HIGH SPEED TRAINS AND THE DEVELOPMENT AND REGENERATION OF CITIES

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Contents **Page**

FOREWORD		**1**
1.	**INTRODUCTION**	**2**
	Impact of High Speed Rail	2
	Regional Economic Benefits	2
	The European Experience	3
	Structure of the Report	5
2.	**WHO USES HIGH SPEED RAIL (HSR) SERVICES AND WHY**	**6**
	General	6
	Critical Factors	6
	The Primary Market	7
	Shorter Distance Travel by High Speed Rail	8
	Longer Distance Travel Markets	9
3.	**HIGH SPEED RAIL AND CITY DEVELOPMENT**	**10**
	Providing Access to the Service Economy	10
	Lyon	10
	Lille	11
	Lessons from Lyon and Lille	12
	Further Case Studies	13
	The Mix of Fortunes	15
	The Regional Balance Sheet	16
4.	**LINKING HIGH SPEED RAIL SERVICES TO REGIONAL AND CITY TRANSPORT**	**17**
	Allocating Effective Access	17
	The Primary Beneficiaries	17
	Rail Links and Secondary Centres	19
5.	**CONCLUSION**	**21**

FOREWORD

This paper examines the relationship between the provision of high-speed railway services and the growth of cities' economic activities. It focuses on provision and use of high-speed rail services and on the activity patterns and spatial planning by cities. The contents reflect study of the published analyses and acquired understanding among those in the European consultancy and research community who have spent time working in this field. Identifying the most useful material and gathering helpful insights would not have been possible without the ready cooperation of several people.

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All interpretation of the material gathered remains, of course, the author's responsibility.

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1. INTRODUCTION

Impact of High Speed Rail

All transport projects produce an effect on the areas served that goes beyond changing patterns of travel (or of goods movement). This is important for two reasons. First, it affects the way in which the new system is used, influencing the income gained and thus the return it will show over time on the investment. Second, it affects the way in which activity patterns evolve, and thus the effect on the economy and structure of places. This is important for economic and spatial planning.

High speed rail lines form a major commitment, in time and resources, with the potential to impact across national, regional and local activities. Because of this, decisions have to be coordinated across a number of administrative fields and levels if they are to produce the optimum benefits. Typically this is likely to include national, regional and local administrations, in terms of the economy, the environment, spatial (land use) planning and transport.

The transport sector as a whole needs to be considered, as high speed rail forms a component of the transport system. For railway companies the main emphasis will understandably be on the financial returns they may gain. But the necessarily high investment needs to show a return. This will be purely in financial terms for any funds invested on a commercial basis. For other funds invested, by the public sector, wider economic assessment of gains and losses is needed.

While it may be possible to evaluate some effects on economic impact and development gains in financial terms, such as funds generated by the extra activities and property which the new high speed system helps bring about, much of this type of impact may not always be measurable, even if it is distinguishable from the impact of other developments. Are gains in employment and rents from a particular property development purely attributable to construction of the high-speed line? Or do they also reflect other factors such as an already strong economy looking for new fast transport? Or a latent demand for using the resources of an educated workforce and vacant land? Indirect factors may also play a part. Gains in perceived ‘quality of life’ or other social impacts on cities and regions served may strengthen the business and working ambience, leading to greater productivity, so that economic benefits emerge. The effects may be positive (benefit) or negative (loss); what is of primary importance is the net effect.

Regional Economic Benefits

Promoters of high speed line development usually stress its benefits as meeting a growing demand for travel while reducing congestion and pollution and supporting spatial planning for improving regional economies. These factors are directly relevant to the current enquiry being led by Rod Eddington into the contribution that transport makes to the UK's economic growth, productivity and stability. Another relevant inquiry was recently completed by Kate Barker, who sought to identify the needs of housing provision related to economic activity.

These inquiries tie in directly with the Government's policies on regional development, aimed at addressing what is effectively a north-south divide in England. The Sustainable Communities policies followed from 2002 have sought to increase the additional housing provision in South East England, where the economic strength of London and the metropolitan region in the national economy is pushing up house prices as supply falls behind demand.

The policies have produced substantial controversy, especially in the Home Counties, who have campaigned against what they consider to be over-development; not least because there is seen to be an absence of commitment to matched investment in communications and other public services. At the same time, plans for the northern regions envisaged demolition of older housing for which apparently no market exists. Concerns over the negative approach this implied have led to the Northern Way policies aimed at a cohesive evolution of economic and spatial development for the northern regions.

The impact of high-speed rail falls primarily on the places actually served: the main cities and other towns, mostly larger ones. But this does not mean that building a line or opening a station automatically brings benefits; the circumstances have to be assessed and the opportunities sought out in each case.[1] Thus the effects depend heavily on the design of the new lines, the pattern of routes and services operated and the economic structures and plans of the cities served. So a high-speed line between the south and the north of the country has the potential to support implementation of both the Sustainable Communities and Northern Way policies. It follows that design for a high-speed line has to take the wider potential effects into account to justify its investment in both direct (financial) and indirect terms. The indirect effects are important in assessing both the role of public investment and the need for (public) action in complementary fields, notably city and regional development planning.

The European Experience

These issues have been seen as crucial to investment in high-speed lines in other European countries where they have been built. This includes Italy, Germany, Spain, Belgium, the Netherlands and Sweden; but it particularly concerns France. France was the first European country to open a high-speed line, between Paris and Lyon in 1982. In 1991 the French government published a strategic plan for a national high-speed network: although some weaker elements of this were rejected after a review in 1996, this strategy has formed the framework for a programme of construction, which is still in hand. Strategies being implemented in neighbouring countries mean that the French lines are being linked across borders to form a European system, broadly in line with a European Commission strategy published in 1989. Cross-border 'Euro-regions' are starting to evolve round some major cities on high-speed lines: notably for Lille (France – Belgium) and Barcelona (Spain – France).

[1] Troin, J-F (1997) **Rail et aménagement du territoire – des héritages aux nouveaux défies** Edisud, Aix-en-provence p.85; Vickerman, R (1997) High-speed rail in Europe: experiences and issues for further development The Annals of Regional Science

Development of the Paris – Lyon line followed considerable analysis and debate, looking not only at the implications for operation and financial results of railway services but also at the implications for national and regional planning. In this the French government regional planning agency, DATAR, played an important role, through identifying how the line would support economic growth in and around Lyon and reduce excessive growth pressure for Paris. The subsequent development of the French high-speed network has been matched by continuing research activities into the impact of high-speed services, providing guidance on design and appraisal of further projects. These activities, largely involving research bodies in the fields of geography and spatial planning, have come to form almost a 'sub-industry' in their own right; the Lille centre of the French national transport research institute INRETS[2] is a key player, in cooperation with centres at several universities (including Lille, Lyon and Paris).

As other countries have developed their high-speed networks, they have also started some research. Consideration of available material has been needed for appraisal of schemes, to establish both the justification of investment and the design of infrastructure and services (as for example in the Netherlands). However, this has not produced a large volume of clear quantitative results. To some extent this reflects the fact that only in recent years have high-speed lines become significant across several European countries with differing geographical structures. It also reflects the extent to which the approach to decision-making for investment in such projects differs between the UK and the main western European countries. For the UK, the main focus remains on the directly attributable economic performance of the transport service itself. In most continental European countries, the wider aspects of economic and strategic impact play an important part in considering the return on public funding; the political and technical processes of establishing this are key to decisions.[3]

Across the Channel, local authorities tend to have more freedom and powers to act than their British opposite numbers, and this is particularly the case for major cities. They also often control substantial budgets for infrastructure and services, in their own right or under contract with national government. While the structure of governance differs between countries, sometimes markedly, city authorities usually have substantial powers to manage and develop public services, plan and manage the development of land over a long time period, invest in infrastructure, coordinate local transport and influence economic activities. Thus construction of a high-speed rail network has usually led the cities on it to plan development around it to fit their overall city strategies. They have, on occasion, and sometimes with the strong support of regional authorities, sought to influence the design of the infrastructure and of the services; in more recent years, this has included financing elements of the investment. In the circumstances, the information that cities and regions require from research is more geared to how a line should be incorporated to optimise benefits rather than what the justification for it is in the first place.

[2] Institut National de Recherche de l'Economie des Transports et de la Sécurité

[3] Menerault, P (2006) Changement d'échelle de l'activité économique et des reseaux – Quelle conséquences pour l'aménagement? CNRS

Structure of the Report

This report considers these various factors and issues about high-speed lines and city development. It looks at three aspects in turn:

- who uses high-speed rail services and why;
- how high-speed rail relates to city development; and
- the importance of linkages into regional and local transport networks.

2. WHO USES HIGH SPEED RAIL (HSR) SERVICES AND WHY

General

Because of its scale and potential impact, the development of a high-speed rail network needs to be considered as a topic in its own right. But it is also important to understand that the evolution and day-to-day usage of high-speed rail services reflect wider changes and growth in society to a large degree. In effect they form part of a trend in which the provision of services across the economy becomes ever more important in the spatial activity patterns of people and places. Services require bringing people together for exchanges of service products, and transport is thus a crucial element. The evolution of opportunities for developing service industries and the transactions they entail is itself in part enabled by the use of new technologies or by using existing technologies in new ways. High-speed lines and the trains that operate on them form a distinct example of this.

The usage of high-speed trains forms a critical element in understanding the wider impact of high-speed rail on economic activities. All passenger transport services have their own particular markets, and high-speed services are no exception. The service available influences the groups in the population that are affected. Since high-speed trains go further in a short timescale, journeys on them are longer than average and thus generally more expensive for the time travelled. In consequence, so far they tend to convey mainly – though not entirely - people from higher income groups (although adoption of low cost airline pricing principles could change this). There are, within this pattern several types of passenger, who can be distinguished primarily by the time and distance travelled. Broadly these time bands[4] can be distinguished as:

- Short travel time, around 1 hour
- Medium travel time, around 2 hours
- Long travel time over 3 hours.

Critical Factors

The primary effect of constructing a high-speed line will be to move the travel time between two or more cities from one time band to another. Thus the impact on the cities concerned, especially a major regional city linked to the capital, will follow this step change in position. Furthermore, operation at the highest speeds between main centres is essential to maximize the time gains and hence any potential economic impact. Reducing the overall speeds by stops at smaller intermediate towns can reduce the benefits for major cities without achieving sufficiently large compensating gains for the smaller centres.[5]

[4] Klein O (1997) Le TGV-Atlantique et les évolutions de la mobilité Les Cahiers Scientifiques du Transport, nr. 32 ; Urena Frances, J M (2005) Alta Velocidad Ferrovia (AVF) y neuvas actividades en tres situacionas territoriales Ingeneria y territorio, nr. 70

[5] Troin, J-F (1997) -op.cit- p.84; Vickerman, R (1997) -op.cit-

The actual level and mix for any one corridor will be determined by two main factors. One is overall *size of the market*. For the most part, high-speed lines link the national capital to other major cities; thus travel time is further determined primarily in its relationship to the national capital. Given the current policy concerns over the relationships between London and the northern English regions, this is important for Great Britain. Not surprisingly the first national schemes tend to link the capital with the other major cities (e.g. Paris to Lyon, Madrid to Seville); and so travel times will be especially geared to the capital city as destination. Many capital cities, because of their size and activity levels, are uniquely difficult to drive into, and accessing their airport, on the fringe, can also be a difficult journey; both factors favour rail services when they can reach the centre at speed. The market for travel will also be influenced by the economic strength of the cities served and from the ease of access to the high-speed service (matters considered more fully in the following sections).

The other factor lies in the *quality of service* offered and indeed the perception of the services. Thus the French TGV system has generally been seen as significantly different to the conventional inter city ('Grandes Lignes') services, largely because of its particular mix of characteristics: high running speeds, frequency, capacity, fares structure.[6] Opening each new high-speed line in France has enabled both a faster service and a new pattern of service. Most trains run between the capital and the major target city, with very few if any intermediate stops; this is essential to maintain the key characteristics. In addition a good number of TGVs also continue on to serve smaller regional cities (e.g. Grenoble and St Etienne, Valenciennes and Dunkerque). Furthermore, the TGV network is strongly marketed as a brand.

The Primary Market

The main potential growth area for high-speed travel is around the 2-hour time band, say between 1½ and 2½ hours. This broadly equates to a distance of 250-550 km. At this distance air and road travel both offer clear competition for some markets. This time band enables travellers to make a return trip within one day with time for a day's activities (meetings, leisure visits). But it is particularly important for business travel, increasing the dynamism of business activity; provided that the context is favourable to business activity.

The actual impact varies by circumstances. The first TGV line in France, between Paris and Lyon, shortened travel time from well over 3 hours down to barely 2 hours; it has fallen a little more with upgrading of the line's speed in recent years. This moved travel between Lyon and the capital into the day return category by rail. Travel between the two cities has increased very substantially. Previously such (day) trips had been possible in practice only by air, from Lyon Satolas Airport; the inauguration of TGV services produced the widely remarked phenomenon of greatly reducing airline services between the two cities.

Central to the growth of travel between Lyon and Paris has been far greater business travel. This has two main components. One reflects the activity of Paris-based firms

[6] Plassard, F (1988) Le réseau TGV et les transformations de l'espace Les Annales de la recherche urbaine, nr. 39

whose activities cover national and even international scales; executives are able to travel between the Paris head office and Lyon subsidiary office more frequently. Much of this involves administrative, commercial and technical personnel, including quite a lot of more junior staff. This can allow such businesses to change their mode of operation, including the responsibilities and location of their Lyon office.

The other component is travel by Lyon-based firms, mostly local and often small, especially those offering specialised services on a personal basis; their executives can travel to Paris to provide services to the major businesses based there. Tourism travel to Lyon has also grown.[7]

Shorter Distance Travel by High Speed Rail

For travel over shorter distances the effect is different. Air travel is not a factor here; though road travel may well be. When a major city is placed within an hour of the capital, it facilitates travel for daily commuting purposes. This phenomenon has applied to Le Mans and Tours (TGV-Atlantique) and to Lille (TGV Nord); but the nature of the change needs to be considered. In the cases of Le Mans and Tours at least, the main change after opening the TGV-Atlantique was for people who had travelled up to Paris Monday and returned Friday to switch from weekly to daily commuting. The overall number of residents of the two provincial cities, a small proportion of the total, who worked in Paris did not change significantly. However, the effect of this change in commuting pattern, added to some increased business travel, was considered sufficient to maintain the economic growth of the two cities.[8] In developing the TGV system, SNCF has not sought to develop this commuting market specifically.

The types of people who take advantage of high-speed trains for daily commuting (as for any longer distance commuters) are primarily those with higher incomes. This is indicated in the French research, and it is also borne out by the impact of the Svealand line in Sweden. This line, opened in 1997, provides a high-speed regional link from Eskilstuna to Stockholm. It has increased travel along its catchment enormously, by a factor of seven, moving rail's share of the relevant travel market from 6% to 30%. The major improvement in accessibility to Stockholm has enabled more residents of the Eskilstuna area to take up jobs in Stockholm; it has also caused those previously travelling by car to change mode. In the opening years, services were run by X2000 high-speed trains, offering high levels of comfort and a new image, appreciated by those with higher incomes and expectations. Living close to a station was also a major factor in attracting users.[9]

[7] Mannone, V (1996) L'impact régional du TGV Sud-Est Integeo-Bulletin, nr. 123 [based on doctoral thesis]; Plassard, F (1988) –op.cit-

[8] Klein, O (1997) -op.cit-

[9] Froidh, O (2005) Market effects of regional high-speed trains on the Svealand line Journal of Transport Geography, nr. 13

In Spain, the high-speed services (AVE) operated by national rail company RENFE provide links between Madrid and cities within the one-hour band. Guadalajara, Segovia (where the HSL station is yet to open) and Toledo all lay at about 30 minutes from the national capital. Of these the second and third are largely historic cities, with strong tourist activities and (as yet at least) minimal impact on commuting growth. But the major impact has been for Ciudad Real and the adjacent city of Puertollano, which lie at about an hour's travel time from Madrid on the first AVE line. These have seen very substantial growth in commuting to the capital. Following calls from regional interests, RENFE expanded its initial service of 18 calls (each way) in through trains in 1992 to 47 in 2005, with much of the increase in through services operating only between the two cities and Madrid and formed of new trains (effectively high speed commuter units). This has strengthened the role especially of Ciudad Real as a regional university and business centre, with Puertollano effectively becoming more of a satellite city.[10]

Longer Distance Travel Markets

Beyond 2½ hours, say over 550 km distance for a high-speed train, the market is again different and hence so too are the travel patterns. Air travel plays a significant competitive role at this distance. Business travel by rail is still boosted to some extent, especially for corporate executives from major firms in the capital. But a day return trip is hardly feasible for longer distances requiring travel time of (say) 4 hours. However, accelerating access between cities offers scope for easier visits on an occasional basis, without the complexity of air travel or the hard slog of long distance driving. In consequence, the high-speed services have expanded the potential for weekends away; social changes mean that all groups are taking more short breaks, but rail travel for these has grown especially for middle-aged couples with a comfortable income. This operates in two directions: from the provinces to the capital; and from the capital, and from other regions, to provincial cities offering attractions, e.g. historic built environment, scenic landscapes, reputed retail and similar services. Interestingly, a sector of 'business tourism' has also been identified, i.e. travel by executives to take part in conferences.

[10] Urena Frances, J M (2005) –op.cit- ; Alvarez, A R & Coronado Tordesillas, J M (2005) La movilidad de alta velocidad en estaciones situadas en ciudades de tamano pequeno Ingeneria y territorio, nr. 70

3. HIGH SPEED RAIL AND CITY DEVELOPMENT

Providing Access to the Service Economy

As indicated above, the types and trends of travel by high-speed trains relate closely to the circumstances in which they are developed and operated. Simply providing a high-speed service does not of itself strengthen the economy of a city, nor necessarily support it. If a high-speed rail service is to play a really positive role, then it has to relate to the activity patterns and developments in the places served. This can involve design of city development being adjusted to match the opportunities created by construction of the high-speed line. It can also involve the design of the high-speed line being related closely to the economic and development patterns for the city and region.[11]

Travel by high-speed trains involves a lot of business related movement, by executives of both large and specialist businesses. It also includes some commuting, essentially into national capitals, over shorter distances and leisure travel (short breaks) over longer distances. Thus the focus is very much on the service sectors of the economy: business, public administration, leisure, commerce, and tourism. It follows that the economic activities which benefit from high-speed train service provision lie in these fields. Thus a positive effect will follow where higher speed rail is provided to a city growing its service sectors. But this can only happen if the high speed rail network is designed in such a way that it affords convenient, ready access to the locations where the service economy is focussed: they want to be within easy reach of a station served by high-speed trains.

Whether and how this has been achieved in practice varies according to place, time and circumstances. Differences in geography and in administrative systems have some influence. However, some common features exist, and information on these can be drawn from examples of experience to date. To start, it is important to look at the two key French cities of Lyon and Lille.

Lyon

Lyon was the first major provincial city served by the French TGV network. Opening of the TGV Sud-Est put it at 2 hours from Paris, the key business distance. Before opening of the TGV line, all main line services operated through Lyon Perrache station, at the south end of historic Old Lyon, lying on the peninsula between the two rivers Rhone and Saone. The physical constraints of this central area had already led the city authorities to start development of a major area of commercial activity to the east of the centre, named Part-Dieu. This lay close to a north-south railway line. Design of the TGV line brought it into the city on to this line, and a major new station was built adjacent to the emerging commercial area; the station was also named Lyon Part-Dieu. Over time this has become the focus of most trains serving the city; Perrache has continued to be served by some regional services.

[11] Menerault, P (2006) -op.cit-

Following the opening of Part-Dieu and the start of TGV services, further development around the commercial area followed.[12] Office accommodation became more valuable in the area. Lyon was already an important commercial centre (as well as having importance as a university and research centre), and many businesses were based there, including local firms and subsidiary offices of major companies. Many of these had had premises elsewhere in the city but decided to move to Part-Dieu to benefit from easy access to TGV travel. The attraction of Part-Dieu has continued, probably for three main reasons. First, TGV services for Lyon have expanded over the years with development of the network, services now operating not only to Paris and down the Rhone Valley but also to other cities across France. (From 1994 Paris – Marseille services ran via the Lyon Bypass line missing the city itself; but the overall increase in TGV services more than compensated for this.) Second, the urban public transport system has been developed to make access to the area, and the TGV station, easier from much of the conurbation and beyond (see later). Third, the scale of business and commercial activities relocating has created its own momentum in attracting further such activities. An interesting feature has been the extent to which hotels have been built in an area formerly lacking them; this suggest that the TGV service has also expanded tourist travel to what was already an important tourist destination, with the corollary that visitors value hotels close to their place of arrival.

Lille

If Lyon had long been the focus of successful third sector activities, Lille in the 1970s was much more an industrial city and the heart of an industrial region. Reliance on coal, steel, cotton and other traditional products had led the region to economic slow down as these industries were displaced by cheaper imports from other parts of the world. The municipal authorities determined that they would change the character of the conurbation, with major growth in the service sectors. The TGV Nord line was seen as a key component in this, enabling the city to place itself as the nodal point between Paris, Brussels and London. In the event, plans were delayed for a decade: the TGV Nord line was moved down the SNCF programme after the British government withdrew its initial proposals for the Channel Tunnel, but its construction was approved after agreement to build the Channel Tunnel. The TGV Nord opened in 1993; from 1994 Lille sat astride services between the three capital cities, which gradually expanded with extension of the TGV network and other countries' high-speed lines.

Lille benefited from its long term vision and practical action to achieve it: it also gained through strong political leadership, primarily from former Prime Minister Pierre Mauroy, who has been Mayor of Lille, Chairman of the joint conurbation authority (Conurbation Urbaine de Lille, CUDL) and Chairman of the Nord Pas de Calais Regional Council. The changes that have been wrought have taken place over a

[12] Mannone, V (1995) L'impact régional du TGV Sud-Est [Doctoral thesis]; Plassard, F (1988) –op.cit-

period of time and have covered activity patterns and especially developments in land use and regeneration[13]. A number of elements can be briefly identified:

- A new through station strictly for TGV services (Lille Europe) was built on part of a former barracks site near to the original station (now Lille Flandres). Most of the rest of this site was used for a major commercial centre, with offices, hotels and a large modern retail centre (Euralille). The remaining part was made into a public park, replacing former open space used to build the new approach lines to Lille Europe. The whole area is adjacent to the old city centre and has formed an extension of it.
- Further programmes have led to substantial new building of offices, public housing and a very large conference and events hall in areas adjacent to Lille Europe. This forms part of a continuing strategy of development for the area. Further expansion is now in hand to take in redevelopment of a closed railway goods yard and other disused land beyond the conference hall.
- Reorganisation of the local universities has included locating some faculties in former cotton mills in older areas, thus creating local employment and businesses there. These older areas have also benefited from regeneration programmes. In turn some of the traditional university buildings have been taken over by larger businesses, often for regional head offices.
- Complementary programmes of regeneration have been undertaken in other parts of the conurbation, notably in the former cotton towns of Roubaix and Tourcoing. These have seen disused public and industrial buildings modernised for reuse as offices, leisure and community centres, and specialist education. Notable is the Euroteleport complex at Roubaix, adjacent to a modern retail centre designed to enhance the traditional city centre. In parallel, housing areas in these towns have seen programmes of improvement and new building.
- Lille gained the position of European City of Culture for 2004. The very active programmes run throughout the year highlighted what had been achieved and gave impetus for further initiatives.

Lessons from Lyon and Lille

Both Lyon and Lille, in different ways, have prospered since the arrival of high-speed rail, developing their service economies strongly. These two examples demonstrate several key factors, which have also emerged as being crucial to other cities which have benefited from high-speed services[14]:

- Both economic and land use trends are relevant to the development of the high-speed line. The best impact is likely if service sector activities already form a key function in the city. But it is possible to achieve success if their development is being pursued in a very positive fashion. The high-speed line then becomes a catalyst for continuing growth. It has to complement an existing strategy; it cannot simply generate activities in a vacuum. Attracting new businesses appears to be easier with a heavy existing service sector economy.

[13] Menerault, P (1997) Dynamiques et politiques régionales autour du Tunnel sous la Manche et du TGV Nord. Annales de Geographie, 593-594

[14] Menerault, P (2006) –op.cit-; Helfter, C (1997) Effets TGV sur le développement urbain [Doctoral thesis]

- The selection of the location for the high-speed line station is critical. It must be developed in line with a masterplan, one that fits high-speed rail into the strategy for the city as a whole. The station location has to fit with the city strategy. The opportunity for regenerating rundown and disused areas may include railway land and redundant industrial areas.
- Strong and well directed political leadership, particularly apparent for Lille, forms an essential element. It is equally evident from these examples that a consistent strategy, followed over a sustained period, is vital to success.
- Effective regional and local transport is crucial to tying together the various elements of the catchment.

Further Case Studies

The picture that has emerged from Lyon and Lille can also be identified in a number of other cities. Several examples are worth referring to. These brief reviews also include some examples of aspects where high-speed rail links have no real role to play or have failed to be used effectively.

Grenoble forms a regional destination for the TGV Sud-Est. Most trains to and from it do not now serve Lyon, as they use the Lyon Bypass line; but the city also has good rail links by regional rail (TER) service with Lyon (and good road links too). With the planned arrival of TGV services, the city authorities developed a new business area close to the station, termed the Europole. They also upgraded the city centre retail area and the environment of adjacent areas (partly in connection with a new tramway system).

In Spain, Zaragoza lies on the Madrid – Barcelona AVE, about 300 kilometres from both cities. The new AVE station lies on the edge of this compact city, about 2 kilometres from the centre. Zaragoza, like Lyon, has already developed a strong service sector economy. It also forms the major focal point for the region and is its key centre for service industries. With the approval and design of the Madrid-Barcelona AVE line, the city strategy was focused on developing the area round the AVE station as a major location, both in its own right but also well integrated into the city strategy. The principal focus is a new Fair site, targeted firstly on the major international Exposition planned for 2008. Complementing this, the development also includes hotels, conference and leisure facilities and a substantial residential area of high quality, much of it in a parkland setting. There are direct transport links (rail and bus) with the central area and other parts of the city.[15]

Köln in Germany has also seen a second station developed as a major hub to complement its existing main line station. This is Köln Deutz, which lies on the right bank of the Rhine, just across the bridge from Köln Hauptbahnhof. The latter serves the city centre and most of the left bank, while Deutz originally formed a local station primarily serving the Köln Fairground (Messe) and local industry. In 1988 the Köln city authorities decided that, with the planning of the Brussels – Köln and Köln – Frankfurt high-speed corridors, the station should be rebuilt as part of a major

[15] Urena Frances (2005) -op.cit-

redevelopment of the whole area around the Fair. This redevelopment includes offices, hotels, retail and leisure centres, and housing, as wall as redevelopment of the main Fair site venues. Combined with access by high-speed trains from much of Western Europe, this puts Köln in a stronger position to host international events. The new station also acts, like Hauptbahnhof, as a key node on regional rail services and local transit. Because it is less than one kilometre from the centre of the city, and linked by bridges, it is able to complement the more traditional activities based there (in the same way that Part-Dieu in Lyon complements Old Lyon).[16]

In contrast Cordoba, on Spain's first high-speed (AVE) line between Madrid and Seville, has both the line and the station alongside the traditional railway alignment through the centre of the city. It was a city which acted rather more as the industrial centre of a rural province. The opportunity was taken to redevelop the entire railway corridor through the city by means of a firmly managed masterplan for the land (which included a good deal of former railway property); the railway lines were placed underground. A range of hotels, offices, conference centres, leisure facilities and housing was developed, with significant green spaces. The redeveloped station became the centre for regional and local rail and other public transport as well as for AVE services. The development corridor strengthened the city in both physical and in economic terms, as a regional services centre and as a tourist location.[17]

Turin, in Italy, lies at one end of the Italian high-speed network (the section into Turin was completed in time for the 2006 Winter Olympics). Here the opportunity has been taken to revise the whole city centre area around major changes to the railway system. The current major terminal, Turin South, is being replaced by a new station on the through route across the city centre, which itself is being heavily upgraded to take all through services, including the high-speed trains. Around this new station, major redevelopment is being carried out. Turin already forms a major regional capital, with a substantial element of service sector businesses in its economy. Its development has been preceded by that of Milan, which has seen major redevelopment of the rail system and the city's structure in recent decades; it is notable that two-thirds of Milan's economic activities are in the service sector.

In Belgium, where the three main corridors to France, Germany and the Netherlands have been developed for high-speed operation, redevelopment has taken place at the three main city stations. Brussels Midi has been substantially rebuilt – it also forms effectively the central interchange point for the national railway system – and a major new business district is rising round it. In Antwerp and Liege, the main central station has also been rebuilt; at Antwerp within the historic building shell, where the new high-speed link to the Netherlands will pass through a new tunnelled line underground; Liege with a striking new station. In both cases the business district around the station is being developed.[18]

[16] Moller, N (1998) The Köln ICE hub and the new ICE terminal of Köln-Deutz Proceedings of Eurailspeed 98

[17] Urena Frances (2005) -op.cit-

[18] Menerault, P (2006) -op.cit-

Not all places have secured the potential benefits from high-speed line access, however. Those which have missed out include a number of small centres (discussed below) and also the city of Tours, brought within an hour of Paris by the TGV Atlantique. The through line serves the junction station of St Pierre des Corps on the edge of the city, while the central station is a terminus. St Pierre des Corps station was rebuilt by SNCF and the municipal council of St Pierre des Corps redeveloped the area round the station, incorporating offices and a hotel. However, the city of Tours, with an economy more heavily geared to tourism, did little initially to regenerate areas around the central station or to link up the developments at St Pierre des Corps with the city strategy as a whole. In consequence neither the immediate area of St Pierre des Corps nor the city of Tours as a whole saw significant gain.[19]

The Mix of Fortunes

In a few cases a new station has been built on the new TGV line, with the aim that it would be accessible by car and local public transport links for nearby regional cities. Examples include Le Creusot on the TGV Sud Est and Haute Picardie on the TGV Nord. Macon Loché on the TGV Sud Est and Calais Fréthun on the TGV Nord are located on the TGV line just outside the city served. These stations are served by very few TGVs; they produce relatively little business. For Avignon and Aix-en-Provence on the TGV Mediteranée, also just outside their respective cities, and for similar stations being provided for intermediate cities on the TGV Est now under construction, there has been more careful commitment to TGV service, through provision of local rail and bus links to the area served and treatment in local spatial strategies.

Some intermediate stations on high-speed lines were built to offer a form of local access, such as Le Creusot and Haute-Picardie. In both cases it was expected that some development would occur around the stations, thus building up their role as a local centre of activity. In fact this has simply not happened. Admittedly the level of train service is very low – it is not efficient to increase journey time on many TGVs for what is a relatively small number of passengers. But the lack of existing business activity in these locations appears to have deterred others from starting up.

However, Avignon and Aix-en-Provence have fared somewhat better. Both are served indirectly by stations on the TGV Mediterannée, located outside the cities concerned but still close to them. Their development was matched by carefully directed planning of land-use and transport links. For Aix-en-Provence (but not Avignon) this seems to have generated development around the station, strengthening the city's activities overall. Lessons from this are being applied for the three intermediate stations on the TGV Est, now under construction.

[19] Troin, J-F (1997) -op.cit- pp.92-95; Vickerman, R (1997) -op.cit-

The Regional Balance Sheet

A question still hangs over the implications for regional cities generally if the gains are likely to be made by major regional cities, such as Lyon, Barcelona and Köln rather than smaller centres. To what extent do the gains made in economic activity of the major cities come at the expense of other smaller regional cities? Strengthening a major regional centre appears to make other cities in the region, as well as the rural catchment, more dependent on it. This does not *necessarily* mean a negative impact – they may all grow together – but it does imply that consideration may need to be given to within-region trade-offs. Thought has been given to this subject in France, and elsewhere, in terms of the complementary transport links that may be needed between the various parts of the region and the high-speed services feeding the central city, a subject to which we turn next.

4. LINKING HIGH SPEED RAIL SERVICES TO REGIONAL AND CITY TRANSPORT

Allocating Effective Access

High-speed trains normally serve only one station in a city. To be effective that station needs to become the focus of major redevelopment and regeneration, geared to the service economy. However, to maximise the economic benefits generated by this node, there has to be a gain for the whole conurbation and indeed for the catchment region it serves. For this reason, effective transport has to be developed to pull together all parts of the conurbation and of the region. High-speed line stations therefore need to act as multi-modal transport interchanges.

The development of regional and local transport systems has to match the development of the city, in line with expected trends and following a consistent strategy. This is any case vital to securing the most effective use of resources and opportunities across a region. But the transport system has to serve the key points in a city's economic activities and link them with other points and with the wide areas of residence for the population. If those key points include a station on a high-speed line, then those transport systems must serve it effectively. The development of high-speed rail lines and stations should also be oriented so far as possible to complement them.[20]

For many users of high-speed rail, car travel is part of regular lifestyle. Therefore the transport network has to include appropriate roads and parking provision. But it is also important to provide effective public transport systems, for the sustainability of both the economy and the environment and generally to make high speed rail distinctions accessible. These will include fixed track systems – regional railway services, metros and tramways – and also bus and coach services, and provision for taxis. The needs for such links and their effects can be seen at two levels: across the region; and within the conurbation.

The rest of this section considers these issues of linkages, reviewing the key issues and setting out examples.

The Primary Beneficiaries

The cities which appear to have gained the most success from connection by high-speed trains are major regional cities. These have substantial economic strength from their own activities, but they also benefit from providing services for a whole region. This means that regional transport links have to be suitable. Providing a suitable road network is important – not least for movement of goods, as well as for car traffic – but public transport, especially rail, is essential to rapid exchange of people and hence activities. This needs to have a common terminal point located close to the main centre of economic activity, to allow for first class access to high-speed rail if its benefits are to be speed across the wider catchment. Two conditions follow: the standard of service provided should be of a high quality suitable for travel related to

[20] Vickerman, R (1997) -op.cit-

major economic activities, whether as customer (higher income groups) or provider (business executives and sales staff); and the interchange should be tied in with the high-speed terminal, located at the core of such activities.

The cities' own strength must also reflect convenient accessibility throughout the conurbation. This will include provision of tracked systems, such as metro, light rail / tramway and perhaps guided buses; it also includes conventional bus systems, albeit with suitable priorities on the roadway to enable fast and reliable operation. These will enable the central core, and other areas of major economic significance, to be linked to other town and neighbourhood centres within the conurbation and to all the residential areas.

The way in which these systems are provided differ according to circumstances and to the policy approach of different cities, but the principles on which they might best be provided are applied on similar lines in most main cities, as the following examples show.

Lyon is at the centre of the Rhone-Alpes Regional Council network of rail services, which continues to be developed, under the powers and finances transferred to the French regional councils in recent years. These services, operated under the banner of Trains Express Regionaux (TER), provide frequent links to various regional cities, notably Grenoble and St Etienne, as well as stopping services throughout the region and beyond. In earlier decades French local trains outside Paris generally ran at irregular intervals, timed to fit to more traditional needs; nowadays the services based on Lyon run mostly at regular intervals, providing a more recognisable and reliable service. Most trains serving the main line corridors operate from Part-Dieu, and plans are in hand to link up lines currently operating from the separate suburban terminal of St Paul. Within the city there is a four line metro system, extended slightly in recent years, now joined by a two-line tramway. Extensions to this are in hand, while the long established trolleybus network is being upgraded, through new vehicles and substantial on-road priorities, to form a complementary high quality transit system across other parts of the city. A finer mesh is provided by a network of bus services.

Similar patterns of significant regional service development can be found for Köln, Milan, Turin and Barcelona; in all cases development lies primarily in the hands of the regional authority. For Barcelona high-speed regional trains are scheduled to become important as a complementary tier in the overall regional train network. This reflects an approach which Spanish Railways (RENFE) have developed significantly. Through this, major cities can become effective centres for a catchment up to 100 kilometres around. This will further strengthen the role of Barcelona but also bring increased activity to the other main cities linked up in the network.[21]

Integrated interurban transit systems play an important role in the various main European cities served by high-speed rail. Lille, Barcelona, Köln and Milan, for

[21] Pita, A L (2005) La contribución de las nuevos infrastructuras ferroviarias a mejora del transporte regional e interregional: el casa de Cataluna Ingeneria y territorio, nr. 70

example, all have metro systems. Almost all of those cities reviewed in this paper have light rail transit systems too, most of them continuing to be modernised and extended. The rapid re-introduction of city tramways in France is closely related to TGV development: of the twenty systems outside Paris, almost all of them built within the last decade or so, fifteen are in cities directly served by several TGV services a day and another three will be once TGV Est opens. Köln, like other major German cities served by ICE services over high-speed lines, has a regional rail system (Schnellbahn) and a substantial tramway system, part operated as Stadtbahn (semi metro). The importance of these city and city-region systems is that they allow the benefits of high-speed rail to be spread across a diverse pattern of origins-destinations, with a consistently high quality service.

Rail Links and Secondary Centres

Smaller cities can lose out, in relative terms, especially if by-passed by construction of a high-speed line. Dijon was a significant intermediate city on the former main line to Lyon (its position similar to that of Arras on the former main line to Lille). It still benefits from a small number of TGVs from Paris on the TGV Sud Est en route to other regional cities, in timings of under 2 hours; these divert off the main TGV line by a link line. Initially, opening the TGV line led to a substantial loss of fast rail services for Dijon, but it now benefits from increased regional (TER) services, providing cross-regional links formerly offered by through main line passenger services. These are mostly coordinated and funded by Bourgogne Regional Council, in cooperation with other regional councils. The regional councils were the main critics of what they saw as SNCF's focusing on TGV development at the expense of other fast services.

Services through Arras have seen a broadly similar development. Arras lies in the Nord Pas de Calais Region, which has been at the forefront of regional coordination for local rail services. Lille has long been the second most important city in France for rail in-commuting after Paris. This has developed in recent years, following the opening of the TGV Nord and Lille's rapid regeneration as a major services centre. This shows how, as service industries develop in major cities, they generate in-commuting, many of their jobs attracting applicants from beyond the conurbation. The need for building up a highly educated workforce means that the conurbation alone may not necessarily be able to supply all the staff needed; some staff may also chose to live in smaller cities and towns where they can commute in.

The Nord Pas de Calais region also demonstrates two significant factors. First, its towns and cities have a very high population density, providing a more effective market for regional trains. Second it has a high percentage of railway lines electrified (mostly to cater for the heavy industrial movement that formerly characterised this part of France), allowing the operation of modern electric trains. As well as providing support funding for service development, the Regional Council has invested heavily in new trains and in some railway infrastructure works. In addition, the Regional Council has supported some fast regional links operated by TGVs. The network of electrification also enables TGVs to operate through to a range of destinations beyond Lille: Boulogne and Calais, Dunkerque, Douai and Valenciennes, and Roubaix and Tourcoing in the Lille conurbation. These provide support for the development of

these cities and their catchments, although the effects are mixed: Valenciennes has retained its role in the automotive industry and also advanced its place as an administrative city; but the coastal cities do not seem to have benefited significantly.[22]

Another small coastal town linked to the TGV system is La Rochelle, on the Atlantic coast. The connection to the main line carrying TGV services is at Poitiers, but the cross-country line from there was not electrified when TGV services were introduced. Initially SNCF ran through services by equipping a few large diesel locomotives to haul TGV trains; subsequently the line was electrified, as this formed a more economical way to operate. However, travel by TGV has never been substantial, and the effect on La Rochelle has been limited.

[22] Menerault, P (1998) Processus de territorialisation des réseaux: analyse de la grande vitesse ferroviaire à l'échelle régionale NETCOM, vol 12, nr.1-2-3

5. CONCLUSION

It is clear that high-speed train services, operating for the most part on new high-speed lines, can serve as a major factor in the development of city economies, supporting city development plans and the regeneration of run-down areas. The growth of high-speed travel in mainland Europe and the matching expansion of city economies in a few countries over the last two decades have shown how powerful a tool this really is. The gains reflect three elements in the European experience to date:

- By placing cities closer to each other in time – and especially by bringing major regional centres closer to the capital – high-speed lines change travel patterns. They boost business travel by executives of major companies and specialist firms alike, enabling business activities in the cities served to benefit from increased exchanges and activity levels. They also promote leisure travel to more distant destinations, widening catchments. Thus they underpin the expansion of service sector activities. For cities at a shorter distance from the capital, they also support some increase in daily commuting.
- Gains from this are most likely to be made by cities which are either heavily oriented towards service sector businesses already (such as Lyon, Zaragoza, Köln or Milan) or which are strongly committed to move in this direction (such as Lille or Cordoba). Fundamental to capturing the maximum benefit is development of the high-speed services station in integrated fashion with the surrounding area, to provide a major area of third tier activities – offices, hotels and conference facilities, retail and leisure – together perhaps with high quality housing. This may involve further development of an existing commercial zone in the city centre or closely linked to it; or it may involve redevelopment of an adjacent area for which suitable regeneration is planned, such as at Lille or Köln-Deutz. Whatever the basis, the most effective use of high-speed access has come with those cities demonstrating an integrated city strategy, consistently implemented over time in cooperation with all interests and with committed political leadership. The rare examples where this proactive approach has not been followed, such as Tours / St Pierre des Corps, have not benefited
- Effective movement within and beyond the conurbation is vital for cities to benefit from high-speed train access. This may well allow them to strengthen their role as regional capitals, extending their labour market catchments and business opportunities. Across mainland Europe, there is evidence of very careful integration of local/regional transport networks, with high-speed rail, which means that the high-speed station should form a major interchange point. The value of this has been demonstrated by transport developments in Lyon, Barcelona, and Köln, among others. To some extent the success of major cities can lead them to greater dominance over the other cities in the regions which may lead to economic losses in some locations. But these can be mitigated by the creation of good quality public transport links at a regional level.
- However, not all places served by high-speed rail have benefited, usually because the conditions noted here as established pre-requisites have not always been present. Places served by low frequency services are one such category. Places unable or not seeking to deliver viable service sector economy are another.

The impact brought by high-speed trains is in fact very real. But it is rarely measurable in any detail despite, in France and elsewhere, a very substantial research effort with an ever-growing body of analytical evidence on which to draw. High speed rail can be at its most effective in countries which include significant distances but also population centres of high density; especially where an important part of the long distance market involves journey distances of around 1½ to 2½ hours.

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