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14 February 2021

Railways: Light Rail

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Summary

Light rail is an environmentally friendly form of mass transit, popular in towns and cities across Europe and elsewhere in the world. Many cities and regions across Great Britain have plans to introduce new light rail systems or expand their existing networks. This briefing provides an overview of light rail, including the benefits of light rail and the barriers to its use, as well as how light rail has been implemented in the UK and internationally.

What is light rail?

Light rail includes traditional trams and metro systems through to more modern very-light or ultra-light rail systems. Light rail vehicles, such as trams, are lighter than those used for mainline rail services and operate at lower speeds, which means they can be integrated within an urban environment. Light rail services often run on a road or on public rights-of-way. For example, tramways, a specific type of light rail, run, at least in part, through areas the public can access. Like other vehicles on the road, drivers of a tram are expected to drive at a speed from which they could stop within the distance they can see ahead. This is known as line-of-sight control.

Benefits and costs of light rail

Light rail is a relatively environmentally friendly mode of transport. For example, the Urban Transport Group (UTG), which represents city region transport authorities, outline that one of the benefits of light rail is that it has zero emissions at the point of use. Light rail systems can also help encourage people to use their cars less. According to the UTG, 30% of tram users in Nottingham switched from using their cars, whereas 29% of Manchester Metrolink users reported that they would use a car if the tram was not available.

Even though light rail offers many social and economic benefits, it is expensive to install, with costs typically around £20-30 million per kilometre but as high as £133 million per km. The Public Accounts Committee's inquiry in 2005 into Improving public transport in England through light rail found that the costs of building light rail systems were driven up by a lack of standardisation in the design of vehicles and networks and the need to divert public utilities such as water and gas.

Light rail in the UK

There are 9 major schemes in the UK, including in Birmingham, Blackpool, Edinburgh, London (in both the Croydon and Docklands areas), Manchester, Newcastle, Nottingham, and Sheffield. There are numerous proposals to introduce light rail systems in other cities across the UK, which are at different stages.

UK Tram, which represents the light rail sector, has highlighted that light rail is a popular mode of transport in the UK cities with these systems, providing high satisfaction rates of 87-97% across the UK. Nevertheless statistics published by the Department for Transport show light rail only accounts for a small share of the journeys within towns and cities with a light rail or tram system.

Most UK light rail systems experienced regular growth in the last decade. However, like other forms of public transport, the use of light rail within the UK has been significantly affected by the Covid-19 pandemic. Overall, there were 271 million light rail passenger journeys in the UK in 2019/20. This dropped to 83 million in 2020/21.

It is not clear the extent to which the pandemic will lead to long-term or permanent changes in the way people travel and their perceptions of public transport and, therefore, what this might mean for the use, and financial sustainability, of light rail.

The Government and light rail

In July 2021, the Government's transport decarbonisation plan, Decarbonising Transport: A Better, Greener Britain, described light rail as an "existing zero emission choice" of public transport, which supports the UK Government's aims to encourage more people to use public transport as well as walk and cycle. The Government is still analysing feedback from its call for evidence in February 2019 into the opportunities for introducing light rail and other rapid transit systems in towns and cities in England. In its transport decarbonisation plan, the Department for Transport said it is incorporating analysis from its 2019 call for evidence "to inform future policy". Even so, the Government has recently announced funding for light rail schemes. For example, the Autumn Budget and Spending Review in October 2021 included funding for schemes such as the renewal of the Sheffield Supertram and the extension of the West Midlands Metro.

The powers required to implement and operate a new light railway are obtained through an order made under the Transport and Works Act 1992 (the TWA). Collating the necessary information and undertaking the process to

obtain a TWA order can take scheme promotors 3-5 years, although if approved there are few grounds for appeal.

Safety within the light rail sector is regulated by the Office of Rail and Road (ORR) under the Health and Safety (Enforcing Authority for Railways and Other Guided Transport Systems) Regulations 2006 (as amended). Established in 2019, the Light Rail Standards and Safety Board (LRSSB) provide guidance and standards for the sector, with support from the ORR and the tram industry body UK Tram.

1 Introduction

1.1 What is light rail?

Light rail is a transportation system that can be integrated within urban environments. This is achieved using lighter equipment that operates at slower speeds than is found on the mainline railway. Vehicles are typically electrically powered and can operate along exclusive rights-of-way at ground level, on raised structures, and in tunnels, or on the highway.[1]

Light rail includes:

- **Tramways.** These use parallel rails that are laid wholly or partly in areas the public can access (including on the road) to support and guide trams with flanged wheels.[2] One of the most significant differences to the mainline railway is that trams are driven on 'line-of-sight', whereby the driver is expected to drive at a speed from which they could stop the tram within the distance they can see ahead, similar to vehicles on the road.[3]
- **Light Metro.** Light metro systems have similar characteristics to metro systems[4], but use trains that are lighter than counterparts on the mainline railway or London Underground. Controlled by signals, they operate with exclusive rights-of-way on tracks that can be underground, elevated or at-grade.[5]
- **Tram-Train**. Tram-Train has been developed to combine the connectivity of a mainline railway with the ability of light rail to penetrate towns and cities. Tram-trains can safely operate on mainline rail tracks as well as on tracks designed for trams.[6] Tram-trains are designed to travel safely alongside 'heavy' mainline trains.[7] The Sheffield Supertram is the only system operating tram-trains within the UK.
- **Very Light Rail (VLR)**. VLR is an emerging subsect of light rail which aims to reduce costs compared to traditional light rail schemes, whilst

1 Urban Transport Group, Leading Light: What Light Rail can do for City Regions, October 2021.
2 The Railways and Other Guided Transport Systems (Safety) Regulations 2006, 2006/599.
3 RAIB, Overturning of a tram at Sandilands junction, Croydon, 9 November 2016, 18/2017, v2.2, October 2020.
4 Metro systems are segregated heavy railways developed specifically for urban areas of cities.
5 Urban Transport Group, Leading Light: What Light Rail can do for City Regions, October 2021.
6 Urban Transport Group, Leading Light: What Light Rail can do for City Regions, October 2021.
7 Ambrose I., Sheffield tram train pilot One year on – lessons learned, PWI Journal, 138 [1], 2020.

maintaining its benefits. It is targeted at routes with lower patronage than is typically seen on urban rail systems where the costs of traditional light rail exclude its use. VLR vehicles are smaller and lighter which enables the use of technology from cars, buses and lorries to reduce costs whilst maintaining suitable performance.[8] A similar concept has been used to develop VLR for rural/regional heavy rail alignments.[9] There is no currently no operational VLR scheme in the UK.

- **Ultra-Light Rail (ULR)**. ULR has been developed with similar aims as to VLR, but with application on rural or regional alignments segregated from the mainline. A system has been operating in Stourbridge, West Midlands since 2009, on what is considered the shortest branch line in Europe.[10]
- **Automated Transit Networks (ATN)**. ATN encompasses Personal Rapid Transit (PRT) and Group Rapid Transit (GRT). Conceived as small, driverless vehicles capable of transporting individuals or parties nonstop from origin to destination, PRT systems generally have 4-6 seats and encourage ride sharing. Meanwhile, GRT uses larger vehicles that are capable of carrying up to 20-30 passengers and which are still driverless.[11]

This note does not cover devolved schemes, such as the Edinburgh tram or Glasgow underground, or airport transit schemes, such as the Birmingham monorail. Further, it does not cover systems designed primarily for segregated operation on the mainline, such as branch lines.

1.2 Benefits of light rail

The Department for Transport see light rail and very light rail as potential ways to decarbonise local transport. [12] [13]

Light rail offers some advantages over other public transport systems. For example, light rail systems:

- Encourage modal shift. Cars and taxis were responsible for 20% of UK greenhouse gas emissions from in 2019.[14] Thus removing cars from the

[8] Zemek K., Very Light Rail research on track, *Railway Gazette International*, 24 January 2020.
[9] Stephen P., Very Light Rail demonstrator offers reopening hopes, *RAIL*, 13 October 2021.
[10] Pre Metro Operations Ltd., About, accessed: [03 November 2021].
[11] DfT, Light Rail (and other rapid transit solutions): A Call for Evidence on the opportunities available to introduce new Light Rail Systems or other rapid transit solutions into towns and cities in England, February 2019.
[12] DfT, Decarbonising Transport – A Better, Greener Britain p162, July 2021.
[13] DfT, Decarbonising Transport – A Better, Greener Britain, p153, July 2021.
[14] DfT, Transport and Environment Statistics 2021 Annual report, 11 May 2021.

roads has significant potential to reduce emissions, ease congestion and improve local air quality. Where light rail schemes exist, there is evidence they have encouraged people to switch from driving. For example, in Nottingham 30% of tram users switched from cars, whilst in Manchester 29% of Metrolink users said they would use a car if the tram system was not available.[15]

- Provide reliable journey times and high levels of passenger satisfaction, with 87-97% overall journey satisfaction across UK systems.[16]
- Offer a low carbon mode of transportation, with zero emissions at the point of use. Direct emissions from the light rail sector in Great Britain totalled approximately 54,000 tonnes CO_2(e) in 2019/20, or 0.13% of the total UK emissions.[17]
- Enable a reduction in non-exhaust emissions (NEE),[18] which the Organisation for Economic Co-operation and Development (OECD) have projected to increase from passenger vehicles worldwide by 53.5% by 2030.[19] The OECD also suggest that emissions in urban areas can be reduced by policies disincentivising private vehicle usage whilst incentivising a modal shift to active or public transport. [20]
- Can lead to/support the regeneration and economic development/growth of areas along alignments. For example, in Birmingham, Croydon, Manchester, Newcastle and Sunderland, Nottingham, and Sheffield, commercial regeneration of targeted sites has been built around existing systems and alongside planned further development of these networks. In London, the Docklands Light Railway has supported housing development in areas surrounding the line. For example, there are double the number of properties in areas in close proximity to the DLR compared to similar areas without ready access to the line.[21]
- Support socioeconomic improvements, such as reduced time to travel for work, above average increases (for the location) in house prices, increased connectivity enabling greater access to jobs and businesses, increased productivity, and improved health along the alignment due to

[15] Urban Transport Group, Light rail: keeping city regions moving during the pandemic -and building back better afterwards, 19 May 2021.

[16] UK Tram, A Light Rail Strategy for the UK, September 2021.

[17] calculated using the average grams of carbon dioxide per passenger kilometre (gCO_2(e)) and the total number of passenger kilometres travelled by the sector

[18] NEEs are typically particles from the road and tyres as well as brake dust, and are associated with an increased risk of cardiovascular, respiratory and developmental conditions

[19] OECD, Non-exhaust emissions from road transport: Causes, consequences and policy responses, ENV/EPOC/WPIEEP(2020)4/FINAL, 25 June 2020.

[20] OECD, Non-exhaust emissions from road transport: Causes, consequences and policy responses, ENV/EPOC/WPIEEP(2020)4/FINAL, 25 June 2020.

[21] Urban Transport Group, Leading Light: What Light Rail can do for City Regions, October 2021.

reduced local emissions supplemented by a greater frequency of active transport.[22]

- Provide a source of local employment. For example, in Nottingham, approximately 44% of construction staff were from the Greater Nottingham area and a further 23% lived elsewhere in the East Midlands.[23] There are over 230 people employed on Nottingham Tramlink, with recruitment targeted at local candidates, particularly those that were on Jobseekers' Allowance.[24] Light rail systems in Manchester, Newcastle and Sheffield have generated approximately 900, 800 and 350 jobs respectively.[25]
- Can be seamlessly integrated with the surrounding environment and alongside wider developments. Light rail schemes can be used to link to other public transport, such as rail or bus stations, and economic centres.[26]

1.3 Barriers to the use of light rail

There are also a number of barriers that have affected the widespread use of tramways throughout towns and cities within the UK. These include:

- The costs to install a new light rail scheme or extend existing tramways, which are typically between £20-30 million per kilometre.[27] Those with extensive operation on-street (i.e. integrated with the highway) tend to be associated with increased costs compared to alignments focussed on disused railway lines.[28] The Edinburgh light rail system, for example, cost £71 million per km.[29] Extensions to existing lines are also expensive; a one mile extension to the West Midlands Metro reportedly cost £227 million (£133 million per km).[30] Other schemes, with a much lower proportion of on-street alignment, have cost less per km. For example, an extension of the light rail system in Nottingham, Nottingham Phase 2 (see Section 2.1)

[22] Urban Transport Group, Leading Light: What Light Rail can do for City Regions, October 2021.
[23] Rossiter W. et al., NET Phase Two Local Economic Evaluation – Report 2: Impact Evaluation Findings, *Tramlink Nottingham*, 2016.
[24] Rossiter W. et al., NET Phase Two Local Economic Evaluation – Report 2: Impact Evaluation Findings, *Tramlink Nottingham*, 2016.
[25] Urban Transport Group, Leading Light: What Light Rail can do for City Regions, October 2021.
[26] DfT, Light Rail (and other rapid transit solutions): A Call for Evidence on the opportunities available to introduce new Light Rail Systems or other rapid transit solutions into towns and cities in England, February 2019.
[27] Taylor M., UK Tram track light rail installation costs – "circa £20m to £30m per route kilometre, 5 July 2019
[28] DfT, Green Light for Light Rail, September 2011.
[29] Shirres D., Making light rail affordable, *Rail Engineer*, 26 August 2021.
[30] Young G., West Midlands Metro one mile extension to Digbeth 'could be ready by 2025', *Birmingham Mail*, 10 December 2020.

cost £33 million per km. [31] The Wednesbury to Brierly Hill extension of the Midland Metro, which is currently under construction, is estimated to cost £41 million per km.[32]

- A lack of standardised designs. Whilst some technical variation can be expected due to the requirements of specific schemes (such as local geography or expected operations), standardisation helps to ensure expertise is shared between schemes, which in turn helps to realise cost efficiencies. Prior to the formation of the Light Rail Safety and Standards Board (LRSSB) in 2019, there was a lack of standardisation across the light rail sector in the UK. Parliamentary inquiries into light rail have called for greater standardisation in the sector.[33] The legislative landscape for light rail in the UK is discussed further below in Section 3.4.
- The requirement to make an application for an Order under the Transport and Works Act 1992 (the TWA) to obtain the necessary statutory powers. This is a public process which culminates in a decision by the Secretary of State for Transport. [34] The process of obtaining government approval is discussed in Section 3.2.
- Behavioural changes and public perceptions following Covid-19.[35] For example, lockdown restrictions, coupled with initial discouragement of car-sharing and public transport, significantly reduced public transport use. During the pandemic, many people opted to drive or cycle rather than use public transport. Some of these behaviours, especially a shift from public transport to cars has continued. Car journeys quickly returned to 90% of pre-pandemic levels, while journeys on public transport remain significantly below levels seen in 2019. Many people shifted to forms of personal transport due to worries about the cleanliness of public transport and as a means of social distancing.[36] The impact of the pandemic on the light rail sector is discussed in Box 2 (Section 2.1).

[31] Whitelaw J., Nottingham's £570M tram extension opens, *Infrastructure Intelligence*, 25 August 2015.
[32] Smale K., Midland Metro extension cost rises by £50M, *New Civil Engineer*, 7 March 2019.
[33] Public Accounts Committee, Improving public transport in England through light rail, HC 440, 9 March 2005.
[34] DfT, Green Light for Light Rail, September 2011.
[35] Transport Committee, Oral evidence: Coronavirus: implications for transport, HC268, 9 September 2020.
[36] Abdullah M, Dias C, Muley D, Shahin M., Exploring the impacts of COVID-19 on travel behavior and mode preferences, *Transportation Research Interdisciplinary Perspectives*, 8 https://doi.org/10.1016/j.trip.2020.100255, 2020.

1.4 Research and development into light rail

Light rail acts at the interface between road and rail, and hence offers an opportunity for research into technologies from and for both sectors.

Vehicle research is typically centred on the propulsion systems,[37] the vehicle structure (for example the bodyshell),[38] or autonomy (driverless technologies).[39] The development of these systems could have implications beyond tramways. For example, autonomous technology have common requirements with other forms of public transport.[40] In the UK, the development of vehicles is typically undertaken by manufacturers. However, UK Research and Innovation (UKRI) has funded projects focused on tram technology development.

Research has been focussed on reducing the costs associated with implementing and operating the infrastructure, such as with the Low Impact Light Rail competition, funded by UK Tram.[41] Further, the novel trackform being developed for urban VLR requires less excavation than traditional systems, reducing installation costs.[42]

There is a significant body of research into the safety of light rail schemes, and how this can be improved at a system level for both pedestrians and passengers.[43] Following the incident at Sandilands (see Section 3.4), there have been investigations into systems which can be used to detect driver inattention,[44] as well as investigations into alternative forms of glazing with increased resilience.[45] The LRSSB state that they will initiate and commission research that is relevant to, and benefits, light rail organisations.[46]

Finally, the socioeconomic aspects of light rail attract significant research interest. This includes consideration of the impact of light rail transit systems on urban development[47] and sustainable development of cities,[48] changes to

[37] Calvo F., Hash W., Wireless Electric Propulsion Light Rail Transit Systems in Spain, *Transportation Research Board 97th Annual Meeting*, Washington D.C., pp. 19, 7-11 January 2018.
[38] Tyrrell M., The right train of thought, *Composites in Manufacturing*, 23 October 2019.
[39] Haveland J.C., Bergen: the autonomous light rail project; *Intelligent Transport*, 25 November 2019.
[40] Systra, Automated and autonomous public transport, 2018.
[41] UK Tram, Competition demonstrates innovations in light rail, accessed: [1 December 2021].
[42] Coventry City Council, Coventry's Affordable Very Light Rail Track Unveiled, 27 September 2021.
[43] National Academies of Sciences, Engineering, and Medicine, Improving Pedestrian and Motorist Safety Along Light Rail Alignments, *The National Academies,* 2009.
[44] LRSSB, Research drives new guidance on inattention systems, 1 June 2021.
[45] Crash-resistant glazing for Coventry rail, *Glass & Glazing Products*, 17 July 2021.
[46] LRSSB, Business Plan 2021-22, July 2021.
[47] Baker D.M., Lee B., How Does Light Rail Transit (LRT) Impact Gentrification? Evidence from Fourteen US Urbanized Areas, *Journal of Planning Education and Research*, **39** [1], 35-49, 2019, 10.1177/0739456X17713619.
[48] Sekasi J., Martens ML., Assessing the Contributions of Urban Light Rail Transit to the Sustainable Development of Addis Ababa. Sustainability 13, 5667, 2021, https://doi.org/10.3390/su13105667.

property values along light rail lines,[49] changes to public transport ridership,[50] and changes to physical activity.[51] Whilst typically these evaluate existing schemes, the methodologies could have impact for the development of business cases for new proposals.

1.5 Alternatives to light rail

There are a number of options to improve mass transit public transport systems, such as heavy rail, bus-based systems, tram-train or personal rapid transit. UK Tram advise that such alternatives should be considered to ensure that light rail schemes deliver the best possible value for money, whilst simultaneously addressing the wider strategic objectives and policies, such as those related to regeneration, social inclusion, and local and national environmental impacts. [52]

Other forms of low-carbon, urban transport include:

- **Buses**: which are the most widely used form of public transport in the UK, however, their popularity has been declining. The Government's national strategy for buses outlines how the bus sector needs to change to increase demand.[53]
- **Bus Rapid Transit (BRT) networks**: offer similarities to light rail. The main difference is the use of rubber tyres, which enable buses to leave a segregated busway and use the main highway. Whilst offering many of the benefits of light rail schemes, costs are typically lower than rail-based systems.[54] This is usually because less planning is needed, less land needs to be acquired and the technological requirements are simpler. However, a comparison between light rail and BRT in 2013 found the latter has an association with typical bus-based transport,[55] and hence does not achieve as significant a modal shift, is not perceived to

[49] Forrest D., Glen J., Ward R., The Impact of a Light Rail System on the Structure of House Prices: A Hedonic Longitudinal Study, *Journal of Transport Economics and Policy*, **30** [1], 15-29, 1996.

[50] Werner C.M. et al., Evaluating the attractiveness of a new light rail extension: Testing simple change and displacement change hypotheses, *Transport Policy*, **45**, 15-23, 2016, 10.1016/j.tranpol.2015.09.003.

[51] Durant C.P., et al., The Effect of Light Rail Transit on Physical Activity: Design and Methods of the Travel-Related Activity in Neighborhoods Study, *Frontiers in Public Health*, **4** [103], 2016, 10.3389/fpubh.2016.00103

[52] UK Tram, Advice Note for promoters considering a light rail scheme, April 2012.

[53] DfT, Bus Back Better, March 2021.

[54] Tirachini A, Hensher DA, Jara-Díaz SR., Comparing operator and users costs of light rail, heavy rail and bus rapid transit over a radial public transport network, *Research in Transportation Economics*, 29 [1]. 231-242, 2010. doi.org/10.1016/j.retrec.2010.07.029

[55] Hensher DA, Ho C, Mulley C., Identifying resident preferences for bus-based and rail-based investments as a complementary buy in perspective to inform project planning prioritisation, *Journal of Transport Geography*, 48, 1-9, 2015. doi.org/10.1016/j.jtrangeo.2015.05.004

be as permanent, and subsequently the positive impacts are not as strong.[56]

- **Mainline rail**: which is one of the least polluting modes of transport. The mainline rail network operates on a fully-segregated alignment, with trains travelling at up to 250 kph to link cities as well as provide suburban services. The characteristics of longer distance rail travel do not allow mainline rail the ability to penetrate cities in the same way as metros, light rail, and underground systems.[57]
- **Active transport**: includes walking and cycling and offers the ability to remove almost all emissions when travelling short distances, as well as reducing the number of cars on the road. It also contributes towards physical activity recommendations, reducing the impact of physical inactivity on the NHS.[58]
- **Micromobility**: encompasses a range of small, lightweight, human-powered vehicles, such as bicycles, that typically operate at speeds of up to 25 kph. [59] According to McKinsey, a management consultancy, electric micromobility, such as electrically assisted pedal cycles, has the potential to account for all trips of less than 5 miles [60] due to the increased attractiveness, especially to those unable to use non-electrified alternatives, as well as by expanding the area that riders can easily travel. Active transport and micromobility support the overall transport network by linking people with public transport and their end destination.[61]

It is worth noting that the success of any light rail system is dependent on it being well integrated with other forms of public transport.[62] However the National Audit Office (NAO), in 2004, found that systems in England are poorly integrated, especially with bus services, and that this needed to be improved to attract more passengers.[63]

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[56] Vuchic VR, Stanger RM, Bruun EC., Bus Rapid Versus Light Rail Transit: Service Quality, Economic, Environmental and Planning Aspects. *In: Ehsani M, Wang FY, Brosch GL., (eds),* Transportation Technologies for Sustainability. Springer, NY, 2013. https://doi.org/10.1007/978-1-4614-5844-9_383

[57] IEA, The Future of Rail: Opportunities for energy and the environment, 2019.

[58] Active travel: Trends, policy and funding, Commons Library Briefing Paper CBP-8615, 7 August 2020.

[59] Institute for Transportation and Development Policy, Defining Micromobility, accessed: [10th August 2021].

[60] Heineke K., Klosss B., Scurtu D., Weig F., Micromibility's 15,000 mile checkup, *McKinsey & Co.*, 29 January 2019.

[61] Oeschger G, Carroll P, Caulfield B., Micromobility and public transport integration: The current state of knowledge, Transportation Research Part D: Transport and Environment, 89, 2020. https://doi.org/10.1016/j.trd.2020.102628

[62] DfT, Light Rail (and other rapid transit solutions): A Call for Evidence on the opportunities available to introduce new Light Rial Systems or other rapid transit solutions into towns and cities in England, February 2019.

[63] NAO, Improving public transport in England through light rail, 23 April 2004.

2 Light rail and trams in the UK

2.1 In the UK

Whilst the origins of tramways can be traced back to horse-drawn wagons, street-based electric systems have been used for public transport in the UK since 1883.

Box 1: History of Light Rail in the UK

The first tramway in the UK was built in Birkenhead in 1860, which consisted of carriages pulled by horses. The first electrified tramways were introduced over 20 years later in 1883 in Northern Ireland and Brighton. The number of tramways grew rapidly in the late 1800s and early 1900s until the advent of mass-produced motor cars alongside readily-available, reliable buses in the 1920s. This, coupled with the depression following the Wall Street Crash of 1929, led to the closure of many smaller and inter-urban tramways. The Blackpool Tramway is the only system that remains in place since it first opened in 1885.

The Second World War had a detrimental effect on most tramways in the UK and France, although some cities had a post-war renaissance. However, this was never to a level that enabled them to become the dominant transport mode of the locale.

The introduction of Passenger Transport Authorities in the 1960s enabled big cities to take responsibility for their local transport network. This led to the Tyne and Wear Metro, the first modern system, to be built in the late 1970s. There are currently eight tramway/light rail schemes operating in England, as well as one in Scotland.

Until 1992, any new light rail scheme or extension to existing systems was required to obtain an act of Parliament, giving the system promoter (e.g. Transport for West Midlands) the powers required to install and operate it. Thereafter, the same powers could be obtained through an order under the TWA, which was introduced to simplify the process.

Tramways and light rail schemes in the UK

There are currently eight light railways operating in England, along with one tramway in Scotland and another in Wales. There are no operational light railways or tramways in Northern Ireland.

Blackpool Tramway

The Blackpool Tramway, which first opened in 1885, is the only first-generation tramway still in operation. It has a total length of 18 km,[64] running along the coast between Blackpool and Fleetwood in Lancashire. In 2014, the system underwent a £100 million upgrade that included replacing the track, creating a new depot and introducing 16 new trams.[65]

Blackpool Borough Council obtained powers, under the Blackpool Tramway (Blackpool North Extension) Order 2017, for a planned extension of the tramway to Blackpool North train station, estimated to cost £22 million. The extension of the tramway has overrun. Originally due to be completed by July 2019, the latest estimate (as of October 2021) is that the extension will not be finished until 2022.[66]

In 2018/19, the last full year of service before the Covid-19 pandemic, 5.2 million passengers travelled on the network,[67] leading to a total system revenue of £7.0 million.[68] The scheme suspended operations between 29 March and 19 July 2020 due to the Covid-19 pandemic,[69] with 1.1 million passenger journeys overall in 2020/21, a 77% reduction on 2019/20.[70]

Great Orme Tramway

The Great Orme Tramway is a 1.5 km long tramway operating from Llandudno through the Great Orme Country Park and Nature Reserve to the summit of Great Orme.[71]

[64] DfT, Table LRT0203, Route kilometres open for passenger traffic on light rail and trams and undergrounds by system: Great Britain – annual from 1995/96, 23 June 2021.
[65] UK Tram, Blackpool Tramway, accessed: [20 October 2021].
[66] UK Tram, Blackpool Trams win Most Improved System at Global Light Rail Awards, 7 October 2021.
[67] DfT, LRT0101, Passenger journeys on light rail and trams and underground: Great Britain – annual from 1983/84, 23 June 2021.
[68] DfT, LRT0301a, Passenger revenue at actual prices on light rail and trams and undergrounds by system: Great Britain – annual from 1983/84, 23 June 2021.
[69] DfT, Light rail and tram quality report: 2021, 23 June 2021.
[70] DfT, LRT0101, Passenger journeys on light rail and trams and underground: Great Britain – annual from 1983/84, 23 June 2021.
[71] Great Orme Tramway, Welcome to the Great Orme Tramway, accessed: [21 December 2021].

Operating annually between late March and late October, it originally opened in 1902 and is the only funicular tramway [72] still operating on public roads in the UK. In 2019, it carried approximately 190,000 passengers. [73]

Tyne and Wear Metro

The Tyne and Wear Metro, a network totalling 78 km, [74] links Newcastle International Airport to Sunderland and Newcastle football clubs as well as the city's business and residential areas.[75] The route combines converted heavy rail alignments with a tunnel underneath Newcastle and more conventional light rail alignments.[76]

Initially 55 km, the Tyne and Wear Metro opened in stages between 1980 and 1984, at a total cost of £284 million, with the 16 km extension to Sunderland built in 2002, at a cost of £149 million. The relevant powers needed to build the network were obtained under four acts of Parliament (see Appendix A).

In 2018/19, there were 36 million passenger journeys [77] and a total revenue of £52 million.[78] During the pandemic, this reduced to 9.4 million passenger journeys [79] and £20 million. [80]

Docklands Light Railway (DLR)

The DLR network is made up of 6 lines which cover a distance of 38km. [81] The first two routes of the DLR system, which joined at Poplar and link Tower Gateway and the Isle of Dogs and Stratford and Island Gardens, were opened in 1987 with a total length of 15 km at a cost of £77 million.[82] The DLR has been extended several times since then:

- In 1994 to Beckton, costing £280 million;
- In 1999 to Lewisham, costing £200 million;
- In 2005 to London City Airport, costing £115 million;
- In 2009 to connect King George V to Woolwich Arsenal, at a cost of £180 million; and

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[72] A funicular railway uses cables permanently attached to opposite ends of the trams such that one counterbalances the other, typically on steep slopes, such that one vehicle ascends whilst the other descends.

[73] Great Orme Tramway, History, accessed: [21 December 2021]

[74] DfT, Table LRT0203, Route kilometres open for passenger traffic on light rail and trams and undergrounds by system: Great Britain – annual from 1995/96, 23 June 2021.

[75] UK Tram, A Light Rail Strategy for the UK, September 2021.

[76] UK Tram, Tyne and Wear Metro, accessed: [20 October 2021].

[77] DfT, LRT0101, Passenger journeys on light rail and trams and underground: Great Britain – annual from 1983/84, 23 June 2021.

[78] DfT, LRT0301a, Passenger revenue at actual prices on light rail and trams and undergrounds by system: Great Britain – annual from 1983/84, 23 June 2021.

[79] DfT, LRT0101, Passenger journeys on light rail and trams and underground: Great Britain – annual from 1983/84, 23 June 2021.

[80] DfT, LRT0301a, Passenger revenue at actual prices on light rail and trams and undergrounds by system: Great Britain – annual from 1983/84, 23 June 2021.

[81] Railways: Docklands Light Railway (DLR), Commons Library Briefing Paper SN/BT/415, 4 May 2010.

[82] Railways: Docklands Light Railway (DLR), Commons Library Briefing Paper SN/BT/415, 4 May 2010.

- In 2010 to Stratford International, costing £238 million.[83]

According to UK Tram, the extension to London City Airport is estimated to have led to 120,000 fewer taxi rides, with car journeys reduced by 288,000 and thus a reduction in carbon dioxide emissions of over 156 tonnes.[84]

The 149 vehicles used on the DLR operate automatically, although it is worth noting that they are not autonomous and do have a concealed driving console which can be operated by the on-board Passenger Service Assistant if required.[85] They carry the largest number of passengers of any UK light rail scheme, with 122 million passenger journeys [86] in 2018/19 and a revenue of £172 million.[87] However, during the pandemic, passenger journeys fell to 40 million[88] bringing in £54 million in revenue in 2020/21. [89]

Powers to install the DLR have been obtained under four acts of Parliament and two orders under the TWA (see Appendix A).

For further details, please see the briefing note on Railways: Docklands Light Railway (DLR).

Manchester Metrolink

Manchester Metrolink began operation in 1992 and is now the largest tram network by route length in the UK, covering approximately 103 km over seven lines that radiate from the city centre. The alignments combine on-street operation with sections previously used for mainline rail routes.[90] As part of the redevelopment of the Salford Quays area, the line was extended in 1999, with a further extension to Eccles in 2001.[91] This now serves MediaCityUK, a development which became operational in 2010, and now houses 7,000 people working at more than 250 creative, digital and technology businesses, including the BBC, ITV, dock10 and the University of Salford.[92]

Unlike other systems that use 'low-floor' trams, Manchester Metrolink uses 'high-floor' trams, with platform heights the same as those on the UK

[83] Railways: Docklands Light Railway (DLR), Commons Library Briefing Paper SN/BT/415, 4 May 2010.
[84] UK Tram, A Light Rail Strategy for the UK, September 2021.
[85] UK Tram, Docklands Light Railway, accessed: [20 October 2021].
[86] DfT, LRT0101, Passenger journeys on light rail and trams and underground: Great Britain – annual from 1983/84, 23 June 2021.
[87] DfT, LRT0301a, Passenger revenue at actual prices on light rail and trams and undergrounds by system: Great Britain – annual from 1983/84, 23 June 2021.
[88] DfT, LRT0101, Passenger journeys on light rail and trams and underground: Great Britain – annual from 1983/84, 23 June 2021.
[89] DfT, LRT0301a, Passenger revenue at actual prices on light rail and trams and undergrounds by system: Great Britain – annual from 1983/84, 23 June 2021.
[90] UK Tram, Manchester Metrolink, accessed: [20 October 2021].
[91] Dickson W., Trams in Salford: 20 years of the Metrolink line in Salford Quays, *Salford Now*, 6 December 2021.
[92] MediaCity, MediaCityUK marks 10 years since construction started, accessed: [25 October 2021].

mainline network. The fleet size is currently expanding from 131 in October 2021 to 147 by late 2022.[93]

There were 44 million passenger journeys in 2018/19[94] with the system generating £82 million in revenue.[95] Conversely, in 2020/21 this reduced to 10 million passenger journeys [96] and £27 million. [97]

The relevant powers to acquire land and construct the system were obtained under various Acts and Orders, as defined in Appendix A.

Sheffield Supertram

The Sheffield Supertram consists of a combination of on-street and segregated routes covering 34 km. It opened in stages between 1994 and 1995 and links the north west, north east and south east of Sheffield.

Tram stops are within walking distance of 43% of employment sites in the city.[98] As such, in 2018/19, 12 million passengers travelled on the system,[99] contributing to a system revenue of £14 million.[100]

The link with Rotherham is the only tram-train operating in the UK.

The relevant powers for the Sheffield Supertram system were obtained through three acts of parliament, outlined in Appendix A.

West Midlands Metro

Largely following the former rail alignment between Wolverhampton and Birmingham with on-street sections in the city centres, the West Midlands Metro obtained the relevant powers for land purchasing and system construction via five acts of Parliament, defined in Appendix A. The system was opened in May 1999 [101] and is now 22 km long.[102]

The Birmingham Westside Extension, opened in 2019, is the first tramway within England to operate on battery power alone in certain sections, such as

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[93] Urban Transport Group, Leading Light: What Light Rail can do for City Regions, October 2021.
[94] DfT, LRT0101, Passenger journeys on light rail and trams and underground: Great Britain – annual from 1983/84, 23 June 2021.
[95] DfT, LRT0301a, Passenger revenue at actual prices on light rail and trams and undergrounds by system: Great Britain – annual from 1983/84, 23 June 2021.
[96] DfT, LRT0101, Passenger journeys on light rail and trams and underground: Great Britain – annual from 1983/84, 23 June 2021.
[97] DfT, LRT0301a, Passenger revenue at actual prices on light rail and trams and undergrounds by system: Great Britain – annual from 1983/84, 23 June 2021.
[98] UK Tram, A Light Rail Strategy for the UK, September 2021.
[99] DfT, LRT0101, Passenger journeys on light rail and trams and underground: Great Britain – annual from 1983/84, 23 June 2021.
[100] DfT, LRT0301a, Passenger revenue at actual prices on light rail and trams and undergrounds by system: Great Britain – annual from 1983/84, 23 June 2021.
[101] UK Tram, West Midlands Metro, accessed: [20 October 2021].
[102] DfT, Table LRT0203, Route kilometres open for passenger traffic on light rail and trams and undergrounds by system: Great Britain – annual from 1995/96, 23 June 2021.

the city centre.[103] There are currently three further extensions under construction:

- the Wednesbury to Brierley Hill extension;
- the Birmingham Westside extension to Edgbaston; and
- the Birmingham Eastside extension, to Deritend.

Additional extensions are planned to Birmingham International Airport and the Birmingham Interchange for HS2.[104] As part of their plan to improve local transport, the West Midlands Combined Authority submitted a bid to Government of £1.7 billion which included £285 million for renewals on Line 1, completion of the extensions and development of further extension options.[105] Following the Spending Review in November 2021, the Government allocated £1 billion for the schemes, £700 million less than requested.[106] The MP for Birmingham Hodge Hill suggested that the decision not to fully fund the project has jeopardised the potential to build the East Birmingham tram line. In response, the Minister of State for Transport did note that further transport investment was being made in the region.[107]

There were 8.3 million passenger journeys in 2018/19,[108] with the system generating £11 million in revenue.[109] During 2020/21, this dropped to revenue of £5.4 million [110] from 3.4 million passenger journeys.[111] Further, the service has been restricted since June 2021 due to cracks on the vehicles. Whilst repairs were made and services partially reinstated within a week after they were first identified, the whole fleet of 21 trams (CAF Urbos 3) was subsequently taken out of service for permanent repairs in November, which were expected to last 4 weeks.[112]

The relevant powers for land purchasing and construction of the extensions were obtained under a number of orders under the TWA 1992, as also defined in Appendix A.

[103] Urban Transport Group, Light Rail Briefing, 8 December 2020.
[104] West Midlands Metro, West Midlands Metro Expansion Programme, June 2021.
[105] TfWM, West Midlands City Region Sustainable Transport Settlement, Draft of CRSTS prospectus, v9.0, 9 September 2021.
[106] HM Treasury, Autumn Budget and Spending Review 2021, HC 822, 27 October 2021.
[107] HC Deb 4 November 2021, c1045.
[108] DfT, LRT0101, Passenger journeys on light rail and trams and underground: Great Britain – annual from 1983/84, 23 June 2021.
[109] DfT, LRT0301a, Passenger revenue at actual prices on light rail and trams and undergrounds by system: Great Britain – annual from 1983/84, 23 June 2021.
[110] DfT, LRT0301a, Passenger revenue at actual prices on light rail and trams and undergrounds by system: Great Britain – annual from 1983/84, 23 June 2021.
[111] DfT, LRT0101, Passenger journeys on light rail and trams and underground: Great Britain – annual from 1983/84, 23 June 2021.
[112] West Midlands tram services suspended due to cracks, *The Guardian*, 13 November 2021.

London Tramlink

Based around Croydon, London Tramlink, previously known as Tramlink and Croydon Tramlink, is a 28 km long, four-line network linking Wimbledon, New Addington, Elmers End and Beckenham Junction.[113]

Croydon Council accepted the plans proposed by London Transport for a light rail scheme in principle in 1990, with the subsequent proposal to Parliament leading to the Croydon Tramlink Act 1994. The lines opened in 2000.

On 9 November 2016, a tram overturned at Sandilands Junction, killing seven people and seriously injuring a further nineteen. A further 43 people, including the driver, were also injured. This was the worst accident on a British tramway in over 90 years. The subsequent investigation by the Rail Accident and Investigation Branch (RAIB) led to significant changes across the sector.[114] This incident and its ramifications is further discussed in Section 3.4.

In 2018/19, the system generated revenue of £24 million,[115] serving 29 million passengers, although in 2020/21 this reduced to 12 million passenger journeys [116] with £12 million in revenue.[117]

Nottingham Express Transit (NET)

Linking Hucknall (to the North), to Queens Medical Centre, Clifton and Beeston (to the South West) and the City Centre of Nottingham, NET is 32 km long.[118] Approximately 30% of Nottingham residents live within 800 metres of a tram stop.

It is the most recent light rail scheme in England, with the first phase of NET having opened in March 2004. The system was significantly expanded in a second phase that opened in August 2014.[119]

[113] UK Tram, London Tramlink, accessed: [20 October 2021].
[114] RAIB, Overturning of a tram at Sandilands junction, Croydon, 9 November 2016, 18/2017, v2.2, October 2020.
[115] DfT, LRT0301a, Passenger revenue at actual prices on light rail and trams and undergrounds by system: Great Britain – annual from 1983/84, 23 June 2021.
[116] DfT, LRT0101, Passenger journeys on light rail and trams and underground: Great Britain – annual from 1983/84, 23 June 2021.
[117] DfT, LRT0301a, Passenger revenue at actual prices on light rail and trams and undergrounds by system: Great Britain – annual from 1983/84, 23 June 2021.
[118] UK Tram, Nottingham Trams, accessed: [20 October 2021].
[119] Urban Transport Group, Light Rail Briefing, 8 December 2020.

The system generated £20.6 million revenue in 2018,[120] transporting 18.8 million passengers.[121] In 2020/21, this reduced to 3.4 million passenger journeys [122] bringing in £5.4 million in revenue.[123]

Powers for the development and operation of phase one of NET were obtained under the Greater Nottingham Light Rapid Transit Act 1994, with powers for phase two under the Nottingham Express Transit System Order 2009.

Edinburgh Trams

Edinburgh Tramway is a 14 km tramway linking Edinburgh Airport with the city centre, via Haymarket and Waverly national rail stations.[124] An extension to Newmarket began construction in November 2019, with estimated completion in spring 2023.[125]

The City of Edinburgh Council first proposed the new tramway in 2001. Attempts to get it funded in 2005 (via a congestion tax referendum) and 2007 (via the Scottish Parliament) led to the scheme being reduced from three lines to one with estimated costs of £498 million.[126] Although preliminary ground works started in 2007, it was not operational until May 2014, with delays exacerbated by conflicts between the Council owned company managing the project and the contractors. The final costs were £776 million, plus over a further £200 million on loan interest, even with the tramway scope further constricted during construction.[127] A public inquiry as to the reasons behind the delays and overspend was launched in June 2014, the findings of which have not yet been published.

In 2018/19, the system transported 7.1 million passengers,[128] generating £15.9 million revenue.[129] In 2020/21, this reduced to 0.9 million passenger journeys [130] bringing in £2.1 million in revenue.[131]

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[120] DfT, LRT0301a, Passenger revenue at actual prices on light rail and trams and undergrounds by system: Great Britain – annual from 1983/84, 23 June 2021.

[121] DfT, LRT0101, Passenger journeys on light rail and trams and underground: Great Britain – annual from 1983/84, 23 June 2021.

[122] DfT, LRT0101, Passenger journeys on light rail and trams and underground: Great Britain – annual from 1983/84, 23 June 2021.

[123] DfT, LRT0301a, Passenger revenue at actual prices on light rail and trams and undergrounds by system: Great Britain – annual from 1983/84, 23 June 2021.

[124] Railway Technology, Edinburgh Tramway, United Kingdom, accessed: [21 December 2021].

[125] City of Edinburgh Council, Trams to Newhaven, accessed: [21 December 2021].

[126] Erdal I., "Hell on Wheels": The Miserable History of the Edinburgh Trams project,2001 to the Present, *Retrospect Journal*, 14 March 2021.

[127] Brocklehurst S., Going off the rails: The Edinburgh trams saga, *BBC*, 30 May 2014.

[128] DfT, LRT0101, Passenger journeys on light rail and trams and underground: Great Britain – annual from 1983/84, 23 June 2021.

[129] DfT, LRT0301a, Passenger revenue at actual prices on light rail and trams and undergrounds by system: Great Britain – annual from 1983/84, 23 June 2021.

[130] DfT, LRT0101, Passenger journeys on light rail and trams and underground: Great Britain – annual from 1983/84, 23 June 2021.

[131] DfT, LRT0301a, Passenger revenue at actual prices on light rail and trams and undergrounds by system: Great Britain – annual from 1983/84, 23 June 2021.

Powers for the development and operation were obtained through two Acts of Scottish Parliament, supplanted by two Order to extend the time for land acquisition, detailed in Appendix A.

Proposals under development

Cambridge Autonomous Metro

In 2020, the Cambridgeshire and Peterborough Combined Authority created a special purpose vehicle to develop plans for a Cambridgeshire Autonomous Metro (CAM) using £1 million from its capital fund and £1 million from the Combined Authority's local growth fund.

The premise behind CAM was for 'trackless metro' to operate between Cambridge and the surrounding towns and suburbs with a 12 km network of complex tunnels underneath the city.[132] However, following his election in May 2021, the new Cambridgeshire and Peterborough mayor cancelled the £2 billion project.[133] Local councillors have expressed their disappointment with this decision and the way it was enacted, especially because no alternatives were outlined.[134]

Plans for a light rail system in Cambridge have been revived by Cambridge Connect and Railfuture, with support from partners including UK Tram and Amey.[135] The promoters have put forward plans for a 55 km network, the Cambridge Light Rail network, which would be delivered in three phases; the first two phases would lead to a £1.5 billion, 40 km system delivered before 2030.[136]

Coventry

A collaboration between Coventry City Council, WMG, Transport for West Midlands and Dudley Council are aiming to create an affordable, reliable, and environmentally friendly on-street light rail system. Novel, lightweight, battery-powered vehicles will operate on an innovative trackform developed specifically to minimise installation costs, although it is still anticipated that an order under the TWA will be required.[137]

The scheme has currently received funding through the West Midlands Combined Authority Devolution Deal (£12.2m), Coventry and Warwickshire Local Enterprise Partnership Growth Fund (£2.5m) and the Getting Building Fund (£1.8m).[138] West Midlands Combined Authority requested an additional

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[132] 'Compelling case' for Greater Cambridge Metro, *BBC*, 19 March 2019.

[133] Gardner G., Cambridgeshire and Peterborough's new major Nik Johnson will scrap £2bn metro project, *Cambridge Independent*, 8 May 2021.

[134] Gardner G., 'Scrapping the Cambridge Autonomous Metro leaves us with no plan', *Cambridge Independent*, 6 August 2021.

[135] Cambridge Connect, Cambridge Light Rail, accessed: [30 November 2021].

[136] Cambridge Connect, Costs, accessed: [30 November 2021].

[137] Coventry City Council, Very Light Rail, accessed: [30 November 2021].

[138] Coventry City Council, Very Light Rail, accessed: [30 November 2021].

£114m from Government prior to the 2021 Spending Review for the scheme.[139] The Autumn Budget and Spending Review in 2021 allocated £1bn to the West Midlands "for schemes such as completing the Wednesbury to Brierley Hill metro extension and Sprint Phase 2." [140] However, it is not clear how this money has been allocated.

KenEx

There are plans to connect Kent and Essex via a tramway that will run under the Thames between Swanscombe and Grays.[141] It has been developed to reduce journey times and provide an environmentally friendly alternative to cars traversing the Dartford Crossing.[142]

Kent County Council have agreed to the construction of the tunnel, which would be large enough to accommodate buses and trams, [143] with the first route estimated to be operational by 2025.[144] It is expected to be privately funded and cost £600 million, compared to £4.4 - £6.2 billion estimated for the Lower Thames Crossing,[145] and has support from local businesses, South Essex college and a campaign group for motorists (FairFuelUK).[146]

London

There have been unsuccessful efforts for further trams in London. For example, plans for a £650 million scheme in West London between Uxbridge and Shepherd's Bush were cancelled in 2007 due to opposition from Ealing Council,[147] whilst the £1.3 billion Cross River Tram proposal linking King's Cross and Peckham was curtailed in 2008.[148]

Plans for the Southwark Supertram, a £50m scheme between London Bridge and Denmark Hill, via Elephant & Castle and Camberwell, first arose in 2012. Although it was anticipated to be privately funded and had support from Southwark Liberal Democrats, it did not gain support from Southwark Labour.[149] Following the pausing of the £3.1 billion extension of the Bakerloo line in 2021,[150] the council voted to commit to explore alternative transport

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[139] WMCA, Covid-19: Economic recovery asks and funding, Appendix 2, 2021.

[140] HM Treasury, Autumn Budget and Spending Review 2021, HC 822, 27 October 2021.

[141] Delaney S., KenEx Tram link billed as potential transport solution for London Resort them park in Swanscombe, *KentOnline*, 18 February 2021.

[142] Thames Gateway Tramlink Ltd., KenEx Tram Proposal, accessed [30 November 2021].

[143] Chessum V., Cohen S., KenEx is the ambitions tram project set to alleviate traffic pressure at the Dardford Crossing, *KentLive*, 14 June 2020.

[144] Gray B., Kenex's tram under the River Thames between Essex and Kent could open by 2025, *KentLive*, 23 October 2020.

[145] LTCA, Proposed stops revealed for £600 million Kent and Essex tram, 9 December 2017.

[146] Payne W., Thames Gateway Tramlink's River Thames crossing bid receives high praise, *KentLive*, 21 December 2020.

[147] Controversial tram plan derailed, *BBC*, 3 August 2007.

[148] Bentley P., Boris scraps £1.3 b Cross River Tram, *The Platform*, 13 November 2008.

[149] Nicolas D., Southwark "Supertram" Could Link London Bridge and Denmark Hill, *Londonist*, 17 October 2012.

[150] Cuffe G., Call for new tram route as London Underground extension plans stall, *MyLondon*, 24 March 2021.

infrastructure, with tram systems, rapid bus routes and walking and cycling infrastructure all of interest.[151]

Preston

Plans for a tramway pilot project in Preston were first outlined in 2010, however successful planning consents were only achieved in 2016. Under the approved proposals, trams would only be for training and demonstration purposes, and would not be able to carry paying customers.[152] Land ownership issues led to this lapsing. However, these were resolved in late 2020 in a deal between Preston City Council and Network Rail.[153]

A 200-metre section of demonstrator track is now planned in Ribbleton.[154] If successful, it is hoped this will form part of a three-mile, privately funded, £25 million 'Guild Line' between Red Scar and the university quarter in the city.[155]

South Wales Metro

The South Wales Metro is a new transport system currently under construction based around the Cardiff Capital Region. Using light rail to support an enhanced heavy rail network, the proposals are for a fully integrated public transport system.[156]

Plans were first outlined in 2011,[157] with a public consultation in 2016.[158] In 2018, KeolisAmey, who already operate the Manchester Metrolink and DLR, won a £5 billion contract to run rail services in Wales for the next 15 years.[159] This included plans to provide an on-street tramway within Cardiff by 2023.[160] However, the service was brought under Welsh Government control, as an Operator of Last Resort, from February 2021 due to significant reduction in passenger numbers during the pandemic. Welsh ministers have still pledged to honour commitments for the new trains and South Wales Metro.[161]

West of England

The West of England Combined Authority (WECA) recently set out plans and policies for transport in the region up to 2036. Supported by a number of other projects, this outlined 5 'Transformational Major Schemes' in and around Bristol and Bath, which are likely to be based on light rail.[162] The costs

[151] Johnston K., Trams could make a return to Southwark 'by 2025', *Southwark News*, 1 April 2021.
[152] Preston Trampower, PWA wins approval for Preston tram pilot, 22 December 2016.
[153] Preston trams: New plans approved for test route, *BBC*, 4 December 2020.
[154] Faulkner P., Preston could have its own tram service in just over a year as test line approved, *LancsLive*, 3 December 2020.
[155] Gavell T., Plans for a new tramway in Preston get a boost after former railway station master's house is snapped up, *Lancashire Post*, 2 June 2021.
[156] Welsh Government, Rolling out our Metro, 2016.
[157] Barry M., A Metro for Wales' Capital City Region, *The Institute of Welsh Affairs*, January 2011.
[158] South Wales Metro consultation to begin, *Railway Gazette International*, 30 November 2015.
[159] KeolisAmey reveal new-look Wales trains and services, *BBC*, 4 June 2018.
[160] New Wales rail franchise - the timetable to 2024, BBC, 10 October 2019.
[161] Transport for Wales rail services to be nationalised, BBC, 22 October 2020.
[162] WECA, Joint Local Transport Plan 4: 2020-2036, March 2020.

of delivering all of the transformational schemes are estimated to be £3-5 billion.[163]

To determine the optimal mass transit option(s), WECA has invested £1.5 million, with a public consultation on 'how mass transit can best connect the four areas within the West of England, and what routes and technologies may work best for our region.' This consultation was planned for "late 2021".[164]

Commissioned by Lightweight Community Transport and Light Rail (UK), Moving Bristol Forward, a partnership between Zero West[165] and Transport for Greater Bristol Alliance,[166] prepared a pre-feasibility study investigating the potential for trams as a core component of public transport in Bristol. It outlines how the first tram line could begin operation within 5 and a half years as part of a phased implementation of a network over 15 years. Whilst costs are not outlined, it is believed that the use of 'third generation tram technology', such as Ultra or Very Light Rail offer significant potential, with the anticipated passenger demand expected to justify the installation.[167]

West Yorkshire

The largest city in Western Europe without a light rail or metro system, Leeds has been investigating methods of mass transit.[168] The West Yorkshire Combined Authority have outlined £4.2 billion plans for a system linking Leeds with surrounding cities, such as Bradford, Halifax, Huddersfield and Wakefield, supported by Norther Powerhouse Rail.[169] The exact funding contribution from Government is to be considered as plans develop further.[170]

The Integrated Rail Plan (IRP) set out a package of rail improvements in the Midland and the North. In the IRP, the Government committed more than £200m to further develop the mass transit plan for Leeds, but also expects local taxpayers to contribute financially.[171] The leader of Leeds City Council, Councillor James Lewis, whilst welcoming the local connectivity of a tram network, said that it would not support the national connectivity required for the city and wider region to "grow, thrive and recover".[172]

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[163] Pipe E., Could a tram network be on the cards for Bristol?, *Bristol24/7*, 18 February 2021.

[164] Turney J., Why trams on Bristol roads are no longer pie in the sky, *The Bristol Cable*, 1 July 2021.

[165] A Community Interest Company promoting the transition to zero-carbon in the West of England

[166] An alliance of transport, environmental and community campaign groups aiming to improve public transport in and around Greater Bristol.

[167] Moving Bristol Forward, Pre-Feasibility Study: Building on the TfGB Rapid Transit Plan to propose a Primary Tram Network Phased over 10-15 years, eds. *LCT Ltd & LR (UK) Ltd*, June 2021.

[168] DfT, Integrated Rail Plan for the North and Midlands, November 2021.

[169] West Yorkshire Combined Authority, West Yorkshire Mass Transit Vision 2040, January 2021.

[170] PQ 78363 [on Rapid Transit Systems: West Yorkshire], 19 November 2021.

[171] DfT, Integrated Rail Plan for the North and Midlands, November 2021.

[172] Hakimian R., Leeds tram proposal not a sufficient replacement for HS2 eastern leg, says council, *New Civil Engineer*, 10 November 2021.

2.2 Light rail use in the UK

In the year ending March 2020, there were 270.6 million passenger journeys made on light rail vehicles in the UK; this was a reduction of 4% from 2018/19. However,these figures include the first few weeks of nationwide restrictions introduced to counter the spread of Covid 19 in March 2020.[173] Light rail use in England during the pandemic is detailed in Box 2; restrictions in Scotland and funding for Edinburgh Tramway were decided in Scottish Parliament separately from those in England.

The National Travel Survey found that the primary use of light rail was for commuting (41% of passengers), followed by leisure (22%), shopping (16%), education (9%), personal business (5%), business (4%) and other reasons (2%).[174]

In those towns and cities with a light rail or tram system, light rail only accounts for a small share of the journeys made, approximately 5% of public transport stages[175] and 3% of the number of journeys made, the distance travelled, and time spent on public transport.[176]

In 2016/17, travel by bus was reported to represent 81% of public transport use by Transport for West Midlands (TfWM), with rail accounting for 17% and light rail 2%.[177] Over the same period, the Greater Manchester Combined Authority (GMCA) reported that 76% of public transport use was by bus, 10% by rail and 14% by light rail,[178] whilst in Sheffield in September 2020, 67% of public transport trips were taken by bus, with 15% by rail and 8% by light rail.[179]

[173] DfT, Light Rail and Tram Statistics, England: 2019/20, June 2020.

[174] DfT, Table LRT0401a, Light rail and tram stages, distance and time by trip purpose: England, 2012/19, June 2021.

[175] A new stage is defined as there being a change in the mode of transport.

[176] DfT, Table LRT0401a, Light rail and tram stages, distance and time by trip purpose: England, 2012/19, June 2021.

[177] TfWM, Strategic vision for Bus, 2018.

[178] GMCA, Transport, January 2019.

[179] Cycle Sheffield, Sheffield transport data, accessed: [3 November 2011].

Box 2: The impact of the Covid-19 pandemic on light rail use in England

The Covid-19 virus reached the UK in January 2020, with the subsequent restrictions to curb its spread affecting transport use within the UK. For example, all travel was discouraged during the first lockdown except in limited circumstances. As restrictions were eased, people were encouraged "to avoid public transport if at all possible".[180]

The total number of passenger kilometres across light rail and tram networks fell from 1.89 billion km in 2018/19 (the last year for which figures were completely unaffected by the pandemic) to 531 million km in 2020/21.[181]

To help support the sector, the Government provided £250 million to English schemes outside London, with TfL supported through a separate funding arrangement. The support for the sector is set out below:

- April to October 2020: £93.3 million provided to 5 of the 6 English schemes outside London (Blackpool ceased operation and so did not receive any funding);[182]
- October 2020: £35.4 million providing 12 weeks funding;[183]
- January 2021: £32.4 million providing funding to March 2021;[184]
- March 2021: £33 million providing 11 weeks funding;[185] and
- July 2021: £56 million providing support until the end of the 2021/22 financial year.[186]

In August 2020, Andy Burnham, the Mayor of Greater Manchester, stated that, while he was 'pleased' that the Government was supporting public transport, and Metrolink in particular, planning the recovery of Manchester required longer term commitments than 12 weeks.[187]

Passenger numbers on light rail systems in the UK were significantly affected by the pandemic, as shown in the Table below. As most systems are used predominantly by commuters, the average journey length only suffered a

[180] Prime Minister's Office, Prime Minister's statement on coronavirus (COVID-19): 10 May 2020.
[181] DfT, Table LRT0103, Passenger kilometres on light rail and trams and undergrounds by system: Great Britain – annual from 1983/84, 23 June 2021.
[182] DfT, Government extends coronavirus support for buses and trams, total funding tops £700 million, 8 August 2020.
[183] The Railway Gazette, Further funding for English light rail services, 26th October 2020.
[184] Cuenca O., English light rail operators receive additional support, *International Railway Gazette*, 23 October 2020.
[185] DfT, Further £33 million COVID-19 support funding announced for light rail and trams in the north and the Midlands, 20 March 2021.
[186] HC Deb, 19 July 2021, HCWS195, Light Rail: Financial Support.
[187] GMCA, Andy Burhnam responds to Metrolink funding announcement, 8 August 2020.

substantial decrease on the Blackpool Tramway, which has a relatively high proportion of its use attributed to tourists.

Passenger journeys and kilometers on English light rail schemes 2019/20 - 2020/21

	Passenger Journeys (million)		Average Journey length (km)		Passenger Kilometers (million)	
	2019/20	2020/21	2019/20	2020/21	2019/20	2020/21
Blackpool Tramway	4.8	1.1	4.4	0.4	**21.0**	**0.4**
London Tramlink	27.2	11.6	5.2	5.2	**141.3**	**60.2**
Manchester Metrolink	44.3	10.3	10.5	10.5	**463.0**	**107.8**
Nottingham Express Transit	18.7	3.4	6.6	6.6	**123.3**	**22.4**
Sheffield Supertram	10.5	2.8	6.5	6.5	**68.2**	**18.4**
Tyne and Wear Metro	33.1	9.4	8.7	8.5	**289.1**	**80.0**
West Midlands Metro	8.0	3.4	10.5	10.5	**84.3**	**35.2**
Docklands Light Railway	116.8	39.7	5.3	5.2	**620.7**	**206.5**

Source: DfT, Table LRT0101, Passenger journeys on light rail and trams and undergrounds by system: Great Britain - annual from 1983/84, 23 June 2021. DfT, Table LRT0107, Average length of journey in kilometres on light rail and trams by system: England - annual from 2011/12, 23 June 2021. DfT, Table LRT0101, Passenger kilometres on light rail and trams and undergrounds by system: Great Britain - annual from 1983/84, 23 June 2021.

Further details can be found in the library briefing on Decarbonisation: The impact of coronavirus on land transportation.

2.3 International perspective

Europe

Compared to the UK, there has been increased investment in mass transit in Europe since the 1960s,[188] leading to a greater presence of light rail. Of the 389 cities with trams or light rail systems in 2018, over half (204) were in

[188] Shehadi S., Why rapid transit systems in British cities lag behind Europe, *New Statesman*, 6 May 2021.

Europe. Over 20,750 vehicles travel over the 1,276 lines consisting of almost 9,300 km of track and carry over 10 billion passengers per year.[189]

The busiest light rail network in 2018 was in Budapest, Hungary, with 427 million passengers, with Paris the most popular modern scheme, with over 300 million passengers, whilst the longest network at 193 km was in Berlin.[190]

According to Railfutures, the main reasons that there are more light rail schemes in Europe than the UK are focused on improved integration planning, committed politics and secure funding.[191] For example, a key element in France has been the *versement transport* (transport tax), levied since the early 1980s by Local Transport Authorities. It is suggested that this has been the most important factor in facilitating the renaissance of urban rail in France. The tax applies to all businesses, public and private, with more than nine employees and can be up to 1.75% of the company's payroll. For example, in 1999, Toulouse had a population of approximately 700,000, with the tax raising £69 million.[192]

Karlsruhe, in South-West Germany, was the first European city to implement track-sharing for light and heavy rail vehicles. Trams have been running on a national heavy rail network since September 1992. This was made possible through conversion of the track to standard gauge (1,435 mm) and updates to the vehicle, such as dual voltage capability to accommodate the differences in heavy and tram line supply, compatibility with mainline signal systems, the use of rail brakes for shorter stopping distances, and all steel bodies to meet mainline crash requirements.[193] Tram trains are now in operation across Europe, including Saarbrücken, Kassel, Mulhouse, Paris, Nantes, Lyon, and Aarhus.

USA

Following poor experiences with heavy rail systems in the 1960s and 1970s, light rail began to gain interest in America. [194] In particular, between 1984 and 1992, the number of light rail vehicles operating rose by 44% from 733 to 1,058 with vehicle miles increasing by 71% from 16.8 million miles to 28.7 million miles and passenger miles by 69%, from 416 million miles to 704 million miles.[195]

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[189] UITP, Light Rail and Tram: the European Outlook, Statistics Brief, November 2019.

[190] UITP, Light Rail and Tram: the European Outlook, Statistics Brief, November 2019.

[191] Brown I., Prospects for light rail in 2020 – a Railfuture view, Rail Professional, February 2020.

[192] South Yorkshire Passenger Transport Executive, Comparative performance data from French tramways systems, final report, 18 December 2003.

[193] Railway Technology, Karlsruhe Light/Heavy Rail, 2 May 2000, accessed: [24 November 2021].

[194] Light rail in USA typically refers to segregated rail based networks that use less complex technology than heavy rail, and did not require significant civil works (tunnels or aerial supports); this is distinct from streetcars, which typically refers to urban railways running on-street with mixed traffic, shorter routes with more frequent stops, and slower speeds.

[195] Zaretsky A.M., Riding the Rails: A Look at Light Rail Transit, Federal Reserve Bank of St. Louis, 1 October 1994.

There are currently 30 cities in the USA with light rail systems, including 26 modern light rail networks, 14 modern streetcar schemes, and 13 heritage streetcar systems. Further, light rail in the USA was responsible for approximately 525 million passenger journeys in 2018.[196]

Most light rail schemes in the US consist of long arms that extend to the suburbs, rather than focussing on the city centre. This is because town planners responsible for these schemes have tried to elicit significant modal shift from car users who were reticent to use buses, but who they thought could be persuaded by a high quality, reliable rail network. [197]

Since the early 1990s, light rail use in the US has been relatively flat. An article by Bloomberg CityLab, in 2020, outlined that part of the reason for a lack of growth in usage is because town planners built schemes too far away from residential areas due to a lack of federal funding. Nevertheless, areas close to light rail alignments have experienced increases in property values and regeneration.[198]

China

Urban rail investment in China is dominated by metro systems. Some 44 cities in China have a light rail system. China has also opened more new tramways (20) than any other country since 2016. Many more cities in China are either constructing a light rail system or planning to. Tramways are being implemented in situations where the standard required for a metro is not met. Most operate without overhead catenary, using a combination of hydrogen, batteries, and supercapacitors to power vehicles. Further, autonomous features are being implemented, such as on an airport people-mover in Kumming.[199]

Australia

Light rail is also undergoing a modern renaissance in Australia:

- The first tram in Australia, the Adelaide and Glenelg Railway, opened in August 1873, but most of the line was closed in the 1950s. The Glenelg tram line is the only surviving of the section of the railway. Since 2003, the line has gradually been upgraded and extended.[200]
- Trams have operated continuously in Melbourne since 1885. The tram system in Melbourne is the largest operational tram network in the world,[201] consisting of 250 km of double track, over 475 trams, 24 routes

[196] APTA, Public Transportation Ridership Report, Fourth Quarter 2018, 12 April 2019.
[197] Bliss L., Out of Darkness, Light Rail!, Bloomberg CityLab, 17 January 2020.
[198] Bliss L., Out of Darkness, Light Rail!, Bloomberg CityLab, 17 January 2020.
[199] Johnston S., China: LRT's new superpower, *Tramways & Urban Transit*, 3 November 2021.
[200] Railway Technology, Coast-to-Coast Light Rail Project, 18 October 2010, accessed: 24 November 2021].
[201] Yarra Trams, Facts and figures, accessed: [24 November 2021].

and around 1,700 tram stops. In 2018/19, 205 million passenger journeys were made on the network.[202]

- Covering nearly 25 km across three lines, Sydney Light Rail is the second largest system in Australia, with 13.3 million passenger journeys made on the network in 2020.[203] Operation of L1 began in August 1997, with L2 and L3 opening in December 2019 and April 2020 respectively, whilst extensions to Parramatta are under construction.
- A single 20 km line, the G:link, opened on the Gold Coast, Queensland, in July 2014. In 2018-19, the light rail network along the Gold Coast was responsible for 35% of public transport patronage, with 8.5 million passenger journeys made that year.[204]
- The Canberra Metro, a 12 km line, opened in April 2019. This line links the northern town centre of Gungahlin to the Canberra Civic city centre.[205] The scheme cost A$675 million, which was A$32 million under the original budget.[206] Plans to extend the network have been delayed due to the Covid-19 pandemic.[207]

The Sydney, Newcastle and Canberra schemes use the same trams as on the West Midlands Metro. Those used on the inner west light rail line in Sydney are suffering from the development of similar cracks, with the NSW Transport Minister suggesting that this could be a design flaw.[208] Although remedial action could take up to 18 months, the state government expects the vehicle manufacturer to pay for the costs of rectification.[209]

[202] Public Transport Victoria, Annual Report 2018/19, September 2019.
[203] Transport for NSW, Light Rail Patronage – Monthly Comparison, accessed: [24 November 2021].
[204] Department of Transport and Main Roads, Annual Report 2019-20, 8 October 2020.
[205] Canberra Metro, Stage 1, Project Overview, accessed: [24 November 2021].
[206] Jervis-Bardy D., Canberra's light rail bill arrives at $675 million, *The Canberra Times*, 13 May 2019.
[207] White D., Light rail contracts delay puts project back on election agenda, *The Canberra Times*, 29 June 2020.
[208] O'Sullivan M., Sydney's inner west light rail line out of action for up to 18 months, *The Sydney Morning Herald*, 5 November 2021.
[209] Rabe T., Transport Minister expects Spanish manufacture to pay for cracked trams, *The Sydney Morning Herald*, 10 November 2021.

3 Government policy, legislation and accountability

3.1 Government policy on light rail

The Department for Transport, in July 2021, published its transport decarbonisation plan, *Decarbonising transport: a Better, Greener Britain.* The plan highlights light rail as "an existing zero emission choice".[210] There are, however, no current policies or targets in the plan specifically for light rail schemes. The Department for Transport has said it is incorporating analysis from its 2019 call for evidence on how to use light rail and other rapid transit systems "to inform future policy".[211]

3.2 Government approval process

Transport and Works Act 1992 (the TWA) came into force on 1 January 1993. This sets out an order-making procedure for new railways, tramways or other rapid transit systems, as well as inland waterways, more aligned with those for highway and other large civil projects.[212]

Prior to the TWA, tramway promotors obtained the relevant powers through acts of parliament. However, these were typically lengthy and costly procedures. For example, the average time taken for light rail projects in London to obtain the relevant powers prior to the TWA was 22 months. However, both the Croydon Tramlink and the DLR Beckton extension took 32 months to gain the necessary powers.[213]

Who is responsible for light rail systems?

The choice of which public transport system to implement is undertaken by a 'promotor'. This is typically the Local Transport Authority (LTA) because of their ability to understand the transport situation within the region for which they are responsible.[214] In metropolitan areas, this is through an executive

[210] DfT, Decarbonising Transport – A Better, Greener Britain, July 2021, p162,
[211] DfT, Decarbonising Transport – A Better, Greener Britain, p162, July 2021.
[212] Transport and Works Act 1992, Commons Library Briefing Paper, SN/BT/103, 14 Aril 2010.
[213] Transport Select Committee, Tenth Report, 23 March 2005, LR 11 2004-05, Table 3.
[214] UK Tram, Advice Note for promoters considering a light rail scheme, April 2012.

agency acting on behalf of Combined Authorities (e.g.Transport for West Midlands or Transport for Greater Manchester).

The promotor is responsible for developing the business case for the light rail scheme, including the strategic rationale for the project and proposals for how it will be funded, financed, and implemented. The development of the business case often takes several years, and is especially important due to the levels of capital funding required. Capital funding is principally obtained through either an Exchequer Grant or Government approved borrowing. The Government expect the LTA to also contribute to the costs through, for example, local contributions or expected operating surpluses.[215] The promotor is also responsible for securing the powers to build and operate the light rail through obtaining an order under the TWA.

Responsibility for maintenance of the infrastructure and vehicles lies with the infrastructure owners of light rail systems: the LTA, or equivalent. Meanwhile operations can either be undertaken within the LTA or through contracts with private or public operators. For example, Midland Metro Limited, a stand-alone business that is wholly owned by the West Midlands Combined Authority and which works closely with Transport for West Midlands, operates the West Midlands Metro.[216] Meanwhile, KeolisAmey, a joint venture partnership between Keolis, a UK public transport operator, and Amey, an infrastructure asset management specialist, were awarded a contract to operate the Manchester Metrolink on behalf of Transport for Greater Manchester for up to ten years following a competitive process.[217]

The process by which a promotor can determine which transport system best addresses the 'transport need' has been outlined by UK Tram.[218] Briefly, this entails:

- Identifying the local transport issues a light rail scheme should aim to address.
- Developing transport objectives that the scheme needs to achieve. This includes ensuring the desired outcomes, including the cost and timescale for the project, are well defined;
- Developing an initial transport case. This includes setting out the adequacy of the current transportation system(s) and what possible alternatives would best solve any weaknesses;
- Generating an initial business case, using extensive studies to detail the transport case, route feasibility, environmental considerations, and an economic assessment; and
- Obtaining authority to proceed by applying for an Order under the TWA.

[215] Urban Transport Group, Leading Light: What Light Rail can do for City Regions, October 2021.
[216] West Midlands Metro, Midland Metro Limited, accessed: [13 January 2022].
[217] Keolis, KeolisAmey Awarded Contract To Run The Greater Manchester Metrhlink, accessed: [13 January 2022].
[218] UK Tram, Route Map for Sponsors of New Tramways and Light Railways, September 2020.

Appraisal

All proposals that involve public spending or taxation, changes to regulations, or changes to the use of existing public assets and resources are subject to guidance outlined in the Green Book. This provides government approved models and methods for appraising policies, programmes or projects. Its use is mandatory for proposals that require the use of significant new or existing public resource.[219] Following a review, announced in March 2020, to evaluate the accommodation of strategic priorities, an updated Green Book was published in December 2020.[220]

Further, the Department for Transport offer specific guidance for transport modelling and appraisal, in the Web-based Transport Analysis Guidance (TAG). This builds on the principles outlined in the Green Book with a specific application within a transport context, incorporating impacts beyond those directly on the users such as those on the environment, wider society and Government.[221]

Approval for the funding and construction of new tramways typically requires an order under the TWA.[222] The Government typically bears the most significant portion of the capital costs for these projects and has processes in place to evaluate local bids. Gaining central government funding can add costs and delays to the process. For example, the NAO note that it costs promoters approximately £1 million per year to develop proposals.[223]

In many cases, the estimated costs of light rail schemes have increased during construction, as shown in Table 1 below. This can be due to factors such as optimism bias and the time needed to gain approval.[224]

Table 1: Cost of Implementing Light Rail schemes in the UK compared to estimates

Scheme	Cost (2021 prices) (£ million)		Government Contribution (%)
	Estimate	Actual	
Manchester (Phase 1)	129	307	38
Tyne and Wear (Sunderland)	163	248	38
NET (Phase 1)	283	314	84

[219] HM Treasury, The Green Book, 3 December 2020.
[220] Government investment programmes: the 'green book', Lords Library In Focus, 17 March 2021.
[221] DfT, Transport Analysis Guidance: An Overview of Transport Appraisal, January 2014.
[222] DfT, Transport and Works Act orders: A brief guide, 26 November 2013.
[223] Transport Committee, Integrated Transport: the Future of Light Rail and Modern Trams in the United Kingdom, HC 378, 1 April 2005
[224] NAO, Improving public transport in England through light rail, HC518, 23 April 2014.

Manchester (Phase 3)	1364	1451	63
Midland Metro (WBH)	450	450	82
NET (Phase 2)	653	653	65

Source: NAO, Improving public transport in England through light rail, HC518, 23 April 2014; CIHT, Building the Tyne and Wear Metro, 2012; Whitelaw J., Nottingham's £570M tram extension opens, *Infrastructure Intelligence*, 25 August 2015; Urquhart J., Nottingham express transit: Phase Two gets underway, *Intelligent Transport*, 25 April 2012, NET; Nottingham Express Transit Phase Two Full Business Case, July 2011; Young A.P., Development and Implementation of Greater Manchester's Light Rail Transit, Greater Manchester Passenger Transport Executive, at the National Conference on Light Rail Transit, San Jose, California, 8-11 May 1988, 1989; Knowles R.D., Transport impacts of greater Manchester's metrolink light rail system, Journal of Transport Geography, 4 [1], 1-14, 1996; MMA, Midland Metro Wednesbury to Brierley Hill Extension: Economic Case June 2017; Railway Technology, Midland Metro, accessed: [26 November 2021].

Costs converted to 2020 figures using the Bank of England Inflation Calculator.

Transport and Works Act orders

Authorisation of any new light railway or tramway in England is obtained by the promotor applying for an order under the TWA to the Secretary of State. The process is defined in The Transport and Works (Applications and Objections Procedure) (England and Wales) Rules 2006,[225] with guidance also provided by the DfT. [226]

The TWA enables decisions on schemes to be made by Ministers, or other delegated persons, appointed by the Secretary of State. It is an Order-making procedure, with, if successful, the necessary provisions set out in statutory instruments. The proposed scheme is debated in Parliament. Debates now take place earlier in the process than when authorisation was granted via private bills to ensure parliamentary agreement of the scheme prior to any public inquiry.[227]

A TWA order application is made by or on behalf of the promotors of the scheme. Approved orders grant the necessary powers to put the tramway in place. These are wide ranging, and cover facets such as construction of the system or alterations to existing transport networks, compulsory land purchase, and amendments or exclusion of legislation.[228]

The documents required to make an application for an order under the TWA include:

[225] The Transport and Works (Applications and Objections Procedure) (England and Wales) Rules 2006, 2006/1466.

[226] DfT, Transport and Works Act orders: A brief guide, 26 November 2013.

[227] Transport and Works Act 1992, Commons Library Briefing Paper, SN/BT/103, 14 Aril 2010

[228] DfT, Transport and Works Act orders: A brief guide, Q5, 26 November 2013.

- Pre-application draft order and explanatory memorandum, submitted no later than 28 days before the application;
- A concise statement of the aims of the proposed scheme;
- A report summarising consultations carried out by the proposer;
- A list of consents, permissions or licences required;
- Environmental statement, or any screening decision or scoping opinion;
- The plans and book of reference, including, for example, names of owners or occupiers of land to be compulsorily acquired; and
- The estimated cost of and proposals for funding the scheme.

Further, the Secretary of State can, within 28 days of receiving the application, request further information if what has been provided is deemed to be inadequate.[229]

The process to obtain a TWA order provides the ability for those whose property or business would be affected, or who have environmental concerns, to raise objections. The objection process for order applications is detailed further below, in Section 3.3.

Once all objections have been considered, the Secretary of State decides on the application. This is conveyed in a decision letter along with any recommendations from the inquiry (if one is held) that is sent to the applicant and other interested parties.[230] Alternatively, the Secretary of State may issue a 'minded-to' letter, which indicates that the Secretary of State's decision is based on the information that has already been presented. This option is used to request further information on particular matters.[231] If approved, the Secretary of State also issues a planning direction, which is likely to include certain conditions. The order usually comes into force 3 weeks after it has been made.[232]

The decision can only be appealed on points of law, a failure to follow procedure or if the powers applied for cannot be approved under an order.

Obtaining a TWA order can take 3-5 years, given the amount of time it takes to acquire the relevant information and seek approval. For example, public inquiries can open 6 months (or more) from the date of the application, with the length of the inquiry dependant on the issues. However, the DfT aim to issue decision:

- Within 3 months of the end of the objection period, if no objections are made;
- Within 3 months of withdrawal of the last objection, if all objections are withdrawn;

[229] The Transport and Works (Applications and Objections Procedure) (England and Wales) Rules 2006, 2006/1466, Rule 10.

[230] DfT, Transport and Works Act orders: A brief guide, Q39, 26 November 2013.

[231] DfT, Transport and Works Act orders: A brief guide, Q40, 26 November 2013.

[232] DfT, Transport and Works Act orders: A brief guide, Q39, 26 November 2013.

- Within 4 months of the end of written exchanges;
- Within 6 months of receipt of the report of the hearing; or
- Within 6 months of receipt of the inspector's report into the public hearing.[233]

Obtaining an Order is, therefore, still considered to be a barrier to further light rail schemes, as the processes can still take considerable time and funds, with no guarantee that the application will be successful.[234]

For further details, please see the library briefing on Transport and Works Act 1992.

3.3 Complaints

The process to get an Order under the TWA provides the opportunity for all those whose property or business is affected, or who are concerned about the impact the scheme could have on the local environment, to raise objections. Objections must be made in writing within 'the objection period', which can be no less than 6 weeks from the date of the application. The decision as to whether to accept objections raised outside of the objection period lies with the Secretary of State. Depending on the nature of the application, objections may be dealt with by written representation, in a hearing or at a public inquiry.[235]

Appeals against TWA orders can be made under section 22 of the TWA in the High Court, but only regarding points of law or a failure to follow correct procedure. Further, challenges based on the decision not being within the powers of the TWA or that any requirement under the TWA or Tribunals and Inquiries Act 1992 have not been met can also be made to the High Court, within 6 weeks of the decision notice being published.[236]

Once the system is operational, complaints should first be made to the operator using their complaint handling procedure. If unsuccessful, the Rail Ombudsman may be able to assist. For example, the ombudsman will look into complaints regarding the Tyne and Wear Metro, Sheffield Supertram and Transport for Greater Manchester, which includes Manchester Metrolink, as these are participating service providers.[237] However, for other networks, the rail ombudsman will not investigate, but may be able to suggest alternative options, which could involve an industry watchdog, such as Transport Focus or London Travel Watch.

[233] DfT, Transport and Works Act orders: A brief guide, Q43, 26 November 2013.
[234] Johnstone S., UK barriers to progress, *Tramways & Urban Transit*, 18 February 2019.
[235] DfT, Transport and Works Act orders: a brief guide, 26 November 2013.
[236] DfT, Q41, Transport and Works Act orders: a brief guide, 26 November 2013
[237] The Rail Ombudsman, Participating Service Providers, accessed: [23 November 2021].

3.4 Legislation and safety of light rail schemes

Safety within the light rail sector is regulated by the Office of Rail and Road (ORR) under the *Health and Safety (Enforcing Authority for Railways and Other Guided Transport Systems) Regulations 2006 (as amended)*.[238] The ORR has identified a number of key focus areas:

- Ensuring appropriate risk control strategies are employed;
- Modelling risks and determining suitable control strategies using an evidence-based approach;
- Assessing health and safety performance against suitable benchmarks;
- Improving inter-system cooperation for safety-related information; and
- Supporting UK Tram (the industry body for the sector) and the LRSSB to provide safety leadership, set standards and issue guidance, based on light rail operations in the UK as well as Europe and the rest of the world.[239]

Further, the ORR have developed a Risk Management Maturity Model (RM3) which assists both ORR and light rail dutyholders to evaluate existing safety management systems and thus identify areas that could be improved.[240]

It is a legal requirement to report accidents and incidents on light railways and tramways to the Rail Accident Investigation Branch (RAIB).[241] The Light Rail Safety Standards Board (LRSSB) was formed in 2019 in response to the RAIB investigation into the overturning of a tram in Croydon in 2016. The LRSSB is the dedicated safety body for the light rail sector. Funded by the DfT and tram operators, and working with other safety bodies, such as ORR and RAIB, the LRSSB coordinates advances in tram safety and sets standards and guidance for the industry.[242] Box 3 discusses the incident in Croydon 2016 and the subsequent effects on the sector.

Whilst there is no specific health and safety legislation for light railways and tramways, they must comply with the Health and Safety at Work etc. Act 1974 and regulations made under that act.[243] This includes the Railways and Other Guided Transport Systems (Safety) Regulations 2006 (ROGS), which sets specific requirements for light rail and tramways.[244] Under ROGS, tramways have a duty of cooperation and are required to manage safety critical work,

[238] The Health and Safety (Enforcing Authority for Railways and Other Guided Transport Systems) Regulations 2006 (as amended), 2006/557
[239] ORR, Chapter 14: Tramways in 'Strategy for regulation of health and safety risks', *Crown*, April 2019.
[240] ORR, RM^3 2019 The Risk Management Maturity Model (amended 2020), 2020.
[241] The Railways (Accident Investigation and Reporting) Regulations 2005, 2005/1992
[242] ORR, Terms of Reference of the Light Rail Safety and Standards Board (LRSSB) review by the Office of Rail and Road (ORR), 18 October 2021.
[243] ORR, Chapter 14: Tramways in 'Strategy for regulation of health and safety risks', *Crown*, April 2019.
[244] Railways and Other Guided Transport Systems (Safety) Regulations 2006 (as amended), 2006/599.

carry out suitable risk assessments and operate under a safety management system.[245]

The lack of standardisation, in vehicle and system design, has been previously associated with increased light rail costs.[246] The LRSSB are responsible for a suite of documentation providing guidance and standards for the sector.[247] The current high level guidance for the design, construction, maintenance and operation of tramways and light railways, the Tramways Principles and Guidance,[248] is based on the 1989 DfT note "Provisional Guidance Note on the Highway and Vehicle Engineering Aspects of Street-Running Light Rapid Transit Systems" and its subsequent updates through ORR and UK Tram ownership.[249]

[245] ORR, Guide to ROGS, 29 October 2021.

[246] Public Accounts Committee, Improving public transport in England through light rail, HC 440, 9 March 2005.

[247] LRSSB, Business Plan 2021-22, July 2021.

[248] LRSSB, LRG 1.0, Tramways Principles and Guidance (TPG), 1 March 2021.

[249] ORR, Chapter 14: Tramways in 'Strategy for regulation of health and safety risks', *Crown*, April 2019.

Box 3: Sandilands incident, 9 November 2016

On 9 November 2016, the sector experienced the worst accident on a British tramway for over 90 years when a tram travelling from New Addington towards Sandilands tram stop on the Croydon Tramlink system overturned at Sandilands Junction. Seven people were killed and 19 were seriously injured, with all the remaining passengers bar one suffering minor physical injuries.[250]

This catastrophic event was investigated by RAIB. According to the RAIB, the main cause of the accident was apportioned to the speed of the tram as it negotiated a curve, with several contributory factors.[251]

The RAIB report made a number of recommendations, several of which were expected to be applicable to other UK tramways. These are underpinned by the first recommendation to develop a body to enable increased sector cooperation on safety matters and develop common standards and good practice guidance.[252] Subsequently, funding was provided by the Government to enable the formation of the LRSSB.[253]

The inquest into the incident concluded that the incident was accidental. Evidence was only obtained from RAIB and the British Transport Police, with none from anyone present at the crash or who was involved. Further, the Norfolk ruling[254] was applied, suggesting that the inquest should only use the RAIB evidence unless their conclusions were "incomplete, flawed or deficient".[255] Concerns have been raised with the precedent that this sets, whereby decisions do not accommodate those who have first-hand experience of the incident in question or are subject experts. A judicial review is being considered, although it is suggested that the application of the Norfolk ruling "could also be clarified by legislation".[256]

The law on death by dangerous driving does not apply to off-street sections of tramway.[257] In a debate into tram safety in September 2021, the Parliamentary

[250] RAIB, 18/2017, Overturning of a tram at Sandilands junction, Croydon, 9 November 2016, v2.2, October 2020, p11.

[251] RAIB, 18/2017, Overturning of a tram at Sandilands junction, Croydon, 9 November 2016, v2.2, October 2020.

[252] RAIB, 18/2017, Overturning of a tram at Sandilands junction, Croydon, 9 November 2016, v2.2, October 2020, p146.

[253] HC Deb, 20 September 2021, v 701, c126 Tram Safety.

[254] The Norfolk ruling was made at an inquest into the death of four men killed in a helicopter crash in 2014. The ruling covered whether the Air Accidents Investigation Branch (AAIB) should disclose the content of the helicopter's black box. The ruling was that the inquest should rely on the evidence from the AAIB and no one else's unless what the investigation body had concluded was either "incomplete, flawed or deficient."

[255] HC Deb, 20 September 2021, v 701, c122 Tram Safety

[256] HC Deb, 20 September 2021, v 701, c124 Tram Safety

[257] HC Deb, 20 September 2021, v 701, c125 Tram Safety

Under-Secretary of State for Transport said that the DfT "will investigate [this loophole] thoroughly".[258]

[258] HC Deb, 20 September 2021, v 701, c127 Tram Safety

Appendix A: List of Parliamentary Acts and Orders for Light Rail Schemes in England

Scheme	Act/Order
Blackpool Tramway	Blackpool Tramway (Blackpool North Extension) Order 2017
Tyne and Wear Metro	Tyne and Wear Metropolitan Railway Act 1973
	Tyne and Wear Passenger Transport Act 1979
	The Tyne and Wear Passenger Transport Act 1989
	Tyne and Wear Passenger Transport (Sunderland) Order 1998
DLR	London Docklands Railway Act 1984
	London Docklands Railway Act 1985
	London Docklands Railway (Beckton) Act 1989
	London Docklands Railway (Lewisham) Act 1993
	Docklands Light Railway (Silvertown and London City Airport Extension) Order 2002
	Docklands Light Railway (Stratford International Extension) Order 2006
Manchester Metrolink	The Greater Manchester (Light Rapid Transit System) Act 1988
	The Greater Manchester (Light Rapid Transit System) (No. 2) Act 1988
	The Greater Manchester (Light Rapid Transit System) Act 1990
	The Greater Manchester (Light Rapid Transit System) (No. 2) Act 1990
	The Greater Manchester (Light Rapid Transit System) Act 1991

	The Greater Manchester (Light Rapid Transit System) Act 1992
	The Greater Manchester (Light Rapid Transit System) Act 1994
	The Greater Manchester (Light Rapid Transit System) (Eccles Extension) Order 1996
	The Greater Manchester (Light Rapid Transit System) (Airport Extension) Order 1997
	The Greater Manchester (Light Rapid Transit System) (Ashton-under-Lyne Extension) Order 1998
	The Greater Manchester (Light Rapid Transit System) (Mumps Surface Crossing) Order 2001
	The Greater Manchester (Light Rapid Transit System) (Trafford Depot) Order 2002
	The Greater Manchester (Light Rapid Transit System) (Media City Extension) Order 2009
	The Greater Manchester (Light Rapid Transit System) (Second City Crossing) Order 2013)
	Transport for Greater Manchester (Light Rapid Transit System) (Trafford Park Extension) Order 2016
Sheffield Supertram	South Yorkshire Light Rail Transit Act 1988
	South Yorkshire Light Rail Transit Act 1989
	South Yorkshire Light Rail Transit Act 1990
Midland Metro	Midland Metro Act 1989
	Midland Metro Act 1992
	Midland Metro (No. 2) Act 1992
	Midland Metro Act 1993
	Midland Metro (No. 2) Act 1993
	Midland Metro (Wednesbury to Brierley Hill and Miscellaneous Amendments) Order 2005
	Midland Metro (Birmingham City Centre Extension, etc.) Order 2005

	Midland Metro Order 2010, the Midland Metro (Wolverhampton City Centre Extension) Order 2016
	Midland Metro (Birmingham Eastside Extension) Order 2020
London Tramlink	Croydon Tramlink Act 1994
NET	Greater Nottingham Light Rapid Transit Act 1994
	Nottingham Express Transit System Order 2009
Edinburgh	Edinburgh Tram (Line One) Act 2006
	Edinburgh Tram (Line Two) Act 2006
	The Edinburgh Tram (Line One) Act 2006 (Extension of Time for Land Acquisition) Order 2011
	The Edinburgh Tram (Line Two) Act 2006 (Extension of Time for Land Acquisition) Order 2011

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