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## HSR STATIONS IN EUROPE: NEW OPORTUNITIES FOR URBAN REGENERATION

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**HSR STATIONS IN EUROPE:  
NEW OPORTUNITIES  
FOR URBAN REGENERATION**

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**ABSTRACT**

The recent development of the high-speed train in Europe means significant modifications in the accessibility conditions of the inhabitants. However, the development of the new network also provides a unique opportunity for the surroundings of the stations. This development depends strongly on the location of the station and on the kind of strategies that are developed.

This paper presents the results of a study on urban interventions in the different European countries which have contributed to change station districts. The analysis reviews issues such as promotion strategies, location of activities and trips generated, and the main functional keys of the new high-speed train projects in different locations.

## 1. INTRODUCTION: THE NEW URBAN SCENERY AROUND THE HIGH-SPEED STATIONS

There are an increasing number of examples of European cities with neighbourhoods that have been recovered through projects that develop their stations for the high-speed railway. Some stations are on the outskirts of the city and create new urban poles, whereas many others redevelop the old railway spaces for the new system. The European cases of central stations include diverse situations that range from the redevelopment of nineteenth century stations to those that provide an axis for growth of a new zone of the city with new neighbourhoods.

In the Spanish case, the necessary modification of the gauges has led to the creation of new lines that, in a very exclusive way, are distinguished from the rest of the national railway network. Not only for this reason, but also due to this exclusive nature of the system, the new stations located in urban neighbourhoods provide urban opportunities for the configuration of a new image of the city, with surrounding spaces laid out to connect with the distinct modes of transport.

Faced with the urban renewal that was provoked by this change in the Spanish city of Logroño, a study was commissioned which is summarised in this communication. The objective of the research work was to analyze the decisions taken in European projects with similar characteristics to those of the city of Logroño: cities under 300,000 inhabitants, with a project for a central station that, like in the case of the capital of La Rioja, act as a driving force for neighbourhood activity.<sup>1</sup>

The conversion of a *conventional* railway station into a *high-speed* one leads to alterations in the urban system itself, and so it must be accompanied by carefully studied urban redevelopment of the surroundings. Added to these measures, there must be other infrastructure management strategies that aid in the optimization of the system.

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<sup>1</sup> The study has been developed by “Sociedad Mixta LIF 2002”, and directed by the University of Cantabria, with the collaboration of researchers from different Universities and administrations: Agustín Arizti, Francisco García, Aleksander Shultz, Carmen Mota, Nuria Pascual, Sonia Díez, Elena Marín and Cecilia Ribalaygua. (a complete copy of the document can be found at: Ribalaygua C. and García F., 2010).

The mere existence of the infrastructure and its project for redevelopment of the related spaces is not sufficient to interfere in the dynamic of the city; in fact it is necessary to organize a suitable type of railway services and the facilities in the arrival area. The number of stops that guarantees the relations with specific destinations, with suitable timetables and frequencies, will be especially determinant for the intermediate cities along the high-speed line, and only in this way can a qualitative change be made in the possibilities of accessibility and growth.

Added to this, the hierarchical position of the station in the line and its relation to the other stops will also be determinant. On the one hand, the number of possible destinations affects the infrastructure's influence (the make-up of the network, instead of specific stages, multiplies the destinations), on the other hand, the place that the city occupies with respect to the other population nuclei with stops on the line will determine the type of activities and the related potential. In particular, the proximity to a large population centre can be considered just as privileged as threatening. The increment in accessibility to a larger market increases the possibilities of interaction between the small city and the large one, although it also implies the risk of population loss to that large urban centre. Other aspects such as the relative size of the cities connected by high speed, or the fact of being the first or second stop also affect the degree of impact of the new mode.

The cost of the service will also determine the existence of daily relations, and thus, the possible appearance of a commuter who uses the train as the transport means to go to work in a city with a high-speed stop (*daily traveller* or *commuter*). The characteristics of the service can motivate or penalize specific mobility habits. For these reasons and due to the situation of the station in the network and the existing type of services, these aspects form a part of the analysis proposed for the case-studies.

The current urban growth in Europe is taking place in the context of the loss of activity in the urban area, and a crisis in the traditional city model. In this context, the renewal of the type of activity in the historic centre must be considered through redevelopment policies, with new ideas about the model of the cities.

This creation of activity in the city centre has a great ally in the new stations, as is indicated in the BERTOLINI and SPIT<sup>2</sup> study on redeveloped spaces around railway stations in Europe. This study analyses the processes of redevelopment of stations and the way they are converted into motors for redevelopment of the deteriorated historic neighbourhoods around the station.

With the transformation of the railway, the city recovers an image associated with new technologies that are usually also accompanied by the freeing up of old railway land (now central), which enable a new city project to be developed:

*“Nowadays, the city benefits from some opportunities to redevelop its structure and to reconstruct its interior space. The urban redevelopment is done with urban residential renewal policies starting from the opportunities that appear in some places: due to their activities becoming obsolete, loss of competitive potential, lack of space, and in general due to the appearance of empty urban spaces due to the economic changes undergone by the city.*

*The construction of new stations for the high-speed train constitutes one of these opportunities, both because it transforms the old railway spaces and because it introduces new technology that can be a focus of interest for vanguard activities.”<sup>3</sup>*

The adaptation high-speed railway in European cases such as those considered in this study has acted as an engine for the recovery of degraded spaces. AS well as spreading the innovatory image of the new mode, a new focus and spaces for activities are generated which substitute the historic deficiencies in the nuclei, occupying valuable central urban spaces, which have until now been occupied by the railway.

In many cases, running the tracks underground has led to an important linking operation for urban access, when confronted with the barrier that was created by the railway lines. The barrier effect created by the railway is often minimized when the lines are put underground as part of the technological leap necessary for the high-speed train. Although, as SANTOS and GANGES (2002) indicate, the combination of the lines with the urban tissue is not necessarily

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<sup>2</sup> “The position of a station location within the emerging urban networks is, as the case studies will show, a crucial ingredient of its property development potential”. BERTOLINI, L. y SPIT, T. (1998): *Cities on rails*, p. 39. Además se trata este tema entre las páginas 21 a 51.

<sup>3</sup> PIÉ NINOT, R. (1998): “La station del TAV: intercambiador modal y element de nueva centralidad Urbana”. *III Congreso de Ingeniería del Transporte, Barcelona*, p. 1196.

damaging, but its effect can be controlled and minimized with good urban planning, and putting the lines underground is not the only solution.

Moreover, the development of a new central urban zone guarantees the renewal with tertiary use and programmed residential zones around the high-speed stations. This regenerator role has not gone unnoticed for authors such as HALL<sup>4</sup>, who wonders whether the station can help the regeneration of the urban centres. This is the case of Germany, where there is evidence of a commercial strategy in the renovation and privatization of its stations. This guarantees the role of the redeveloped stations that maintain their location, modernising their installations for the new railway requirements and orienting the railway space for commercial purposes.

## **2. METODOLOGY FOR STUDYING THE EUROPEAN HIGH-SPEED RAILWAY STATION PROJECTS**

To understand the subject, a methodology with two aims is envisaged which enables the analysis first of *what* type of impact and strategies are developed through a literature study. The second aim is to extend the analysis to *how* these strategies are carried out through the study of particular cases.

To achieve these aims an analysis is proposed to compare six significant cases of European stations in six different European countries. The analysis of the measures has grouped the measures into three categories, which are detailed in the following text, based on an initial study of the strategies developed in France in the Transport Economy Laboratory in Lyon (LET)<sup>5</sup>, and adapted for the Spanish circumstances (Ribalaygua, 2004).

La initial information that indicates some guidelines about the strategies followed in France originated with the French Ministry which in 1989 requested the elaboration of a list of the possible strategies to be carried out by those City Halls that received an important lineal infrastructure (highway or railway). The study undertaken by the LET consisted in a survey of 139 cities, of which 36 were affected by the arrival of a high-speed stop, where the measures

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<sup>4</sup> "Will high-speed rail assist in the regeneration of city centres and other interchanges so that the exodus from cities is reversed? Only after these and other questions are answered will we be able to conclude that the second age of the train has actually arrived". HALL, P. and BANISTER, D. (1994): The Second Railway Age, *Built Environment*, vol. 19, n 3 and 4, p.157.

<sup>5</sup> The Transport Economy Laboratory at the University of Lyon (LET) developed part of the most important studies commissioned to evaluate the impact of the high-speed train in the French routes. The data referred to are part of an unpublished study: LET (1989): *Guide pour la valorisation des infrastructures de transport*.

taken to “enhance the value” of the infrastructure. From the questionnaires filled in by the City Hall representatives, chambers of commerce and other local organisms, a list of 9 possible measures are reported which are useful in the diffusion of the effect of a high-capacity infrastructure, corresponding to the distinct action areas.

These data are completed with aspects detected in the bibliography and the comparative analysis itself of French and Spanish experiences (Ribalaygua, 2004). These measures are corroborated, and some new ones are incorporated, in a new classification enabling the identification of strategies in a separate way, not only of the agents involved, but also the distinct phases of development. This classification separates three types of strategies:

- Prevision Strategies
- Project Strategies
- Promotion Strategies

As far as the *prevision* strategies are concerned, there is no doubt of the importance of reserving land, both for the immediate construction of a new space around the station, and for the future of the city with the creation of growth zones. However, strategies that protect zones and reserve land for infrastructures providing access or connection with the city centre are also common.

The *project* or *management* strategy for transport and the land foreseen for activities around the station is just as necessary as *prevision*. There is no point in having access to a high-speed line if there is no guarantee of a sufficiently good service for the city in terms of timetable, frequencies and prices. The urban and interurban transport network also has a fundamental role in the diffusion of the possible effect. In the same way, the development of activities around the station will depend on the urban design project foreseen in the management of land and the characteristics of the proposed projects.

Other key aspects include the *promotion* measures for the activity zone linked to the station, as well as different tourism sector activities, economic activities, or the real estate sector, which list among their strengths the high-speed train. These aspects are therefore included in the analysis of the case studies.

Once the possible prevision, project and promotion strategies have been identified, a detailed analysis is carried out of their characteristics and the way in which the distinct agents intervening in the process are related. This analysis requires a monographic study of six different countries, in order to obtain a global view of the variety in European strategies.

Through the case studies, the strategies will be understood in greater depth, analysing what their repercussions and characteristics are and whether they are applicable in the case of Logroño. It is therefore necessary to analyse the singular cases of each city, although following a systematic scheme that first of all sets out the particularities of each city and those of their surroundings, and secondly, the prevision, project and promotion strategies developed.

The proposed focus combines the formal urban-planning vision with the socio-economic one, given that it is not possible to decompose the two viewpoints. To provide the most complete analysis of this urban-planning phenomenon it is necessary to study not only the physical support, but also the functioning of the activities that are developed there<sup>6</sup>.

It is therefore necessary to combine the formal analysis with the reality of transport management, the urban projects with their previous formal reservation, as well as with the tools and final promotion strategies with the previous processes. All these aspects are compiled in the reports made in each case. The specific natures of each city, and the complexity of the urban phenomenon itself, do not allow conclusions to be drawn about the suitability of one type of model, or to recommend formulas that can solve all the problems, but only to extract conclusions about the previous experience that can be useful later in local studies. With these premises, this paper reviews the principal results detected in terms of prevision and project strategies in the spaces around the high-speed station in the European cities analyzed in this study.

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<sup>6</sup> TERÁN highlights this necessity:

*"If the city is seen as a field of moving forces, which constantly reorganises itself, or as the economic and social result of a combination of historical circumstances in dynamic interaction, we are using a very accurate method of understanding the city, which starts with the consideration of the transformation-provoking elements and highlights the changing, transitory and moving aspects of its nature". TERÁN, F. de (2002): "Medio siglo de pensamiento sobre la ciudad", Discursos de Ingreso en la Real Academia de Bellas Artes de San Fernando.*



### 3. PRESENTATION OF THE CASE STUDIES

Six singular cases of intervention in urban projects around European stations in medium size cities, with a population in their metropolitan areas of no more than half a million people, have been chosen for analysis. These are the cases of Liege, Strasbourg, Kassel, Cuenca, Stratford, and Arnhem.

The choice of cities includes very different aspects in the solutions adopted for integration of the railway lines in the urban area.

The Dutch city of **Arnhem** takes advantage of the future redevelopment of the railway line for high-speed services. The strategy of re-designation of the land use in the area adjacent to the old railway station and the generation of the new station neighbourhood attempts to solve the existing inter-modality problems.

The UNStudio project with Ben van Berkel as the head attempts to integrate the different elements under one roof from which two office towers rise (Arcadis-Essent) forming the World Trade Centre. The proposal includes the reorganization of paths within the station through a new tunnel and an overhead walkway accessed from the other side of the tracks. The project also provides a bicycle parking facility and significantly increases the size of the car park, around 5000 new places in the newly urbanised area where about 150 new dwellings will be built, as well as 1,000 square metres of cultural installations.

The new Arnhem Master Plan Maestro for the Rijnboog neighbourhood, which extends from the Central Station to the Rhine, consists in the redevelopment of a degraded area that has great possibilities for transformation. The project, envisaged initially by Manuel de Solà-Morales, is divided into two phases, the first with an already approved budget, will take until 2014 and includes the renovation of several sectors through the creation of dwellings and commercial spaces, the pedestrian connection with Central Station and a controversial plan to bring the city closer to the Rhine by creating an interior port. The second phase, which will take until 2019, will undertake the redevelopment of the residential blocks as well as the pedestrian route linking Central Station with the Rhine footpath that goes to the future marina.

The **Strasbourg** case is different, as it redevelops the role of its old station through a complete structural remodelling to enable intermodal connections. The station and its plaza provide a spatial and visual tribute to the architecture and urban planning of this century. Situated in the heart of the city, the terminus is placed on the edge of the consolidated city, providing service for an extended metropolitan area.

The reorganization of the station and its surroundings are part of a urban redevelopment strategy de renovation that goes further than the physical ambit of the station itself, attempting to fundamentally improve the access conditions and to promote inter-modality in public transport.

The high-speed station also proportions a new “centrality” character, as an axis for generating a development strategy based on construction of new lodgings and activity centres. The urban transformation strategy throughout 11 km distributed from east to west that, with a total of 250 Has., links the principal development poles of the metropolitan area. The largest operation is the Strasbourg-Kehl axis, with more than 100,000 m<sup>2</sup> of new architecture and a diverse service offer.

**Liege**, however, proposes a radical transformation in the relations between the city and the railway station. By breaking the barrier effect created by the railway an attempt is made to facilitate the relations between the two side s of the historically separate city. Situated between two different zones of the city of Liege, the Cointe Hill and the Guillemins Neighbourhood, the station is connected towards the city by a grand boulevard with water and green spaces. The connection with the city is extended with the creation of a pedestrian walkway over the river Mosa. The strategic localization of the station permits rapid connection to the A602 (E-25) motorway which links to the northern E-40 and E-42 ring road. The urban renewal of the Gillemins neighbourhood is defined by its strategic situation linked to the new railway infrastructure. The neighbourhood has become a thoroughfare towards the central station and the reconversion of the zone responds to a strategy of recuperation of urban quality in the degraded surroundings and has the visual reference of vanguard architecture.

An urban project is under development, whose objectives are to provide diverse public spaces for pedestrians, namely an open tree-covered square and the previously mentioned bridge over the Mosa. The reconstruction will approach the urban tissue through new more open typologies where mixed use can be developed (public and private offices, housing, hotels and

commerce), as well as enhancing the value of the historic heritage, while respecting the historic structure of the neighbourhood, and the new contemporaneous landscape created by the image of the Santiago Calatrava station.

In the case of the English city of **Stratford**, the connection to high-speed services is through the new intermodal station, which has brought about a scale change in the Greater London communications structure. *Stratford International Station* becomes an urban reference of the complex metropolitan system, greatly improving the offer that will be available in the future 2012 Olympic Village.

Stratford International is a mega-structure that has been created with the intervention of the public and private sector to redress the urban vacuum among the municipal areas of Newham, Hackney and Tower Hamlets. The station is situated in the neuralgic centre of this vast space which, through a system of walkways over the railway lines, enables the interrelation of all parts of this new urban tissue. The Stratford International area, which is currently a large unused extension, will be the seed of a new way of urban planning in the London conurbation, with the recuperation of traditional mixed use schemes.

The Master Plan for the area establishes a structure of permeable occupation, where different tertiary uses associated with the Olympic Village are concentrated. The infrastructure will act as a catalyst for regeneration the lower Lea valley promoting new residential development estimated in 5,000 dwellings, recreation services, commerce, etc.

The Wilhelmshöhe station, in **Kassel**, provides, like many other German cities, an example of compact intermodal infrastructure in a mainly low-density residential area. The large pergola that covers the transport interchange zone creates a referential element within the urban area. The intervention, compared with other European cases analyzed, is remarkable for its austerity and its criteria and extension, but it shows great efficacy. The contact of the station with the public thoroughfare is through a huge pergola under which the interchanges among the different transport modes take place. The station itself is conceived as a connecting element between the two sides of the city, both for vehicles and pedestrians.

The subterranean lines of the Kassel station favours rapid access to the station building and the car park, situated over the platforms.

Beside the station there is a public transport interchange. To improve the circulation in the area, the tram lines have been brought from the middle of the street to the station access, thus bringing it closer to the bus lines within the urban transport interchange. Moreover, in Kassel the Regiotram enables connections to the urban centre and other regional destinations directly from the platforms.

The connection with the outskirts of the city is guaranteed with an interurban bus service. The taxi services also use this zone. The Wilhelmshöhe station neighbourhood has recently culminated with the installation of hotel chains and restaurant services that are providing a new impulse to the zone.

The **Cuenca** station provides a new centrality originating with the high-speed localization. In contrast to the previous cases, this new station is the driving force for a new occupation of rural land by housing and tertiary activities. It generates a new mega-neighbourhood that facilitates the connections between the historic city and the high-speed stop. The project, currently under development, places the station building perpendicular to the train lines and has a surface area of 3,950 m<sup>2</sup>. To the northwest, the 303-place car park is parallel to the train line. The zone public transport parking area in front of the south face of the station has a surface area of 5,400m<sup>2</sup> and is composed of a public plaza, taxi rank and two bays for buses.

The station will have two spaces. The first will contain a hall, the passenger transit zone and a boarding zone. The second will have the ticket sales zone, public information point and commercial premises. The project recommends sustainable building with solar panels to obtain hot water and geothermal energy for climatization.

The General Urban Plan, approved in 1997, is the current town planning standard in Cuenca, although in 2006 the Municipal Planning Scheme was submitted to public information. In the new plan an extensive re-designation of land use is proposed, in terms of surface area, so that the residential land is extended from the consolidated city to the limits of the HSR train station, near where a large number of economic activities are also being generated. The proposal has been rejected by various public and private bodies. At present and due to this conflict of interest, a new town planning document has not been re-submitted.

TABLE 1. TERRITORIAL AND SOCIO-ECONOMIC SITUATION OF THE CASES STUDIED

	<i>Year of first services TAV.</i>	<i>Nº de lines of HS. /nº líneas noTAV</i>	<i>Nº de passengers/year in station (year)</i>	<i>Population municipal area (year source)</i>	<i>Population metropolitan area.</i>	<i>Surf. km² municipal area</i>	<i>Surf. km² metropolitan area.</i>	<i>Distribution of the sectors in the activity of the province (%)</i>		
								<i>Agriculture</i>	<i>Industry(*)</i>	<i>Tertiary</i>
<b>STRASBOURG</b>	2007	8/13	15,000,000 (2009)	276,063 (2007, INSEE)	474,524 (2007, INSEE)	78.26	304.01	2	29	69
<b>ARNHEM</b>	2002	2/10	14,600,000 (2009)	143,582 (2008, CBS)	306,230 (2007, CBS)	101.53	373.16	4	38	58
<b>STRATFORD</b>	2009	1/18	2,500,000 (2009)	111,484 (2001, Census)	250,000 (Newham)	36.22	36.22	39	13	54
<b>CUENCA</b>	Foreseen 2010	2/2	-	54,600 (2008, INE)	217,363 (2008, INE)	1712	17.061	2	30	68
<b>KASSEL</b>	1991	7/18	6,400,000 (2009)	193,392 (2007)	239,373 (2007)	106.81	1292.48	1	44	55
<b>LIEGE</b>	2002	2/16	13,140,000 (2009)	190,102 (2008, INS)	750,000 (2008, INS)	69.39	265	4	25	71

(\*) The % of the construction sector has been incorporated into the secondary sector.

The individualized details described summarise the main characteristics of the cities and their stations. From a contextual analysis of the territory and the urbana rea where the station is located, to a broader study of the decision parameters and the strategies of infrastructure planification, urban project and their new opportunities.<sup>7</sup>

<sup>7</sup> For a complete vision of the details of each city studied see Ribalaygua C. and García F., 2010. As well as the aspects described, in those cases where it was detected, the analysis of the promotion activities for tourism and business investment are also included, although this aspect is not the object of analysis here as it is not common in all cases.

## 4. RESULTS

The analysis of the variety of solutions found enables some conclusions to be drawn with respect to the relations between city and high-speed railway station. The most outstanding aspects refer to the strategies in terms of *prevision* and *project*, which include the localization of the station, the reservation of land and the solutions in terms of image and urban linking around the station.

The decisive factors in the configuration and impact of the activity spaces linked to the station are of two possible types: on the one hand, factors to do with the physical or socio-economic situation of the nucleus and, on the other hand, factors related to the strategies that accompany the arrival of the high-speed train.

Thus, among the aspects analyzed in each case we can distinguish two groups of factors that intervene in the definition of the urban project:

### **Intrinsic or structural factors about the station and the city:**

- situation of the city in the network
- localization of the station

### **Extrinsic factors or factors created with the accompanying strategies:**

- connection with other modes of transport
- mitigation of the barrier effect
- consolidation of an urban image

These aspects, along with some specific cases of urban promotion of the city, have been identified in all the European cases as key factors in the configuration of the urban project. Tables 2 and 3 synthesize some parameters that were useful in the comparison of the cases studied.

### **a) Intrinsic or structural factors about the station and the city**

#### **Situation of the station in the network**

The situation of the station in the hierarchy of the railway network implies the potential of the station as a connection and gives an indication of the importance of the station in the national or even international context.

Table 1 shows the interconnection with other lines, which is common in European countries, and demonstrates the enormous rail node in Strasbourg, a city in the European country with most experience in high speed. However, this “dimension” of the area of influence of the station in terms of potential travellers does not necessarily correspond to the physical dimension of the urban project, or to the importance that the focus or the decisions in the project may have in the urban surroundings. Thus, we can see that in the Strasbourg case, despite having 15,000,000 travellers a year (2009)<sup>8</sup> and interconnection with 8 high-speed lines and 13 regular lines, it is the city that programmes the smallest intervention in the surroundings of the station.

The Kassel case shows the inverse situation: a station where 6,400,000 passengers come per year (7 HS lines de AV and 18 conventional lines in the station), has foreseen a urban actuation around the station that will reach 46,000 m<sup>2</sup>, with usages related to residential, commercial and service areas, of which 7,700 m<sup>2</sup> correspond to the station building.

Nevertheless, the passenger attraction capacity of the station in many cases relates to the regional radius of influence. In this sense, the transport service offer with an irrigation effect in the territory augments the demand of both HS and regional transport lines, which increments the importance of the number of passengers utilizing the railway station and so the improvement in the service offer. This is a self-feeding strategy which is advantageous both for the railway company and local and regional interests which can optimize access to the new network.

### **Localization of the station and planned usage of its surroundings**

The placement of the station determines the possibilities of actuation, not only related to the above-mentioned opportunities for regeneration, but also related to profitable land use and economic benefits. In the case of rehabilitation of central areas, despite the urban renovation being conditioned by pre-existing factors, their effects have a greater effect on the whole city than on the stations that are on the edge of the city or in the periphery.

This is the case of Liege, where they plan an urban restructuring with offices (public and private), housing, hotels and shop in an area of 140,000 square metres. This is a clear example of the use of the new station for the transformation of the station neighbourhood, and with it

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<sup>8</sup> Source: SNCF

so too the urban structure. A similar case is found in Arnhem, where the arrival of the HSR is accompanied by the remodelling of the Southern Neighbourhood (Rijnboog), with 30,000 m<sup>2</sup> planned for areas for residences, offices and equipment and the creation of a marina.

The stations on the edge or in consolidated zones at some distance from the urban centre enable the development of the surroundings without existing conditioners. In this way, the land use is freer, although the positive repercussions for the city are less direct. The case of Stratford is of this type, with an integral plan whose goal is the renewal of a currently residential and tertiary neighbourhood, with an orientation toward new installations and urban growth associated with the Olympics.

In the Cuenca case, the station brings about a complete change in the pre-existing state of the territory, where a rural space will be transformed into a new residential neighbourhood whose driving force will be the station along with some tertiary and productive activities. In both cases there will be large interventions on the scales of those cities, although on a different scale (due to the different scale of the cities: the first in the metropolitan area of London and belonging to a municipal area (Census) with double the number of inhabitants of the small Spanish city of Cuenca (54,600 inhabitants), at a distance from the big Spanish cities. In both cases the operation will involve a large area of land for the intervention, although its repercussion in the consolidated urban zone is not, at least in the short term, significant.



**TABLE 2. LOCATION OF THE STATION AND CHARACTERISTICS OF THE INTERVENTION**

	<i>Placemen t of the station</i>	<i>Previous activity around the station</i>	<i>New activities proposed around the station</i>	<i>Station buildin g: new/ reforme d/age</i>	<i>Year of first service in the station</i>	<i>Is the arrival of HS used to transform the neighbou rhood?</i>	<i>Dimensio ns of the interventi on strictly in the station (m2)</i>	<i>Urban Actuation around the station (m2)</i>
<b>STRASBO URG</b>	Central- edge	Residentia l/Tertiary	No new proposal. It is a consolidated area.	New and Reform ed	2007	Partially	2000	23000
<b>ARNHEM</b>	Central	Residentia l/Tertiary	Surroundings with mixed use. Residential, offices and equipment, creation of marina.	New	2012	Yes	4700	30000
<b>STRATFO RD</b>	Edge	Residentia l/Tertiary	Integral plan for renewal of the Station area.	New HSR station	2010	Yes	8400	500,000
<b>CUENCA</b>	Periphery	Rural	Plan de Ordenación Municipal town plan to be established. Proposal for extension of residential and economic activity area.	New	2011 foreseen	No	3950	18,250
<b>KASSEL</b>	Central- edge	Residentia l/Tertiary	Around the station residential, commercial and service areas are proposed.	New	1991	Partially	7700	46000
<b>LIEGE</b>	Central	Residentia l/Tertiary	Urban project for restructuring: offices (public and private), housing, hotels, shops.	New	2009	Yes	32000	140,000

## **b) Extrinsic factors or strategies developed to accompany the arrival of the railway**

### **Strategies for connection with other transport modes**

The interconnection with other transport modes opens up new development opportunities generated by the high-speed railway. A determinant factor in the success of a station originates in the intermodal offer of the station and its immediate surroundings.

The intermodal connections have a triple scale: local, regional and interurban. The immediate access to the local public transport network is indispensable for the optimization of the high-speed services in the city and the consolidation of a sustainable model. On the other hand, the regional connections, especially with commuter belt services and transfers to airports, are key in opening up the area of influence of the station (and with it probably its rail offer). In this sense, the connection capacity with other interurban destinations contributes to the consolidation of the station as an activity pole and reinforces the opportunities of the railway service.

From the analysis carried out, it can be concluded that the majority of European countries guarantee the interconnection with other modes of transport. Thus, in the cases of Strasbourg, Arnhem, Stratford, Kassel and Liege, the connection of the HS stations to conventional railway lines and urban and interurban buses was verified. Moreover, in the cases where there are other specific modes of transport such as the metro (Strasbourg, Stratford and Liege), the tram or regional trains (Kassel) or the trolleybus (Arnhem), these services are also linked to the HS stations.

Except in the Spanish case of Cuenca, it is also frequent to have parks for bicycles, although there is not always a direct connection with the local bicycle lanes. The number of parking places available varies depending on the cases, but around a thousand is the most frequent number. The information about the distances from the station doors to the other modes of transport can be seen in table 3, where the lack of programmed communication with the Cuenca high-speed station should be highlighted, as it is still in the project stage.

**TABLE 3. STRATEGIES FOR INTERCONNECTION WITH OTHER MODES OF TRANSPORT**

	<i>Private car places</i>	<i>Bicycle park?</i>	<i>Dist. (m) to cycle lane</i>	<i>Distance in metres to stop:</i>							<i>Distance en kms .to Stations and Airports:</i>		
				Rail	Metro	Tram	Inter-urban bus	Urban bus	Taxi	Others	Interurban bus	Regional trains	Commercial airport
STRASBOURG	1000	Yes	160	0	50	-	-	100	95		0.750	0	12
ARNHEM	1000	Yes	190	0	-	-	120	120	150	Trolleybus 120	0.120	0	86
STRATFORD	1000	Yes	No	0	0		20	20	20	no	20	0	9
CUENCA	303	No	No	5,000	-		5,000	0	0		5,000	5,000	160
KASSEL	500	Yes	60	0	-	50	50	50	40	0	50	0	15
LIEGE	800	Yes	No	0	0		0	0	0		0	0	

### The station's role in configuration of the new urban landscape

The high-speed network is intimately related to a vanguard image, in such a way that the new station represents an opportunity to hook up to the future in the transport context. In this sense, the railway stations are useful to re-establish an image of the city and of the areas linked to stations, generally degraded or practically abandoned zones.

The station has been converted into the emblem of change and transformation of a building that provides a guideline for town planning and architectural development of the surrounding neighbourhoods. Thus we can see in all the cases that the arrival of the high-speed train is used to transform the neighbourhood where the station is, with interventions in stations that range from the 2,000 m<sup>2</sup> to the spectacular extension of Stratford, with a project for around 200,000 m<sup>2</sup> in the station and 500,000 m<sup>2</sup> of urban development in the surroundings.

The Strasbourg central station serves a wide metropolitan area. Its rehabilitation is framed within an urban renewal strategy that goes further than the physical ambit of the station itself, attempting to fundamentally improve the accessibility conditions and to promote inter-modality in public transport. The original German neoclassical station, dating from 1883, has been maintained with a functional reorganization of the services. The project, designed by the

architect Duthilleul (AREP) establishes a transition from the public space through a large glass structure of 120 m. long and 23 m. high with a surface area of about 2,000 square metres.

In the Liege case, the municipal strategy for the recuperation of the urban quality of the neighbourhood has the visual reference of the vanguard architecture of the high-speed railway station. The objective is to develop a complementary pole which is competitive with the city centre which at the same time contributes to the reinforcement of a specific urban image.

This situation is repeated in all the cases analyzed, where the station is much more than a mere communication space and becomes a symbol of modernity, as can be observed in the graphic analysis carried out in the document (Ribalaygua C., 2010)

### **Measures to mitigate the barrier effect**

The railway infrastructure, inherited from the nineteenth century industrial development, last century became a conflictive element in the development of contemporary cities in the majority of European scenarios. The change to the new high-speed system may or may not generate a substantial modification of the relations among different parts of the city, depending on the strategies defined in the project.

In the analyzed, it can be observed that on occasions the station itself is the connecting device between two parts of the city, as happens in Liege, where the historic barrier had an inaccessible length of 750 metres, which has been drastically reduced with the intervention provoked by the arrival of the high-speed train, as is confirmed in the graphic analysis.

In Stratford, the creation of overhead walkways also enables the improvement in accessibility. The initial barrier of more than a kilometre has been bridged by four new crossings that communicate both sides of the urban area. Once again the strategies that minimize the barrier effect have been protagonists in the design decisions about spaces linked to the new railway.

Other interventions do not start with a previous barrier state, such as in Cuenca or Kassel, where a crossing minimizes the communication break between the two sides of the city. In Arnhem and Strasbourg, however, the intervention generated by the arrival of the new train has not been used to lessen the historic scar that the railway leaves in the city. In fact, the kilometre of separation without crossings and the 560 metres in Arnhem are only broken by one functional crossing.

## 5. CONCLUSIONS

The arrival of the new train line to a nucleus provides an opportunity for increased dynamism in a space that generally has a high localization value but also has problems inherited due to the scar of the nineteenth century railway. The current situation of centrality of the railway stations enables the City Halls to develop projects that integrate the new mode with other existing transport systems and so to guarantee an efficient use of the new accessibility conditions.

In the analysis carried out of systematic studies of cases of different European countries common patterns can be observed related to the purposes of interventions. In the first place, a direct relation can be seen between the city's "intrinsic" factors and its situation in the network, and the potential impact of the station in the city. Added to this starting situation, three types of common strategies or "extrinsic" factors can be highlighted: the configuration of the new landscape or image, the designs that favour inter-modality and those that break down the barrier effect. The projects analyzed and the quality of the proposals depends on these three variables. Although the previously mentioned localization factors condition the strategies the cities adopt, the City Halls have the possibility to develop them or others that enable the optimization of the arrival of the high-speed train to the nucleus.

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