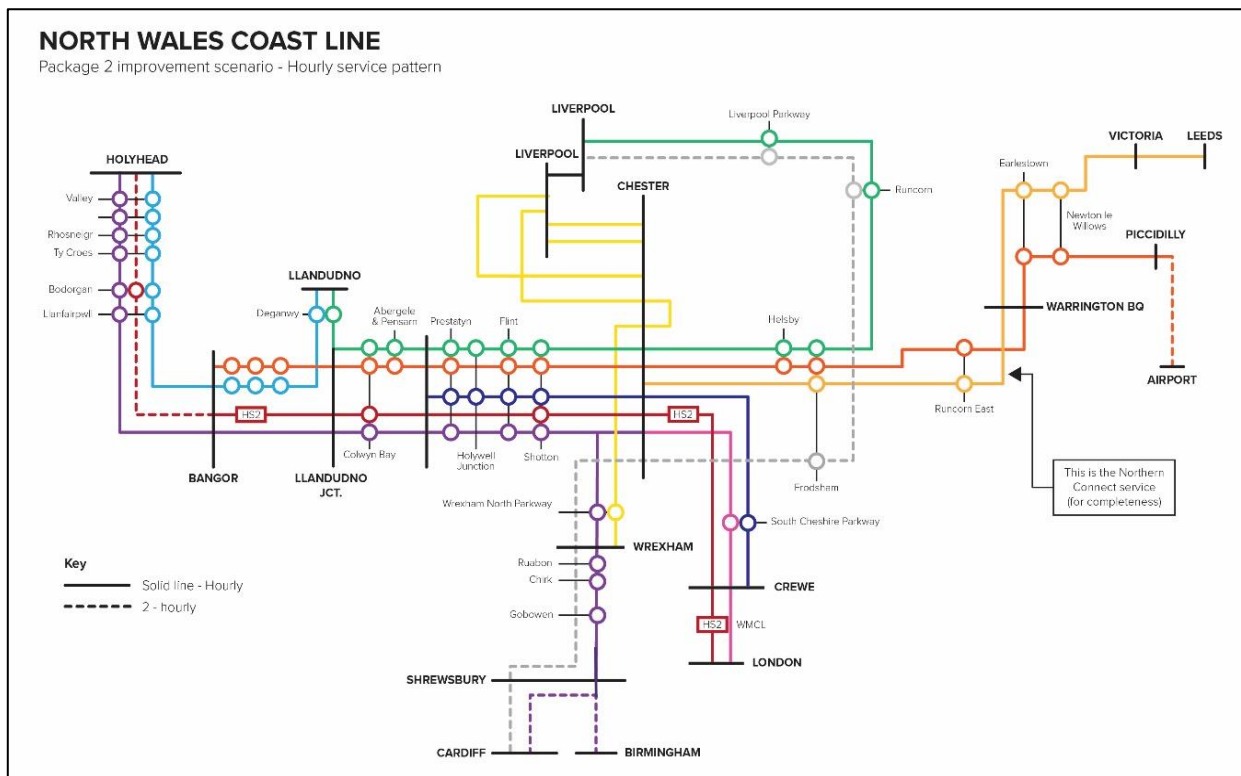


Figure 26 Potential north Wales service patterns

There are further interventions that could be considered in future which would deliver further economic benefits but may be associated with significant additional capital costs, these include:

- Full electrification along the entire North Wales Main Line (NWML)
- Operating of classic compatible HS2 services (without need for loco haul)
- Manchester Airport western rail access and extension of trans Pennine services to north Wales
- Further stations
- New route (e.g. Bangor to Caernarfon)

5.4 Wrexham – Merseyside

5.4.1 Wrexham – Merseyside: Vision and Objectives

Vision: Supporting economic growth and improving connectivity across the north Wales and Merseyside area by enhancing the Borderlands rail line to deliver faster, more frequent, and better integrated services.

Objectives: To deliver on this vision for the Wrexham – Merseyside area interventions will need to:

1. Widen access to employment across north Wales, Cheshire, Liverpool and Manchester by improving rail services.
2. Provide a frequent and well-connected transport system that supports the economic aspirations of the north Wales and Mersey – Dee regions.
3. Promote social inclusion by improving local access to employment, services and key centres.
4. Maximise the potential for stations to accelerate urban regeneration and major development site delivery.
5. Increase the proportion of journeys in north east Wales undertaken by rail.
6. Contribute to developing a north Wales Metro including improvements to multi-modal interchanges.
7. Reduce the environmental impact of transport, especially carbon emissions & air quality.
8. Improve rail network efficiency to allow a lower future subsidy requirement per passenger.

5.4.2 Wrexham – Merseyside: Possible interventions (Figure 25)

The interventions modelled to estimate the transport and wider economic benefits are:

- Full operational integration of the Wrexham-Bidston service with Merseyrail Electrics, permitting through running to central Liverpool with 4tph
- A frequency of four trains per hour is assumed, the same as most other branches of Merseyrail Electrics
- Operation using new class 777 units, and either full / partial electrification and / or battery power
- A new station at Deeside Park and major improvements at Shotton interchange
- Park & ride facilities are assumed for Heswall and Buckley stations along with bus integration at several stations along the line
- Line speed improvements are also assumed, mainly focussed on the English part of the route, where higher running speeds are possible.

There are further interventions that could be considered in future which would deliver further economic benefits but may be associated with significant additional capital costs, these include:

- Operating of tram-train to enable extension (for example to Wirral Waters, to Mold of through Deeside Industrial estate to Chester)
- A second tier of potential new stations has also been identified some or all of which may be brought forward over the longer term

5.5 South Wales & Great Western Mainline

5.5.1 South Wales Main Line: Vision and Objectives

Vision: Supporting inclusive and balanced economic growth in Wales and south west England by providing faster and more frequent services through investment in the Great Western rail corridor.

Objectives: To deliver on this vision for the South Wales Main Line interventions will need to:

1. Reduce rail journey times between West Wales and London, towards targets of:
 - a. 90 minutes between Cardiff and London Paddington
 - b. 30 minutes between Cardiff and Bristol Temple Meads
 - c. 30 minutes between Swansea and Cardiff
2. Increase service frequencies between south west Wales and London; Cardiff and Bristol Temple Meads; and Swansea and Cardiff.
3. Provide sufficient capacity and improve rail network resilience between Cardiff and Bristol to accommodate future passenger and freight demand.
4. Enhance rail connectivity to international gateways/airports and Enterprise Zones
5. Improve Park and Ride provision for accessing the South Wales Main Line and reduce reliance on the M4 corridor
6. Improve integration between main line rail and the wider transport network, especially the developing south Wales and Bristol Metro systems.
7. Maximise the potential for stations to accelerate urban regeneration and major development site delivery.
8. Increase the number of trips made by public transport, focusing on commuter trips.
9. Reduce the environmental impact of transport, especially carbon emissions & air quality.
10. Improve rail network efficiency to allow a lower future subsidy requirement per passenger.

5.5.2 South Wales Main Line (SWML): Potential Interventions (Figure 27)

The interventions modelled to estimate the transport and wider economic benefits were based on:

- The upgraded Wales and Borders rail services for which the following frequency and station stops are proposed to be operated with 100mph capable rolling stock:
 - One train per hour Birmingham/north east England to Cardiff calling only at Newport on the SWML
 - One train per hour Nottingham to Cardiff
 - One train per hour Gloucester to Cardiff calling at local stations including new stations at Cardiff Parkway and Rover Way on the SWML
 - One train per hour Abergavenny to Cardiff
 - Two trains per hour Manchester to Cardiff
 - One train per hour Holyhead/Liverpool to Cardiff
 - Subject to further infrastructure interventions, two trains per hour Ebbw Vale to Maesteg and two trains from Ebbw Valley to Newport
- Creation of an upgraded SWML enabling improvements in journey times from Severn Tunnel Junction to Swansea through upgraded rail infrastructure and faster linespeeds towards a 100mph railway (and higher where feasible) that enables the benefits of new trains to be realised.

- Faster long-distance services offering journey times for selected stop services as shown in *Table 4*.
- More frequent South Wales Main Line services based on a standard pattern (Figure 28):
 - Two London – Cardiff services with current stopping pattern and the other calling at a new Cardiff Parkway station
 - Two London – Swansea services with both trains only calling at Reading, Bristol Parkway, Newport from where one train would call only at Cardiff Central and Swansea whilst the other train would serve local destinations.
 - Two Bristol Temple Meads – Swansea services. One limited stop service would stop at principal stations whilst the other would serve all local stations to Swansea
 - Two Bristol Temple Meads – Cardiff services serving local stations with one train each calling at new stations at Rover Way and Cardiff Parkway.
- New Stations (subject to further development) at Magor, Llanwern, Cardiff Parkway, Rover Way, Miskin-Junction 34, Brackla, Cockett and St Clears.
- Enhanced transport interchange at Llansamlet.

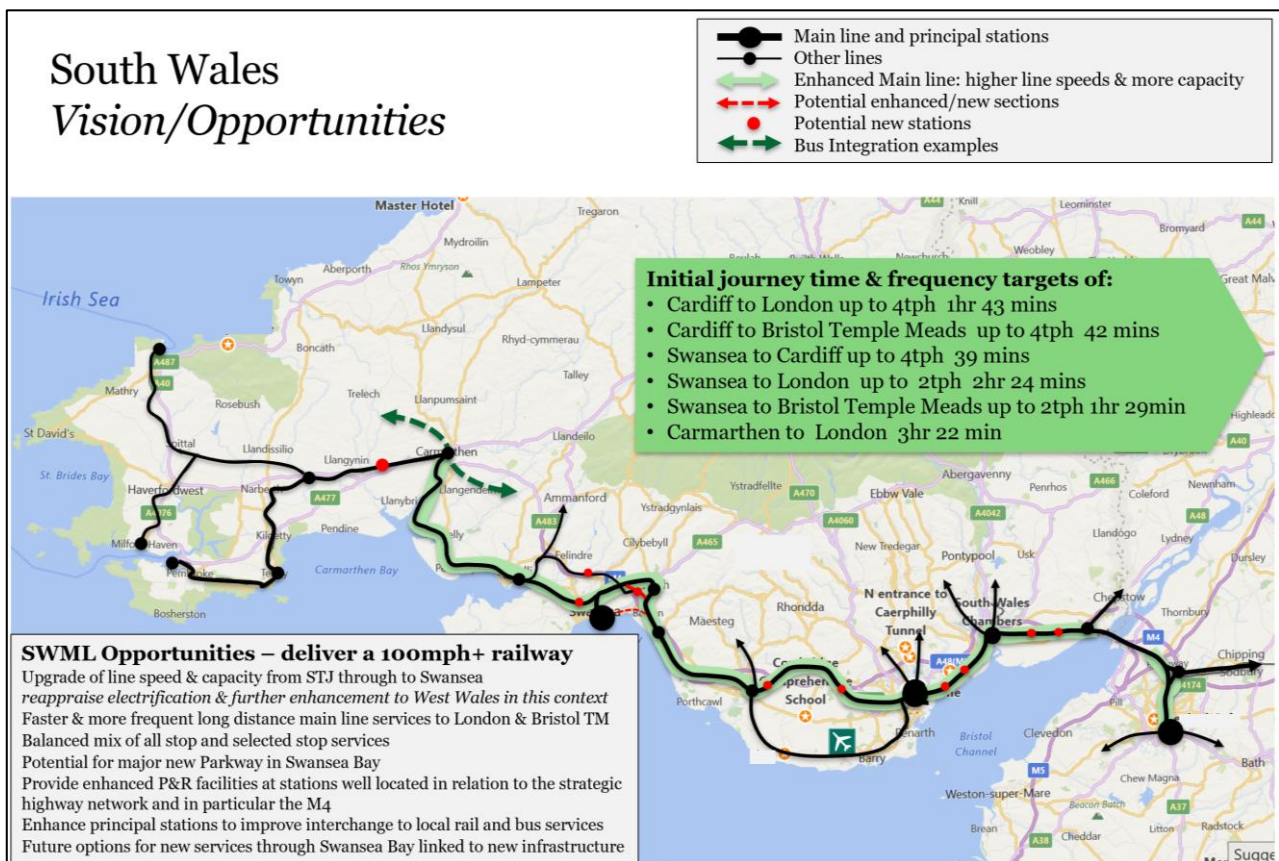


Figure 27 South Wales Main Line – the ambition of a 100-mph railway

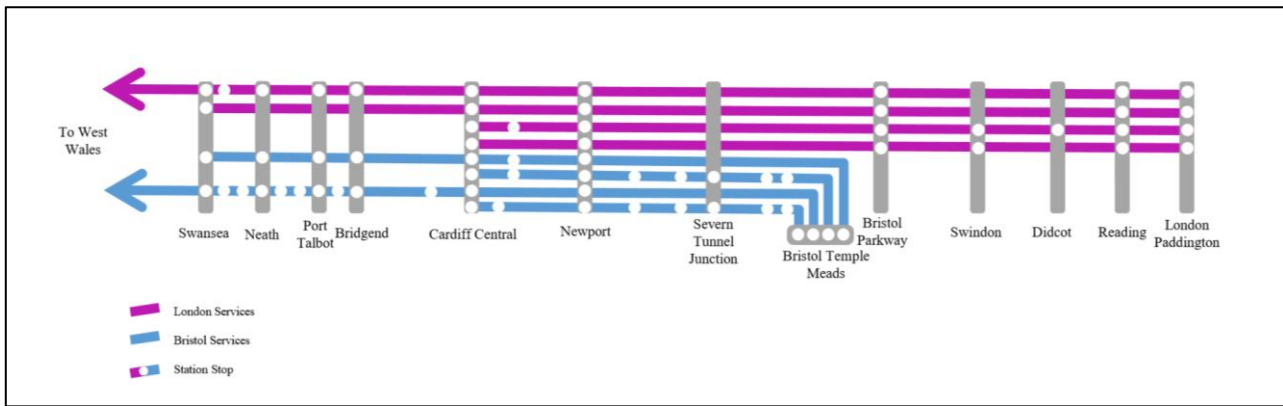


Figure 28 Potential "balanced" SWML service pattern

Table 3 Potential SWML service frequencies

	Existing Frequency	Post IEP Frequency	Concept Future Timetable (Balanced)
Pyle, Baglan, Briton Ferry and Skewen	0.5 (0)	0.5 (0)	1 (0)
Llansamlet	0.5 (0)	0.5 (0)	2 (1)
Port Talbot	2.5 (1)	2.5 (1)	3 (1)
Neath	2.5 (1)	2.5 (1)	3 (1)
Swansea	2.5 (1)	2.5 (1)	4 (2)
Carmarthen	1.5 (0)	1.5 (0)	3 (1)
Milford Haven	0.5 (0)	0.5 (0)	1 (0)

Table 4 Potential SWML journey times for a range of service scenarios

Route	Existing	Post IEP (estimated)	Concept Future Timetable (Balanced)	Concept Future Timetable & Linespeed Enhancements	Concept Future Timetable & Linespeed Enhancements & Electrification to Swansea
Cardiff – Paddington	1h 59m	1h 51m	1h 47m	1h 43m	1h 43m
Cardiff – Bristol TM	48m	48m	43m	39m	39m
Swansea – Cardiff	52m	52m	45m	42m	38m
Swansea – Paddington	2h 56m	2h 48m	2h 35m	2h 28m	2h 24m
Swansea – Bristol TM	1h 49m	1h 55m	1h 40m	1h 34m	1hr 29m
Carmarthen – Paddington	3h 55m	3h 47m	3h 34m	3h 27m	3hr 22m

There are further interventions not assessed in the baseline economic analysis that could be considered subject to further development and stakeholder discussions that can improve journey

times further. These would also deliver additional economic benefits as well as potential significant additional capital costs, these include:

- Further journey time reductions through line speed upgrades to over 100mph throughout the SWML (including west of Swansea) and which may require significant new alignment options to be considered (for example use of some of Swansea District Line and new links to the current main line - see below)
- Electrification to Swansea to be re-considered in this context of a more frequent timetable and less constrained linespeed
- Further line speed upgrades on entire GWML to London to achieve 140mph running (which the new IET trains are capable of) which may require new infrastructure and/or new signalling capabilities
- Development of a West Wales/Swansea/Neath Parkway station on the Swansea District Line (SDL) perhaps at Llandarcy (inc additional services) and/or route/station alternatives
 - this may need a link between SDL and the main line near Llansamlet which could deliver further journey time reductions to Swansea and west Wales;
 - for example, routing an additional London service to Carmarthen and West Wales via a new Parkway without stopping at Swansea High Street or Neath would enable even shorter journey times to Carmarthen and West Wales
- Options to reduce journey times to Llanelli, Carmarthen and West Wales by using a combination of new alignment options and reduced stops
- With further enhancement measures in Cardiff (eg at Cardiff West junction and Rhoose Station) and subject to operational considerations, it may be possible to extend some services from the east of Cardiff via the Vale of Glamorgan (VoG) line to Barry and Cardiff Airport (Rhoose)
- In future, measures to address the journey time and frequency constraints of the Severn Tunnel will need to be considered

5.6 Swansea Bay Urban Area

5.6.1 Swansea Bay Urban Area: Vision and Objectives

Vision: Accelerating economic growth across the Swansea Bay City Region, expanding labour market catchments, and encouraging investment by transforming the region's rail network.

Objectives: To deliver on this vision for Swansea Bay interventions will need to:

1. Reduce journey times between key population centres including Swansea, Neath, Port Talbot, Llanelli, Carmarthen, Pembroke and Milford Haven.
2. Increase service frequencies
 - a. for local stations on the main line between Carmarthen and Port Talbot, especially during peak periods
 - b. on the Heart of Wales line to serve commuters into Swansea and beyond
 - c. across south west Wales to improve suitability for daily commuting
3. Improve regional transport accessibility through widening the spatial reach of the rail network and services.
4. Improve Park and Ride provision for access to the Swansea Bay region.
5. Provide a viable public transport alternative to the congested M4/A48 corridor
6. Contribute to developing a Swansea Bay Urban Area Metro including improvements to multi-modal interchanges.
7. Maximise the potential for stations to accelerate urban regeneration and major development site delivery.
8. Increase the number of trips made by public transport, focusing particularly on commuter trips.
9. Reduce the environmental impact of transport, especially carbon emissions & air quality
10. Improve rail network efficiency to allow a lower future subsidy requirement per passenger

5.6.2 Swansea Bay Urban Area: Potential Interventions (Figure 29)

The interventions modelled to estimate the transport and wider economic benefits are:

- A new dedicated Swansea Bay Urban Area commuter rail network serving a range of new and existing stations, consisting of two initial routes potentially operated using the same tram-train rolling stock that will be procured for the South Wales Metro.
 - A Llanelli – Pontarddulais – Swansea 'Metro' service providing three trains an hour. The route would call at the following stations where * signifies new stations: Llanelli, Llangennech, Bynea, Pontarddulais, Penlleger*, Felindre*, Morriston*, Llansamlet, Winch Wen*, Landore* and Swansea. In order to operate this route a new section of line would be required to the east of Llansamlet station to connect the SDL and the main line.
 - A Port Talbot – Neath - Swansea 'Metro' service providing two trains an hour. The route would call at the following stations where * signifies new stations: Port Talbot, Baglan, Briton Ferry, Neath, Skewen, Llansamlet, Winch Wen*, Landore* and Swansea.

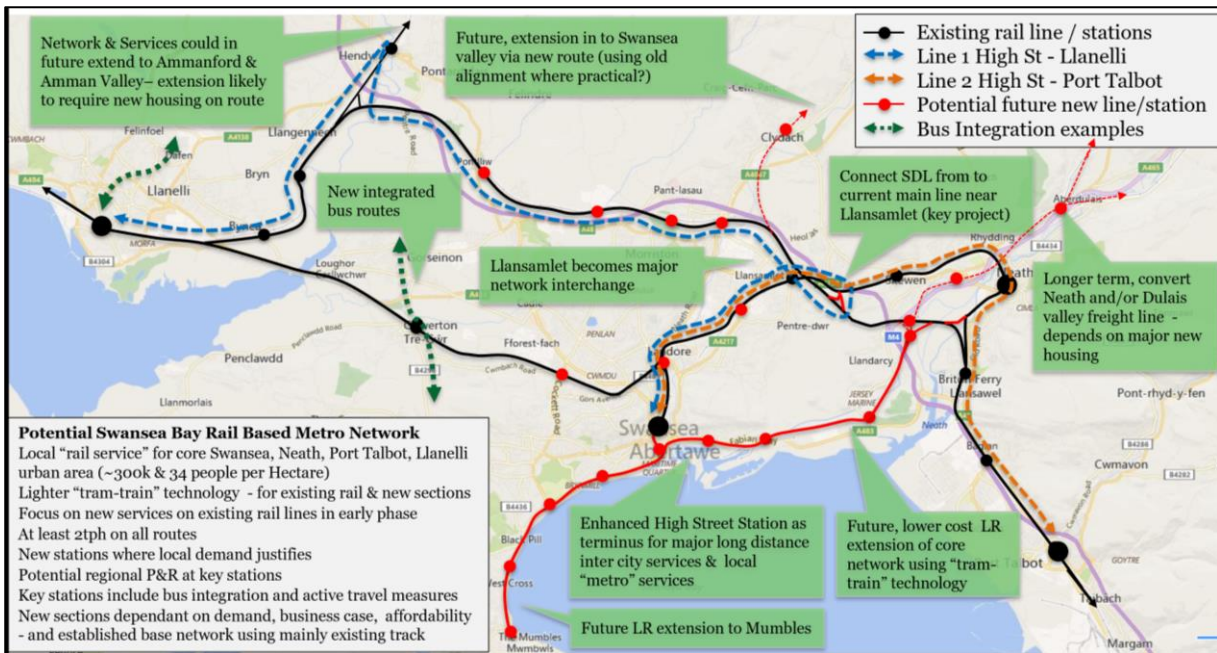


Figure 29 Illustration of a potential rail foundation for a Swansea Bay Metro

In developing proposals for a Swansea Metro, it will also be necessary to consider:

- Park and Ride provision at stations such as Llansamlet and Felindre
- Integration measures for active travel and bus routes

There are also further interventions (also shown in *Figure 29*) that could be considered in future which would deliver further economic benefits but may be associated with significant additional capital costs, these include:

- More ambitious lines and longer term
 - New extension south of High Street in Swansea city centre to Mumbles using “on street” capability of tram-trains
 - Use of the freight lines south of Llandarcy through to Swansea University’s Bay campus, SA1 and on-street to High street. This would enable a tram-train service to operate from Swansea to Neath via SA1
 - Dependant on land use changes (especially housing allocation) service extensions (in part using existing freight lines) could be considered on the Neath and Dulais valleys and from Pontarddulais to Ammanford and through to the Amman valley

6 NEXT STEPS

In parallel with a planned public consultation, the next stages of development could include further Business Case and Scheme Development (where appropriate undertaken jointly with partner organisations in England); at this stage the emerging programme is:

- To identify complementary works to maximise the benefits of the new W & B rail service
- A gap analysis of business cases that have been carried out or in the process of completion including those commissioned by Network Rail across all of the workstreams
- North Wales Main Line
 - NWML Target of 100mph railway through further signalling & alignment upgrades to deliver more capacity (including consideration of electrification in that context)
 - Build on the ongoing work with partners to determine the rail and passenger infrastructure necessary at Chester station to unlock operational capacity and deliver a step change in North Wales rail services
 - To assess the potential for early introduction of NWML all stop commuter services
 - Extension of Liverpool services from Chester to Wrexham (including consideration of Wrexham-Chester Doubling)
 - New stations (including Gaerwen, Holywell, South Cheshire Parkway)
 - Ensure Welsh requirements are reflected in scheme development of HS2 Crewe hub
 - To progress development (via 3rd parties) of interventions that deliver faster services and more capacity between Chester, north Wales and Manchester, Manchester airport, Leeds, etc. In doing so, development of NPR, HS2 Phase 2b and the potential airport western rail access and variants therefore, should reflect this requirement
- Wrexham-Merseyside (Borderlands Line)
 - Capacity and line speed upgrade of Wrexham-Bidston (Network Rail workstream i/p)
 - Work with NR and Merseytravel to assess integration with Merseyrail services to deliver 4tph, including assessment of rolling stock options
 - Shotton Interchange (including consideration of Network Rail's renewal of overbridge)
 - Land Use & Development Study (with Merseytravel) along length of route
 - P&R, Integration & new stations (esp Deeside Parkway) studies
- South Wales Main Line
 - SWML upgrade from Bristol to West Wales to deliver 100 mph+ railway; initial focus on Cardiff-Bridgend line speed enhancements (to complement work being undertaken by Network Rail for the relief lines and potential to extend scope of that work) – consider case for electrification and further capacity in this context
 - To assess the potential for additional services on the SWML to deliver the “balanced service pattern” set out (inc additional London and Bristol Temple Meads services)
 - Explore the potential for a West Wales/Swansea Parkway station linked to a new section of line between SDL and main line and associated new services (including variants) and dependencies on proposed local metro services
 - New stations (including Cockett, Miskin-M4 J33, Brackla, St Clears, Rover Way, Magor, Llanwern and Cardiff Parkway)
 - Western Rail Link to Heathrow (being progressed by DfT/NR)
 - Maximise benefits of Port Talbot Phase 2 re-signalling

- Swansea Bay Urban Area
 - Rail based Swansea Metro, potentially using tram-train technology, utilising existing and potentially new routes (including a new link between SDL and main line if required), new stations and potential enhancements required at Swansea High St (and other stations if necessary).

In addition, we seek to further develop proposals for

- Improving north-south rail journey times in Wales
- Development of other rail corridors

7 APPENDICES

7.1 Approach

Following the Cabinet Secretary for Economy and Transport's announcement in May 2018, Prof Barry has led teams to develop two Programme Strategic Outline Cases (PSOC) that make the case for rail investment to support economic development and growth: one for North Wales and another for South Wales - which is the best way to assess a range of potential interventions that can frame an initial assessment of overarching and interdependent needs.

This work has been undertaken using Welsh Government's updated WelTAG guidance³⁵ (stage one) and also complies with the DfT's WebTAG guidance³⁶, Strategic Case Guidelines³⁷ and Rebalancing Toolkit. The business cases also demonstrate how investment will meet the broader aims of Welsh Government as set out in its Well-being of Future Generations Act, Environment Act and its economic strategy, Prosperity for All, as well as meeting the UK Government's aspirations for a more productive and balanced economy.

At this early stage the focus has been on making the case for investment by first undertaking an analysis of the strategic and economic characteristic of these regions; this included reviewing economic indices, demographics, travel patterns as well as an assessment of existing transport constraints, issues and opportunities.

These programme level business cases then identify a range of potential solutions that address not only current economic and strategic needs but that can also deliver rail infrastructure and services fit for future generations. The PSOCs establish an overall vision for the future of the north and south Wales rail networks that meets the Welsh Government's and, indeed, other key stakeholders' aspirations.

Solutions comprise multiple complementary projects to create an efficient and reliable railway network, delivering the speeds and capacities which meet the connectivity needs of people in urban and rural communities. The emerging proposals were also developed cognisant of the ongoing work by Welsh Government to develop metro systems in north and south Wales.

At this early stage, no options have been ruled in or out. A determination of where further development (via more detailed business cases) should be concentrated will take place after a planned public consultation later in 2018.

7.2 Initial Scope of Work

This 'case for change' builds upon recent and pending rail improvements including the Great Western Main Line (GWML) electrification to Cardiff, the South Wales Metro and new Wales and Borders rail services. The study also reflects the current work being undertaken by Network Rail for the Department for Transport on specific interventions on the Wales Route.

Beyond this overarching context, initial work on the 'case for change' has focussed on interventions in four geographical areas:

- South Wales Main Line (from Milford Haven, Pembroke, Llanelli, Carmarthen through to Swansea, Cardiff, Bristol, Heathrow and London)
- Swansea Bay (focussed on the main urban area between Llanelli and Port Talbot)
- North Wales Main Line from Crewe to Holyhead via Chester
- Wrexham – Merseyside (via Bidston)

Other cases for other parts of Wales will be developed independently.

This work has not explored in any detail the crucially important role of active travel and buses, and the opportunity to integrate services and facilities more effectively with the rail network across Wales.

³⁵ [Welsh Government, Transport Appraisal Guidelines](#)

³⁶ [Department for Transport, Transport Appraisal Guidelines](#)

³⁷ [Department for Transport, Strategic Case Supplementary Guidance Transport Investment Strategy](#)

7.3 UK Secretary of State for Transport Announcements & Network Rail work

At the same time as announcing the cancellation of the GWML electrification to Swansea in July 2017, the UK Government's Secretary of State for Transport also signalled his intention to support further work and development of a range of schemes in Wales³⁸. As set out in the DfT's announcement at that time these included:

- improving journey times and connections between Swansea and Cardiff, and south Wales, Bristol and London
- improving journey times and connections across north Wales
- direct services from Pembroke Dock to London via Carmarthen on new, state of the art Intercity Express trains
- station improvements at Cardiff Station
- station improvements in and around Swansea including looking at the case for additional provision

Subsequent discussions refined those initial commitments to the following list of schemes

1. Improving journey times on the North Wales Main Line
2. Improving journey times on the Wrexham-Bidston line
3. Station improvements at Cardiff Central Station
4. Improving Cardiff to Severn Tunnel Junction Relief Lines
5. Station improvements in and around Swansea including looking at the case for additional provision, and
6. Improving journey times and connections between Swansea and Cardiff, and South Wales, Bristol, and London

The DfT has asked Network Rail to commission further, more detailed work on specific projects related to schemes 1, 2 and 4. This study, which is at a strategic level, complements and supports that work in providing further data and evidence from a broader programme. Consideration of schemes 1 and 2 is included in the North Wales Programme Strategic Outline Case and schemes 4, 5 and 6 in the South Wales Programme Strategic Outline Case. A separate case for Cardiff Central is being developed independently.

³⁸ <https://www.gov.uk/government/speeches/rail-update-bi-mode-train-technology>