



The Open Transportation Journal

Content list available at: www.benthamopen.com/TOTJ/

DOI: 10.2174/1874447801610010001



Editorial

High-Speed Rail Transport and its Implications for Different Types of Cities and Territories

High-Speed Rail (HSR) has generated many debates, studies and publications given its implications for transport and the cities and regions that it serves. In most countries, these debates started before it was first introduced -centring on the envisaged implications - but diminished significantly about 20 years after it came into service and once HSR had become part of everyday life. This special issue seeks to add to this debate some 50 years after HSR services first began in Japan and 34 and 23 years, respectively, after they were introduced in France and Spain.

Apart from technical aspects relating to its infrastructure, telecommunications, security procedures and rolling stock, there are six major socio-economic, transportation and spatial planning issues associated with HSR that have been subjects of debate.

The first concerns the actual process of travelling. It relates to the modal split, or changing the form of transport, the sharing of travellers between different modes of transportation, and the creation of what is known as “induces demand” (attracting new travellers who did not previously travel). All of this occurs within a context in which the introduction of a new mode of transportation may/should imply the reorganization of others particularly in terms of their supply and spatial distribution. Most of the railway stations that start receiving HSR services increase the number of passengers they handle and undergo a veritable mobility revolution.

The second issue concerns connecting territories/economies that had previously been much more difficult to interconnect and providing them with the opportunity to establish new and/or more intense relations. This does not imply that HSR infrastructure should be expected to provide new relations immediately after its introduction, but rather that these relations are possible and that they may develop at some time. However, it is important to underline that it is equally possible that such realtions may never developed.

Whatever the case, these territories/economies will have more interconnections and a greater potential to develop such opportunities. In some cases, entrepreneurs also locate their companies in HSR cities even though they do not use this mode of transport; this is an exemple of what is konwn as the psychological/image effect of HSR [1]. However, this second issue may also have a contradictory effect upon the chosen location: the number/diversity of public transportation services may be reduced as a consequence of the introduction of HSR services (particularly the number of short distance and/or regional rail services).

The third issue relates to facilitating and catalysing the spatial impacts in the territories in which HSR infrastructure has been built. The construction of new railway infrastructure is usually accompanied by significant changes to the urban environment at the local scale [2, 3]. These spatial impacts are of two very different types [4]. The first involves an increase in the number of barriers created as land is occupied by railway tracks and other rail installations; this takes place in many areas in which new HSR infrastructure is located. The ways to mitigate the effects of these barriers and integrate the new infrastructure are many and highly varied. The second is a result of the increased interest of some economic activities in being located near one of the few places from which the HSR infrastructure can be accessed (stations) and in taking advantage of opportunities that are presented to transform these key areas of the city [5]. Thanks to the associated improvements in accessibility, HSR tends to complement or even enhance previously existing territorial dynamics. However, it is also important to stress that the arrival of the new HSR service is unlikely to induce or create new dynamics out of nothing. In this respect, where to locate HSR stations remains at the centre of what

constitutes a very relevant debate, at both the local and regional levels.

The fourth issue concerns energy and the emissions of CO₂ and other pollutants associated with the production of this new infrastructure and its use and maintenance. This must be compared to the situation prior to the arrival of HSR infrastructure/services and to the previous modal split [6].

The fifth issue concerns the capacity to harness the potential introduced by this technology and to be able to use it and also share it with other societies, regions and nations. This also includes the additional economic and social returns that it is hoped to derive from this process.

The sixth, and final, issue relates to whether it is possible to combine all of these different issues in order to make investment in HSR both socially and economically profitable. It is also relevant to consider whether this profitability might not have been greater if the same resources had been invested in other assets (opportunity cost).

These six issues are neither easy to evaluate nor to even consider. This is not only because of the difficulty inherent to their accurate measurement, but also to the fact that they belong to different socioeconomic and territorial contexts and periods. Changes in transport technologies tend to take place quite rapidly, while those in territorial interconnections, new developments, and their consequent changes in transportation, may take much longer to occur (around 40 years) and be much more difficult to predict. Although there have not been many long term ex-post evaluations of the consequences of introducing new transport technologies, such studies offer a good way to explore the previously mentioned interpretations.

The expectations for socioeconomic development associated with HSR are usually initially high, but often fail to materialise; and when they do, the resulting changes tend to be slower and less intense than expected [5, 7].

This special issue examines various aspects of transportation and whether its improvements have been the main driving forces behind some recent urban developments. Predicting trends in passenger demand and maintaining the current dynamics (whether of growth or decline) is not very difficult; it is however, much more complicated to forecast the creation of new economic and/or social activities and the number of new passengers to be expected.

The number of people (or goods) transported largely depends on territorial characteristics, on the size of the cities connected and the distance between them. It also depends on such factors as: the location of the station, the specific nature of the transportation services provided, the travel time/speed, the price and diversity of the services provided, and the timetables. Local urban characteristics, including the attitude and dynamism of the main local stakeholders, are also important.

A revealing insight into the need to consider these two sets of variables can be obtained from a comparison of three small/medium-sized Spanish cities with similar territorial locations: a one hour train journey from a major metropolis and a similar distance from a smaller metropolis. The twin city of Ciudad Real/Puertollano is 200 km from Madrid and 200 km from Seville; the city of Cuenca is 150 km from Madrid and 150 km from Valencia; and the city of Lleida is 180 km from Barcelona and 150 km from Zaragoza. There are slightly better road connections for relations between Cuenca and Madrid and between Lleida and Barcelona, with motorways covering the whole trajectory, than those between Ciudad Real/Puertollano and Madrid, with 30 km of motorway and further 47 km of dual carriageway. However, this similarity does not extend to the surrounding territorial structure, which is different in all three cases. While the populations around Ciudad Real/Puertollano and Lleida double within a 20 km radius, there is very little population near Cuenca. The local situations of the HSR stations and the types of HSR services available at them are also notably different. The twin cities of Ciudad Real and Puertollano (which are 35 km apart) both have central stations, as does Lleida. These two urban areas also have cheap, and relatively frequent AVANT HSR services (Spanish HSR regional services which are around 60% of the price of normal fares) connecting them to Madrid and Barcelona, respectively, whereas Cuenca has a peripheral station and no AVANT services.

These national level similarities and local/regional differences in the type of HSR services provided have resulted in overall numbers of HSR services that are fairly proportional to the number of inhabitants, with around two daily HSR services for every ten thousand inhabitants. However, the ratio of the number of passengers per thousand inhabitants differs substantially. The highest ratio is found at Ciudad Real/Puertollano, while those at Lleida and Cuenca are proportionally lower (see Table 1).

Other reasons apart, this comparison of the similarities and differences in interurban/territorial characteristics and the different local characteristics of HSR services is very revealing. It also highlights factors that must be considered in order to understand the implications of HSR for transport services. It also underlines the fact that what are known as the

structural effects of a particular transport infrastructure cannot be isolated from, or considered without reference to, a series of other factors: the territorial context in which each station is located; the characteristics and dynamics of its specific setting; and/or the actions and measures undertaken by the agents that act within each local context [7].

Table 1. HSR Services and Passengers at three similarly located Spanish Cities.

Relationship	Inhabitants 2012	Number of HSR services (2013)	Services per 1000 inhabitants	Number of passengers using the station per year (in thousands, 2010)	Number of passengers using the station per 1000 inhabitants
Ciudad Real/Puertollano-Madrid	126,918	24	0.19	2,290	18,031
Cuenca - Madrid	57,032	11	0.19	250	4,386
Lleida - Barcelona	139,834	29	0.21	1,390	10,000

Source: ferropedia.es/wiki/N%C3%BAmero_de_viajeros_de_Renfe_por_estaciones and www.renfe.es

The opportunities deriving from the new-found accessibility provided by the HSR service will normally be greater when the associated actions and strategies undertaken at the local level are coherent, comprehensive and dynamic. These local strategies and actions cannot be improvised; and should be coherent with urban master plan and territorial scheme. Such strategies must also include coordinated actions involving stakeholders who normally act at the local scale [5].

HSR offers new opportunities for accessibility that must be exploited at the local scale. To do this, cities and territories often undertake a series of different types of policies and actions which can be divided into three groups [5, 8]:

- Planning measures aimed at integrating the new infrastructure into the local territory as efficiently as possible.
- Measures aimed at managing the mobility generated by HSR and taking advantage of the station's vocation for centrality.
- Promotional measures that seek to take advantage of the arrival of HSR in order to carry out urban and territorial marketing campaigns.

Over and above the expected total demand for HSR travel, one aspect that has been the subject of abundant research is the profile of the passenger and their reason for travelling. This has mainly been studied through ex-post research and that based on passenger surveys. Initial research projects tended to mainly focus on business travellers, while later works focused on other types of users and uses (such as commuting, tourism and family trips, *etc.*).

One key question to be considered in relation to the transport-related implications of HSR, is whether the investment in HSR has to take place in an already highly demanded and/or congested transportation corridor/link, in which the role of HSR would be to improve the existing situation, or whether the investment in HSR has to take place in a corridor/link for which there is only a low demand, where the role of HSR would tend to change the existing situation by becoming a promoter of new flows. In the first case, the main consequence of the arrival of HSR would be to reassign the demand for transport with respect to other modes of transportation and also to induce some additional flows (with an increase of 10 to 20%, either as a result of new flows/passengers or of more frequent use by existing ones). In the second case, the main consequence that we would expect would be the generation of new flows (associated with new passenger travel demands) that either did not previously exist or which previously had very limited repercussions.

The normal situation is to establish a (very expensive) HSR infrastructure in what are already very highly demanded and/or congested corridors (as in such cases as the Tokyo-Osaka, Paris-Lyon, Madrid-Barcelona, Los Angeles-San Francisco corridors, *etc.*). The second case tends to be much rarer (Vendôme-Paris and Ciudad Real-Madrid), while in some cases, the impulse effect does not exist at all, or can only be detected at a very slow rhythm. Whatever the circumstances, the most interesting cases from both the scientific and policy-making points of view, are those in which an impulse effect can be observed, because these are the most difficult to forecast.

Numerous studies have tried to define which travel times/distances are most efficiently covered with HSR than with existing popular modes of transportation. Initially, HSR was mainly thought of for business day-return travel between different metropolises. It has been shown to be very effective for travel over distances ranging from 400 to 600 km, which are equivalent to 2 to 3 hours of HSR travel time, excluding the additional time required to travel to/from the station point. This travel time/distance budget allows total journeys of at least 6 to 7 hours, from the starting point to the

final destination, which is a useful travel time for business purposes. Within these limits, the share of HSR travel with respect to other means of transportation (particularly air travel) reaches and/or surpasses 50% of the total number of trips [9].

Coronado *et al.* [10] evaluated the total number of useful hours available at each destination by considering all of the possible HSR links in Spain; they also added the factor of travel cost in order to evaluate the efficiency of day return tourist travel by HSR. They concluded that only 191 out of 462 possible connections were economically/personally viable for day return trips. They also observed substantial differences between cities. While the citizens of Madrid could make day-return trips to nearly all the HSR cities in the country, HSR line endpoint cities (such as Huesca) and small intermediate locations (such as Requena, Puente Genil and Antequera), most of which have fewer HSR services, offered considerably fewer viable options. Madrid obviously benefits from the radial structure of Spain's HSR network, but also from a higher frequency of services and greater number of trains. A similar situation can also be observed in France, with respect to Paris and other key metropolitan areas located in the centre of the country.

It has also been discovered that certain types of passengers can be associated with other time budgets [11]. HSR is most widely used for daily (or very frequent) commuting for travel times of up to one hour (Ureña, *et al.*, 2005 and 2012). It is also used for longer distances with travel times of more than 3 hours for occasional family/personal travel for a range of different purposes (for instance Paris - Marseille, a journey of nearly 800 km, Lille - Marseille, Sevilla - Barcelona, or Barcelona - Paris, around 1,000 km). Even so, overnight travel for quick return business and/or personal travel purposes is only generally found in China.

It should be noted that HSR mainly became established before low-cost air transport became widespread and popular and at a time when HSR fares were lower than the corresponding air fares. Nowadays, however, low-cost air fares are often cheaper than HSR ones and this has increased competition between these types of air and train travel. One of the consequences of this competition has been the recent creation of a low cost HSR service in France called "Oui Go".

From a transportation point of view, the utility of comparing travel times based on different means of transport is open to question as they cannot be compared in strictly numerical terms, such as the number of hours spent on a HSR train *versus* those spent travelling by plane. Comparing personal appreciations of travel time requires the inclusion of other variables than just time. These other variables should include comfort, reliability and price, all of which are normally scored higher for HSR than for air travel. Among these variables two have been seen to be relevant. The first is the amount of travel time that can be used for relaxing and/or working during the checking in, security control and waiting procedures. Here too, HSR tends to score higher than air travel. The second variable is comfort. This considers the amount of space available to the passenger and the possibilities of working while travelling. Again, HSR tends to score higher than air transport in this respect. All of these variables mean that while the total travel time, including that required for pre and post travel formalities, may imply bigger time budgets for HSR than for air travel, passengers may still opt to use HSR based on the overall perception of its utility and that it implies a better use of their time.

CONTENTS OF THE SPECIAL ISSUE

In this special issue, we present eleven different contributions from European and Japanese universities, which are the two contexts with the most important experience of HSR.

Two contributions deal with **economic activities in and around HSR station hubs** that have converted their stations into not only transport nodes but also places of work.

The first contribution, by Bazin-Benoit, Beckerich and Delaplace, tries to identify the exact role that HSR plays in decisions made by companies concerning where to locate their businesses and relative to the availability of property for development. The authors analyse the case of Reims (France), a city that is served by the Eastern Europe HSR Line and which has had two HSR stations (one central and the other peripheral) since 2007. The area of Reims near the central station has been transformed into a new business district. Through two surveys conducted in 2008 and 2014 the authors try to identify whether HSR constitutes a locational factor in itself or whether it has simply had an indirect effect by triggering a supply of property which then helps to explain the location of new businesses.

The second paper, which was written by Pagliara, Delaplace and Cavuoto, tries to identify the characteristics of clients renting temporary offices and the role of HSR in this process, using Naples (Italy) as a case study. Redesigning transport nodes on three different levels (national, regional and local) also provided them with wider functions, converting stations into places and economic hubs. Business parks and business centres have been built around stations,

renewing their surrounding districts. In some cases, temporary offices have even been facilitated inside stations to reinforce their roles as places to work. The traditional concept of a station as a node has now changed because stations can now also be considered as places of work.

Another two contributions explain **how cities and territories prepare themselves to receive HSR** and the type of local policies and actions deployed by different stakeholders in order to take advantage of their new-found accessibility.

The article by Terrin explains the results of ENTER HUB, a project within the framework of the European Programme URBACT II(2012-2015). ENTER HUB is a network of medium-sized European cities which has drawn up a series of Local Action Plans in order to improve the integration of HSR within their respective urban and territorial dynamics and to take advantage of their common characteristics and share their experiences. The project partners believe that HSR hubs can considerably increase the accessibility of medium-sized European cities, effectively bringing them closer to large metropolitan areas, enlarging their catchment areas and increasing local opportunities.

The second contribution related to this issue is by Bellet and analyses the local urban planning strategies that have been undertaken around peripheral HSR stations in Spain (9 out of its 35 HSR stations). To a large extent, these stations were built as a result of pressure from local stakeholders but have ended up as stations that are poorly integrated within their respective territories. In general they tend to suffer problems of poor accessibility, and, in the majority of cases, offer very few railway services. Governance seems to be a fundamental issue in the case of peripheral stations because they need coordinated actions if they are to overcome the main challenges that face them.

Four further contributions deal with **the impact of HSR on different kinds of tourism**.

The text by Kurihara and Wu analyses the impact of the Shinkansen network extension to Tohoku and the Kyushu region on tourism, focusing on changes in demand and tourist behaviour. The results obtained suggest that the number of tourists increased significantly in cities that were connected to the extended Shinkansen network. Even so, it seems that such impacts tend to decay over time.

The second paper, by Guirao and Campa, seeks to empirically assess the impact of HSR on tourism in Spain, using a ranking model of city pairs. In this paper, the authors propose a new methodology, which is tested with 1,176 pairs of Spanish cities. The research was conducted in a country with over 20 years of HSR operating experience, which has the longest HSR network in Europe, and where tourism accounts for more than 10% of GDP.

The third article, written by Moyano, Coronado and Garmendia, deals with the possibilities that HSR offers for weekend tourism journeys in Spain. The aim is to analyse the efficiency of HSR in comparison with private vehicle travel, with the aim of identifying the most convenient mode of transportation for making weekend tourist trips. The results show that HSR offers a real alternative in terms of connection efficiency, as almost half of Spain's cities are served by HSR and they are more efficiently connected to Madrid *via* HSR than by private car transport.

The fourth and final contribution on HSR and tourism is by Ortuño, Bautista, Fernandez and Sanchez. This paper studies the profile of HSR passengers with reference to the well-known sun and beach destination of Alicante (Southeast Spain), which is a relevant tourist destination for both Spaniards and foreigners. After the first year of HSR services between Madrid and Alicante, the flow of return travellers visiting Alicante province was greater than that of those heading to Madrid. However, the expected "suction effect" between large and medium-sized cities has so far failed to emerge. The two cities mutually benefit from each other: Alicante needs business from Madrid, while passengers travel from Madrid to Alicante in search of the sun and beach tourism.

Another contribution deals with **the influence of personal characteristics and travel purpose on the use of HSR**. The paper by Mohino, Ureña and Solis evaluates the influence of education on work-related travel in both rural and metropolitan regions, using Castilla La Mancha and Madrid as case studies. The paper points out that while the private car plays a predominant role in the modal split for both commuting and business travel, differences have been recorded in terms of travel purpose and educational level: HSR is seen as having greater relevance for business trips and among highly-skilled professionals.

The final contribution in this special issue deals **with the use of HSR for freight transport**. The paper, written by Stale, examines previous experiences, the existing literature and the prospects for the use of HSR for freight transport. It examines three hypotheses that have been used to evaluate the development of HSR freight services in Europe. The article concludes that the potential for HSR-borne freight services is somewhat limited in Europe due to logistical constraints and limited network capacities. It also highlights the fact that the policies followed in Europe could be modified to change the current situation.

This special issue is one of two to be published after the conference “High-speed rail and the city” which was held at the Paris Est University in January 2015. The other will be published in *Belgeo*, the Belgian Journal of Geography, and will include articles with a more geographical focus. At the conference, no fewer than 60 researchers from ten different countries, discussed around 30 papers related to the two main themes, “High-speed rail and urban dynamics” and “High-speed rail and tourism”.

This conference was the culmination of a European research process organised by the research group “City, Transport, Tourism and Territory”, which was supported by the Paris Est University’s “Urban Futures” Labex (“Laboratoire d’excellence”). This work was undertaken during three international seminars held in Paris, Naples and Toledo between 2013 and 2014. More than 20 researchers from the Alicante, Brussels (ULB), Castilla la Mancha, Lleida, Rovira y Virgili, Naples and Paris Est universities took part in these fruitful seminars.

The guest editors of this special issue would like to wholeheartedly thank the “Urban Futures” Labex for its support.

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