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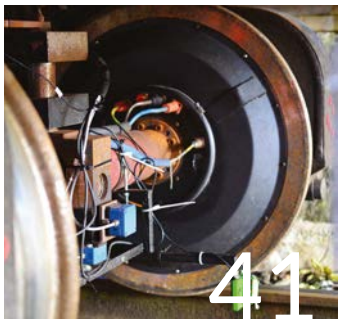

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Limoset®, from Lucchini, is an innovative solution for very low-floor LRVs. Thanks to a clean design, low weight and ease of maintenance, the wheelsets are straightforward to assemble, disassemble and inspect.

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Failed projects offer valuable lessons for future schemes

The possibilities for the application of light rail as a high-quality mode of urban public transport are countless. **Rob van der Bijl, Kiyohito Utsunomiya** and **Niels van Oort*** examine how light rail projects can be implemented in more cities and urban areas.

The RandstadRail project in the Netherlands successfully converted former commuter rail lines into light metro operation serving Rotterdam, Zoetermeer and The Hague (pictured). Photo: Shutterstock.com

THE social value of high-quality public transport is recognised worldwide, but we need to answer three basic questions to get a deeper insight into its benefits. First, what kind of public transport is available, and which technologies and modes are most appropriate for a specific application? Secondly, why is public transport necessary and why should projects be implemented? Thirdly, how does a project become feasible, and how can it ultimately be realised?

Light rail is an excellent mode of urban public transport. Other forms of high-quality public transport such as bus rapid transit (BRT) and metro have similar, but not necessarily identical, characteristics. Ultimately, light rail, BRT, metro and commuter rail represent the entire palette that can and should be used in cities around the world.

A mode that matches the characteristics of light rail is a means to achieve a goal - no more, no less. In order to investigate the broader benefits of light rail, it is therefore necessary to come up with a precise definition of light rail, find a solid argument for light rail, and finally identify how the intended application can be realised.

> “Many large rail projects are doomed to failure and, if they are realised, are likely to be completed with unexpectedly high costs and rarely without defects.

The term light rail was first coined in the mid-1970s and is defined as an urban electric railway characterised by its ability to operate single cars or short trains along exclusive rights-of-way at street level and on elevated or underground sections with passengers boarding at street or vehicle level.

Light rapid transit uses a variety of infrastructure including traditional street running tram lines, shared space, traffic lanes, segregated track, light metro-style lines and tram-trains. There are four basic vehicle types: conventional trams, high-floor LRVs, low-floor LRVs and tram-trains, with many cities operating a mixture of vehicles. Conventional overhead catenary is now being supplemented by catenary-free systems using ground power supply, batteries and super capacitors.

Some cities have chosen to upgrade an existing conventional tram network to modern light rail standards or build new lines from scratch. Others such as Manchester have converted commuter rail lines to light rail operation or combined this approach in the suburbs and connected the new light rail lines to an existing tram network to form a tram-train system, as in Karlsruhe. Rotterdam and The Hague have gone even further by converting commuter rail lines to light metro operation and connecting these lines to the metro in Rotterdam and the light rail/tram network in The Hague to form the RandstadRail regional network.

Obviously, the greater the proportion of dedicated right-of-way, the easier it is to control the network and achieve attractive journey times and good punctuality.

The justification for investment in light rail is based on several considerations. Cost is often given as the reason to favour a certain mode. For example, an important argument for preferring high-quality buses is often based on lower construction costs compared with rail, which is valid. However, our concerns relate to the wider benefits of light rail, which can be summed up with five “Es”:

- effective mobility (E1) - effectiveness of transport and mobility
- efficient city (E2) - suitability of spatial use, and spatial and urban redevelopment
- economy (E3) - prosperity and wellbeing in cities and urban regions
- environment (E4) - decreasing carbon footprints and creating sustainable cities and urban regions, and
- equity (E5) - creating socially inclusive cities and urban regions.

Naturally, the definition and reasons for implementing a light rail project are important, but how projects are implemented deserves an adequate answer.

Many large rail projects are doomed to failure and, if they are realised, are likely to be completed with unexpectedly high costs and rarely without defects.

Delays and cost overruns appear to be the rule rather than the exception. In particular, organisational and institutional complexity and construction costs seem to be underestimated. While this applies more to heavy rail and metro projects, there have been some light rail project failures as demonstrated in our case study of the Groningen scheme.

Our two case studies were selected on the basis of our experience with light rail projects worldwide. In particular, the selection is based on recent work on current developments within the application of light rail in both The Netherlands and Japan.

The Groningen RegioTram project in the Netherlands targeted the construction of two city tram lines radiating from the main station with one line passing through the city centre to the university district on the northern side of the city, and the other running to a residential area in the northeast. A second phase would have seen regional trams running from the city to the surrounding area using existing railway lines. The Groningen project, which ran from 2006 to 2012, was well prepared but ultimately failed.

While the Utsunomiya light rail project in Japan has also been the subject of debate for decades, the city council nevertheless decided to build the first phase in 2015. Construction started in 2018 and the line from the main station to Honda Giken Kitamon in Haga to the east will be commissioned in 2022 as planned. A second phase is under discussion.

Complicated

It would be too easy to blame administration and politics for the failure of the Groningen project and the very long preparatory discussion in Utsunomiya, since the inevitable planning processes were and are very complicated, but there are several causes at play.

The case for the Groningen project was remarkably narrow. Of the five Es, justification for the project was exclusively focused on the idea that the light rail line was necessary because buses would no longer be able to cope with the number of passengers travelling to the university, a prediction which has not come to fruition. Honesty dictates that the traffic forecast is not low, but not spectacularly high.

In a spatial sense (E2), the tram line was predominantly seen as a problem. For example, an associated plan to plant trees was described as ‘compensation’

The Utsunomiya project has successfully integrated light rail with conventional rail operation.

for what would have been lost with the arrival of the tram, instead of as a nice addition to the project and the city. Economic value (E3), environmental benefits (E4) and social inclusiveness (E5) were never used as arguments.

Support for the project gradually crumbled as local residents and shopkeepers feared the inconvenience and potential problems with delivering supplies in the city centre. The impact on the city centre was reduced by proposing a single-track solution, but this failed to quell opposition to the project. Initial communication with the population was good, but worsened with the rise of Twitter. Official support was also limited, but the final blow for the project was the opposition from top Groningen municipality officials.

While projects such as this need to remain small to reduce complexity, the scope of the Groningen project was enlarged. Moreover, as a city tram project it was loaded from the outset with the status of a regional project, hence the name RegioTram, which resulted in a change in track characteristics. The addition of a second line also extended the planning process by one year.

A new long-term design, build, finance, maintain and operate (DBFMO) form of tendering was chosen for the project, which included acquisition and maintenance of the tram vehicles. The choice of DBFMO was frivolous. With DBFMO, once the actual tendering process has started, it is difficult to communicate with the outside world, as all information exchanged between the project organisation and the private sector is confidential.

The project organisation was very professional, but undeniably suffered from a technocratic bias with the project seen mainly as a technical task. Building a light rail line is not only a matter of civil engineering but must also consider urban and social development. Instead of designing the project to meet social demands and wishes, priority was given to engineering from the outset. The dominance of engineering was partly due to the choice of DBFMO, which requires that all specifications be made explicit in advance, and therefore at an early stage.

Untimely, a change in political climate following an election was the final nail in the coffin for the project. The newly-elected politicians regarded the project as an expensive toy, while the DBFMO was seen as a 'black box' and they also favoured other projects. Moreover, the city faced financial problems as a result of the 2008 financial crisis.

Utsunomiya

The Utsunomiya project is fundamentally different from the

UITP: European light rail growth strong

LIGHT rail network length and patronage has grown steadily since the start of the millennium, a report from the UITP has found, with 108 new cities around the world opening their first line, including 70 in Europe.

The Light Rail and Tram: The European Outlook statistics brief found Germany and central Europe make up half of all patronage, with the rest split between southeastern Europe, France, Poland, the Benelux countries (Belgium, The Netherlands and Luxembourg), western Mediterranean, Nordic/Baltic and the British Isles.

Between 2015 and 2018, light rail infrastructure in Europe grew by 3.9% from 8943km to 9296km, with ridership growing 6.9% from 9740 million to 10,422 million passengers between 2015 and 2018. Light rail now carries as many passengers as metros and regional/commuter rail, and 10 times more passengers than air travel in Europe. The average light rail journey in Europe is 3.27km.

The busiest light rail network in Europe is in Budapest, Hungary, with 411 million passengers, while Berlin takes the title of longest light rail network in Europe at 193km. Ridership growth varies from region to region, ranging from 17.5% in the British Isles to 1.5% in Poland.

There are notable differences between network structures across the countries. While the average European line is 7.3km long, they tend to be longer on average in countries with newer systems and a limited number of lines, while older, more complex systems feature lower average line length.

The fleet operating on the 1275 light rail lines in Europe consists of 20,750 trams and LRVs, with 51% of this fleet comprising partial or full low-floor vehicles, ranging from countries with almost 100% such as France, Spain, Ireland, Britain and Norway to those with much lower percentages.

The average annual mileage per vehicle in Europe is 52,000km, ranging between 38,700km and 77,500km. The discrepancy can be partly explained by the fleet age structure. In addition, this value is theoretical and based on the assumption that all vehicles are used equally.

UITP says that with continued pressure to reduce congestion, tackle poor air quality in cities and reduce greenhouse gas emission contributing to climate change, light rail will continue to obtain support of decision-makers and the travelling public in Europe.

However, much attention and resources will go into the maintenance, modernisation and replacement of assets to keep ageing systems attractive and fit for purpose. For this reason, the growth of green-field projects in Europe will continue to slow down.

Groningen scheme. First, Utsunomiya has a large population of more than 500,000. In addition, because the neighbouring town of Haga has a large industrial area, around 30,000 people commute from Utsunomiya to Haga daily. Although some bus services are available, most commuters travel by car which causes serious congestion.

In the early 1990s, while some elevated transport systems such as monorails and Automated Guided Transit (AGT) were considered, light rail eventually became the preferred mode.

Public transport in Japan is usually operated on a commercial basis, with public money used only in special cases. Every light rail scheme always considers profitability, including capital costs. Despite the high numbers of commuters, initial costs were high and the project was heavily criticised. Nevertheless, construction was successfully launched in 2018.

There were three main reasons why the project was finally approved. First, the Utsunomiya municipal government took note of the criticism and began disclosing much more information and communicating with residents. Secondly, the Ministry of Land, Infrastructure, Transport and Tourism (MLIT), strongly supported the project and financed half of its initial costs. MLIT also provided a senior official to assist with the project management. Thirdly, some citizen's groups, including experts, expressed support for the project and mediated between the local government and people who were not familiar with light rail. The citizen's movement also contested messages in the press, which had been critical of the project.

Light rail in Europe

Unfortunately, the failed project in Groningen is not an exception, with Britain developing projects in Leeds, Liverpool and Portsmouth, which ultimately failed because they could not get government backing.

However, we should underline that many projects have been successful since light rail's revival in the 1980s. New light rail lines and networks have been built in cities in France, Spain, Britain and more recently in Denmark.

In many circumstances complicated light rail projects should be split up, particularly in the tendering and construction stage, and even after construction has started if serious problems arise. An open, flexible approach is necessary to review planning, design, tendering, construction and operation.

However, the five Es illustrate why light rail and, to a certain extent, BRT are important for urban transport, in particular the reliability of public transport, the quality of urban spaces, the structure of urban development, and the sustainability of cities in economic, environmental and social terms. **IRJ**

* Rob van der Bijl is visiting professor at Ghent University's Department of Mobility and Spatial Planning in Belgium; Kiyohito Utsunomiya is professor at Kansai University's Faculty of Economics in Japan; and Niels van Oort is assistant professor at Delft University of Technology's Smart Public Transport Lab in the Netherlands. The full paper, entitled *Sustainable Urban Development with LRT: Lessons from the Netherlands and Japan* is available at: https://bit.ly/2uqyswt

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Fresh faces

Mr Pavel Spilka has been appointed CEO of Czech-based open-access operator Leo Express, with the current CEO, Mr Peter Köhler, continuing to sit on the board of directors. Spilka has previously held managerial roles at companies including Škoda Transportation, O2 and energy supplier Jablonecká energetická.

The Community of European Railway and Infrastructure Companies (CER) appointed Austrian Federal Railways (ÖBB) CEO, Mr Andreas Matthä, as acting chair of its management committee. Matthä is taking over from SJ president and CEO, Mr Crister Fritzson.

Mr Mark Hopwood has taken over as managing director of South Western Railway (SWR). Previously managing director of Great Western Railway (GWR), Hopwood said his mission at SWR is to drive through change and make a positive impact for SWR passengers (p17).

Former German Rail (DB) CEO, Prof Dr Rüdiger Grube, has been appointed a member of Vossloh's supervisory board and assumed chairmanship of the board. Dr Bernhard Düttmann also resigned as a member of Vossloh's supervisory board from December 31 2019.

The supervisory board of Polish manufacturer Pesa has appointed vice-president, operations, Mr Krzysztof Zdziarski, as the company's CEO. Mr Robert Tafilowski has also been appointed as the new CFO.

Network Rail (NR) has appointed Ms Ellie Burrows as route director for Anglia. Burrows has more than 20 years' experience in the British railway industry in a variety of roles, including area director at NR and train services director at Southeastern.

Mr Emilo Bayarri Roca has been appointed managing director of Valencian State Railways (FGV) by the company's board of directors. Mr Juan Andrés Sánchez Jordán, who assumed the management of FGV in June 2017, has returned to Adif.

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