Speed: The less important element of the High-Speed Train

Moshe Givoni and David Banister
Transport Studies Unit, School of Geography and the Environment, University of Oxford.
South Parks Road, OX1 3QY, Oxford, UK.
moshe.givoni@ouce.ox.ac.uk
david.banister@ouce.ox.ac.uk

There is growing recognition that past increases in personal mobility and goods' transport cannot be continued and therefore we should 'manage' rather than 'meet' demand for transport. A new paradigm is proposed in which travel time should be 'reasonable' rather than the conventional perspective of minimising travel time (Banister, 2008). If railways are to play a major role in sustainable transport policy, it must be as a mode of transport that is environmentally more efficient and one that replaces road and air transport, not as one that is seen to be the 'fastest'.

In many countries, rail transport used to be the backbone of the transportation system, and an important factor in the growth of cities. It then lost significant market share to the road and air modes. More recently, with growing congestion, rail use is again increasing. In some transport corridors, rail again dominates the mode choice, for example between Tokyo and Osaka in Japan and London and Manchester in the UK. This renewed interest in the railways is closely linked to the development of the modern High-Speed Train (HST - see Givoni, 2006), which has turned the railways into a new, fast, convenient and fashionable mode of transport. In Europe (arguably the most pro-rail region of the world outside Japan), HST has increased its share in the demand for rail from 15.9% of rail passenger-km in 2000 to 23.9% in 2008 (and 62% in France). Yet, despite this rail renaissance, passenger rail accounts for only 6.3% of all passenger-kms (9.8% in France) down from 6.6% in the EU27 countries in 1995. Furthermore, while the HST network has more than doubled in length between 1995 and 2008, the railway network as a whole lost about 6% of its lines in that period, and HST lines still represent only 3% of the European rail network in 2008 (EC, 2010).

In the current transport paradigm, travel time is generally considered to be wasted time and a disutility (but see Lyons and Urry, 2005; Lyons et al., 2007). This means that travel time needs to be minimised and consequently speeds need to be increased, and this argument has been central to investment in HST. 'Time is money' and therefore 'faster is better' is a central concept in transport planning (Banister, 2011).

It is therefore not surprising that 'speed' gets the headlines in the HST development discussion, but even the concept of 'speed' is open to discussion. The 'speed' that dominates the debate is the maximum operating speed, but the travel times that passengers experience are a factor of the average-speed, of which the maximum operating speed is only one element. The number of stops on the HST line and the percentage of the line on which maximum speed can be achieved are both crucial factors. Each additional stop (station) can 'cost' 5-10 minutes and often trains must 'slow-down' through cities, even if they are not stopping there. While maximum speed of 350kph is considered the new standard for HST, most HST services are provided at a much lower average speed, and the world's most successful HST line in terms of passengers carried, between Tokyo and Osaka in Japan, operates at an average speed of less than 240 kph (for the fastest service)[1].

Furthermore, passengers are not necessarily concerned with the station-to-station travel time when deciding on their mode choice. Door-to-door travel time is of importance, together with the convenience and reliability (and the cost, an element we do not deal with here) of the entire chain of journeys from the beginning to end of a trip. The characteristics of the HST favour minimum intermediate stops, and this factor becomes more important with increases in the designed maximum operating speed (as the costs of additional stops and deviation from the shortest start-to-end route will increase time more than proportionally). This characteristic of HST, like with air travel, often means that most of the travel time (and effort) is spent on getting to and from the HST station, and this constitutes the bulk of the journey travel time.

There are two important consequences arising from this argument. First, HST travel is not attractive for many travellers, despite its faster speed compared to other modes, especially when the origin and/or the destination are not in the city centre. Second, any time savings on the rail journey from the high speed section might be lost on the additional time taken for access and/or egress journeys to/from the HST station. Faster rail services often result in shorter travel times (in absolute terms and in comparison with other alternatives) on only a few selected corridors, and only for certain locations within them. In addition, as the high speed network is often sparse, the total travel journey distance may be considerably increased when using HST, and this again reduces its attractiveness. Finally, in the trade-off between time spent on the train and on getting to it, it is likely that passengers will prefer to reduce access time (Brons et al., 2009). These comments have important implications not only for the number of stations on a given HST line, but also for their location, which should be accessible to the rest of the transport network and integrated with it, especially with the urban (public) transport network, the conventional rail network and the main airports (Givoni and Banister, 2010).

Rail and HST are often considered as one mode of transport from an overall public policy perspective. Yet, the promotion of HST is often at the expense, and not in addition, to other rail initiatives. The financial discussion surrounding HST rail development is based on the construction costs, while the substantial operational and maintenance costs, which may not be covered by the revenues, are not explicitly accounted for. This situation can result in direct competition for public funds and policy attention between the high-speed and conventional rail networks and services. Most of the passengers transferring to HST from other modes are likely to have used conventional rail services before. In such a competitive situation, the HST investment is likely to take preference over other rail investments. This can result in deterioration of conventional rail services, and may in turn reduce the overall viability of rail transport across a country or region, even if HST gains significant market share on the few city-pairs it services. Such effects can be seen in France and Spain.

Unfortunately, some countries like the UK may embark on constructing new HST lines, that strive to set new standards for speed, but this may reduce the role of rail transport within a national perspective, even if absolute number of passengers continues to increase. There is a risk that efforts to develop new HST services will reinforce current trends, where HST gains an increasing market share, but the share of rail overall remains largely unchanged or declines (Givoni and Banister, 2011). This will not represent a

[1] The world record for average speed of a commercial HST service is 313kph, held by a non-stop service between Wuhan and Guangzhou in China (2009). Since then the speed on this route was reduced and a station added, reducing the average speed. Before that a French TGV service held the record with an average speed of 279 kph.

status quo, since from a spatial perspective many more ‘places’ will see rail travel diminish in importance as compared with those seeing it increasing.

The main rationale for the development of HST in Japan and France, the first HST countries, was to increase capacity, not reduce travel time. Likewise, the need for HST in the UK arises from the realization that the main rail corridors on the conventional network are near capacity and there is a need, if rail is to provide a greater role in providing mobility needs, to expand capacity. Yet, this initial capacity increase is quickly forgotten and travel time (savings) ‘calculations’ overtake capacity (enhancement) ‘calculations’. At the same time, the cost of higher speeds in terms of energy consumption and CO_2 emissions are not ‘calculated’ at all.

The lack of integration between the high-speed and conventional, 'classic' networks is also important as they are usually ‘seen’ as being separate competing networks, but in some situations trains operate on both networks, especially when this possibility is seen as a means to extend the HST service beyond the HSR network. This again increases travel time, but it also has the potential to extend the range of HST routes. There are several important elements that constitute reasons for investment in HST, including network enhancement, capacity increases, improvements in door-to-door travel time, maintenance of market share, and reductions in environmental costs, as well as higher speed.

The changing (normative) definition of what speed is ‘high-speed’ in rail operation has become inconsistent. The European Commission official definition (used to collect statistics on HST operation), seems a reasonable one as it defines the operating speed as being in excess of 200 kph. In China, which is in the midst of constructing the world’s largest HST network (even when considering Europe as one country), the government has ordered the maximum operating speed to be cut to 300kph, from 350kph. But the speed that really counts is the average speed on the total journey we make or want to make. More important than average speed is the journey reliability, comfort, security and safety and service frequency, all of which make up the journey experience. Achieving high quality values for these components of a journey that include a rail segment might often mean compromising on the maximum speed achieved just over one part of that door-to-door journey.

For rail to play a larger role in providing transport services and meeting demand for mobility, HST services and their speed must be given a more strategic consideration and be seen, first of all, as an integral part of the rail network, and then as an integral part of the transport system.

References:

Banister D. (2008) The sustainable mobility paradigm. *Transport Policy*, 15: 73-80.

Banister D. (2011) The trilogy of distance, speed and time. *Journal of Transport Geography*, forthcoming.

Brons M., Givoni M., and Rietveld P (2009) Access to railway stations and its potential in increasing rail use. *Transportation Research Part A*, 43: 136-149.

European Commission (2010) Energy and Transport in Figures, EC.

Givoni M. (2006) The development and impact of the modern High Speed Train. *Transport Reviews*, 26(5): 593-612.

Givoni M. and Banister D. (eds.) (2010) *Integrated Transport: from policy to practice*. Routledge, London.

Givoni M. and Banister D. (2011) Reinventing the wheel - planning the rail network to meet mobility needs of the 21st century. In, Frenkel A., Nijkamp P and McCann P. (eds.) *Societies in Motion:*

Regional Development, Industrial Innovation and Spatial Mobility - Essays in Honor of Daniel Shefer. Edward Elgar (forthcoming).

Lyons G. and Urry J. (2005) Travel time use in the information age. *Transportation Research Part A*, 39: 257-276.

Lyons G., Jain J., Holley D. (2007) The use of travel time by rail passengers in Great Britain. *Transportation Research Part A*, 41(1): 107-120.