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Chapter 15

Assessing spatial planning policy with accessibility indicators: the case of Lille's metropolis scenario

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Abstract

This chapter presents an analysis of transport services in the context of regional transport planning. It proposes to use specially designed accessibility indicators, which allow to really apprehend the quality of the services supplied to different segments of the population and help to assess alternatives solutions. The methodology is applied to the case of Lille as a region capital, and in particular to its main stated objective of enabling people to reach the region capital in less than one hour from the major surrounding urban centres.

The improvement of accessibility may be classically measured in many ways, especially using GIS techniques. Nevertheless, the classical accessibility indicators do not provide a correct measurement of the travel times through a scheduled transport system. The railway service architecture –the way omnibuses and expresses are associated in the transport supply– and the intramodal transfers cause strong bias in the usual measurements of the travel times.

Moreover, the travel demand is strongly constrained by the daily urban rhythms and the location of the major traffic attracting activities. These are the source of difficult peak hours traffics to which transport supply should be better adapted.

To deal with these problems, new accessibility measurements are proposed, which use scheduled graph modelling. They integrate the full information of transport time-tables of the regional rail transport system in order to model the transport supply of a usual week day. The accessibility measurements produced by this model provide an assessment of the way the transport system can address the spatial planning policy objective of setting the major regional urban centres within one hour of Lille.

15.1. Introduction

In the French context of the regional authorities' responsibility for the rail passenger transport system, this contribution focuses on the relations between collective transport networks and regional planning in the Nord-Pas-de-Calais region. Beyond the analysis of the existing situation, we want to build a prospective approach, in order to propose some modifications to the transport system responding to identified regional planning stakes. Through a modelling of the transport system it is possible to simulate these modifications of the supply and to measure their potential consequences.

At the intersection of supply and demand, the measure of actual transport services enables to question and to go beyond the classical accessibility indicators based on average travel times and frequencies.

Many models, stemming mostly from operations research, tackle the problems of mobility and transport, but mainly from an economic perspective (McFadden 1997). The general

purpose of these researches is to model and analyse equilibrium between supply and demand. The regional planning criteria not being reducible to an economic optimisation problem, we propose to build a complementary tool dedicated to measurement and simulation. If our aim is different, many methodological advancements developed in the flow models may be mobilised to enrich our approach.

In order to build this assessment of the transport system in its contribution to regional planning objectives, the chapter is divided in five sections:

- The first section identifies the major regional planning stakes through the creation of spatial organisation scenarios;
- The second section confronts the scenarios to the spatial planning orientations set at the state and the regional levels, concerning the Nord-Pas-de-Calais territory;
- In a third section, the transport service assessment method is detailed and its principles are explained;
- The fourth section shows an application of the method to study the position of the regional capital in the urban system;
- In the last section a prospective approach is developed, through a measurement of the gap between the existing and the desired situation; it permits to identify the modalities of intervention.

15.2. The scenarios

We first describe the scenarios of possible futures of the Nord-Pas-de-Calais region which have been developed by geographers and spatial planners (Bruyelle 1996), (Damette 1994), (Pumain, Saint-Julien et al. 1990), (Giblin-Delvallet 1990).

The scenario "0" refers to the existing state which is in fact largely the heritage of the introduction of the high speed rail in the region and its accompanying measures.

15.2.0 : Present scenario of Paris attraction : high speed rail and accompanying measures

The organisation of the Nord-Pas-de-Calais rail network is based on the principle of its articulation on the high speed rail system. In this perspective, the relations to Paris are highlighted.



Figure 15.1. Map situating the Nord-Pas-de-Calais 'Région'

Such a scenario is exposed by Bruyelle (Bruyelle 1994) and named « the great north in the Parisian orbit ». It is confirmed by a series of rail infrastructures investments made either by the national SNCF or the Regional Council

The modifications of the network related to the high speed rail (Menerault 1997 and 1998) confirm this scenario with:

- ▶ The organisation of the crossing of the TGV lines inside Lille that makes it the main regional access node to the high speed rail;
- ▶ The Arras junction that makes it the second regional entry point on the high speed rail network,
- ▶ The completion of the electrification of the Calais-Lille line,
- ▶ The electrification of the Lille-Tournai line that enables another direct link to Belgium,
- ▶ A high speed line junction to Dunkerque,
- ▶ The electrification of Boulogne-Calais,
- ▶ The electrification of Douai-Cambrai.

The function of all these investments, except the electrification of Lille-Tournai, is to facilitate the relations between the major cities of the Nord-Pas-de-Calais and Paris.

Nevertheless, the system offers some potentialities for the development of intra-regional relations centred on Lille, or going through Lille. These potentialities have started to be exploited only very recently with the introduction of regional high speed relations since the year 2000.

The major trends of this phase of the regional planning process corresponds to the opening of Lille to the European network, and to an improvement of the accessibility to Paris. This is a planning model in which the reinforcement of the Parisian attraction dominates.

A scenario directly inspired from this trend would further strengthen the centrality of Lille in the entire region with an “hegemonic metropolis”, as shown on figure 15.2.

15.2.1 : Hegemonic metropolis

The “hegemonic metropolis” scenario is developed by Damette (Damette 1994) from the statement of the predominance of Lille:

“The Nord-Pas-de-Calais region is the model of a rudimentary network: between the conurbation of Lille and the second agglomeration of the region, Valenciennes, there is a true abyss” (Damette 1994).

The results of the last census in 1999 confirm the demographic dynamism of Lille. The relations analysis –through the study of the phone flows– and the functional analysis –based on the rail passenger flows– conducted by Damette shows the importance of the relations with Lille for the entire regional territory. Within this framework, the regional planning strategy –in the spirit of the ‘equilibrium metropolis’ policy set up by the state in the mid sixties– considers the reinforcement of the relations with Lille as essential.

The spatial model associated with this scenario is based on center-periphery connections between Lille and all the cities of the region. To consolidate this scenario based on an extension of the metropolitan space to the totality of the ‘Région’ territory, the action on the regional transport system would consist in giving the priority to:

- ▶ direct rail relations between Lille and the cities of the former mining basin ;

- ▶ direct and fast rail relations from pole to pole towards Lille with regional high speed rail called TER-GV from the littoral area and Arras, and improved relations between Lille, Valenciennes, Maubeuge and Cambrai.

In addition, the metropolis is extended by better links with its Belgian side (Tournai and Kortrijk). In this spatial scenario there is no reinforcement of the sub-regional identities around Valenciennes or the littoral area.

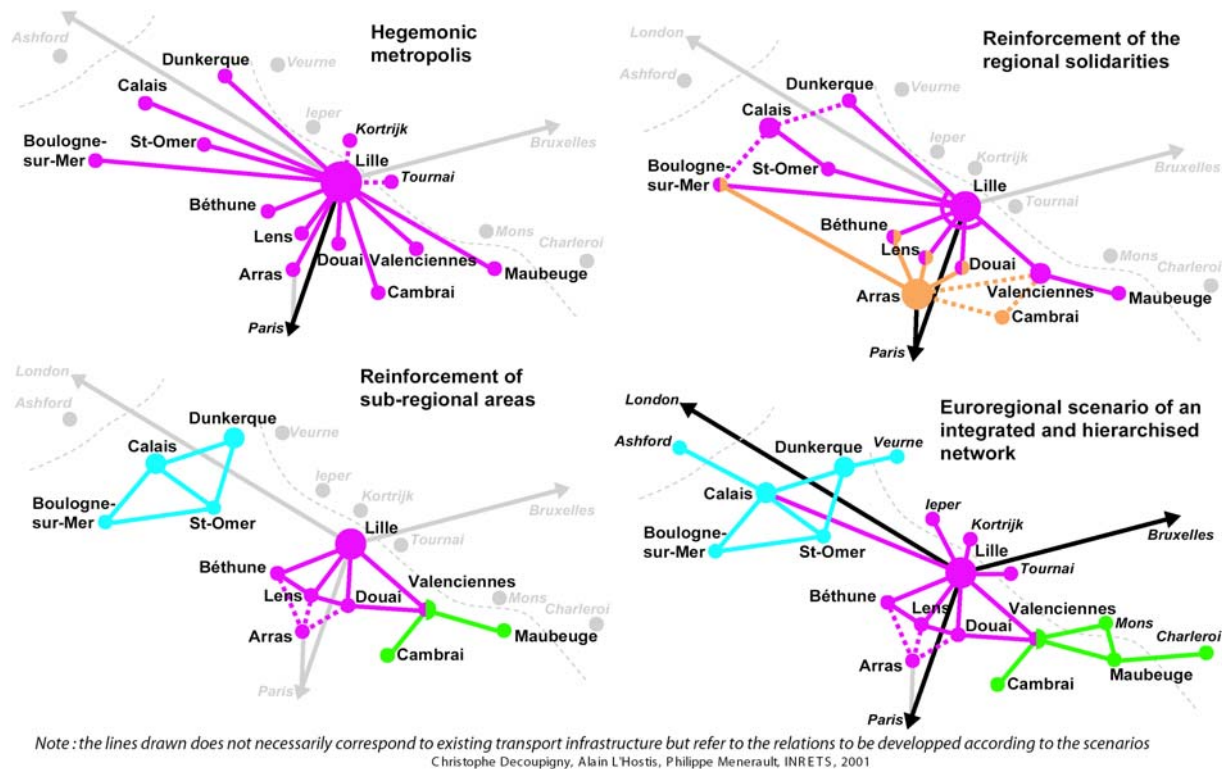


Figure 15.2. Four regional planning scenarios

15.2.2 : Reinforcement of the regional solidarities

A different network organisation could be based on the idea of a 'reinforcement of the regional solidarity'. By relying on Arras, the second administrative centre of the region, and a gate to high speed rail (Barré 2000), it is possible to develop relations which are not centred on Lille.

The main idea behind this scenario is a bipolarisation of the regional space around Lille and Arras, supported by relay cities –Valenciennes and Calais. But the objective is also to bring closer together the peripheries of the region, particularly by developing a railway bypass of Lille.

15.2.3 : Reinforcement of sub-regional areas

In place of a scenario with a polarisation around Lille (and Arras) one could consider as an alternative the consolidation of a set of coherent areas (Direction Régionale de l'Équipement Nord-Pas-de-Calais 1999). In such a schema, three major urban systems take shape: the central urban area around Lille, the littoral area, and a network of cities around Valenciennes.

This scenario raises the question of the role of Arras in the regional urban system between its insulation, the Parisian influence or its connection to an enlarged metropolitan area. In a

regional scenario which privileges territorial coherence, one will choose the last option which corresponds to an inclusion of Arras into a second belt of the metropolitan area.

15.2.4 : Euroregional scenario of an integrated and hierarchic network

In a Euroregional perspective the previous scenario of reinforcement of the regional subspaces can be extended by developing cross-border relations towards Belgium and the South of England. The objective is then to balance the Parisian pressure by means of open relations with the neighbouring countries of Northern Europe.

The Belgian cross-border area can be considered through a polarisation on Lille and/or a reinforcement of the Franco-Belgian relations: Belgian littoral-Dunkerque, reopening of the Valenciennes-Mons line, development of the Sambre-Charleroi and Sambre-Mons lines, as well as, inside the metropolis, the Comines line towards Ypres, the relations Lille-Courtrai and Lille-Tournai, and the prolongation of the urban lines.

These four scenarios develop variants between the two extreme spatial patterns of the uni-polarisation and the multi-polarisation. To that extent, they can be considered as non exhaustive of all the possible futures but representatives of the major trends of the spatial planning (Brunet 1986).

15.3. Confrontation of the scenarios to the Regional Council and State orientations

The analysis of the orientation documents of the Regional Council¹ and of the State² enables to sort out their recommendations according to each scenario, as shown in table 1.

Table 1 : Confrontation of the State and Regional Council orientations to the regional planning scenarios

	State orientations	Regional Council orientations
Scenario 1		<ul style="list-style-type: none"> ▶ Programme of mobilisation of the high speed rail network at the regional level ▶ Opening up the Sambre and Cambrai areas through fast and frequent relations towards Lille (Speed of 200 km/h, Maubeuge in 50 min) ▶ Objective that no major agglomeration of the Region is at more than one hour from Lille

¹ « Document d'Orientations Régionales », juin 1999 (Document of Regional Orientations), and « Rapport d'orientation sur le schéma régional ferroviaire des transports de voyageurs », 1995 (Orientation Report on the Passenger Rail Transport Regional Scheme).

² « Schémas multimodaux de services de transport de voyageurs et de transport de marchandises », automne 2000 (Multimodal Freight and Passenger Transport Service Schemes) and « Stratégie de l'Etat dans la Région Nord-Pas-de-Calais 2000-2006 », 1999 (Strategy of the State in the Nord-Pas-de-Calais Region 2000-2006).

Scenario 2	<ul style="list-style-type: none"> ▶ Find solutions to the saturation of the rail traffic node of Lille for the crossing of the metropolis 	<ul style="list-style-type: none"> ▶ The metropolis as a “head of a regional network of cities” with an “equilibrated distribution of the urban functions” ▶ The Boulogne-Etaples-Arras line ▶ Modernisation of the Lille-Maubeuge line ▶ According to the principle of an intra-regional cooperation “Cambrai must cooperate with Valenciennes, but also with Arras and Douai” ▶ The Arras area –“Southern gate of the Nord-Pas-de-Calais”– as a relay pole of the metropolis organising a network of cities in the South of the region (St-Pol, Bapaume, Cambrai)
Scenario 3	<ul style="list-style-type: none"> ▶ Develop or create an integrated collective transport network at the scale of the urban area of Lille from: <ul style="list-style-type: none"> ▶ the existing railways network and, ▶ a set of inter-connections with the urban networks 	<ul style="list-style-type: none"> ▶ The Region wishes to encourage the development dynamics of the littoral area around the University and to strengthen the association of local authorities (the cross-Channel is seen here as an economic activity but not as a spatial relation) ▶ The East of the Region must open itself to the Valenciennes area ▶ Avesnes must cooperate with Valenciennes and Cambrai ▶ Doubling of the track on the Don-Sainghin-Béthune line ▶ Electrification of the Calais-Dunkerque line ▶ <i>Good connection of the rail network on Calais-Fréthun (Orientations TER 2010)</i>
Scenario 4	<ul style="list-style-type: none"> ▶ A hierarchic spatial organisation at the regional scale that: <ul style="list-style-type: none"> ▶ Facilitates the access to the high speed networks ▶ Facilitates the access to the functions and services available only in the regional metropolis ▶ Reinforce the links around the sub-regional poles ▶ <i>Cross-border relations referring to the RAFHAEL (Réseau des Agglomérations de Flandres, du Hainaut, d'Artois Et du Littoral) network : Valenciennes Mons, Lille, Kortrijk and Tournai (Stratégie de l'Etat 2000-2006)</i> 	<ul style="list-style-type: none"> ▶ A development of the metropolis according to the model of the Central Urban Area developed by the planners in the early 1970's (OREAM Nord) ▶ The cross-border development of Lille ▶ Cooperation of the East of the Region with the Belgian side ▶ Strengthen the interregional links with “our Belgian and British neighbours” ▶ Make of Calais-Fréthun a real international station (<i>Orientations TER 2010</i>)

From a general point of view, according to the planning orientations, the regional rail transport system has firstly to ensure the inter-city relations; the model of the Parisian railway network called RER (‘Réseau Express Régional’) with almost no hierarchy of services is not defended at all.

As one can check in the table, the State orientations express a clear preference for the scenario number 4 of a ‘Euroregional hierarchic and integrated network’.

On the other hand, the orientations of the Regional Council are much more ambiguous. It is not a unique scenario which emerges, but rather a superposition of principles and actions which define the scenarios of a ‘hegemonic metropolis’, of ‘regional solidarity reinforcement’ and part of a ‘Euro-regional hierarchic and integrated network’.

The main priorities displayed by the Regional Council consists in connecting the major agglomerations to the metropolis in less than one hour by high speed regional lines to the

cities of the littoral, and in the modernisation of the Lille-Maubeuge axis for the Eastern areas. These priorities are clearly associated with the scenario of the 'hegemonic metropolis'; nevertheless, the attention given to the relations with the littoral and Maubeuge areas also corresponds to the scenario 2 of 'regional solidarity reinforcement'.

We will now evaluate this specific objective through an analysis of the quality of the transport service.

15.4. Method principles

The method developed here aims at assessing transport systems in their contribution to spatial planning objectives. The focus is set here not on the internal performance of the system itself but rather on the service produced by the system as an answer to the mobility needs. The transport service is analysed from three points of view:

- the segmentation of demand,
- the identification of the major attracting locations,
- the urban rhythms.

The transport services can be studied with two different methodologies: the transport flow models, and the accessibility models.

The flow models rely on detailed description of transport demand and supply (Trépanier and Chapleau 1996) (McFadden 1997), particularly when public transports are involved (Orfeuill 2000). Nevertheless, one should notice that the integration of the timetables in the description of transport supply is very recent (Nuzzolo, Crisalli et al. 2000), despite the fact that the constraints induced by the schedules can play an important role. In effect, missing a transfer because of a bad timetable coordination –inside a mode or between two modes– can generate a substantial increase of the total duration of a trip.

Another way to assess the contribution of transport networks to spatial planning is through accessibility indicators (Rietveld and Bruinsma 1998). In spatial analysis, the accessibility of an object can be defined as the relative easiness to reach that object, and can be applied to a unit of population, information or production (Hurriot and Perreur 1994). According to that definition, the concept of accessibility contains two different and complementary ideas (Martellato and Nijkamp 1998): the idea of opportunities –i.e. the possibility for two economic agents to meet– and the idea of the distance to cross for reaching such an interaction. Consequently, two dimensions have to be considered: on the one hand the places to be reached at the origin and at the destination, and on the other hand the distances over the transport system. The places to connect are selected according to the demand segments and the traffic generators to be treated. As to the measure of distances, the classical solutions based on averaged or minimal time distance are not appropriate, because of the gap effect induced by the schedules' degree of co-ordination. A more complex type of measurement has to be developed.

In addition, the promotion of intermodality, which is placed to the fore in France by the law on the sustainable development of the territories (*Loi d'Orientation sur le Développement Durable des Territoires*)– requires that more attention should be given to transfers between modes, i.e. to the co-ordination of timetables and the connection between different transport modes. These elements must be taken into account when distances are computed.

Thus, the accessibility indicators introduced here are based on exact travel time including transfer time. The necessary information is provided by the railway time-tables for the stations located in the Nord-Pas-de-Calais. The relevant data are introduced in a graph representing the passenger rail network. It is made of approximately 30 000 arcs and nearly

300 nodes. The measurements of accessibility result from the computation of minimum time paths which integrate transfer times. This full time-table information approach is relatively new (Nuzzolo, Crisalli et al. 2000), and the application to strategic supply analysis has seldom been made before (Mathis, Baptiste et al. 1997).

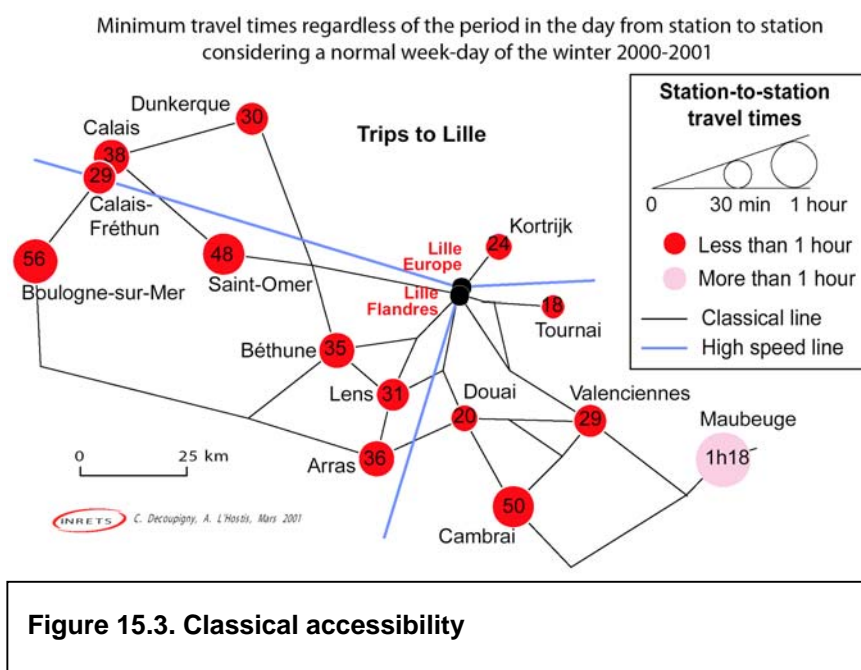
This approach permits to go beyond the simple notion of transport supply by including explicitly some elements of the demand that are spatially and temporally disaggregated (Rietveld and Bruinsma 1998). It applies at a regional scale a methodology that is more usually employed at an urban scale (Trépanier and Chapleau 1996). Indeed, at a regional scale, we will focus on the daily mobility that constitutes by far the most important part of the overall regional mobility (CERTU and SNCF 1998).

15.5. Is the 'hegemonic metropolis' a reality?

The 'hegemonic metropolis' scenario considers that the spatial relations to develop in priority are the bilateral links between Lille and each regional urban pole. This scenario is clearly supported by the objective of setting the cities at less than one hour of Lille. This is the policy objective that must be assessed for its contribution to the scenario of 'hegemonic metropolis'.

15.5.1 Classical accessibility: potential relations

In a first step, a classical accessibility indicator with no reference to the notion of transport service will be applied (figure 15.3). For each origin-destination pair, the set of possible rail trips is computed, from station to station and including the transfer waiting times inside the railway network. Then, the shortest one is selected regardless of the period of time, in order to determine which agglomerations cannot meet the objective. The map on figure 15.3

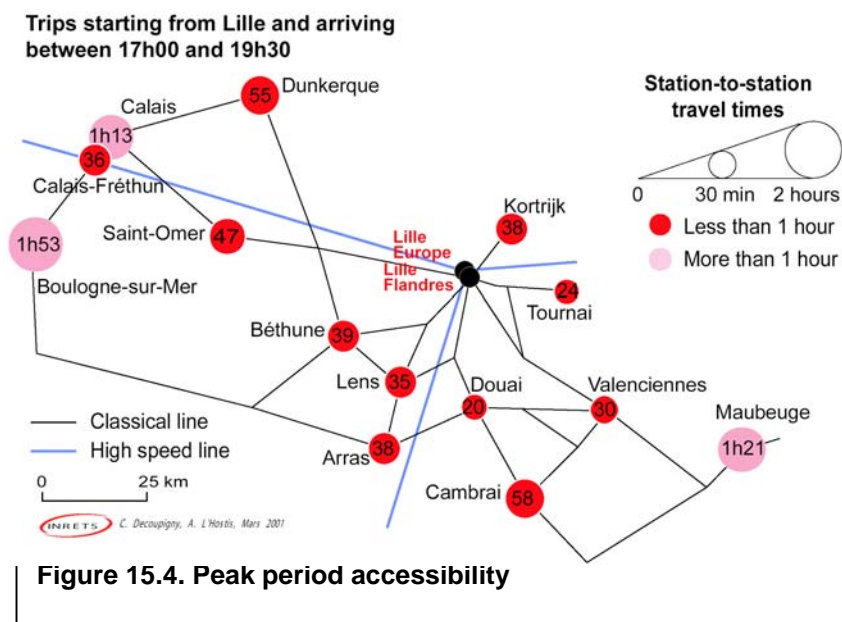


indicates the best travel times on the railway network to Lille-Flandres or Lille-Europe, the two central stations of Lille. The best return trips from Lille take similar times. It is seen that all the great agglomerations – except Maubeuge – have at least one railway service allowing to reach Lille in less than one hour.

The shortest travel time from Maubeuge takes 1h18. This is a significant gap with the stated goal. It has been shown (Menerault and L'Hostis 2000) that the relation to Lille is possible in one hour, but only at the price of a major reorganization of the architecture of the railway service.

15.5.2 Peak period accessibility: useful relations

The problem raised by this first result in terms of transport service is the lack of references to the rhythms of the daily mobility. Indeed, at the regional scale, 61 % of the morning commuting trips during the week arrive between 7h00 and 9h00 (CERTU and SNCF 1998). While 67 % of the evening commuting trips reach the destination between 17h00 and 19h30 (CERTU and SNCF 1998). While 67 % of the evening commuting trips reach the destination between 17h00 and 19h30, the evening peak period being more spread out.



Hence, this first measure of travelling time, ignoring the period of time during the day, is not really relevant. The second indicator proposed here, of peak period accessibility, goes one step further in the description of transport service by taking into account the urban rhythms and a first segmentation of the demand (figure 15.4).

From the point of view of the regional polarisation on Lille, only the trips during the above peak hours between Lille and the major urban centres were analysed. The map on figure 15.4 shows the best travel times from Lille between 17h00 and 19h30. Concerning the morning trips, only the journey from Maubeuge does not satisfy the objective. In the evening, the situation is more difficult: the returns to Calais (1h23), Boulogne (1h53) are not satisfactory. The reason is that the regional service of high speed trains does not play the same role as in the morning, as the return trips arrive only at about 20h00 beyond the peak period.

Moreover, one observes much similarity between the best travel times during the day and the shortest travel times during the peak periods for the whole of Nord-Pas-de-Calais, with the exception of the return trip to the littoral between 17h00 and 19h30. Indeed, return trip travel times are practically doubled for Dunkerque, Calais and Boulogne.

Thus, the objective of a trip time of less than one hour in the 'hegemonic metropolis' scenario is already almost a reality for a large majority of the Nord-Pas-de-Calais agglomerations. Two areas only remain beyond the limit of one hour: the East with Maubeuge, for which a deep modification of the rail service would be needed, and the littoral as far as the evening return is concerned.

15.5.3 Scheduled accessibility: real relations

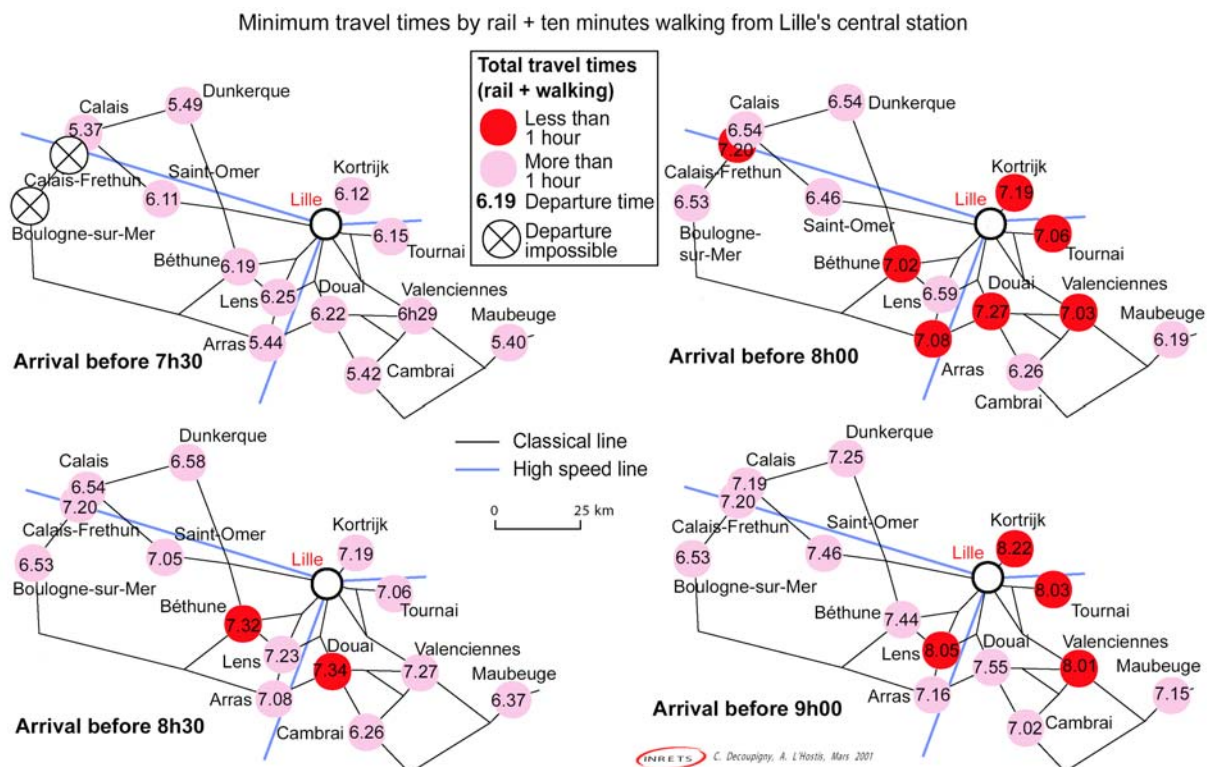


Figure 15.5. Scheduled accessibility to Lille

In order to fully integrate all aspects of transport services, the peak period indicator has to be extended in two directions: on the one hand the rhythms of urban activities impose time constraints that are often more precise than the indication of a two hour period and, on the other hand, the trips do not end at the destination railway station.

Focussing on the commuting segment towards Lille as a destination, it can be seen that, within a walking radius of ten minutes around the central stations, one can find a set of traffic attracting locations with a very developed commercial and tertiary centre (Bertolini and Spit 1998). This additional time must be integrated into the analysis. Furthermore, the commuting mobility is strongly constrained by the starting time of activity. This aspect of mobility must also be taken into account by an indicator aiming at the quality of service for this important part of the demand. From this point of view, the transport service can be defined by the conditions of access to the centre town of Lille for purpose of work starting at a well defined time. This new indicator differs strongly from the two previous ones: it is not the simple trip duration which is considered, but the duration computed from the *departure time* from each node considered. It may include a waiting time at destination, if the time of arrival is not equal to the starting time of activity. In doing so, we focus more on the transport service quality than on the performance of the transport system itself.

The maps on figure 15.5 show the departure times from the major urban centres corresponding to a time constraint of arrival in Lille taking into account the 10 minutes that are necessary to reach the final destination. Under these conditions, the objective of a trip time of less than one hour for four time constraints during the morning peak period is achieved by no agglomeration. In the best cases this objective is achieved for two time constraints only: namely, in the case of Douai, Béthune, and Valenciennes, as well as Courtrai and Tournai.

The most favourable constraint is that of arrivals before 8h00, where 6 agglomerations out of 13 are located at less than one hour of the metropolis, and where the regional high speed rail

places the littoral at 1h10. In contrast, for an arrival before 7h30 no agglomeration is at less than one hour, and from Boulogne it is not possible to reach the metropolis.

The regional valorisation of the high speed line produces an obvious effect on the Lille-bound access from the littoral. However the railway supply could still be improved to meet these constraints. In particular Calais could be better linked if the connection with the Fréthun station was optimised: for arrivals before 8h00 and 8h30 the relation between Calais and Calais-Fréthun takes as much 26 minutes, which means that it takes hardly less time than the high speed trip between Fréthun and Lille-Europe.

5.4 'Hegemonic metropolis' scenario assessment

On the basis of all these indicators an assessment of the objective to set the major agglomerations of the Region at less than one hour of Lille can be conducted. Two main considerations can certainly be made.

First, the measurement of best rail travel times regardless of the day period shows that the direct relations Maubeuge-Lille must be deeply modified to meet the objective. Concerning all the other agglomerations, the railway supply enables –at least potentially– to establish relations in less than one hour. In this first approach, the accessibility indicator reveals a regional situation that is not very far from the scenario of 'hegemonic metropolis'.

However, the approach emphasising the quality of transport services identifies the problem of evening returns to the littoral and raises the question of the connection between Calais and Calais-Fréthun. The improvement of this connection would certainly contribute to the role of Lille as a hegemonic metropolis, despite the fact that it is seen by the Regional Council as an objective for supporting the scenario of 'integrated and hierarchic network'.

The stated objective by the Regional council to link the major cities of the Region to the metropolis in less than one hour appears more like a transport supply objective than a transport service objective. Actually, the classical and peak period accessibility indicators have shown a situation that is not very far from that objective, with the exception of some peripheries of the territory. On the other hand the transport service analysis –expressing the user's point of view– raises the question of the metropolitan area internal coherence.

5.5 Methodological lessons

The transport service, and the related planning strategy objectives, can be assessed through a new family of accessibility indicators based on a very detailed analysis of the transport supply.

In order to adopt a service perspective, and to go beyond a strict supply analysis, elements of demand have to be included. Demand segmentation, spatial disaggregation and time scheduled constraints, associated with a full time-table information allow to build these new accessibility measurements. They permit to focus on the real services produced by a transport system. Nevertheless, the lesser degree of aggregation in space and time, induces a reduction of the range of validity of these measurements, which are relevant only for specific relations and demand. The above analysis focused on a very important segment of transport demand, the commuting traffic. Obviously, different but similar indicators would be relevant for shopping trips, for instance. In any case, this is the type of indicators, defined in view of set objectives, that are relevant for developing a spatial planning strategy

6. Intermodality for reinforcing the internal coherence of the metropolis

In order to obtain a more comprehensive understanding of the transport services supplied to the population, it is necessary to extend the analysis to another important transport demand segment linked to education activities. Actually, education related mobility constitutes about half of the regional clientele of the rail network

To begin with, it is necessary to identify the major points of attraction corresponding to this demand segment. figure 15.6 shows the five major campuses of Lille and the urban transport system that can be used to reach them starting from the regional rail transport network.

Initially, the heavy urban transport system was designed to link the major campuses to the central station of Lille-Flandres through an automatic metro called VAL (Véhicule Automatique Léger).

The regional users can access the campuses through the metro line number 1 with an interconnection at the central station. However, the

regional rail network includes a set of stations located inside the metropolis, some of them well positioned at proximity of the campuses. In order to *better exploit the existing network* our approach is based on the principle of the *virtual network* developed by Dupuy (Dupuy 1991). By exploring all the possible ways to reach the destinations –the virtual network– one can build a ‘real

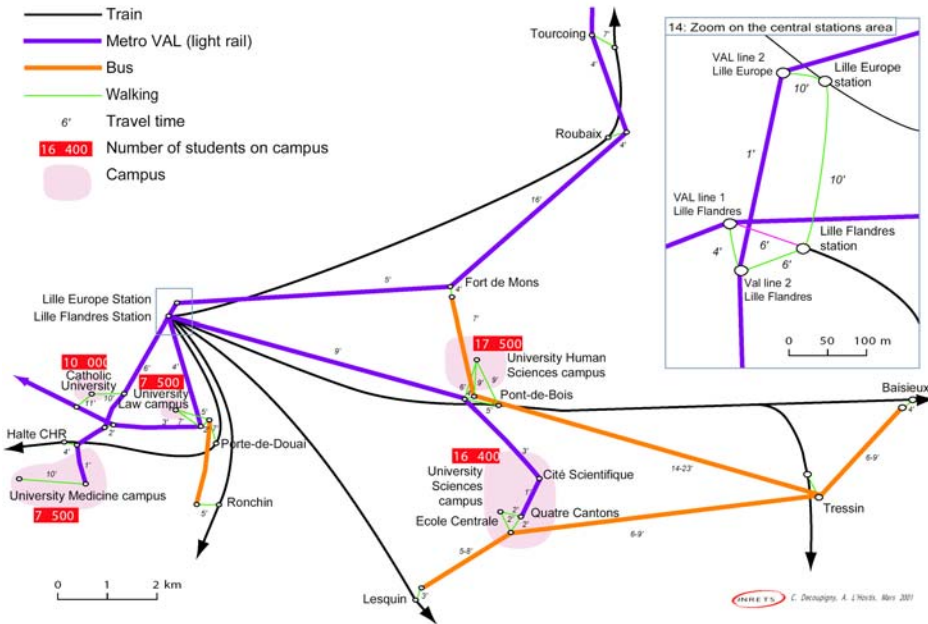


Figure 15.6: train-bus-metro connections to the campuses of Lille

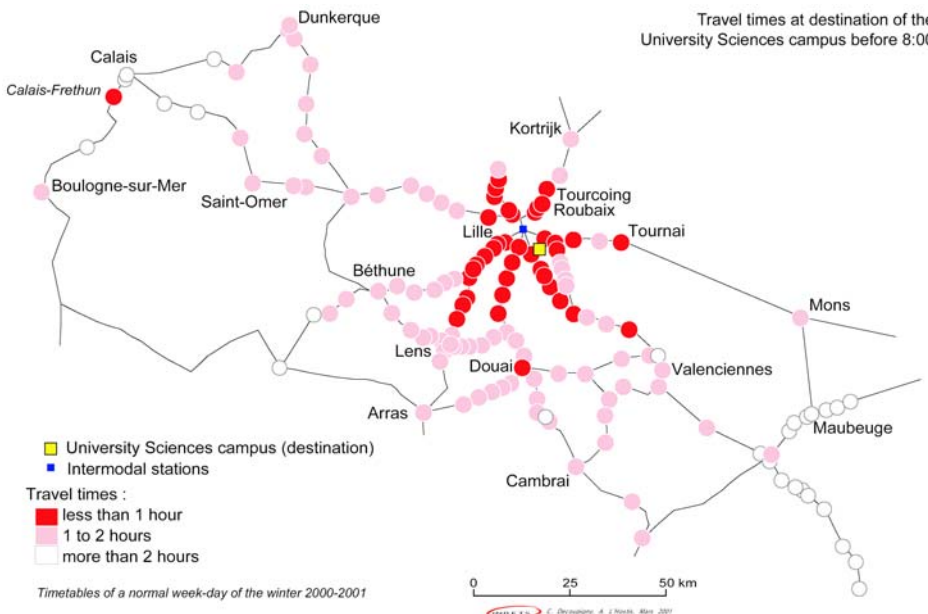


Figure 15.7. Scheduled accessibility to the University Sciences campus

network' that is made of credible alternatives enhancing the connectivity of the network. The virtual network appears on figure 15.6 with interconnections between rail and metro: at the hospital station named 'Halte CHR', at the 'Porte-de-Douai' station, and at the University Human Sciences campus Pont-de-Bois station, as well as between rail and buses at Ronchin, Porte-de-Douai, Baisieux, Tressin, and Lesquin stations.

The normal way of reaching the University Sciences campus from Lille-Flandres and with the metro is taken as the base accessibility measure. The students must be able to reach the University campus before 8h00, the normal starting time of the lectures. The map in figure 15.7 shows the best departure times from each railway station to get in proper time to the 'Ecole Centrale' on this campus. This does not correspond to a very favourable situation since, with the exception of Douai, no major urban centre of the region is located at less than one hour of the campus. The accessibility to the Sciences Campus is even less favourable than the accessibility to the centre town of Lille as shown in figure 15.5.

Considering now the access to the University Medicine campus, located in the East of the metropolis, it seems difficult to take into account the central stations only, and to ignore the Hospital railway station ('Halte CHR'). Actually, its introduction into the network analysis provides a better level of accessibility for some towns. In particular, Béthune enters the set of stations at less than one hour, while the accessibility from Douai is slightly degraded.

At this point it is worth considering whether the use of this new gate would also improve the accessibility of some other campuses. Figure 15.6 shows that the University Law campus can also be reached that way using the two metro lines. Indeed, this alternative solution can be considered as credible, because of the very high frequency of the metro system during the peak period –1'30" between two metros– and the quality of the pedestrian link between the two platforms facing each other. Moreover, the arrival times at this station are likely to be more reliable than at Lille-Flandres given the railway congestion at this central station. The effect of its use on accessibility is measured by the difference of departure times when this solution is included. It reveals a strong effect resulting from the fact that the few minutes saved by going through the Hospital station permits to take a later train in Béthune and the surrounding stations. A gain of 45 minutes can thus be obtained for some stations in the Western part of the region, and the University Law campus can be reached in less than one hour from Béthune.

The *virtual network* approach can be applied to analyse the Eastern campuses access with some bus lines. Among them, the bus connection at the Lesquin railway station can be taken as a credible alternative for the students coming from Valenciennes. A close examination of the connection conditions is presented in figure 15.8.

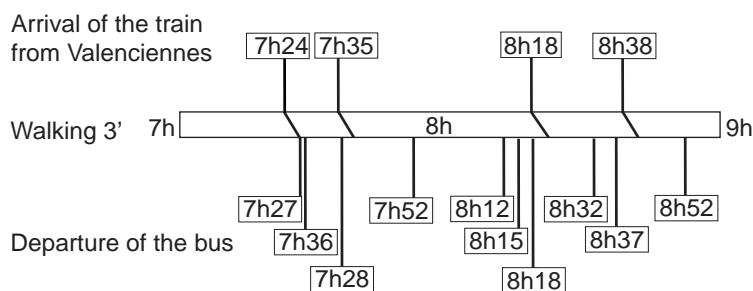


Figure 15.8: existing train-bus connections at Lesquin in direction of the University Sciences campus

On top of figure 15.8 the arrival times of trains from Valenciennes are given, while departure times of the buses to the University Sciences campus are indicated. Only one of the four trains during the morning peak period is connected to a bus, if we count three minutes walking from the railway station to the bus station. Clearly, the interconnection of trains and

buses is not today a criterion in the design of the bus timetables. Nevertheless, marginal modification of the bus timetables could clearly improve the quality of the rail-bus connections as shown in figure 15.9.

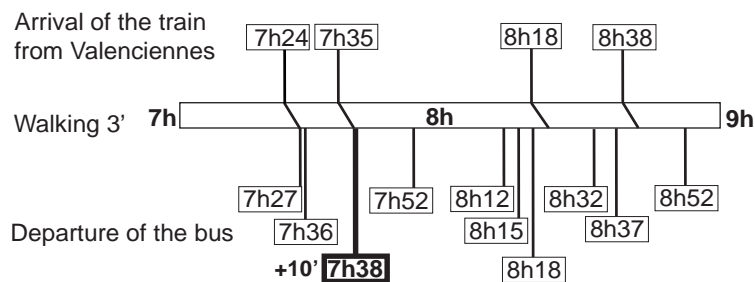


Figure 15.9: Proposed train-bus connections at Lesquin in direction of the Sciences campus

Figure 15.9 shows that a simple 10 minutes delay for the arrival time of one bus at Lesquin would suffice to realise a good connection for the train of 7h35 predominantly used by the students. The introduction of a new bus service could also be considered. It is worth mentioning that the use of this second alternative solution would have no effect on the fares paid.

The improvement of accessibility brought by this modification is measured in figure 15.10 by the difference between departure times when these two alternative connections – via the Lesquin and the Hospital stations – are activated. 15 minutes is gained at the departure from Valenciennes, which brings the city into the one hour trip category. A similar travel time saving is observed at St-Amand, Orchies and Templeuve. Beyond Valenciennes, the savings are very high with half an hour from Le Quesnoy and 45 minutes from Maubeuge.

There is also an improvement in the access to the University Sciences campus. Indeed, the metro line between Lille-Flandres central station and the Eastern campuses begins in the hospitals area. Hence, the students coming from the Lille-Béthune area and beyond may use the Hospital station instead of the Lille-Flandres station to take the metro. By doing so they avoid the congestion of the central station and they save a few minutes that enable them to take the next train.

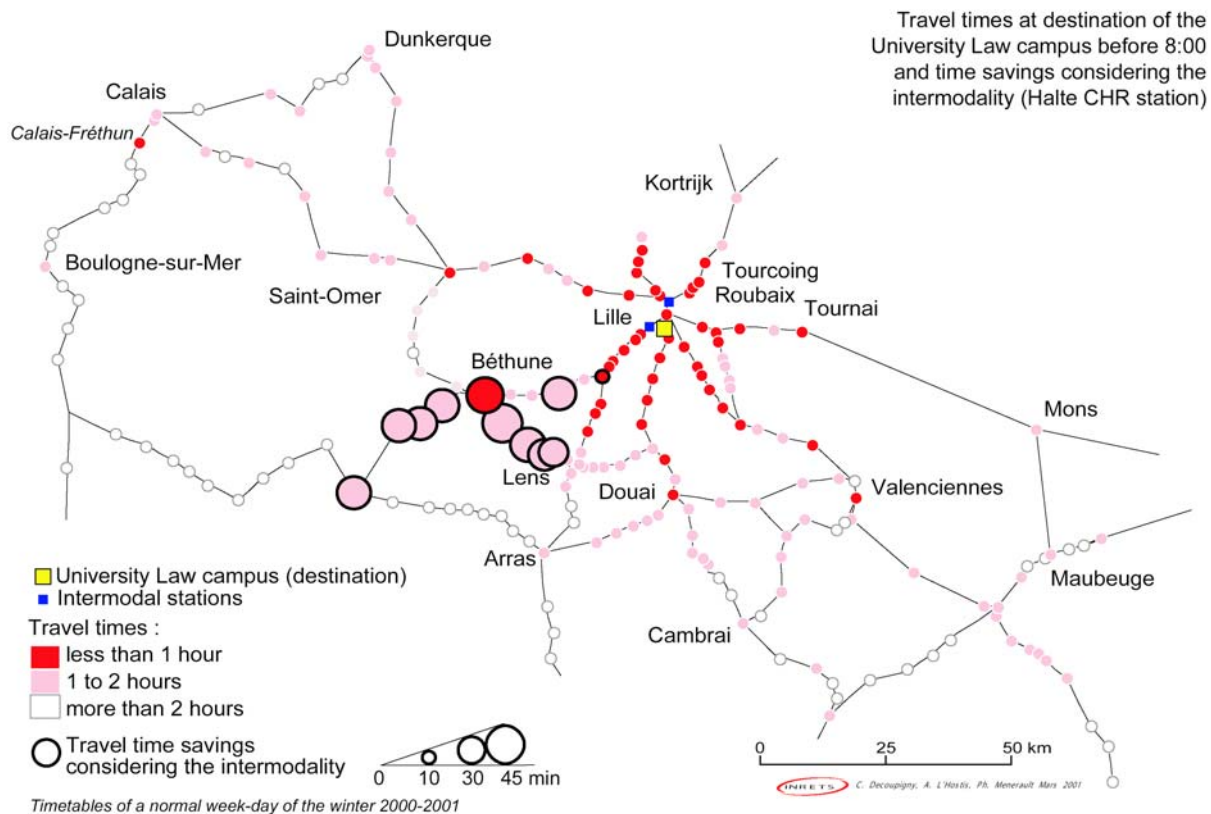


Figure 15.10: Accessibility improvement by the development of intermodality

There is also some improvement in the accessibility of the University Human Sciences campus. Therefore, these modifications would provide much better accessibility to the major University campuses, which attract about one-third of the total regional student population.

15.7. Conclusion

This chapter proposes an assessment methodology of the transport systems contribution to the regional spatial organisation. To illustrate this approach, the focus was placed on the role of Lille, the region's metropolis, in the regional urban system.

This methodology belongs to the field of strategic analysis. Nevertheless, it is shown that to develop a correct analysis of transport services it is necessary to proceed to a very detailed modelling of the transport supply that includes the full timetables of the different transport means and the specific needs of the different demand segments at different times of the day. A new family of accessibility indicators was proposed, which incorporates the timetable information as well as the timing and location of activities. As tools for the regional planning of transport services, they enable us to better measure the adequacy between the supply and the transport needs, and the quality of transport services.

The objective of connecting the cities of the Region to Lille in one hour – the emblematic measure of the 'hegemonic metropolis' spatial scenario – corresponds to a transport supply objective. Traditional accessibility indicators can be used in its assessment, but the proposed approach is better able to identify the real problems of accessibility. Applied to the case of the Lille region it suggests, for instance, that the development of the scenario 'hegemonic Metropolis' would benefit from improved relations to and from Maubeuge, and from better evening return trips towards the littoral area. Combined with an analysis of the regional 'virtual network', this approach is also able to identify concrete alternatives like a new

scheduling of buses or an improved connection of existing railway stations to the urban network. The proposed modifications would also contribute to a better implementation of the planning objectives.

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