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Questioning the relevance of regional bus and train for low traffic flow through a sustainable approach

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Abstract

In the current difficult economic situation, a political debate about the more relevant mode for regional low-traffic services has been opened in France. This paper aims to contribute to this debate by studying the next complex issue: is a train more relevant than a coach for low-traffic routes? It suggests a specific methodological approach based on a sustainable comparative analysis of a regional service supply according to the operating mode (train or coach). It does not pretend to conclude on this relevance topic but underlines the strengths and weaknesses of each mode.

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Keywords: mode relevance; low traffic; train; coach; sustainable

1. Introduction

Since the French decentralization process of regional railway services in 2002, Regions have become the competent authorities for the organization of regional public transport services. They are responsible for defining their consistency: routes, operating mode (railway or road service), level of service and pricing. And since 2002, the regional transport service supply has been developed. More especially, railway services have been restructured, for

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some of them strengthened. Pricing ranges have been expanded and heavy financial investments have been made for the rolling stock renewal.

But, in the current economic situation, and considering the large budgetary constraints for local authorities as well as for the French State, a political debate about the more relevant mode for regional low traffic services has been opened in France. It provides lively discussions among the various French associative or political structures. In particular, in 2009, the Court of Auditors, a French structure in charge of ensuring the proper use of public funds, raised the issue of a potential transfer of some rail services on the coach services network. This aims to reach a better economic, financial and environmental cost-effectiveness of the transport supply by changing the operating mode on specific links.

In this context, our work relies on some questionings about the relevance of regional train and coach services. Can we really say that the coach is “a low-cost transport mode” compared to the train? Could it find its place among low traffic routes market? Under which conditions is there a duality between train and coach or rather a complementarity? In other terms, what is the relevance perimeter of these modes? To discuss these questionings, this paper suggests a methodological approach based on a comparative analysis of a regional service supply according to the operating mode (train or coach).

First, the paper will provide a literary review about the issue of transport mode choice. It will also remind the main elements of the French debate about train and coach. After presenting our methodological approach, we then broach the subject of relevance, distinguishing the main actors involved, that is to say decision-makers and individuals. Finally, we will conclude with the French challenges to give to the coach mode its place in the transport market.

2. Current state of knowledge

2.1. Influence of the decision making process on modal choice

The modes relevance influences the decision making process of modal choice. And each country has its own decision-making model. For example, Richer et al. (2014) evoke a well-centralized decision-making process based on an economic reasoning in the United Kingdom contrasting with the French situation which refers to a decentralized model based on a “political enthusiasm”. Moreover, these authors (2012) also summarize the French decision making process as a political rationality whereas in Germany it seems more to be a functional rationality. Nevertheless, whatever the model, it relies on an economic analysis which has a significant weight in the modal choice. We have chosen to focus below on the French case in order to give some specific contextual elements. The latter will help readers to have a better understanding of the nature of the further debates and challenges in the following of this paper.

For a transport service project, a French elected representative has to choose the more suitable mean of transport according to territorial services challenges. To legitimate his project and justify his political choice, he will generally argue it according to an approach of transport mode relevance (Richer et al. 2011) combining attendance, capacity of the mode and cost. Certu (2004) suggests an appraisal of the relevant field of urban transport modes based on a comparison between traffic flows and attendance forecasting. This theoretical and calculating approach, widely used for urban transport systems, may be questionable because the notion of technical relevance is here summarized by an indicator of relevance threshold as if it was possible to “normalize” the choice of urban public transport system (Richer et al., 2011). Moreover, as Merlin (1991) underlines, it appears that the costs of public transport systems are proportional to the provided capacity of them. That means that elected actors combine two criteria to legitimate their service project: the potential attendance with the choice of the mode.

An individual will also justify his modal choice for his regular and occasional travels. Some scientific works highlight that the main decision factors of modal choice are travel time and cost (Crozet 2005, Vleugels 2005, Frank et al. 2008, Buehler 2011). This explanation is based on the principle of a rational choice. But these only utility criteria of modes are not sufficient to characterize individuals’ behaviors (Brisbois 2010, Munafo et al. 2012, Johansson et al. 2006). Others subjective factors have an influence on the decision making process. We will specifically come back to this point latter in this paper. To conclude, the modal choice made by individuals results from a combination of technical criteria, of habits, of socio-cultural aspects and also of value system factor (Amar, 1993).

2.2. Overview of French political debates

In France, the current financial constraints enduring by land-use planning actors have been a driving force for reintroducing political debates about the relevance of train and coach for regional low-traffic routes. These routes especially concern periurban and rural services.

The debates about the relevance take place at different geographic decision-making levels. At the national level, the Court of Auditors (Cour des Comptes, 2009) raises the issue of a potential transfer of some low-traffic rail services on the road network for economic and environmental reasons. Thus, it invites communities to have local debates about this subject. This point of view was also supported by several senators, in particular by Senator Hubert Haenel who suggested the decentralization process of regional rail services (Haenel, 1994). It encourages to redefine the functionality of each regional transport mode -train and coach- based on a viable and sustainable economic model for communities.

This French debate was also fueled by the discussions on opening up the rail and road public transport market to competition at both European and national levels. At the French railway convention in 2011 (Assises du ferroviaire, 2011), all the actors involved suggested to encourage Regions to examine the opportunity to transfer some rail services on the road network. Considering the coach operating “flexibility”, the political aims were to implement more attractive pricing, to optimize services and strengthen their frequencies because of the bus operating “flexibility”.

At a local scope, in some urban planning processes, elected representatives debate on the potential railway infrastructures reopening to operate some passenger rail services. On these infrastructures mainly located in rural or periurban areas, there has been no more passengers train running for several years or at least there was a few freight traffic. The problem is that the transport demand is low on such areas. As a consequence, there is a real difficulty to reach flows massification and the train system seems to be an inadequate solution. But we have noted that most often, the gateway of a new train service project seems to be the existence of a railway infrastructure that could be enhanced. This may in part be explained by the French legislation. Indeed, the Grenelle laws adopted in 2009 and 2010 in order to translate the national environmental commitments, encourage the enhancement of the rail network both in terms of transport uses and support of land-use planning policies. But the potential consequence of this way of thinking from elected representatives is that local debates may rule out road operating technology (coach service).

This debate about train and coach services remains a sensitive subject influencing the political choice. However, the French State recently decided to liberalize medium-sized and long distance coach services. Since July, new implementations of coach services on more than 100 kilometers long routes by private operators are allowed without authorization process, even if there is a rail service. These services concern both national and regional routes.

3. Our methodological approach

3.1. A specific definition of modes relevance

Questioning the relevance of modes invites us to have a specific approach. We chose to define the relevance according to the three pillars of sustainable development: economic, environmental and social items (see Fig. 1 below). It is not a common practice in France where the tradition is to mainly focus on socio-economic aspects.

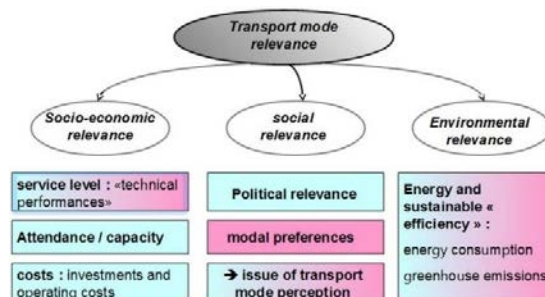


Fig. 1. Our transport mode relevance definition (source: S. Hasiak).

The economic relevance consists in comparing the transport service level, especially its technical characteristics with its investment and operating costs.

In the framework of sustainable development principles, the analysis of the transport system choice has to take into account an environmental approach of transport modes relevance. This relevance might be defined by the concept of energy and sustainable efficiency, that is to say on evaluations of both energy consumption and greenhouse emissions.

But the issue of relevance has also to be considered from a social and sociological point of view. We especially mean the notion of political relevance and modal preferences. These two notions question transport modes perception.

Moreover, the notion of relevance is not the same according to actors. And there are two main ones: individuals who are the key actors of the mobility system and decision makers who implement mobility supply. It refers to the duality between a collective relevance and an individual one which takes its specific needs into account. This dichotomy allows us to talk about an opposition between an objective relevance for local authorities and a subjective one for individuals.

3.2. Capitalizing the knowledge

Our work is mainly based on a literary review of available data and actors strategies in France. Indeed, numerous works had been led on the subject of socio-economic aspects and so it appears rather interesting to capitalize the knowledge than leading another assessment of economic aspects. Moreover, we have to point out that there are some knowledge gaps in France. They are mainly due to the French transport organization, especially due to the monopoly of the historical rail operator (the SNCF) and the operating by different small coach operators.

We also analyzed some local press articles and made an interview of the French railway owner operator.

4. The modal relevance according to the three pillars of sustainable development

4.1. The relevance for decision-makers: the technical and economical relevance

In France, elected representatives seek to legitimize their transport project through a socio-economic approach combining the technical performances of the transport system project with its cost.

4.1.1. A link between mode relevance and traffic level?

During many years and still today, the discussions about the most relevant mode between train and coach are relied on the principle that there is a threshold of rail traffic level, below which it might be interesting to transfer the service on the road public transport network. But the fact is that there is no standard value. The French Court of Auditors uses two different values in its public reports (Cour des Comptes, 2007, 2009). From a value of less than 20 passengers trains per day in 2009, the Court evoked a value reduced in half in 2009.

Moreover, this threshold appears to be rather an arbitrary value because no socio-economical study is able to prove its scientific reality. After having used a threshold in its strategical works, the French rail network owner (RFF) rather prefers to adopt a more qualitative position based on the principle of a case-to-case analysis. This latter considers the local challenges supported by land planning stakeholders to propose a new transport train service: the forecast attendance and the train service level are compared to the investment cost to rehabilitate the rail infrastructure.

4.1.2. A rooted idea that rail technology provides better technical services performance

It is obvious that a rail system provides a higher theoretical transport capacity than a regional bus. But for low traffic lines, the relevance analysis based on this criterion is unsuitable. Indeed, these two modes are able to carry low flows. Thus, the political argumentation is based on the notion of technical relevance defined by the technical characteristics of modes performance. And nowadays, in the mind of many actors, operating a service by train suggests a better performance level. But is it really the case for low traffic routes?

To answer this issue, we compared different criteria of French service levels assessment according to the operating mode (table 1). We didn't take the criterion of accessibility for persons with reduced mobility into account since transport authorities have to implement accessible services to all persons.

Table 1. Transport service levels according to the operating modes – France.

Technical relevance: criteria	train	coach
Rolling stock capacity	Important variation (trains modularity): from 50–80 seats (X2200 or X74500 models) to 780 seats (Region 2N model, 8 bodies/two-level train) allowed to carry standing passengers	From 55 to 58 seats on average the “high comfort” regional coach: 45 seats not allowed to carry standing passengers
Average commercial speed	From 60 to 70 km/h on the entire regional network (on small lines: no available data) a track speed limit depending on the lines type: small lines with low traffic: < 100 km/h + slower speed imposed by the poor track conditions High influence of the number of stations	Assessed between 30 and 65 km/h coaches have to respect the Road Traffic Rules - speed limit for coaches: 100 km/h (on highways) - a speed limit modulated according to the roads type Incidence of road congestion High incidence of stops number
Regularity	Impact of an event occurring on tracks, rolling stock breakdown on train traffic: variable delay depending on the event nature a rail service is subjected to its infrastructure: from waiting to go back to normal situation to an eventual transfer of passengers on coach services or a change of rolling stock	Impact of an event on the road network, traffic conditions (recurrent or occasional traffic congestion): variable delay depending on the event nature from waiting for the congestion resorption to the implementation of an itinerary deviation
Comfort	Rolling stock manufacturers (trains and coaches) have taken into account “basic” comfort (seat, space between seats) and also “leisure” comfort (Wifi, WC, electric sockets, etc.). the main issue: passengers’ perception of comfort? The topic of comfort has to be appraised through a systemic approach integrating other exogenous factors such as: impact of tracks conditions, route profile, driving condition, requirement to wear seatbelts in the coach, rolling stock age,...	
Modularity of services	For both rail and coach services, services may be adapted: modification of frequencies, change of the stops number according to periods or schedule times, increase the capacity of rolling stock in case of peak attendance (coupling of two trains, doubling of coach service), combination of different types of services (coach: regular service combined to a transport on demand; train: train and taxi service), and finally possibility to mix two operating types: rail and road on the same route. But a more complex adaptability for the train than for the coach (train paths availability, regulatory procedures to change a train service)	

This comparison does not underline significant differences in the technical performance of the two modes. Besides, it shows that the technical performance is measured for a transport system, that means the other factors play a role in the performance level. Thus, if we consider the transport service policy, the number of stops and the average distance between stops have an influence on the commercial speed. Likewise, the infrastructure network, especially its characteristics and track conditions, impacts the system performance level. Indeed, the railway tracks on which low traffic train services run are most often non-electrified single tracks. They correspond to a capillary subnetwork (Degest, 2015). And their poor track conditions impose a speed limit.

The technical performance is usually assessed with specific indicators such as travel time, frequency, comfort. But there is another factor which is important but often forgotten: services adaptability. Even if train and coach services may be adapted, coaches offer more flexibility than trains because changing train services requires to be planned ahead and depends on train paths availability while coach sector may be highly “demand-responsive” (Steer Davies Gleave, 2009).

As a conclusion, we cannot conclude than the train is more efficient than the coach in terms of performance service levels. Each mode has its advantages and inconveniences.

4.1.3. Economic relevance at the heart of the decision making process

In France, the legitimization of a transport service project is mainly based on its socio-economic relevance. The financial evaluation is thus an important component of the decision making process. It implies a multiplicity of stakeholders because of a dividing-up of French transport competencies: regional transport authority, operators

(SNCF, the historical operator; road passengers transport operators), infrastructure managers and finally users who contribute to the public transport service financing through ticket prices. This paper only considers the cost supported by local transport authorities. So, the notion of cost refers to operating costs, notion that differs from production costs used by operators.

The approximate operating cost for coach service is evaluated around 2 or 3€/per vehicle.km (Certu, 2013).

For train service, we based our analysis on a feedback of evaluations of French regional railway services costs led by different works (Séguret 2005, Gratadour 2007, Court des Comptes 2009, Senator Grignon 2011, Centre d'Analyse Stratégique 2011, Beauvais Consultant 2012). It delivers the situation of the French economic model based on an operating by the traditional operator, the SNCF. This feedback underlines that there are different values of French operating costs according to the assumptions taken by the authors in a context of low transparency in the SNCF data. As a consequence, this caution leads us to suggest a range of operating costs of French regional rail services operated by the SNCF. In the early 2010s (Fig. 2), they are appraised between 16 to 18€/per train.km whatever the type of lines.

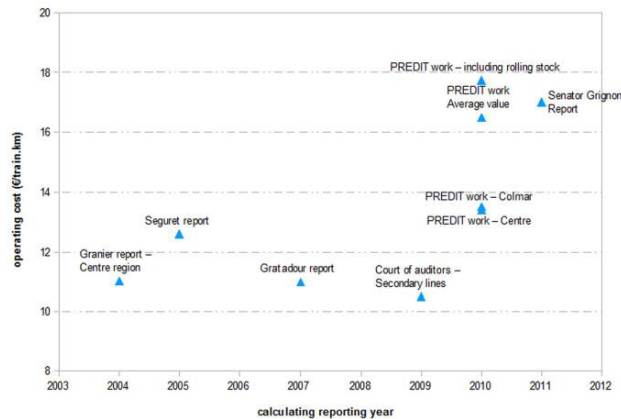


Fig. 2. Variation of operating costs of French regional railway services.

Operating costs of low traffic lines are not well known because of a lack of analytical cost accounting. However, they have been assessed around 11€/train.km (Cour des Comptes, 2009). According to the rail owner operator, this value has to be considered as a low value since the degraded tracks need more regular maintenance operations. Besides, the feedback of few low traffic railway lines operated by other operators tend to prove that it would be possible to reach a kilometer operating cost around 5€/per train.km according to a specific model (only one operating agent, low-capacity rolling stock, selling tickets on board, reduced controls,...).

In the current context of governance of French railway system, the rail technology choice remains more expensive than a regional coach service both in terms of investment and operation.

4.1.4. Which place for the sustainable relevance?

The literature reports that the train is the most relevant transport mode (Fig. 3 (a)) when we consider its external costs (Degest, 2015). It also reports that a train is intrinsically more energy efficient than a public transport bus service and emits low CO₂ per passenger. That's the reason why one could talk about a sustainable transport mode. And this finding might also explain the reason why decision makers don't in depth focus on an environmental approach of their mode choice in their arguments discourses.

But, this result is true when the railway system fulfills its function of "mass transportation system", that is to say when there is a high occupancy rate of train. Indeed, works comparing greenhouse gas emissions (ADEME 2008, Beauvais 2012) underline that this indicator has a significant influence on sustainable modes efficiency (Fig. 3 (b)). If a train is, energetically speaking, very efficient in terms of emissions per passenger, an empty or even half full regional train is less efficient than a regional coach which is full.

As a consequence, we are not able to conclude here that, whatever the case, the train is more sustainable relevant. For low traffic routes, it requires an assessment of sustainable efficiency of each mode, train and coach, according to the forecast attendance of these services.

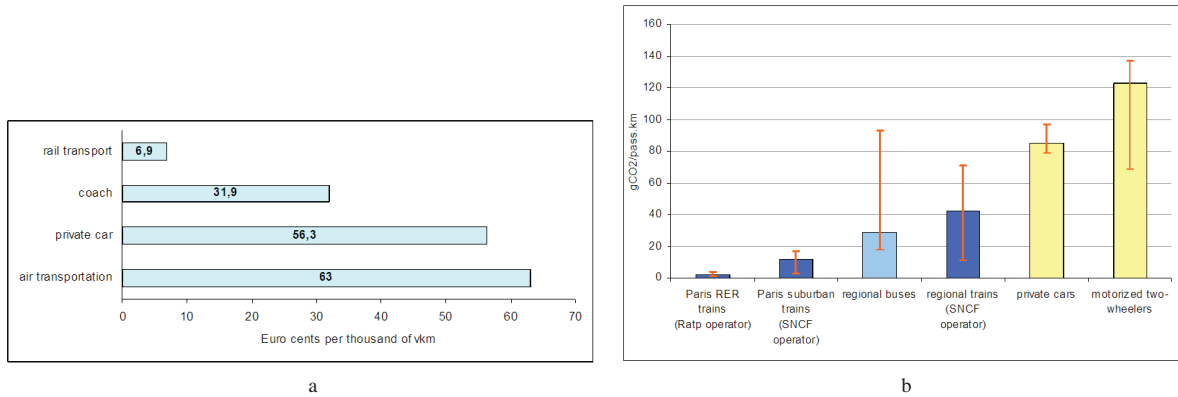


Fig. 3. (a) external costs of Transport in Europe (source: Degest); (b) Variation of greenhouse gas emissions according to the occupancy rate of regional transport modes (source: Ademe).

4.1.5. Conclusion: a political relevance closely linked to the image of transport modes

As explained previously, French public authorities essentially build their modal choice arguments on the notion of modes relevance. More specifically, it concerns the technical efficiency of modes, the way they face service challenges for an acceptable cost. However, one cannot deny the fact that the image of modes comes into play in the political decision. For example, stakeholders often bring into opposition tramway and urban bus and consider the tramway as a vector of modernity. Richer et al. (2012) suggests that “the strength of the modern tramway image for elected representatives -a factor largely used by rolling stock manufacturers in their booklets- exceeds the debate on modes relevance only based on transport criteria”.

It is also the case for long distance modes such as train and coach. Indeed, in France, the tramway renewal, the first running of new trains and the modernity image which is conveyed through discourses and press papers are arguments in favor of good perception of rail technology. On the contrary, coaches do not have a very positive image and are compared to a discount mode for disadvantaged populations. The French railway operator (SNCF) suggests some “historical and cultural reasons” related to the implementation of the French railway passengers network. According to territorial debates reported by the local press, we can point out the idea of a “decline” introduced by a coach service.

As a consequence, the notion of mode relevance is associated to the notion of political relevance which also takes the image of modes into account. And we can ever say that there is a French political resistance to implement some regional bus services instead of train services. This resistance seems to be fueled by the negative image of coach from both elected representatives and citizens. But in recent years, there is a growing awareness to rehabilitate the coach image among manufacturers, professional bodies, local public transport authorities and some transport systems operators. This leads to various actions to promote the bus, or to define functional specifications of coach of the future. But it is still too early to judge the impact on coach perception by French elected representatives.

4.2. The relevance for individuals: a compromise between modal performances, habits and image of the mode

4.2.1. A choice according to the convenience of mode: the couple travel time and cost

Many scientific works prove that people uppermost make their modal choice by considering travel time and cost criteria (Crozet, 2005, Vleugels et al., 2005,...). Without pretending to deny these conclusions, these criteria are not sufficient to explain the modal choice of individuals. Indeed, these works are based on a principle of a behaviors standardization which is essential for modeling studies. However, when we consider the individual as the key actor of the mobility system, we have to take into account the fact that each individual has his own personality and his own mode of reasoning. And so, is the priority of speed and economic price the same for all of them? In France, the development of low cost mobility services and the worsening of certain rail services levels invite us to question the place of these key factors in the individual modal choice process.

4.2.2. *An individual and not collective social relevance*

One has to consider that there is a potential difference between the point of view of public authorities and the one of individuals concerning the notion of transport mode relevance (Brisbois, 2010). Indeed, the modal choice cannot be considered completely rational and only based on technical characteristics of modes efficiency (Brisbois 2010, Munafo et al. 2012). Several works have shown the existence of “symbolic and emotional attributes” related to personal value system (Brisbois 2010, Flamm 2003, Bourg 2011). Likewise, psychosocial factors have a significant influence on the individual process of modal choice (Frenay, 1997). And finally, the lived experience of modes plays a role in the modal choice decision (Clochard, 2008): a non-use of a transport mode will accentuate negative images and will contribute to deliver some constraining arguments of using it.

What is the modal preference of French individuals between a train and a coach for regional trips whose average length is about 90 km (variation of this length from 20 to 300km)? We have got very few elements to answer this question since it concerns interurban public transport perceptions. Indeed, most of research works focus on a comparison between the individual means of transport (private car) and the urban public transport, whatever the mode: tramway, bus, underground (Kaufmann et al. 2010, Rubens et al. 2009, Flamm 2003, Munafo et al. 2012). Some international works (Cain et al. 2009, Scherer et al. 2012) prove a preference for rail technology (light rail, tramway and train) so that they conclude that there is a “psychological rail factor” and a superiority of the train. Moreover, Van de Velde (2009) talks about a segmentation of train and coach uses according to users’ profile. Thus, public coach services operated on medium and long distance are used by “European disadvantaged citizens”. This finding is crying out: would the coach only be a popular mode of transport for low-income populations?

Whatever these previous consideration, it is obvious that the coach suffers from a negative image from French individuals as the rail system has been largely developed.

5. Conclusion

In France, regional coaches have found their place in the regional services supply, especially on areas where they are complementary to rail services because there is no rail infrastructure, or on territories where rail and bus services are mixed (spatio-temporal adaptation according to running hours or area). But, when there is a rail infrastructure on a regional link, it seems that the coach has more difficulties to find its place.

However, this paper underlines that a regional coach may be as relevant as a train for low traffic routes. Without pretending to conclude on the relevance of each mode, it rather highlights the strengths and weaknesses of each means of transport by an approach combining the three items of social, economic and environmental subjects.

Nowadays, in France, considering the context of budgetary constraints, the challenge is to change ways of thinking and mentalities of both stakeholders and individuals in order to give to coach services their place in the transport mobility supply like the train.

Coach services already have their place in the transport market in some European countries. In France, the recent liberalization of them on medium-sized and long distance routes should have an influence on their perception. But there is a need to act on several fronts in order to change the image of the coach. Indeed, this paper reminds that there is a modal preference for the train.

First, there is a need to lead some educational actions for elected representatives. Beyond the coach image issue, we have seen that the social relevance is nowadays not really taken into account by French policy makers. Their challenge is to consider the individual at the heart of the decision-making process for the transport system choice by considering his modal revealed preferences between two operating public transport modes. The way of modal choice reasoning of individuals, their modes perception may contribute to identify and define the levers for action on travel behaviors and communication around coach services supply. Moreover, this paper also invites French local actors to consider these two modes into comparative studies in relation to territories challenges. But we have to keep in mind that, in the French decision making model, the political relevance of mode choice will inevitably impact the final political decision.

Then, specific actions for individuals may be also defined and implemented to ensure that coach services will be considered as a mobility solution like any others and for all people.

To conclude, liberalization of French coach services, cost or reliability of train services, family and public budgets, etc. may have an impact on the image of modes and their use. The challenge is not to strengthen the power of balance between train and coach, but it has to reaffirm their complementarity, even though we will have to ensure cohabitation between public and private supply.

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