Midland Metro

2.2 Features of Light Rail Transit Systems

2.2.1 What is Light Rail?

The exact origination of the term "light rail" is unclear. However, it was reportedly first used in the 1960s in order to avoid the American terms "trolley" and "streetcar" or the British "tram" and "tramway".

There are a number of definitions of light rail systems in existence. However, "light rail" commonly refers to electric railway systems constructed during the 1970s or later. They are characterised by an "*ability to operate single or multiple cars [trains] along exclusive rights-of-way at ground level, on aerial structures, in subways or in streets, able to board and discharge passengers at station platforms or at street, track, or car-floor level and normally powered by overhead electrical wires*" ([10]).

2.2.2 Key Characteristics of Light Rail Schemes

The development of LRT systems in Europe and the USA began in the latter half of the last century, principally in response to the advance of the private car and the consequent increase in congestion and car ownership within cities. There was, as a result, a need for a change in the function of public transport, such that it could offer the ability to:

- travel longer distances than buses and traditional tramways, but shorter than heavy railways;
- deliver public transport services on a regional rather than an urban scale; and
- compete with the private car on a door-to-door basis in terms of comfort and speed.

The term "light" implies a number of characteristics, including less demanding construction parameters leading to reduced costs and construction time, lighter vehicles than those used on conventional rail schemes and structures with steeper gradients and sharper curves, with more flexibility for integration with the urban environment.

The maximum speed of light rail vehicles is usually around 95 km/hr (or 59 mph) while "heavy", or conventional, trains can normally operate up to speeds of around 200 km/hr (or 125 mph). Light rail speeds are variable due to restrictions imposed by Her Majesty's Railway Inspectorate (HMRI) or as a consequence of the characteristics of the streets in which they operate. However, in general terms the average speed is lower than that of heavy rail.

Light rail vehicles can operate as single or multiple units, carrying up to around 250 passengers. The number of cars in any one unit is limited by a number of factors, including station platform length, highway design and the manoeuvrability of the vehicle.

There are over 400 light rail and tramway systems in 50 countries worldwide. Since the 1950s and 1960s, many tramway systems in several countries (including Germany, Switzerland and Belgium) have been modernised and upgraded to light rail systems. In a number of other countries, where tramways have disappeared completely from cities and towns, completely new systems have been developed. This has been the case in North America, in the Asia-Pacific region and in certain European countries such as the UK and France. Over 100 such systems are currently being planned worldwide.

Light rail systems have demonstrated that they can reduce dependence on the use of the private car in urban environments and overall they have a number of benefits, which are outlined below.

- *Capacity*. Systems have a relatively high capacity and are capable of carrying between 3,000 and 11,000 passengers per hour per direction ([11]). This is equivalent to around 2,300 to 8,500 cars per hour, assuming occupancy of 1.3 persons per vehicle. Put simply, "*the higher capacity of the light rail vehicle can reduce road congestion for a given traffic flow and an attractive and reliable light rail service can reduce car usage and so reduce congestion further*" ([12]). The Midland Metro Line 1 performs very well in terms of capacity, being able to carry 15, 000 passengers per hour.
- *Speed and regularity*. Light rail can attain reliable service speeds and is capable of accelerating quickly. With effective design features such as segregated rights-of-way and priority at crossings and traffic lights (which make light rail congestion-free), vehicles are able to achieve average speeds of between 20 and 30 km/hr in pedestrian areas and city centre streets, and speeds of around 40 to 70 km/hr on other street-running sections, thus ensuring short journey times. This compares to average speeds of around 43 to 51 km/hr for cars on urban roads.
- *Reliability*. As a congestion-free system, light rail is a "turn up and go" system being both regular and reliable. In addition, light rail systems can continue to operate during adverse weather conditions.
- *Environmental benefits*. Notwithstanding any short term environmental impacts that may occur during construction, light rail systems have a number of environmental benefits. There are no emissions at street level and modern traction equipment with regenerative braking allows considerable energy saving. Light rail schemes are also a relatively quiet transport mode. Noise and vibration impacts can be further mitigated with good maintenance of tracks and vehicles.
- *Comfort and accessibility*. Vehicles with a well maintained track and good suspension can ensure a smooth ride. The combination of low-floor vehicles with gapless boarding points offers more efficient accessibility for all categories of passengers, including wheelchair users and people with prams or pushchairs.
- *Safety*. Light rail has a relatively good safety record in the UK and all systems are required to conform to rigorous HMRI requirements. The total number of injuries reported by operators during the period 1 April 2000 to 31 March 2001 was 126, which is equal to around 0.1 casualties per billion passenger kilometres ([13]). In 2000 1,665 car drivers and passengers were killed on Britain's roads, and there were 3,409 road accident casualties in total. This equates to approximately 2.8 deaths per billion passenger kilometres ([14]). In the case of light rail, having both priority at traffic lights and segregated rights-of-way can assist in reducing risks of accidents with road traffic. Safety for

passengers can also be enhanced with appropriate design of stations or stops.

- *Flexibility*. Light rail can negotiate relatively tight curves and steep gradients and can operate at ground level, underground or elevated. It can operate within traffic and can run at high speeds when segregated from other traffic. It can access narrow historic centres and can also run on conventional railway track.
- *Affordability*. Light rail is one of the cheapest and best value forms of quality mass transit.
- *Contributions towards a positive city image*. Light rail can be aesthetically pleasing, giving a positive image to a city. In the view of the International Association of Public Transport (UITP), it "*contributes positively to the social dimension of a city, improves the quality of life and makes it more liveable*" ([15]).
- *Regeneration*. Light rail schemes can contribute to both the modernisation and regeneration of urban centres as well as to the development of new areas.
