III The development of the HST in Europe

As pointed out in the previous chapter, the delimitation of a discourse is difficult to define and will necessarily remain fuzzy. The developed approach based on the three dimensions of discourse provides the framework for the analysis of planning cases with an emphasis on specific (national, regional, local) contexts. Yet it is clear that all case study regions form part of Europe and the European Union, which represents the general context of the analysis. The emergence of the HST as a transportation means and policy vehicle, as well as the development of a European policy framework for its implementation are therefore crucial discursive references in every planning case.

Furthermore, for planning the integration of the HST a large amount of *expert knowledge* about this transport mode and its relation to sectoral developments has become available from research activities parallel to the planning processes, and has also been constantly growing in terms of scope and quantity. Consequently, this knowledge also represents a trans-national reference for the respective planning discourses.

Both, the expert knowledge and the European context and chronology of the HST are presented in this chapter as an introduction to the case studies. This review is not comprehensive and also not rigorously structured according to the three discourse dimensions of context, process and text, although these are necessarily present. It is not meant to form a "5th case study" (which would go beyond the scope of this thesis), but gives preference to the basic understanding of the HST and its context, framing the four cases in respect to the process and the concepts developed, and providing the clues for the interpretation of the planning discourses.

1 HST and spatial development

Abundant information is already available regarding the interrelations of high-speed train lines and spatial development since the subject has been studied by different disciplines for more than two decades. Yet, this has been done with a changing focus of interest. In a first approach, many studies have been analyzing the creation of particular HST linkages in order to identify their "impacts". One can distinguish empirical studies of the transport effects immediately after HST operation from empirical studies on space-functional effects that consider longer time periods and therefore have only been feasible in Japan, France and – to a limited degree – Germany.[1] These evaluations of *measurable effects* of the HST on transport systems, spatial structures and urban development have provided a first stock of knowledge and hypotheses with an important orientating function for the starting process of HST integration.

Despite that, the advance of HST projects in various European countries showed that the set goals could not always be achieved easily, while at the same time new problems also arose.[2] The insufficient scope and explanatory frameworks of the different impact assessment studies thus became visible. Yet they

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[1] Schütz 1996, 51

[2] cf. Zembri 1997, Troin 1997

have still been (and are) commissioned and realized as an attempt to reduce the complexity of the subject and supply orientation for (sectoral) policy decisions.

A second type of research approach then emerged with a focus on the *planning processes* and the *context conditions* that influenced the projects. This has been based on cross-national comparative case studies in major agglomerations, but concentrated on the level of the urban project (main station areas). Here the principal research interest consisted in identifying “success factors” for the integration of the HST, including the analysis of qualitative aspects and a broader array of sectoral implications. These studies have decisively contributed to a better understanding of the practices and problems of HST integration and developed helpful analytical and conceptual frameworks. However, the criteria for the envisaged “success” have either not been made explicit or else show a strong bias towards a particular research interest.[3]

1.1 Characteristics of the transport mode HST

1.1.1 Technical features

Compared to conventional rail, what is now commonly understood as a high-speed train is characterized by a high operating speed of 200km/h or more. It is mainly conceived as a passenger transport mode, whereas applications for schedule-sensitive freight (parcels, perishables) still play a subordinate role.[4] To achieve the high speeds, three conceptions have been developed and applied so far. They differ substantially in respect to their implications for spatial and urban development.

The first option consists in the construction of new specialized infrastructure for the exclusive use by high-speed passenger trains, so that the gradient and curve radius of the tracks are limited. Rolling stock, control and signal system are designed specifically for this type of “HST only” operation. This model allows maximum operating speeds of 270-300km/h on the new tracks and has been adopted originally in Japan (“Shinkansen”) as well as in France (“TGV”).

Second, the rail infrastructure can be used by both specially designed HST and conventional trains. The existing infrastructure is, for this purpose, upgraded by adapting gradients and curves, while new tracks are built with compatible control and signal systems. Here, maximum travel speeds of 200-250km/h can still be reached. It is the model applied in Germany as well as in other West-European countries that currently envisage the introduction of HST services. Yet, combinations between specialized HST tracks and mixed operation can equally be found, for example, in the Netherlands, while Germany has also decided to build a new Cologne-Frankfurt track for HST only.

The third conception makes use of tilted trains that allow an increase of up to 40km/h as well as operation on existing tracks without major infrastructure modifications as the trains level their position when running through narrow curves. Travel time reductions are therefore significant, but not as spectacular as in the case of an HST operation based on new infrastructure. This solution has been the starting point for the

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[3] cf. Berg/Pol 1997, 1999, Bertolini/Spit 1998, VROM 1998. Only Schütz (1996, 196) refers the integration of the HST to an urban development model he defines as the “European city”.

[4] HST freight will only be dealt with here in as much as it has significantly influenced the integration of the HST as a whole.

Swiss “Bahn2000” program that does not envisage the construction of dedicated new HST tracks. Italy (“Pendolino”) and Sweden (“X-2000”) have also opted originally for this kind of train. In the meantime, the German and French railway operators have purchased tilted trains too, as a complementary measure for certain sections.[5]

1.1.2 Costs

Nevertheless, the acceleration of the transport mode “train” is not only a question of speed. Regarding the required infrastructure investments for these alternatives, the construction of new tracks results in being the most expensive by far. In Germany, the average cost per km of new track has been estimated at €26mio, compared to €0.7mio. for upgraded tracks, last but not least due to the sophisticated control and signal systems.[6]

To this, one has to add the augmented sensitivity of the HST for track irregularities or deformation resulting from intensive high-speed operation or mixed operation with heavier (freight) trains. The narrow limits of tolerance therefore cause comparatively high maintenance costs, which in economic terms can make a specialized operation the more attractive solution.[7]

Regarding absolute costs, the HST is an extremely expensive transport mode. As investments usually exceed the possibilities of public budgets, private finance has become an important source for realization. Yet, this combination of high costs and profitability interests makes the HST, from the outset, highly susceptible to possible modifications in the financing modes or operation revenues.

Total costs of the currently envisaged European HST network mount up to €200billion to be invested in the period from 1993 to 2010. Between 1993 and ’99, €88billion have already been spent, so that according to official estimations, the investment still required is equivalent to 0.19% of the annual GDP of the countries concerned.[8]

1.1.3 Energy consumption

Another important aspect of the HST is the unfavorable correlation of energy consumption and speed. As a consequence of speed increase, the weight of the rolling stock has to correspond to stability and security requirements, necessitating high energy supplies for the phases of acceleration and braking. Compared to a conventional train, energy consumption thus results in being 45-67% higher, depending on the vehicle generation (e.g. ICE, ICE2). This is a direct consequence of the speed increase, as energy consumption doubles with the acceleration from 160 to 250km/h or from 200 to 300km/h, and still rises by 50% from 200 to 250km/h (figures for ICE and TGV).[9]

The positive image of the HST in terms of energy efficiency and emissions is based on the practice to exclude the primary energy supply from calculations. As a result, the distinctions between the positive

[5] cf. Strohl 1994, 23

[6] Schliebe 1983, 215

[7] cf. Strohl 1994, 21

[8] CEC 1996, 89

[9] Zängl 1993, 53

characteristics of the conventional railways, in this respect, and the specific disposition of the HST, have become blurred. For instance, in the environmental impact assessment (EIA) for the European HST network carried out for the European Commission, it is estimated that passenger cars consume 2,3 times and aircraft 3,0 times more energy than the HST for the same transport performance.[10] By contrast, in 1991, a German government commission incepted for the evaluation of the future development of the national railway company (DB), noted:

> "In long-distance passenger transport the primary energy consumption of the HST is – against general expectations – alarmingly high. In terms of passenger kilometers the ICE consumes approximately as much primary energy as a passenger car and not much less than newer airplane generations." (RKB 1991, 52, *translation*)

This subject can certainly not be resolved here, but poses a fundamental question mark in respect to the argumentative ground that has supported and supports the development of HST connections, in particular according to the first two infrastructure conceptions.[11]

1.2 Spatial implications of HST conception and operation

In respect to these system characteristics, the HST influences spatial structures and development dynamics through a wide range of factors. First of all, its conception has implicit effects on the cognition and value orientation of the actors that partake in the definition of future HST plans and projects, as well as of other social actors and potential users. At the same time the high investments and the HST-specific conditions of operation and urban integration also modify planning procedures or prompt institutional change.

The spectrum of implications broadens immediately once the HST is in operation. We then find changes in four principal dimensions: Transport flows and further adaptations of the transport networks, altering dynamics in regional economies and the distribution of employment and incomes, local environmental impacts and long-term effects on the eco-system, and finally urban developments and shifts in the space-functional structure of regions or countries (Fig.III.1).

Last but not least, a direct economic effect is also generated through the physical construction of new HST infrastructure and related urban projects. Especially for the planning process, the direct economic effects play an important role as a supporting argument. However, they will be neglected here due to their short-term character and the difficulty of quantification and comparability.[12]

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[10] Quoted in CEC 1998, 102; Yet, even if the primary energy consumption is considered, the figures remain questionable. The study uses the example of the Swedish X-2000 to illustrate the positive energy balance of the HST - thus assuming that this tilted train system with maximum speeds of 200km/h as well as the Swedish energy supply-mix with 52% hydropower and 42% nuclear power would be "representative". (*ibid*.)

[11] See also: Whitelegg/ Holzapfel 1993, 206; Whitelegg/ Hultén/ Link 1993, 231; Estevan/ Sanz 1996, 231-33

[12] See also: Schliebe 1983, 215; Schütz 1996, 51

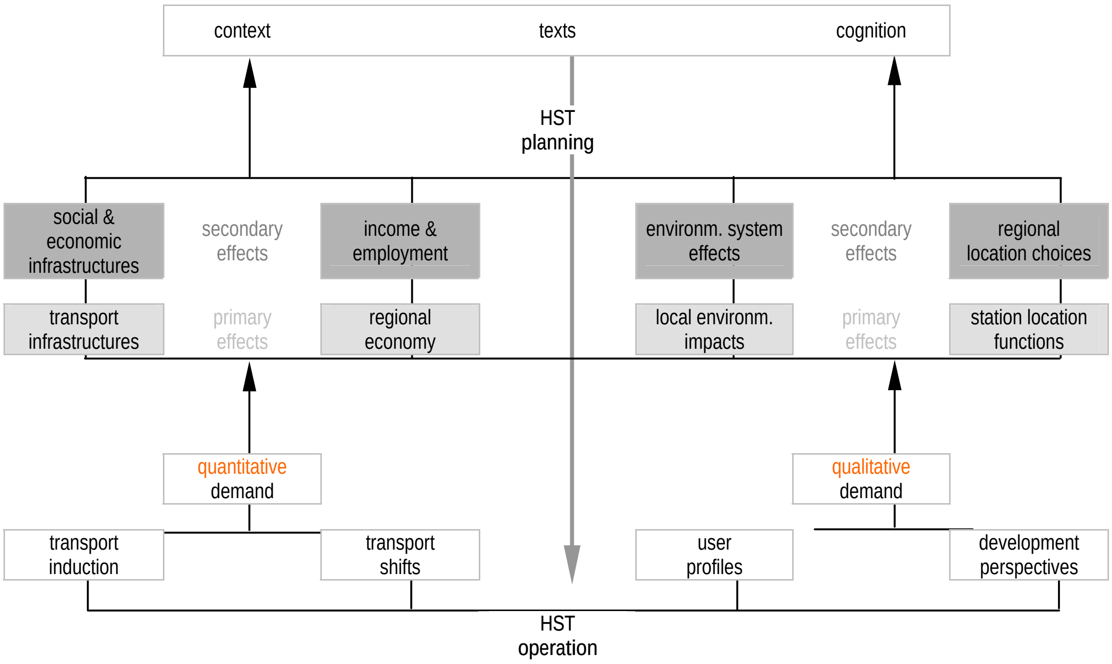

Fig.III. 1: Influences of HST planning and operation on spatial development; following Schütz 1996, 11 - *modified*

1.2.1 HST and the transport system: Substitution, intermodality and induction

First of all, the HST results in having important implications for air travel. The two transport modes appear to be both competing and complementary, depending on the particular transport relation considered. The ambiguities of this intermodal relation have been elaborated in a COST study[13] on the interaction of HST and air travel carried out in 1998. It shows that, regarding competition, and for distances up to 500-600km, the creation of an HST line between two cities has led to shifts of passenger transport volumes from the aircraft to the HST.

Short travel times and high frequencies have been identified as the most influential factors for this “substitution” of short distance flights. If the connection is attractive, the HST can contribute to liberate capacities at the airport, enlarge its catchment area and increase the number of international/-continental flights offered. This is also exactly the expectation of the aviation industry, which does not show major concerns about a “competition” with the HST, but underlines the advantages regarding capacity extensions and efficiency gains for the air traffic system as a whole, as the conditions of a Paris-Lyon-type link are rather singular.[14]

With respect to a potential complementarity, the exact location of the HST station becomes more important. Airports with a direct intermodal connection to the HST allow the combination of both modes without additional changeovers or public transport trips between the station and the airport. The

[13] European COoperation in the field of Scientific and Technical research

[14] Neumeister 1995, 21-23

integration of ticket and luggage services may further facilitate this option. However, the COST study also concludes that the HST connection of airports furthers air transport concentration on major “hubs” that benefit from the passenger potentials at small and medium sized airports where the result of an HST connection is either balanced or negative.[15] The study proposes to consider 32 airports in 29 cities and 15 countries for a connection to the HST (multiple locations in: Germany: 6, UK: 4, France: 3 – London: 3, Paris: 2), distinguishing three types of complementary journeys:[16]

- Intercontinental relations: HST takes over the European segment of the journey
- Intra-European relations a): HST connects less attractive centers with little demand to airports with good offer
- Intra-European relations b): HST relieves a major airport from congestion

At present, the interconnection of airport locations by HST does not have any distributive effect that would increase the efficiency of the transport system. However, in the COST study this is deemed to be possible as soon as the large airports reach congestion.[17] In the logic of the HST, the concentration and congestion of flows at major air transport hubs thus results in being a condition for an improvement of transport efficiency.

The operation of an HST line has significant inferences for road transport as well. A study on rail traffic development and profitability commissioned by the International Railway Association (UIC) in 1993 estimated that from 1990 to 2010 rail traffic would increase by 73%. Three quarters of this transport volume would be shifted from the road (55%) and the air (45%). The UIC underlines that, for this purpose, average speeds need to be around 200km/h, meaning operating speeds of 250 to 300km/h (Fig.II.2).[18]

Shifts from the road to the HST have in fact been observed for travel distances up to 150km. However, these shifts result in short-term effects, as the case of the first European HST line Paris-Lyon indicates. Here, the HST has initially taken over a certain share of the transport growth. Yet, after five years the road transport volume continued to grow with the same rate as before. The HST has thus provided a temporary capacity increase that allowed further road transport growth (Fig.III.3).[19]

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[15] CEC 1998, 165; cf. Schütz 1996, 57

[16] CEC 1998, 71-72

[17] CEC 1998, 167

[18] UIC 2000, 35, 37

[19] cf. Schütz 1996, 55

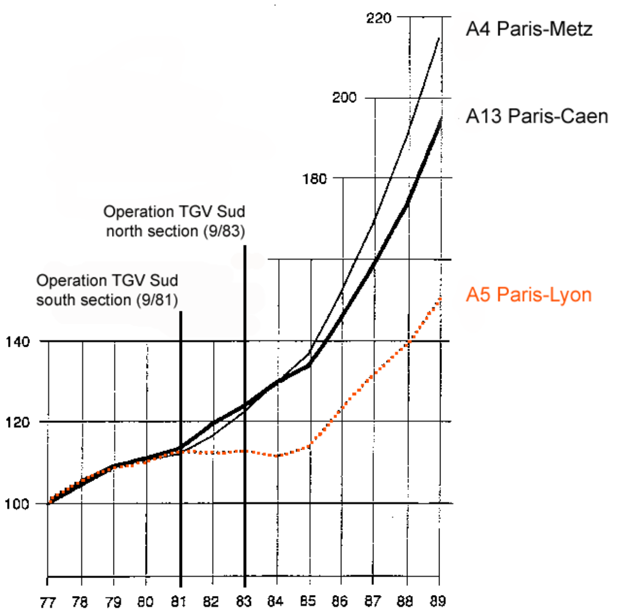
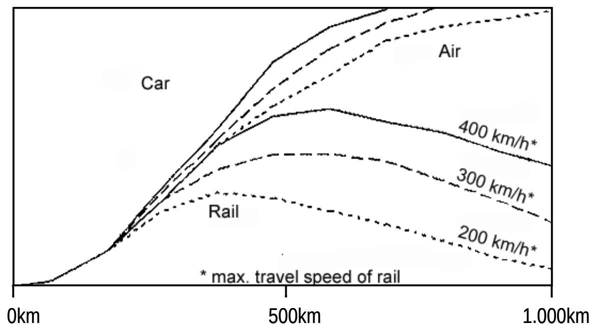


Fig.III. 2 (left): Short-term influence of the HST on the development of motorway traffic volumes in France; Source: Schütz 1996, 56

Fig.III. 3 (below): Transport market of the HST in relation to road and air transport, depending on operating speed and travel distance; Source: CEC 1998, 164



Apart from capturing present or future air and road passenger volumes, the HST also heavily *induces* new transport volumes. Yet, comprehensive studies on this effect are countable and only consider primary induction, i.e. new transport that resulted from the creation of the HST offer. The dimensions vary from project to project, for instance 15% (Okayama-Hakata), 34% (Madrid-Seville), 41% (Amsterdam-Paris), 45% (Paris-Lyon), or 50% (Hannover-Würzburg). Nevertheless this shows that a substantial part of HST users would not have travelled at all without the HST offer.[20] This fact is particularly important since it reflects that the HST modifies and *extends the existing spatial patterns of social interaction*. With respect to secondary induction effects, i.e. new transport as a mid- to long-term feedback from changing location choices and spatial structures favoured by the HST, empirical studies have not been realized so far.

Moreover, the HST also induces new transport volumes on its feeder systems, i.e. local roads and public transport networks. This traffic has an urban regional scope, focused on the accessibility of the HST station(s) and requires existing capacity reserves or new capacities in order to avoid negative effects on the already congested urban regional transport infrastructures. However, systematic quantifications of this effect are not available.

1.2.2 Implications of the HST for spatial development

Infrastructure

As a first implication of the HST system, the number of stops that are served on a single journey becomes reduced. To reach the high speeds, the HST requires minimum distances between stops that assure the envisaged travel time advantage compared to conventional trains. Thus, the HST supports a highly

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[20] Schütz 1996, 58; Klein 1999; V&W 1994, 98

selective large-scale accessibility with a focus on major urban agglomerations, since a basic condition for its commercial feasibility is that sufficient possible origins and destinations of potential HST users can be easily reached from the stations.

This condition also results in new requirements for the interconnection and accessibility of HST stations, as the velocity of the HST also increases the share of the secondary modes in total travel time. In particular the accessibility of HST stations by public transport and private car has to correspond to the modified rail access and envisaged passenger volume increases. They need to become major public transport interchanges, assure road access and incorporate different forms of parking facilities, while also safeguarding the utility and attractiveness for pedestrians. The development of an HST station therefore not only changes the rail infrastructure itself, but also the infrastructures of secondary transport modes, seeking to distribute the relative accessibility advantage and bind dispersed traveller potentials.

But while HST stations experience an “upgrading” of their accessibility level, the in-between space and those stations not served by the HST result in being relatively less accessible. Accordingly the introduction of the HST always opens a severe debate about which stations to serve. The existing main stations in the city centres represent an apparent choice as the urban density of their surroundings is high and their accessibility by public transport and for pedestrians is excellent. This circumstance underpins the competitiveness of the HST as compared against the airplane, where the peripheral location of the airport and the duration of check-in/out procedures prolong the total travel time.

The “heart-to-heart” connection between cities has traditionally been one of the main advantages of the railway system that also applies to the HST, but it is challenged both by the process of suburbanization and the relocation of HST stations. Within large urban areas the existing infrastructures frequently need modification to accommodate the HST and to improve the travel time required for passage. This may lead to the consideration of (partially) underground tracks that remove the HST from the surface and facilitate the track layout. The upshot of such modifications can also be that other urban places appear as suitable station locations, especially those with an excellent road access that contrasts with the city centre. This kind of situation hence poses the questions of which station to use and how to develop the respective surroundings.

Furthermore, beyond the city scale, the design of new tracks that cut down travel times can imply options for new HST stations at places close to the line. The example of Lille demonstrates this possibility at the European scale, but we also find new HST stations originating from the infrastructure layout at the regional level (e.g. Rhône-Alpes-Sud/ Valence), El Vallés/ Barcelona).

Vice versa, the appearance of HST stations at airports indicates that, wherever possible, the design of new infrastructures also takes into account the potentials of specific locations – in this case the direct connection between air travel and the HST. The evaluation of different HST station location alternatives is therefore strongly influenced by considerations regarding physical infrastructures and their conditioning parameters (topography, urban structure, capacity, speed, flexibility, connectivity, costs, etc.), but these are neither the only factors nor the determining ones. The degree to which they apply depends especially on the chosen conception of HST operation (pure, mixed, tilted).

Economic structure

To assess potential regional economic effects of the HST, one has to start from the specific utility and user groups of this transport mode. A common feature of the different operation concepts is the fact that they provide fast passenger transport links between distant locations. Hence, the HST allows the conception of daytime trips or even commuting relations over distances between 150 and 600km, reducing the required travel time to a maximum 2,5 hours.

For long-distance travel demand, travel motives follow a distribution of about 25% business, 25% holidays and 50% leisure- and short-trips. Among these, business trips have the highest share of rail (ca.20%).[21] Yet, the opening of an HST line has always led to substantial increases of rail business trips between the connected locations, both by shifting air and road passenger volumes and by inducing new transport.[22] Some studies on the actual and potential use of HST lines have shown that the share of business trips can even be up to 60% (e.g. Paris-Lyon). On the average, the HST use is thus approaching a similar split between business and leisure trips as in air travel, where these motives have approximately the same share.[23] In respect to this composition, it is obvious that the HST focuses on a specific clientele with good prospects for demand growth. The probability of an average HST user to be male, aged 25-45 and belonging to an upper-income group is therefore high.[24]

Against this background, the integration of the HST can imply important structural economic effects for the connected cities. The improved accessibility represents a potential location advantage and also favours new business contacts and activities. Especially in the branches of (knowledge-based) services, finance and insurance, the importance of face-to-face contacts and accessibility strongly influences location decisions. Furthermore, it is mainly enterprises operating at the inter-regional or international level that profit from the HST, rather than local enterprises.

By contrast, for industries, wholesale and retail (except for the station areas), the direct effects of the HST are irrelevant or even negative (e.g. inner-regional competition and adaptation pressures in retailing). As a result, the process of structural change and tertiarization is further enhanced. Consequently shifts in the regional income structure and the employment market have been observed as secondary effects of an HST connection, as well as an increase of employment demand, salary- and price levels, strongly concentrated on the station areas.[25]

At the regional level the HST supports a reorganization of businesses through the formation of (central) head offices and (peripheral) back offices. Whether the relocations concern regional enterprises or firms from other regions or countries depends on the concrete location, but in most cases inner-regional shifts prevail. Consequently, the space-economic structure experiences become polarized through the concentration of HST affined activities on the one hand, and the regional dispersion of “conventional”

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[21] Schliebe 1983, 220

[22] Klein 1999, 16

[23] dRO 1994, 11; Klein 1999, 16

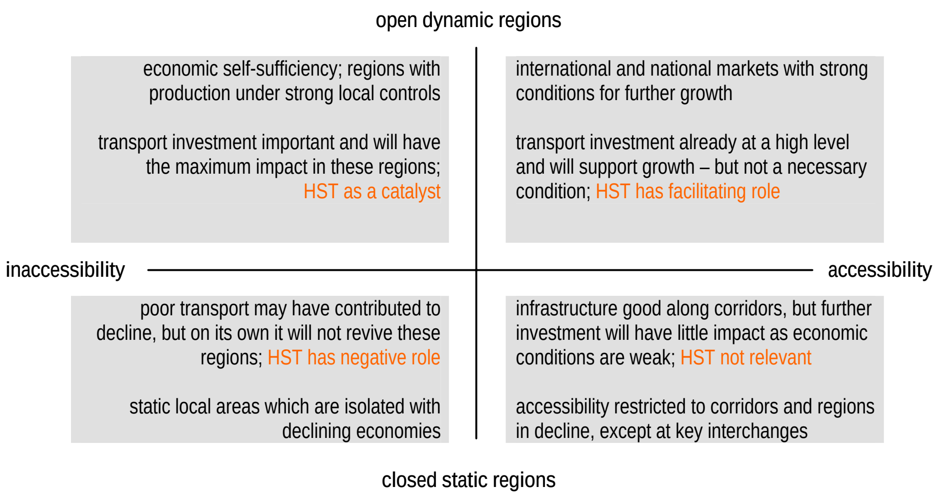
[24] Whitelegg/ Holzapfel 1993, 207

[25] Schütz 1996, 66

activities on the other. The intensity and also direction of these shifts depends in particular on the quality of interconnection between the HST and other transport modes. Once the HST is operative, a reduction of regional disparities can only be achieved if excellent regional transport connections are ensured.[26] An emerging question is, therefore, which systems are realized by priority since the high costs do not allow a parallel completion but the in-between time span may decisively modify space-functional structures.

Not every region benefits from the HST, and if so, not necessarily in the same way. The economic effects of the HST depend on the structural characteristics of the respective region and its capacity to respond to the infrastructural change.[27] In general, four types of regions can be distinguished (Fig.III.4):

Fig.III. 4: Possible relationships between (HST) accessibility and economic development at the regional level; following Banister/ Berechman 2001, 325 -*modified*



For regional economic development the HST can thus fulfil very *different* roles. In the large European agglomerations the HST will act only as a facilitator for developments already on the way. These regions are well accessible and economically dynamic so that the HST has “little to add”. The strongest economic development impulse can be expected in peripheral regions with good location dynamics e.g. South France, North Spain, North Italy, South-East Germany, Denmark, coastal areas of England and Ireland.[28] By contrast, in peripheral regions with structural weaknesses, except for potential touristic/cultural destinations, the HST may even lead to an outflow of activities towards the next important centers. Finally, little or no economic effects are generated in those regions that lack inherent dynamics, but are

[26] cf. Schliebe 1983; Schütz 1996, 60-67

[27] cf. Funke et al. 1992 concluded that the presence of “bound” location factors (human capital, business services, “quality of life”) condition the use and utility of “transfered” factors (HST accessibility shift).

[28] Lutter/Pütz 1993, 634

already well accessible.[29] To this one can add a fifth type of region that remains without an HST connection: Here, the economic disadvantages resulting from increased relative distances are obvious.

The global influence of the construction of an HST network on accessibility in Europe has been analyzed by Bruinsma/ Rietveld (1997). They conclude that the HST will favour those cities *already* best accessible by rail. For Northwest Europe the consequences for equity or competing accessibility will be limited, regardless of singular exceptions like Lille. This refers to the *relative* changes of accessibility, whereas the absolute changes are deemed substantial.[30]

Urban structures

Since the integration of the HST is practically always accompanied by urban developments, a positive correlation with the economic effects cannot be confirmed. Changes in the urban structure are not only a consequence, but also a necessary condition of economic activity. In particular at station areas an increase of real estate activity can be observed. If the available space is not sufficient (e.g. conversion areas), housing and industry functions, especially, will result in being expulsed from the area. A specialization of the HST station locations is taking place, focused on (high-grade) service activities and complementary functions.[31]

However, the strong location effect on station areas is actually accompanied by little distribution along the axes of secondary transport modes. In parallel the continuous process of suburbanization increases the employment and housing offer in the corridor spaces where land consumption is still growing. Because for profitability reasons the main centers are served first, the HST fosters the tendency toward the concentration of centrality functions at well-established locations. The high workplace density and substantial accessibility improvements lead to an enlargement of the respective commuting areas.The HST thereby lifts the problem of the expanding agglomerations to a higher level, especially where the private car remains a main feeder mode and strong transport induction effects can be expected. At the same time, the HST also supports regional social segregation as high-income groups tend towards the station locations (gentrification) and the new corridor spaces, while low income groups concentrate in the old urban districts.[32]

In sum, the urban development implications of the HST result in being rather *positive* at the local, but rather *negative* at the regional level. The selective inner-urban concentration of high-grade functions is contrasted by a parallel deconcentration of housing and enterprises and the extension of activity patterns.

Environment

New infrastructures are necessarily related to local environmental impacts such as further land consumption and cutting effects, while by upgrading existing tracks this can be avoided. Yet, independent

[29] cf. Banister/ Berechman 2001, 324

[30] Bruinsma/ Rietveld 1997, 18-24

[31] cf. Koleskas 1992; Decoutere et al. 1993; van Dinteren/ Fancello 1994, 165-70; Schütz 1996, 67

[32] cf. Schütz 1996, 68-75; Schliebe 1983, 225

from the type of track, any HST operation generates noise emissions that require costly protection measures in urban areas.

Apart from these direct impacts the HST causes significant structural effects with long-term environmental implications. We have already seen that the energy consumption of the HST is considerably higher compared to conventional trains, so that emissions augment with the proliferation of high-speed technology as long as the primary energy supply cannot be assured through renewable resources.

More importantly, the HST leads to an enlarged activity radius of social actors, which in turn conveys an increase of goods flows and induces new transport on the rail and its feeder modes.[33] This development is only contrasted by the potential for emission reduction by shifting air and road traffic to the HST and its public transport access.

Nevertheless, the HST enjoys a fabulous reputation with respect to its environmental achievements. The assumption that negative environmental impacts of the HST can be “excluded”[34] is, however, based on hypotheses. For instance, it is typically argued that the HST would still be “better than other modes” in direct comparison, and that it would also “substitute” road and air transport. But as soon as the spare capacity liberated by the HST is used up by air- and road transport growth, this argumentation is actually losing ground.[35]

Schütz (1996) even attributes an “eco-bonus” to the HST, referring to its image effects for public transport and an innovation impetus for the railway sector.[36] This would justify to “partly forgive its environmental sins”, although a quantification is not supplied. A systemic evaluation of the actual environmental impacts of the HST would therefore be urgently required. Yet transport researchers agree on the principle that *any* extension of the offer in terms of capacity and/or speed induces transport and extends mobility patterns. Apparently, the corresponding negative environmental and social consequences differ if this offer is a highway, a new HST line or a local public transport link.[37]

1.2.3 Planning the integration of the HST

Cognition and value orientation

Apart from being a passenger transport mode, the HST is also a carrier of ideas, convictions and values. One should recall that before becoming a competitor of the airplane and the private car, the HST owes its creation to the desire for higher speeds and comfortable travelling over larger distances – a limited vision for those who have and can afford a wider horizon of activity.

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[33] Floeting/ Henckel 1993, 2627

[34] Schliebe 1983, 226; UIC 2000, 32

[35] Schliebe 1983; Schütz 1996, 139; Whitelegg/ Hultén/ Link 1993, 231

[36] Schütz 1996, 139

[37] cf. Zumkeller 1994, 3; Apel/ Henckel 1995, 152; Monheim 1996, Misereor/ BUND 1997, 153-59

Starting with the Japanese Shinkansen, faster connections and the least time “loss” were thus the prime objectives that have inspired this technological innovation.[38] Based on these origins, the image of the product “HST” is composed of speed, internationalism and modernity, sublimed by the attribution of benefits for transport safety and the environment i.e. two policy issues that have gained considerable relevance over the last decades. Through this specific composition, the HST already appears as a symbol of social progress before any concrete plan has actually been announced.[39] Planners and “decision makers” can draw on this image to support the development of new identities (spatial, economic, social, etc.), while inhabitants and users may feel attracted to it as part of a particular lifestyle (professional or private).

But the HST also promises real change. The potential reductions of travel distances, measured in time instead of kilometers, contribute to modify the individual and collective perception of space. Remote places suddenly appear as well accessible destinations or come into a commuting distance. Thus, the location of regions, cities, households or firms experiences a repositioning on the *mental maps*. The relative approximation of places with an HST connection has been illustrated graphically by modulations of geographical maps representing this selective “contraction of space”.[40]

In consequence, social actors have acquired a *new awareness* of development possibilities and options for action. Based on this awareness, they may decide to simply expand their mobility patterns, but also to change business organizations or even transform urban structures. Since it has been shown that managers and transport experts perceive air accessibility as most important for business development (whereas quantitative approaches emphasize short distance connections as more relevant), the HST is likely to experience a similar *biased* categorization.[41] Image and impact of the HST are therefore two complementary cognitive dimensions that influence the planning process and individual action. Consequently, the same value orientations that helped the HST to emerge also result in implicitly orientating spatial developments.

Institutional context

The institutional context dealing with the integration of the HST has experienced a thorough modification *at the same time* that the corresponding plans have been elaborated. From the outset, the emergence of the HST has been closely related to the debate about a restructuration and privatization of the railways. The partly disastrous market perspectives of the national railway companies in the 80s constituted a major incentive to envisage different private ownership models of infrastructure and operation units. Additionally, from 1991 the EC directive 91/440 also demanded to separate operation from infrastructure provision, which accelerated the process in particular towards the creation of private operators.

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[38] Usually, the urge of the railways for maintaining their transport market share is seen as the primary incentive. Yet the HST is already a particular response to this requirement, so that transport economic considerations do not suffice as an explanation. cf. Mohnheim 1996, 295

[39] cf. chapter IV

[40] Spiekermann/ Wegener 1993, 459; See also Fig.I. 1

[41] cf. Bruinsma/ Rietveld 1997, 24

In this situation, the railway companies have started to instrumentalize the HST as a key measure to save them from continuous decline by conquering new transport markets and improving the corporate image. In turn, this approach required adaptation of their institutional organization in order to deal with the necessary infrastructural changes e.g. new track planning, station buildings, rationalization of freight facilities and conversion. The need for specialization and marketing has thus led to the creation of separate units with complementary tasks. In this process, the principal actors have been the national governments and the railway companies that together defined the path of restructuration.[42]

The other public authorities have also been affected by the changing role of the railways. The cooperation with the railway companies for planning the integration of the HST has gradually left the traditional framework and required them to establish *partnerships* with precisely defined rights and duties, capable of solving the conflicts between public and private interests. Furthermore, in many European countries the responsibilities and resources of railway planning and operation at the regional level have become redistributed. The new relationships between regional authorities and railway companies still needs to bring about adequate practices. Finally, authorities at the local level have also started to set up public-private partnerships and project companies for the development of concrete station areas. These partnerships have equally added a different dynamic to the conventional (railway) planning procedures.

Urban policies

As the general objectives and strategies of the railway companies for the integration of the HST have become more transparent, further insight is required in respect to the public authorities. Apart from the different expectations of regions and cities in terms of economic development considered above, the question remains, what *urban policies* can be related to this complex task.

While the interest of most analysts has been focused on the development of singular HST station locations, little has been written so far about the implications of the HST at the (urban-) regional level. Schütz (1996) proposes a detailed ideal planning scheme for the realization of an HST station, underlining timely coordination of infrastructure and urban planning, a broad analytical basis in respect of potentials and risks, the integration into an overall urban development model and a stepwise realization, but excludes the regional level where “control requires an additional effort”.[43]

Also, Bertolini/ Spit (1998) raise the question of new HST stations in the urban region, but do not deal with it.[44] However, for the analysis of station area development processes they suggest a theoretical framework that regards station locations as characterized by their quality as a *node* (accessibility by different modes, intersection of socio-economic networks) and as an urban *place* (urban location with diverse functions and designs).[45] The specific dynamic of station area projects thus results from the overlap and interaction of both dimensions, which can lead to conflicts as well as to synergies. The

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[42] cf. chapter V 1.1.1

[43] Schütz 1996, 152-54

[44] Bertolini/ Spit 1998, 178

[45] *idem* 1998, 7

authors identify in particular the following 5 characteristic “dilemmas” that need to be resolved in planning station area (re-) developments:[46]

- *Material dilemma* – between optimizing urban development and transport connections
- *Functional dilemma* – between mixture and specialization in time and space
- *Financial dilemma* – between high costs and limited resources
- *Temporal dilemma* – between short- and long-term perspectives and uncertainties (politics, market)
- *Organizational dilemma* – between competencies, resources, politics and markets

More specifically, comparing urban developments in HST station areas Van den Berg/ Pol (1997) have underlined 6 criteria “for an optimum contribution of the HST to urban development”, which they use to suggest concrete policies and measures. These criteria also address the planning dilemmas described above, but put the emphasis on a successful realization for the “development of prosperity in urban regions” and “sustainable urban economic growth”. Most importantly, due to its focus on economic development this approach draws the attention to the strategic interrelations between the urban-region and the particular HST station location:[47]

- *Accessibility* - of the station location by different transport modes and its relative position to other transport nodes for the attraction of investment
- *Economic potential* - of the urban region and correspondence between the economic structure and the specific quality of HST access
- *Quality of the living environment* - limited environmental impacts and good public space design as important location factors and measures to broaden local support
- *Balanced spatial distribution of activities* – local mixture of activities and relation to other development locations within the urban-region to avoid oversupply
- *Balanced social distribution of effects* – to justify public investment and avoid local opposition
- *Organizing capacity* - of the actors involved for achieving the necessary support

In their follow-up study of HST station developments, van den Berg/ Pol (1999) have further narrowed down this analysis by distinguishing only three basic policy types, not necessarily free from internal conflicts (i.e. dilemmas): 1) An *accessibility policy* that aims at the interconnection of the HST station, providing links between transport systems, establishing through-stations for faster travel and assuring a well-designed interchange, 2) a *revitalization policy* that focuses on the upgrading and integration of the station area as well as a good quality of the urban design, and 3) a *location policy* which deals with meeting the preconditions for new urban activities, attracting high-grade functions and creating

[46] cf. *idem* 1998, 170-75
[47] van den Berg/ Pol 1997, 9-12

functionally mixed urban areas. This combination also reflects more clearly their key research interest in the use of the HST as an instrument for enhanced economic development.[48]

Apart from the sectoral differentiations, urban policies related to the HST depend essentially on the scale considered. As has been pointed out above, at the local level the development of a station area may be integrated with strategies that pursue a concentration of urban settlement, closing gaps in the physical urban structure and using inner-urban conversion areas. It can equally be part of a revitalization strategy for downtown areas suffering the negative impacts of suburbanization. At the level of the agglomeration or urban region, the development of further HST stations could for instance represent a measure for establishing complementary and specialized centers or creating new “growth poles”. In turn, within a region the HST might be seen as a means to establish a new type of “city network” or kick off development in remote areas, while at the national level the HST could be an instrument to reinforce the principal urban centers. Finally, at the European level the HST can be understood as a key tool for the realization of the single market, as well as social and economic cohesion. These different orientations and objectives in terms of spatial scale and their confrontation in concrete projects form a central issue to be considered in the case studies.

2 The emanation of a Transeuropean HST network

The current development of the HST is promoted by political decisions of the European Commission and national governments. Public and private actors at all levels are creating strategies and look for solutions for the integration of the HST, befitting their respective interests and goals. From this side, it is comprehensible that the predominant research focus turns out to be one regarding the “impacts” of particular HST connections on the transport system and urban development. Usually the construction of new HST links forms the starting point for the evaluation of planning processes and project realizations.

However, it should be recognized that this perspective implicitly attributes a crucial role to technological innovation as a driving force of social development. It therefore bears a risk of accepting and supporting *technological determinism* since social development as well as spatial and urban development appear as a mere reaction to changed technological conditions and possibilities. By contrast, it has been shown exhaustively that technological innovations themselves can be regarded as products of social, economic and political interaction.[49] These processes of interaction constitute the frameworks for the emergence and implementation, but also disappearance of technological innovations over time.

Therefore, the following brief review acknowledges that the idea of developing HST links in Europe has been forwarded by particular national railway companies and their respective governments, by the International Union of Railways (UIC) as well as by influential industry lobbies. While initially only singular HST links and projects were envisaged, soon the creation of a Europe-wide “HST network” became the guiding ambition. This idea was finally supported by the European Commission and attained an official policy status.

[48] cf. *idem* 1999, 9-22

[49] See e.g. Berger/ Luckmann 1969; Hacking 2000

2.1 National actors and interests

2.1.1 Conquest of transport markets

The creation of HST services has appeared at a time when the railways were in continuous retreat from the European transport market. Within EC countries the share of the railways has dropped from 28% to 15% in freight and from 10% to 6% in passenger transport between 1970 to 1990.[50] On the other hand, the existing infrastructure networks presented significant deficits in terms of capacity, technical standard or maintenance.

In Germany for instance, in the middle of the '80s about 90% of the railway transport volume was performed on half of the infrastructure network to the point that the need for renewal was urgent.[51] However, considering the fact that the relation between long-distance and short-distance passenger trips in rail transport is approximately 1:9, this renewal would have been mainly required for regional infrastructures.[52] Yet, in Germany the investment into the HST has taken place at the same time as over 2.000km of "low priority" tracks have been closed down.[53]

Nevertheless, the introduction of the HST results in being a considerable commercial success for the railway operators. The HST has practically always led to increased transport volumes on the established relations, in some cases of spectacular dimensions (e.g. Paris-Lyon: +40%). Thus we find the paradoxical situation that while the HST is expanding, the total market share of the railways remains constant or even decreases.[54]

2.1.2 Competing development of HST systems

The deployment of the HST at the European level was not the outcome of international cooperation, but rather of national competition. In France, the *Train à Grand Vitesse* (TGV) connecting Paris and Lyon in only two hours was put into service in September 1981 and also represents the first European HST line. In 1988 the Italian *ETR 450 Pendolino* opened on the "Direttissima" Rome-Florence, introducing the technology of tilted trains. The German *InterCity Express* (ICE) commenced operation between Hanover and Würzburg in June 1991. In Spain, the operation of the first Alta Velocidad Española (AVE) started in 1992, based on the French TGV model, but using track and signal systems from German manufacturers.

This quick-motion retrospective of the introduction of HST services in Europe indicates what has been at stake. The development and construction of the power units, rolling stock, power supply equipment and train control equipment is dominated In Europe by three major manufacturers (GEC Alsthom, Siemens/AEG, Fiat). These companies, each interwoven by multiple national supplier relations, are of a considerable importance for their national economies and appear to compete worldwide only with Japanese firms as new markets for the HST have emerged for instance in South Korea, Australia, USA or

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[50] Capdevila 2000, 29

[51] Schliebe 1983, 213

[52] BMVBW 2001, 210-11

[53] Whitelegg/ Holzapfel 1993, 207

[54] Prognos 1999, 28; UIC 2000, 35

Canada. The fact that in Europe the HST has first been introduced in France, Italy and Germany thus not only reflects an existing concentration of technical know-how and productive capacity, but also the respective political interests linked to the promotion of this transport mode as a measure of economic development.[55]

Those railway companies and suppliers that had managed to successfully establish a national HST system soon started to think of new market potentials. International transport relations, in particular, appeared as an attractive target where the HST could compete effectively with the airplane.

This orientation is reflected in the development of the first international HST project linking Paris, Brussels, Cologne (Köln) and Amsterdam (PBKA). The PBKA-project constitutes the nucleus of the later "European HST network", but has been promoted by the national governments and railway companies of France, Germany, Belgium and the Netherlands, under participation of the UK and Luxemburg.

After the successful operation of the Paris-Lyon line, the SNCF had started to further develop its plans for an HST connection towards the North, and Brussels in particular. Also the German railway company Deutsche Bundesbahn (DB) was looking for a connection of its *Intercity* network with the French TGV lines. Hence, in 1983 the transport ministers of France, Germany and Belgium agreed to carry out a study on an HST line Paris-Brussels-Cologne.

It was actually the difficulties in defining the right track for the section between Brussels and Cologne that led to a participation of the Dutch railways Nederlandse Spoorwegen (NS), since for an optimum design the line had to pass Dutch territory. In return, it was proposed to realize an HST branch towards Amsterdam.[56] A first report elaborated by French, German and Dutch research institutes, published in July 1984, underlined the importance of the project "for economy and society".[57] The respective transport ministers thus decided to create an international working group composed of members from the ministries and railway companies of France, Germany, Belgium and the Netherlands. Its task was to realize a feasibility study for the PBKA-project.

Still in 1984, the same research institutes started to elaborate a study on the development of a "European HST network", now on behalf of the European Commission. With this step the HST finally became a European policy issue. Another important event for the international establishment of the HST that took place in 1984 was the World Congress on HST in Paris, organized by the International Railway Union (UIC). It was also the background for the agreement between France and the UK to realize the Channel tunnel until 1993, set for an HST operation Paris-London and London-Brussels.

In December 1984 the Roundtable of European Industrialists (ERT), an international lobbying organization of major industrial firms, further added to this development with the publication of a report entitled "Missing links". In this influential report, the ERT demanded enhancement of the development of

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[55] cf. Strohl 1994, 33

[56] Bentvelsen/ Visser 1991, 23

[57] DFVLR/ INRTS/ NIT 1984, 103

cross-border ground transport connections between European countries, emphasizing three priorities: The Channel tunnel ("EuroRoute"), the "Scandinavian link" (Øresund) and a "European HST network".[58]

Finally, based on the expert study commissioned two years before the European Commission also adopted the recommendation for the development of a "European HST-network" in June 1986. The new framework was welcome by the ERT. In its report "Keeping Europe mobile" of 1987 the ERT anticipates later conceptions of European policy by suggesting to enhance a "large road, rail and airport building programme" for cross-national transport, arguing that "if Europe is not kept mobile, it will stagnate." [59]

2.2 HST in European policy: The Transeuropean Networks (TEN)

The development of a European railway network is not an invention exclusively related to the HST. Already in the late 1950s seven European railway companies created a common service, the "Trans Europe Express" (TEE), connecting major European centers with 12 international lines. However, this service disappeared as a consequence of the increasing competition from air travel and the private car, scheduling problems, costs increases and failed market studies.[60]

A new service with a European scope has then been created in May 1987, when the "Eurocity" (EC) railway network, connecting 200 cities in 13 countries, was inaugurated. The trains are scheduled at attractive day times that allow day-return trips for business travellers and offer standardized comfort and services.[61]

The Eurocity railway network formed the starting point for the development of international HST lines. In January 1989 the UIC published its first proposal for a "European HST network". It envisaged a development in three phases, identifying a total of 14 transnational HST links as priority projects: In a first step until 1995, fundamental connections in central Europe should be realized, including the PBKA project. The second step until 2005 then should comprise the completion of all national plans, while connections with Italy, Spain and Southeast Europe would still be based on conventional trains. In a third step, the network would become completed including the "missing links" across the Alps, the Pyrenees and towards Scandinavia. At this stage, the "Eurocity" network will have been replaced by the more selective HST network. For financing, the UIC expected substantial subsidy from regional and national governments, as well as the EU.[62]

Again, the ERT contributed to the debate with a new report that focused on the question of the institutional framework for these large-scale infrastructure projects ("Need for renewing infrastructure in Europe"). It recommended the increased participation of the private sector and the establishment of European infrastructure institutions for management and financing issues.[63]

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[58] ERT 1984
[59] ERT 1987, 35
[60] Strohl 1994, 26-30
[61] *ibid*.
[62] UIC 1989
[63] ERT 1989

In September 1988 the four railway companies participating in the PBKA project had finally published a report that, after considerable debates, confirmed the profitability of the PBKA project – except for the Belgium and the Dutch sections. Still, only massive public subsidy was expected to be able to ensure the feasibility of the project (67-92% for the Dutch railways).[64]

In November 1989, an agreement between transport ministers was signed to urgently realize the HST lines between Amsterdam, Brussels, Frankfurt, Cologne, London and Paris. This was considered a first step towards a "European HST network". The agreement also first mentioned the reduction of environmental impacts of transport growth as an objective for HST deployment.[65]

After the European council had passed a decision to elaborate a structure plan for a "European HST network", the corresponding report of the High-Level Group constituted for this purpose was presented in December 1990. It emphasized the interest in a complementarity HST/air and the 14 priority projects, now officially designated as "missing links". For the 9.000km new tracks and 15.000km upgraded tracks, as well as for the rolling stock, private financing was envisaged "to a great extent".[66]

In June 1993 the Commission published the White Book "Growth, competitiveness, employment: Challenges and paths to enter the 21st century". It first disseminated the notion of "Transeuropean networks", which form a key axis of development proposed.[67]

> "These infrastructures [TEN] will also provide the possibility to:
>
> - enable our industry to initiate mid- and long-term driving projects, and to develop our products
> - search for the optimum combination of the existing transport modes (multimodality) in order to augment their efficiency and at the same time limit the negative repercussions for the environment
> - complete the single market: after the great collective effort that has been made to suppress the frontiers, we have to reinforce the links, including those connecting with the most remote regions" (CEC 1993, 30)

From December 1993 to February 1994 a group of personal representatives of the heads of government ("Christophersen Group") further elaborated this concept. In their report about "Transeuropean networks" (TEN) they underlined the priority projects in respect to the HST and demanded that the nation states facilitate the immediate execution of these projects.[68]

Finally, in August 1994 the Commission published an outline plan for the Transeuropean Networks for the horizon 2010. The suggested high-speed train network comprises new tracks operable for speeds of 250km/h and higher, and adapted tracks for speeds of about 200km/h.[69] The envisaged total network length inside the EC is 35.000km, of which 20.000km will be new lines (Fig.III.5).[70]

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[64] Bentvelsen/ Visser 1991, 26

[65] *ibid*., 28

[66] CEC 1990a, 7

[67] *idem* 1993, 30-34

[68] The TEN are subdivided into networks for transport (TEN-T including HST), communication (TEN-C) and energy (TEN-E).

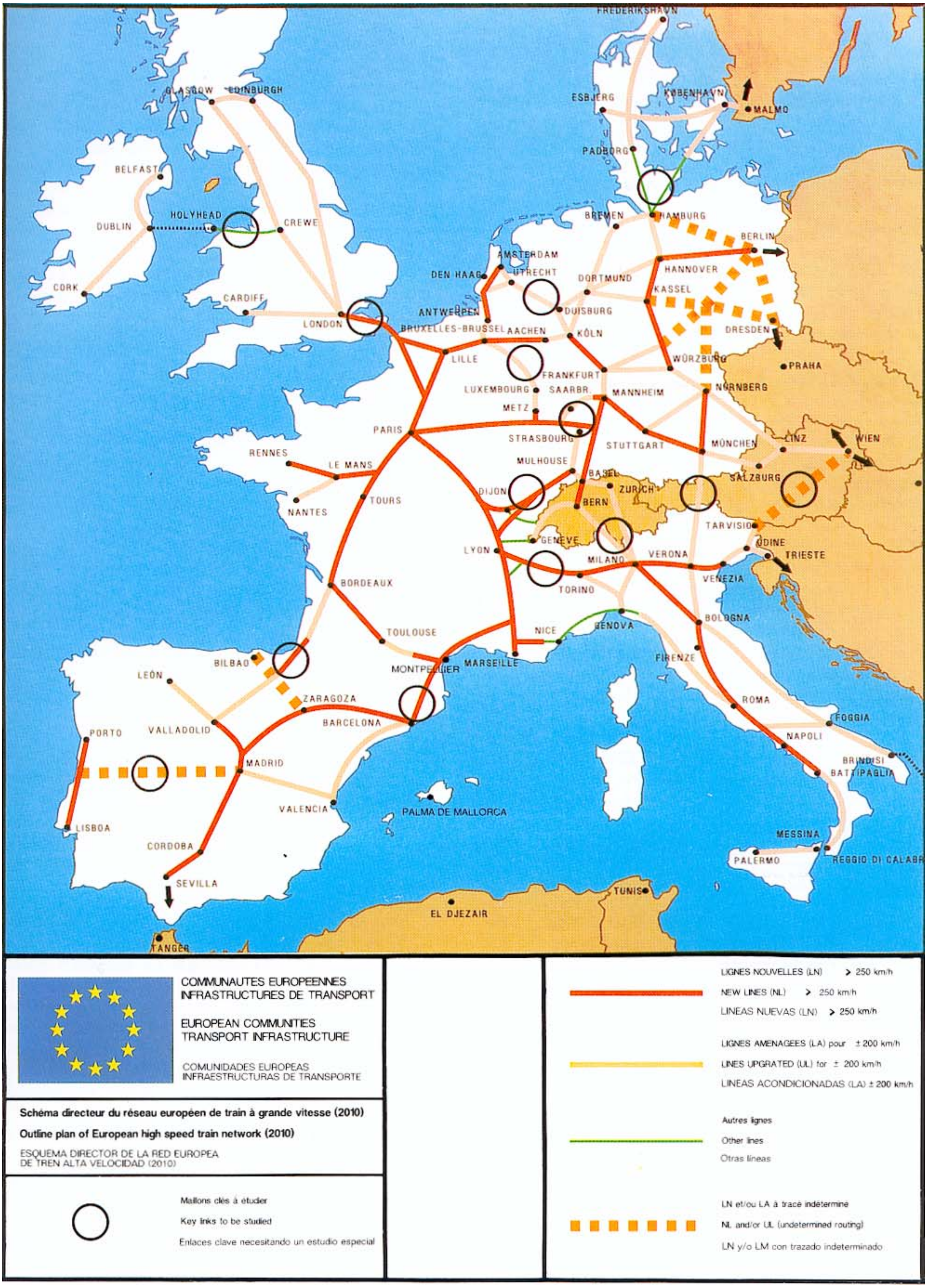
[69] CEC 1994, Art.10

[70] *idem* 1998, 89

In this plan the development of the TEN's was characterized as a “contribution to the key community objectives of realizing the single market and reinforcing the social and economic cohesion”. The TEN's were equally envisaged to “guarantee a sustainable mobility of people and goods in the best social and environmental conditions possible, and combine all transport modes according to their respective advantages.”[71] With this outline plan the key objectives of “mobility”, “transport safety”, “transport efficiency” and “transport sustainability” thus became inseparably linked to the construction of the “Transeuropean networks”.[72]

[71] CEC 1994, 1
[72] cf. Hajer 2000, 2

Fig.III. 5: Proposal for a European HST network and the 14 key projects; source: CEC 1994



2.3 The network of “Eurocities”

The development of transport policies at the European and national level was of immediate relevance to the local level, and in particular the large cities. These cities were also not passively observing the changing policy context and the space-economic dynamics it refers to, but starting to develop their own strategies and approaches. In this, the recognition of the structural similarities between problems and tasks in the large European cities led to new forms of cooperation that in turn influenced the approach to HST integration.

Based on the initiatives of the mayors of Barcelona and Rotterdam[73] and supported by multiple European authorities and associations[74], the “Eurocities” network was founded at a conference in Barcelona in April 1989, initially comprising 17 local authorities.[75]. This event followed a preparatory conference that had been held in Rotterdam already in 1986, the year of the Commission recommendation on a European HST-network. In Barcelona the partners agreed on a common manifest expressing their will to cooperate in the promotion of the “European city” and the exchange of experiences concerning the principle problems of urban development, finally proclaiming a “Europe of the cities”.[76] Until the creation of its headquarters in Brussels in 1994, the Eurocities secretariat was run by the town hall of Barcelona.

In conjunction with the Eurocities network, the European Institute for Comparative Urban Research (EURICUR) was also founded with the mission to provide scientific support to decision making in urban policy. This institution was integrated into the department of economics at the Rotterdam University. EURICUR also shared part of its staff with this department, which partly explains the economic bias of its research approaches and orientation.

Several steps have marked the incorporation of the HST into the agenda of the Eurocities network. At the 1990 annual conference in Lyon a common charter was signed, identifying three main areas for cooperation. The first area of “Networking of the Eurocities” also included the construction of HST links, the development of direct air links and the establishment of a telecommunication system.[77] At the Birmingham conference one year later a special working group was created for transport and communication issues, led by the city of Turin.[78]

Following the Eurocities conference in Lisbon of 1993 it was the city of Lyon that initiated a common approach to HST integration in European cities. In parallel to the elaboration of the European TEN policy the Eurocities working group met during 18 months on a regular basis to discuss the topic and share experiences. In 1995 they commissioned a comparative study of 14 cities and their strategies for HST integration to EURICUR.[79] This study was publicly presented at an international conference on HST

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[73] P. Maragall and B. Peper

[74] CEC, CEMR, IULA, national governments of France, Spain, Italy,

[75] Barcelona, Birmingham, Cologne, Genova, Lille, Lisbon, Lyon, Madrid, Marseille, Montpellier, Naples, Rotterdam, Toulouse, Valencia, Valladolid, Vitoria.

[76] Ajuntament de Barcelona 1989, 11

[77] *idem* 1990, 2

[78] *idem* 1991, 3

[79] EURICUR 1997

integration in Lyon in 1997.[80] The same authors at EURICUR also elaborated a follow-up study, which was then discussed at a second conference on HST integration in Dortmund in 1999.[81] Both studies formed an important contribution to the debate about HST integration among Eurocities' members and beyond, and significantly contributed to the (common) understanding of the related questions.[82]

3 HST deployment and integration: Open issues

According to what has been discussed above, HST integration results in being a strategic spatial planning topic with long-term structural effects on urban-, transport-, economic-, social- and environmental development. The high investment volumes, the multiple sectoral implications, and the objectives of both public and private actors at all levels engender that the topic can usually be found at the top of European policy agendas.

At the same time it has become transparent that the development of the HST relies on a set of concepts and knowledge advanced by particular actors and interests. The account made of the basic knowledge about HST integration and the corresponding interaction between institutions at the European level reflects that the understanding of the HST exchanged shows certain limitations or “blind spots”. These appear to contrast with the well-articulated concepts, objectives and strategies that have been identified so far.

3.1 Spatial shifts and HST

This is especially the case regarding the interdependencies between the HST and spatial structures, where orientations are moving between two extremes. On the one hand we find overall strategic objectives formulated for a future stage, where a “Transeuropean HST network” would have become reality (e.g. “cohesion”, “integration”). Here, the alleged effects of the HST rely on hypotheses justified through a general development vision.

On the other hand, empirical research studies have identified very specific problems and potentials of the HST for particular connections or station area development projects (e.g. “transport substitution”, “urban development impact”). Between these two orientations, it seems that what has been left behind unnoticeably is the consideration of spatial planning. The main conceptual gaps that need to be filled are:

- The spatial implications of the *time* required for transport network modifications, since priorities for infrastructure developments equally set priorities for spatial developments that cannot be reversed
- The interrelation with *regional urbanization processes* in regards to transport and urban patterns, spatial economies or social structures at a regional scale.
- The interaction between *multiple HST station locations* developed within one large agglomeration, concerning their differences and similarities and the changes they introduce into the spatial structure.

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[80] *ibid*.; van den Berg/ Pol 1997

[81] van den Berg/ Pol 1999

[82] cf. 1.2.3 in this chapter

3.2 Value orientations and the concept of "sustainability"

The concept of "sustainability" has introduced a significant theoretical re-orientation into planning that is of crucial importance for the integration of the HST as a long-term strategic planning issue. Since its adoption by the UN commission on environment and development in 1992, the concept of "sustainability" has been further developed and operationalized continuously.

The basic aim of sustainability consists in an intra-/ inter-generational equity, stating that decisions in the present should not restrict the development options of future generations or different global regions (esp. North/ South). In respect to an increasing resource consumption and deteriorating environmental quality, the maintenance of the global stock of natural resources is therefore a key objective. A fundamental implication of these aims is that the social, economic and ecologic targets of development need to be equilibrated. Furthermore, in order to achieve their equilibration, any process of decision-making and implementation has to deal with the existing institutional frameworks and value orientations.[83]

Although a generally accepted definition of "sustainability" does not exist, a limited number of theoretical planning principles can be indicated that need to be addressed, independent from the particular definition employed.[84] These principles concern both the spatial and transport structures envisaged and the planning process itself. They provide a simple overview of the "state-of-the-art" in spatial planning in respect to what "sustainability" means, and how it can be operationalized (Fig.III.6). For the integration of the HST, these principles raise the important questions of how the concept of "sustainability" is employed in practice, and how it is actually understood.

Principles for planning products	Principles for planning processes
▪ Decentralized concentration: urban growth in selected centers with good public transport (rail) access, relative autonomy of centers and functional mix ▪ Qualified interior development: conversion, densification, improvement of functional mix ▪ Ecological compatibility of new urbanization (ecological construction) ▪ Protection and development of a regional system of open spaces ▪ Ecological compatibility of transport: integrate transport networks, shift towards public transport modes, limit demand (push & pull) ▪ Inner-regional metabolism: circular supply and disposal structures	▪ Durability: variety, efficiency, sufficiency, risk precaution ▪ Integration: consistency, networking ▪ Participation: cooperation, transparency ▪ Equitable distribution: justice (interpersonal, intra-/inter-generational) ▪ Planning has to consider the differences between anthropogenic and natural time frames ▪ Planning has to initiate social and cultural processes

Fig.III. 6: Planning principles for a sustainable spatial and urban development at the level of products and processes; Sources: Hilligardt 1998, 14; Hübler 1999, 246; Hübler et al. 1999, 482

[83] Lambrecht/ Thierstein 1998, 104

[84] For a discussion of sustainability definitions in spatial planning see e.g.: Wolf 1996; BfLR 1996; WBGU 1996; Hilligardt 1998; Lambrecht/ Thierstein 1998; Spangenberg/ Bonniot 1998; Hübler 1999