Feature

Light Rail: Making Urban Transport More Attractive

Pierre Laconte

Introduction

This introductory article provides some glimpses of the historic background of urban mobility. It describes the rise and decline of market-led urban rail transport operators, the rise of market-led individual modes, and the shift to public transport owned by the public sector (or operated on its behalf). Good examples of the increasing attractiveness of urban passenger transport through surface light rail include Manchester, Karlsruhe and the lesser-known expansion of surface light rail in France, Turkey, Japan, etc. The accounts are based on the experiences of UITP members and personal visits and interviews with people involved.

Urban Rail Markets of Yesterday and Today

In 19th century, most interurban road network was private and operated under concession. Contractors were in charge of building and maintaining roads and collecting tolls. In the UK around 1820, an estimated 20,000 miles of roads were operated under concession agreements.

Starting with the interurban link between Liverpool and Manchester in 1830, railways gradually expanded worldwide and, in addition to interurban services, opened suburban areas to the urban middle class. Private businesses were entirely responsible for determining routes, acquiring land, and investing in tracks and operations. They are naturally concerned with marketing and segmentation by classes of potential passengers.

Suburban land development became a key objective for rail operators and combined the creation of property values and urban passenger markets. Probably the most adventurous and successful combination of passenger transport and urban development was the extension of Cairo planned by the Belgian banker, Edouard Empain (1852–1929). Empain bought a huge tract of plateau desert land some 10 km from the centre of the city and a tiny corridor through the desert on which he built a tramway line and utilities (water supply, sewage, etc.). He sub-divided the desert land according to a simple, high-density low-rise street grid and public services master plan and thus created a huge suburban passenger market between Cairo and the new settlement called Heliopolis.

The success of the market-led Heliopolis transport and land-use project later enabled Empain to repeat it on a larger scale in Paris where he financed the metropolitan railway network. He again combined property development and electricity generation with investment in public transport. The project was entirely private. No elected officials attended the opening in July 1900. The new Metro was an immediate market success—helped by the 1900 Paris Exhibition—with more than 16 million passengers during the first 5 months of operations.

Rise of motor vehicles and dawn of market-led railways

Electricity and the combustion engine were possibly the two most important transport-related technical innovations of the late 19th century. The telephone also played a role as a substitute for travel but even more as an incentive to additional physical mobility. Generation of electricity on an industrial scale facilitated the rise of new urban transport operators backed by a modern industrial sector.

Steam-locomotive hauled commuter trains boosted interurban travel and suburban travel into the countryside, while electric tramways allowed convenient short-distance urban transport in towns. In very large towns, the gap between the two modes opened the mobility services market to the electric-underground metropolitan railways; the first lines in London, New York, Paris, and Budapest appeared exactly when surface traffic had reached a peak of congestion and pollution caused mainly by horse-drawn carriages.

Since neither steam-locomotive hauled carriages nor horse-drawn carriages could be put underground easily, the market was open to building long underground tunnels for electric railways. This meant the acceptance of daily underground mass travel by city dwellers, leaving the street to individual transport. Paradoxically, a delay of a few years would have permitted building tunnels for cars, leaving the streets to the city dwellers.

Combustion engine vs urban rail

The invention of the combustion engine opened the market to the new, glamorous, convenient and street-friendly (at least initially) individual vehicles. At the turn of the century, the oil industry was on the verge of collapse because electricity was replacing oil lamps but it adapted quickly to the new market created by the advent of the mass-produced automobile.

The combined forces of the oil, the automobile and the road construction industries created an even mightier lobby than the rail barons at the peak of their strength. Roads financed entirely by taxpayers replaced the earlier user-financed toll roads, designed, built and maintained by the private sector. The 'automobile' welfare state was to go much further.

While the tramway companies had to pay for their track investments and maintenance and charge their passengers accordingly, the automobile used the space it consumed to run and to park without specific charges. Meanwhile, the commercial speed of trams was jeopardized because they had no segregated right of way and automobile traffic clogged their tracks.

At that point, the automobile industry in America and elsewhere did what would be expected—it bought up the ailing tramway companies, closed services and

replaced them with its buses. In many places, the ailing tramway companies were taken over by government, becoming part of the public sector and subject to the management style of subsidized public services. In most cases, the tram tracks were pulled up and services replaced by buses that were slower, noisier, less comfortable, and more polluting than the replaced trams.

In Paris, the transport authorities were heavily influenced by a well-orchestrated media campaign and abandoned the entire tram fleet of more than 3000 cars—many brand new—in just 5 years between 1932 and 1937. The trams were replaced by a fleet of buses produced by the national automobile industry.

This historic reminder helps us understand that the rise of 'automobility' was the result of a coherent and broad-ranging multi-sector marketing strategy as much as it was the result of spontaneous individual preference. 'Preference for space' occurs when space becomes available at less than full cost. This was indeed the case. Not only were the streets and roads made available free of charge but a wide range of market incentives were made available to buyers of individual detached homes. The most famous incentive was the postwar GI Act in the USA that offered vast home-buying subsidies and generated the Levitt Towns and thousands of suburbs. The standard form of urban growth in the USA became leapfrogging—land developers buying up tracks of cheap agricultural land ever further from built-up areas. However, instead of providing the connection to the city at their own cost as Empain did in Cairo, they only had to ensure that the government-financed road programmes (under the Federal Highway Act, etc.) guaranteed the connection. Consequently, land plots and homes could be sold at bargain prices assisted by the Federal and State subsidies.

These mechanisms were copied worldwide. In Europe, several countries

Trains and trams sharing same track at Karlsruhe Central Station, used for high speed rail (Author)

even went so far as to introduce tax deductions for commuting by automobile. In terms of transport markets, this low density form of urban development favoured the automobile and excluded public transport from most of the market. More importantly, it maximized kilometers travelled and fuel consumption. As a result of this deeply unequal competition, public transport services gradually gave way to reliance on the automobile. The private sector left the realm of public transport which became a government-provided bare-bones service that was affordable by all but far less attractive, giving the automobile the largest modal share.

This explains why statistics for 1980 to 1995 in the OECD countries show that vehicle-km travelled by car increased by 65% while car ownership increased by 50% and population by 13%. In other words, vehicle-km increased five times faster than population and there were four times more new cars than new babies.

Improving Attractiveness of Public Transport

A growing number of citizens—not only mobile older people—are more sensitive to comfort and ease of use rather than to time gains. Metropolitan underground railways are fast but rarely achieve optimal ease of use. As an example, a return trip on the Paris Metro with one change each way requires the same total effort as climbing the stairs of an eight-storey building. Escalators have been installed in a number of stations but they are still far from widespread. Buses are usually slow because of traffic congestion. These are powerful reasons why surface light rail enjoying right of way could capture a large market.

New opportunity for public transport

Interest in the example of Manchester in the UK goes beyond the new *Metrolink* system (see pp. 22–25). Very soon after deregulation when on-street competition was introduced, the Greater Manchester Passenger Transport Executive (GMPTE) and Public Transport Authority (PTA) took measures to integrate transport supply by offering the *Travelcard* unlimited-use pass accepted by all operators (rail and bus) in the Manchester area.

The uniqueness of *Travelcard* is in how passenger revenues are allocated to different operators. A continuous sample survey covering all the operators is performed by an independent team according to a stochastic model accepted by all parties and the revenues are shared

according to actual daily use (demand) rather than by seat kilometers (supply). Although the cost of the permanent survey sample is relatively high (about 2% of income), it has been a remarkable success in terms of user attractiveness and marketing. It has allowed identification of passenger profiles by asking three simple questions: point of entry, point of exit and passenger fare category (child, adult, concession). The results allow neutral assessment of the daily evolution of patronage level to the benefit of each operator. In addition, they allow independent assessment of the number of subsidized concession riders. Integration of *Metrolink* with its own tariff structure has proved compatible with *Travelcard*.

The market niche specifically generated by *Metrolink* was a direct result of its commuter rail–urban rail interoperability concept. In 1989, the GMPTE decided to link two disused heavy rail commuter lines via on on-street tram (see pp. 22–25). To implement this idea, they launched a European-wide call for consortia ready to design, build, operate and maintain (DBOM) the new network for 15 years. The winning consortium committed itself to taking the full risk of the construction investment while providing 5% of the total cost (about $200 million) and to take the full commercial risk of operation (no operation subsidies).

The niche effect was obtained through several operating innovations, especially:

- Very simple fare structure
- Simple timetable with one tram every 6 minutes (later changed to every 5 minutes) from 07:00 to 19:00, and every 12 minutes at other times
- 50% fare discount for travel outside peak hours, targeted at housewives shopping and leisure trips
- Staff hired according to service criteria (no previous transport experience needed) and trained to perform any job when necessary

High- and low-speed, heavy and light rail interface

High-speed railways have created a renaissance for interurban journeys of less than 3 hours. As an example, the Paris–Brussels *Thalys* service (300 km in 80 minutes) has already achieved a market share of more than 50% with business travellers forming 53% of traffic. As a result, Air France abandoned all flights on the route from 2001, replacing them by direct trains with airline-style on-board service from Brussels to Paris Roissy Charles de Gaulle Airport. The first direct *Thalys* service between Paris-Nord and Brussels Airport started in 2003.

Urban stations for high-speed trains unquestionably offer a market niche for urban and suburban public transport. The taxi ranks and parking at stations often have insufficient capacity to cope with the sudden mass of passengers. Consequently, passenger interfaces between such stations and the local rail network should be a priority investment area. Timetable information to main urban and suburban destinations, convenient ticketing, and unmissable signs checked by 'undercover passengers' are some possible tools that are too rarely used. Moreover, from the viewpoint of sustainable urban mobility, the recent construction of several high-speed rail stations in exurban areas with poor public transport services reflects the old attitude of mono-modal rail plus car. It eliminates rather than takes advantage of intermodality developing the public transport niche, and also increases dependence on cars in the areas. Examples are found in Florence (Italy) and Avignon (France).

Some connectivity best practices are found at: Madrid's Atocha Station (high-speed rail, commuter rail, and metro); Antwerp-Central (high-speed rail, commuter rail and tramways); and Düsseldorf Hauptbahnhof (high-speed rail, commuter rail and tramways).

Karlsruhe dual-current *Tram Train*

Interoperability between heavy and light rail is the most important passenger rail interface from the viewpoint of attractiveness, because the vehicle moves from one track to another instead of the passenger changing trains.

This requires track sharing between high- and low-speed trains and between heavy and light-rail rolling stock. Sharing the same electrified tracks has benefited all modes involved in the Karlsruhe urban and suburban *Tram Train* network, which started in 1995, 3 years after Manchester. The suburban tram operator succeeded in convincing Deutsche Bahn AG (DB AG) to allow heavy and light-rail rolling stock to use the same tracks. As a result, the same light-rail stock is running alternately on central city streets and traditional railway track.

For passengers, remaining on the same train for the entire trip removes all negative perceptions of changing mode and waiting. (see p. 10)

Track access issues

Copying the examples of Manchester and Karlsruhe in other cities could create a promising niche for public transport. However, it requires bridging the cultures between traditional railway operating staff and urban rail operators. It would mean putting more emphasis on active safety (avoiding collisions) than on passive safety (collision resistance) and adapting safety standards accordingly. Some engineers have suggested a compromise standard of 600-kN compression resistance.

The Karlsruhe experience presents a realistic case for encouraging the establishment of a body in charge of both tracks and operations to open up infrastructure to third parties while ensuring safety. In Karlsruhe, this happened by persuasion; in Japan it happened by regulation.

Opening track to third parties should not be confused with total separation of infrastructure and operations. A useful comparison can be made between the reportedly successful privatization and division of Japanese National Railways into the regional JR companies and the somewhat less-successful British Rail privatization with a split into a monopoly track owner (Railtrack) and various franchised operators.

The regulatory obligation for the main operator to accept third parties on its track is compatible with service development and new investments in track. By contrast, the experience of Railtrack in the UK confirms the fears that a monopoly track owner has every interest in creating scarcity in order to maximize position. If track-only monopolies were common in Europe, we might wonder who would have a market-led interest in developing new rail links!

Worldwide renaissance of surface light rail

Besides the pioneering events in Manchester and Karlsruhe, new tramways or light-rail systems have started appearing on urban streets in many countries worldwide.

More than 100 cities in North America and Europe (especially France, Germany, Spain and Italy) have developed or are planning completely new light-rail systems, financed via different public sources. In the UK, there is additional input from the private sector. In some countries, like Switzerland and Belgium, the remaining prewar tram systems have been updated and improved.

In many cases, building a new light-rail system has been the occasion for revamping citywide public spaces. Nantes and Grenoble pioneered this approach and Strasbourg combined its new system with a traffic reduction and pedestrianization programme with special emphasis on rolling-stock design and related urban furniture.

Istanbul's new tramway using refurbished metro cars (Author)

Barcelona's new light-rail line uses the main diagonal thoroughfare crossing the city. In Bilbao, the new light-rail line follows an industrial waterway that is presently undergoing a complete renewal, coordinated by a single public enterprise (Rià 2000) entrusted with the landholdings of different public owners. It links new developments like the Guggenheim Museum with Old Bilbao.

Rouen (France) has a specific combination of trams, buses (classic articulated buses guided by optical system) and 'trams on tyres' (aka busways) designed like tramways and benefiting from a segregated right of way to escape traffic congestion. (See pp. 13–14 for a discussion of LRT financing in France.) This system narrows the reserved busway, leaving more space for other street uses.

The North American boom in new light-rail systems even in cities like Dallas and Houston is interesting because it recognizes the limits of 'automobility.' Elsewhere, Turkey has an outstanding number of cities with new light rail systems. Sometimes the rolling stock is pre-owned tram cars from Europe—in Istanbul, surplus metro cars have been adapted to run on streets. (See p. 11 for the total number of LRT systems.) In Japan, the government merging separate ministries into the Ministry of Land, Infrastructure and Transport could open the way to new light-rail systems running on roads. (See p. 15 for the case of the Man'yo Line.)

Increasing Public Transport Market

Having described a number of attempts by operators to gain new customers, we have to admit that the number of readily available new customers is small simply because of the unequal competition with cars for the use of public space. Although public-transport operators can regain small market segments themselves, large segments will only be recovered by adopting land-use policies that are public-transport friendly.

The city itself could be developed along lines compatible with effective use of public and non-motorized transport, allowing people to reduce automobile dependence and encouraging linear patterns of urban extensions.

In the UK, in line with its commitment to cut emissions of greenhouse gases and to reduce urban sprawl, the government has decided that 60% of all new urban development until 2010 will be on 'brownfield' sites in existing urban areas

Strasbourg tram as element of urban design (Author)

Portland city planning favours new patronage for tramways (Author)

instead of 'greenfield' locations. In addition, Planning Policy Guideline 13 forbids all development not adjacent to existing urbanized areas. In the future, development of large exurban shopping centres like Bluewater Park will no longer be approved.

The UK government also reviewed its road programme, following the 1995 report of its Standing Advisory Committee on Trunk Roads Assessment (SACTRA). This report concluded that the additional traffic generated by new roads often exceeds the additional capacity they provide. Finally, the government introduced legislation enabling local authorities to levy a yearly charge of £150 (£1 = US$1.80) on workplace parking provided by employers. This levy could be used to improve public transport. Unfortunately, the need to get the agreement of all local authorities in a conurbation to the levy has delayed the implementation of this mobility tool.

Portland's (Oregon) ongoing policy of urban containment is part of the same broad category. Under this policy, all urban development must remain within the borders of the urbanized perimeter set by the 1973 state legislation. This has proved successful in attracting higher-density activities and housing to the city. It also enabled the city to introduce a new tramway system and reduce its automobile dependence.

The examples of the Curitiba (Brazil) busways, Zürich (Switzealand) on-street priority for trams and buses, the Ghent (Belgium) combination of trams and pedestrians, etc., described below illustrate the emphasis on land use.

Pre-rail busways in Curitiba

Somewhat paradoxically, the most extreme example of public-transport-friendly land use comes from Curitiba, a very large (pop. 1.7 million) bus-only city. Moreover, Curitiba is the centre of Brazil's national automobile industry and has one of the highest automobile ownership rates. The concept was developed by Jaime Lerner, an architect, three-times mayor and later governor of Parana State. To make buses competitive with cars, all large roads have a double lane reserved for buses (to be used later for light rail). Access and exit is through an elongated shelter where all ticketing and waiting takes place. Multiple doors make the boarding and alighting very fast. The commercial speed of 32 km/h is similar to a metro. Patronage includes all levels of society and links all parts of the city, including the airport. This idea has been replicated in Bogota and Delhi.

Another land-use feature is worth mentioning. To increase development along the corridors served by the transit routes, the city has sold development rights to realtors who are ready to build there. These development rights were acquired from owners of marginal land, such as dilapidated brownfield sites, gravel pits, wetlands, etc. The city acquired this land in order to transform it into city public parks and recreation grounds, while also increasing the density of land occupation along the development corridors.

Zürich blue zone

In 1985, the Zürich city authorities decided to introduce a blue zone (allowing residents unlimited parking) after a survey of the number of public parking spaces occupied by non-Zürich commuting drivers. This blue zone covers the entire Zürich electoral district—everybody else is only allowed 90 minutes of free parking. This measure instantly created a new market for public transport. In addition, it increased the value of the city-owned parking concessions and

Trams sharing street with pedestrians in Ghent (Author)

encouraged suburbanites to return to the central city, pay their taxes, and invest in housing. Drug-riddled areas, such as the notorious 'Needle Park' next to the central station were rehabilitated. Shopkeepers soon realized that 90 minutes parking was ample for shopping if street parking was easy to find. Increased demand for commuter public transport triggered additional commuter rail (S-Bahn) services within the Zürich transport community. Last but not least, the scheme proved a lasting electoral success.

Additional features include an efficient right of way in favour of trams and buses (coupled with a shortening of the traffic light cycle). The entire scheme gives a little more urban space to public transport and a little less to individual transport, but much more mobility to citizens.

Ghent trams & pedestrianization

Over the years, the City of Ghent (pop. 500,000) has gradually reduced car traffic in its historic and commercial centre while keeping trams, making the latter very successful. The number of people over 65 shopping in the centre has been increased by giving them a free pass, and policies to limit traffic have found favour with voters.

Freiburg-im-Breisgau and Vauban extension

Freiburg in Germany (where apartments and car parking spaces are traditionally sold together) has a long-standing record of public transport and bicycle-friendly land use. There is an excellent tramway system and a large Bike & Ride multistorey bicycle park next to the main train and tramway station. In 1985, the city started developing a car-free quarter on the site of the former French army barracks. High-density low-rise energy-efficient apartments for the middle class have proved a successful investment.

Conclusion

Urban rail transport was born with the ascent of the modern city in the 19th century. Market-led entrepreneurs developed rail tracks and services between cities and within cities and their suburbs. Since the early 20th century, the automobile gradually became king of the road and street. Public transport was taken over by public authorities as a service to people with no car. More recently, the increasing dependence on the automobile has shown its limits, opening up new possibilities for public transport, in particular for congestion-free rail corridors.

Although the pioneering examples of Manchester and Karlsruhe are part of a worldwide renaissance of tramways, the best chance for public transport to regain market share may be through adoption of new land-use policies. The authorities and operators have said little about this so far, but successes have been achieved through the cooperation of both parties as well as by appropriate urban rail lobbying. ■

Further Reading

M. Gaillard, *Histoire des transports parisiens* (History of transportation in Paris), Horvath, Paris, 1985.

M. Gauchet, *Le désenchantement du monde* (The end of creeds), Gallimard, Paris, 1985.

P. Laconte, *Ville et transport: l'expérience globale* (City and transport: A global experience), *Dynamic City*, SKIRA/Seuil, Paris, January 2000.

P. Laconte, Innovative Finance for Urban Rail Transit, paper to Transport Research Board Annual Meeting, Washington, January 2000.

P. Newman, and J. Kenworthy, *Sustainability and Cities: Overcoming Automobile Dependence*, Island Press, Washington DC, 1999.

The Standing Advisory Committee on Trunk Road Assessment, *Trunk Roads and the Generation of Traffic*, HMSO, London, 1995.

I. de Sola Pool, Communication Technology and Land Use, *The Annals*, September 1980.

UITP/SOCIALDATA, *Switching to Public Transport*, Brussels, 1998.

UITP/SOCIALDATA, *Assessments of Mobility in Europe*, Brussels, 1992.

J. Weitz and T. Moore, Development inside Urban Growth Boundaries: Oregon's Empirical Evidence of Contiguous Urban Form, *APA Journal*, Autumn, 1998.

D. Yergin, *The Prize: The Epic Quest for Oil, Money and Power*, Simon and Schuster, New York, 1992.

Pierre Laconte

Dr Laconte is Honorary Secretary-General of UITP and Vice President of the International Society of City and Regional Planners (ISOCARP). He studied at the Catholic University of Louvain (UCL), Belgium, where he received a doctorate in law in 1956 and in economics in 1978. He became Secretary General of UITP in 1985. He has published widely on urban planning issues, receiving the Credit Communal Award in 1974–78, and was one of the three planners of the Louvain-la-Neuve rail-oriented new town, which received the UIA Abercrombie Award in 1982. He has been a Fulbright scholar and a visiting lecturer at the Massachusetts Institute of Technology.