



## Intracity heavy rail and metro systems



Bangkok

Photo: Ko Sakamoto

### Heavy rail and metro system explained

Metropolitan railways are urban, electric transport systems with high capacity and a high frequency of service. Metros are totally independent from other traffic, road or pedestrians. They are consequently designed in tunnel, viaducts or on surface level but with physical separation. In Asia, metro systems are being developed or expanded in many developing cities including Bangkok, New Delhi and Singapore.

### Performance, evaluated

Capacity	High: Approximately 1,000 persons per vehicle, with peak capacity at 45,000 people per hour per direction and typical capacity between 20,000 and 30,000. <sup>1</sup>
Geographical range	Medium to high (from up to 20 km to beyond 20 km)
Implementing cost	High: dependency upon a number of factors, such as management and organizational structure and the land and labour costs. Costs run about US\$55 million to \$207 million per kilometre.
Payback period	High (more than 10 years)
Applicable city size	Large (more than 5 million inhabitants)
Applicable stage of development	Developing and developed, Appropriate generally in cities with more than 5 million inhabitants or linear spatial development and with at least US\$18,000 per capita annual income. <sup>2</sup>
Examples	<ul style="list-style-type: none"><li>• Metropolitan rapid transit in Bangkok, Thailand</li><li>• Star metro in Kuala Lumpur, Malaysia</li></ul>

### Strengths of bus rapid transit

- High carrying capacity.
- High frequency and reliability of service – more than 700,000 trips per day.

<sup>1</sup> German Agency for International Cooperation (GIZ) website "International Fuel Prices". Available from [www.gtz.de/en/themen/29957.htm](http://www.gtz.de/en/themen/29957.htm) (accessed 22 February 2012).

<sup>2</sup> Lloyd Wright and K. Fjellstrom, *Sourcebook Module 3a: Mass Transit Options* (Eschborn, Germany, GIZ, 2004).

- Lowest energy use and CO<sub>2</sub> emission per person per kilometre of the mass transport options.
- Major transit interchanges along the route can catalyse high-density development, if managed effectively.

### Challenges to using bus rapid transit

- Lengthy construction times.
- A high level of investment is needed for the required infrastructure.
- High level of skill required for maintenance and operation.
- Requires exclusive right-of-way status.<sup>3</sup>
- Construction on steep gradients is technically and financially difficult.

### Limitations

Due to the high capital and operational costs, rail-based systems are most appropriate in cities with a large population, where passenger capacities are expected to exceed 25,000 passengers per direction per hour.

### Implementing strategies

**Secure financial resources for the initial costs:** Land value taxes or long-term loans from bilateral and multilateral development banks (such as Asian Development Bank) help to secure capital.

**Designate an institutional body with professional expertise:** The body should be responsible for setting fares and for ensuring that the timetable is integrated with other transport services in urban areas.<sup>4</sup>

**Plan to meet financial sustainability of the operation:** Financial viability of the operation can be secured through increased ridership. The measures include densification of land use around stations, effective integration with existing transport modes and policies that can stimulate feeder services and good interchange facilities between modes; the development of complementary mass transit systems.<sup>5</sup>

### Further reading

*Sourcebook Module 3a: Mass Transit Options*, by L. Wright and K. Fjellstrom (Eschborn, GTZ (GIZ), 2004).

<sup>3</sup> German Agency for International Cooperation (GIZ) website "International Fuel Prices". Available from [www.gtz.de/en/themen/29957.htm](http://www.gtz.de/en/themen/29957.htm) (accessed 22 February 2012).

<sup>4</sup> Lloyd Wright and K. Fjellstrom, *Sourcebook Module 3a: Mass Transit Options* (Eschborn, Germany, GIZ, 2004).

<sup>5</sup> German Agency for International Cooperation (GIZ) website "International Fuel Prices". Available from [www.gtz.de/en/themen/29957.htm](http://www.gtz.de/en/themen/29957.htm) (accessed 22 February 2012).