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Public transport: making the right mobility choices

Over recent years, public transport has registrered significant ridership increases, not only in cities with sophisticated systems, but also in many large cities in developing or emerging countries. This requires more capacity.

Today, planners no longer ask: "Should we invest in public transport", but: "Which modes should we choose"? **This was the focal theme of the 58th UITP World Congress.**

The choice of a public transport system has never been more complex. This theme is a hot issue in many countries, and the need for clarification is high. Decision-makers should be aware of their responsibility to consider the bigger picture, and take with a pinch of salt any opinion claiming to offer a universal solution. Selecting a mode requires a complex multi-disciplinary analysis and cannot be summarised in terms of simplistic slogans. Each mode has its own merits and areas of relevance, and yes, there are overlapping zones between the options. It is not a clear-cut science, and those in charge of deciding should understand the multiple parameters, and analyse them against their background and context in order to make the optimum decision. Below is a list of the factors to be considered:

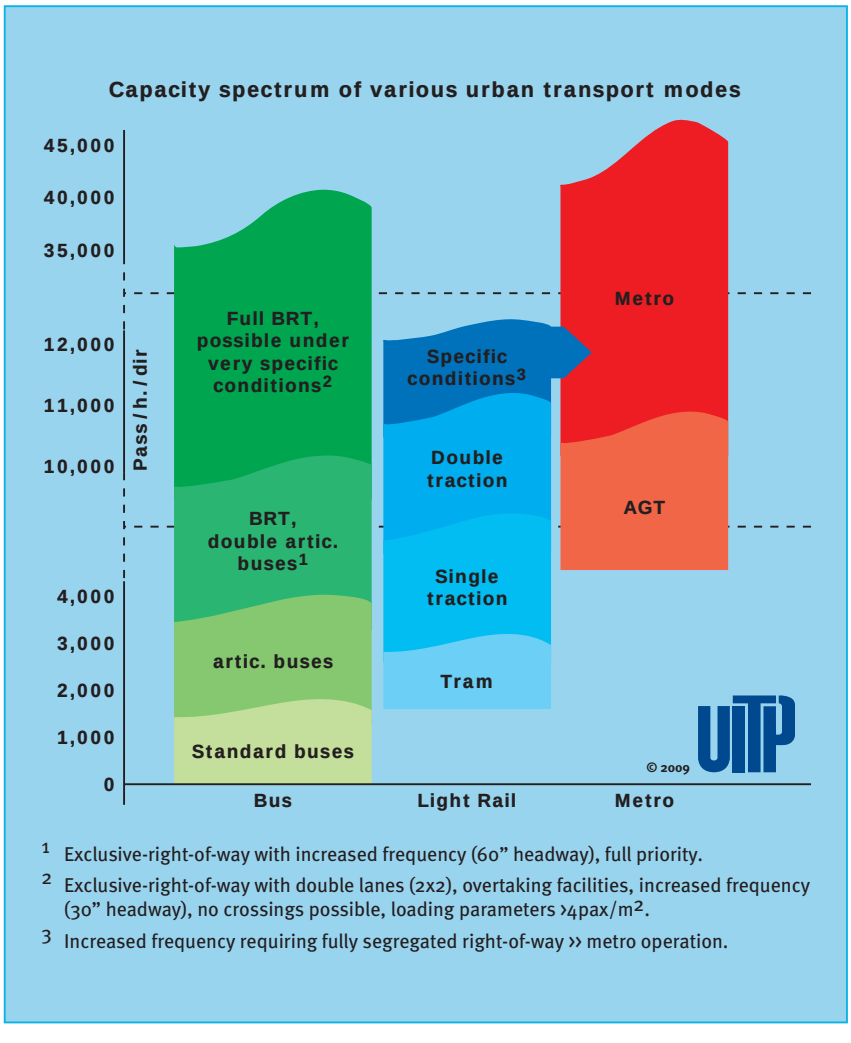
Capacity

The first element that pops up in planners' minds when pondering this issue is capacity. Transport science used to provide typical capacity thresholds for the choice of transport technologies. Each was associated to a range of investment cost indicators.

The growing popularity of Light Rail Transit and Bus Rapid Transit and the advent of driverless small-sized metros blurred this simple, almost 'deterministic' choice criteria and defied the conventional thresholds. On the one hand, buses can carry more passengers than previously assumed, and on the other, mini-metros can become affordable for smaller cities (see graph).

With very short headways using double-articulated buses on dedicated roads, it is indeed possible to run 90/100 buses per hour and per direction, which leads to a throughput trunk capacity of 12,000-15,000 pax/h/dir. More is possible if double bus lanes (2x2) are provided to accommodate all-stop and express services. Does this mean that buses should replace rail by principle?

Experience shows that transport demand on any corridor tends to increase over time. It is therefore wise to plan capacity reserve for the medium and long term. Implementing a system that immediately performs at capacity might be necessary, eg. if funds are scarce, but it may not be the best option. Two pitfalls must be avoided: rapid bottlenecks and structural over-capacity; let's call this the scalable and reasonable reserve capacity potential.



1 Exclusive-right-of-way with increased frequency (60" headway), full priority.

2 Exclusive-right-of-way with double lanes (2x2), overtaking facilities, increased frequency (30" headway), no crossings possible, loading parameters >4pax/m².

3 Increased frequency requiring fully segregated right-of-way ›› metro operation.

Costs

Rail systems require heavier investments than bus systems. Whilst conventional wisdom considers underground metro as 5 times more costly than surface light rail, BRT is tagged as 3-4 times cheaper than LRT.

The price may vary over time and according to location, but the proportions remain largely valid. However, the investment level depends on the desired quality of segregation. BRT with full quality attributes can come close to the cost range of LRT (sophisticated BRT can cost up to 15-20 million EUR/km).

In general it can be said that higher investment costs are offset by lower operation costs, especially in countries with expensive labour. Efficient ratios of passengers carried per driver help to keep operation costs low. To carry 10,000 pax./h/dir, some 90 bus drivers are needed against 30 LRV drivers and 6 metro drivers. These costs are structurally recurrent day after day, year after year. Local wage conditions are therefore of paramount importance to the analysis. When labour is expensive, rail can be more cost-efficient[1]. So if demand justifies it, higher investment costs will be offset over the full life cycle. The increased frequency and flexibility of automated metro operation have made this mode accessible to smaller cities, thanks to its impact on staff costs, but also on infrastructure costs (increased frequencies mean smaller stations and shorter trains).

It is possible to achieve similar capacity performance as some rail systems for lower capital expenditure. However, for the sake of fairness, it must be said that you do not get the same thing. Planners need to look at all the attributes of the modes, because the transport infrastructure is not a closed system, but part of the urban fabric and it interacts with inhabitants.

None of the restrictions or reservations expressed above and below have to be interpreted as intrinsically "good" or "bad" features. The objectives of the projects and their constraints will determine the boundary conditions, and decision-makers have to be aware of these features to make THEIR (not THE) right decision. The conditions of access to capital markets (bankability) and the labour costs are the two main factors to consider.

Space, urban integration, regeneration

Land commodity has variable value from city to city, and land acquisition may therefore greatly impact the price of the project and lean in favour of one option rather than another one.

The alignment for a guided system requires less clearance than a steered system, and the land requirements for bus transport, especially for overtaking facilities and lay-over space at terminals is substantially higher than for rail. In cities with few space restrictions, this is not a problem. In severely built-up environments, however, it may be a major issue.

The headway described to achieve high capacity with buses implies permanent and uninterrupted bus traffic, causing suboptimal intersection performance and difficult insertion into the urban fabric (this is not the case for urban 'bus motorways' without any crossings, eg. as seen in Istanbul). Intensive BRT operation generates a higher severance effect and coexists less compatibly with soft modes such as pedestrians and cyclists.

The presence of efficient public transport increases the value of land, housing, business and retail along the corridor. Scheme promoters should endeavour to capture part of this added value. Depending on the context, various modes can generate different value increases. This factor has to be investigated, even if it requires complex computing, in order to be duly included in the decision-making process.

Customer expectations, quality, comfort

It is vital to understand correctly the expectations of the public in a specific city in terms of offer, objective quality and subjective perception. The success and acceptance of a transport system depends primarily on the responsiveness of the targeted population. A solution might be successful in one city whereas a perfect replication somewhere else might be a miserable failure.

If car-ownership and alternative options are low, any improvement to conventional bus services is much welcomed and provides an attractive solution to citizens. When available income and car ownership increases, comfort expectations get higher and a rail-based system will offer a more convincing option.

Intensive on-site operation, with up to 90 vehicles per hour and per direction, is physically more prone to disruption and to affect the speed and reliability of the service.

Rail-based systems tend to offer better ride quality and to generate a better perception and confidence, which experts have often tagged as 'the rail bonus'. Or else, tram-train operations can provide convenient, seamless travel options for both commuters from less densely populated areas and urban dwellers.

Environmental impact

Environmental effects (emissions, noise) in the direct neighboorhoods are also different and might be a critical factor for planners and decision-makers. Electrically powered transport generates zero local emissions in sensitive urban areas. Rail and trolleybus are therefore unbeatable, even though the latest combustion engines do perform very efficiently and cleanly. New technologies promise also (nearly) zero emission for buses, but it is too early to understand precisely the full LCC of such options.

The energy efficiency per pax transported is incomparably much bet-

ter with BRT than with conventional buses or cars, but could be improved through rail service, if this aspect was to be considered as a priority.

Political calendar/deliverability

Politicians are keen to reap the political benefits of their decisions before the end of their political term. Bus systems may enjoy easier planning and legal frameworks, and overall quicker implementation. BRT systems therefore have an advantage over rail-based systems. This aspect is particularly critical in the case of 'first timers'.

Experience, however, eg. in France and Madrid, has shown that with careful planning, it is also possible to implement rail projects within reasonable political cycles of 4-5 years.

Other aspects

Legacy

When an existing, underused or even disused infrastructure is present, it is worthwhile considering its extension or revitalisation for upgraded use. Where the construction or expansion of a metro system is not possible, regional rail networks can be upgraded and brought to 'metro operating standards'. London Overground and Sao Paulo are two examples of good practices, where such an upgrade was accompanied by integration measures with the existing network. On the other hand, a new line might not be, strictly speaking, eligible for rail mode if it had to be built from scratch, but nevertheless be chosen for 'legacy reasons'.

Know-how availability

Notwithstanding international trade rules and principles, local expertise and know-how in planning, construction or manufacturing competence are also factors to be taken into account. It is understandable for decision-makers to seek local content and competence to support the local employment market.

Non-conventional

Finally, it is still necessary to address the so-called non-conventional modes. In addition to the same set of criteria, other factors have to be considered.

Non-conventional systems are those relying on proprietary concepts and technologies. This means features provided exclusively by only one specific manufacturer and protected by industrial patent. Typically, monorails, automated guided transit, rubber-tyre trams, people movers, cable systems etc. are classified as non-conventional.

Such technologies are in operation in many places and do meet transport requirements, sometimes, however, with substandard levels of reliability. They may provide a "modern image" that is valued by promoters.

Stakeholders should, however, be aware of some drawbacks of proprietary features. Any replacement or extension of the line or the fleet will occur in largely non-competitive conditions and will not be conducive to attractive prices.

Such technologies are also most often found as shuttle services and may be more difficult to integrate into a real network.

Conclusions

The implementation of any public transport **system** is an opportunity to boost and change the image of public transport, and requires strong political will, regardless of the specific technology chosen.

What makes a system attractive is its high level of interconnectivity, meshing territories with one another. This is most often achieved with various forms of bus and rail operation, and why not some non-conventional services.

There is no magic formula and no 'one size fits all' because local conditions and constraints form major considerations in the decision-making.

Claims that one mode offers **universally** better value for money over other options must be rejected. What matters is your value for money and this is per se what you perceive, a result of your specific boundary conditions and ambitions in the short, medium and long terms.

What are your priorities? Offer enough transport capacity on your corridors? Trigger a modal shift from car users? Regenerate deprived areas or your city centre? Reduce road congestion? Reduce traffic accidents? Improve quality of life (air and noise) for the local residents? Pedestrianise your city centre without reducing its accessibility? The different modes all have specific attributes to meet your goal(s). The decision will require strong expert advice and arguments, but will always remain essentially political.

So the final message should be: know your ambitions and the intrinsic multidisciplinary features of the various modes.

[1] Data from cost breakdown in a dozen of European companies suggests the following order of magnitude: rail systems cost 60% more than bus per convoy*km, but are 30% cheaper to operate per place*km.

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