

High-Speed Train Planning in France, Lessons from Mediterranean TGV-Line

Stéphanie Leheis

Abstract—To fight against the economic crisis, French Government, like many others in Europe, has decided to give a boost to high-speed line projects. This paper explores the implementation and decision-making process in TGV projects, their evolutions, especially since the Mediterranean TGV-line. This project was probably the most controversial, but paradoxically represents today a huge success for all the actors involved.

What kind of lessons we can learn from this experience? How to evaluate the impact of this project on TGV-line planning? How can we characterize this implementation and decision-making process regards to the sustainability challenges?

The construction of Mediterranean TGV-line was the occasion to make several innovations: to introduce more dialog into the decision-making process, to take into account the environment, to introduce a new project management and technological innovations. That's why this project appears today as an example in terms of integration of sustainable development.

In this paper we examine the different kinds of innovations developed in this project, by using concepts from sociology of innovation to understand how these solutions emerged in a controversial situation. Then we analyze the lessons which were drawn from this decision-making process (in the immediacy and a posteriori) and the way in which procedures evolved: creation of new tools and devices (public consultation, project management...). Finally we try to highlight the impact of this evolution on TGV projects governance. In particular, new methods of implementation and financing involve a reconfiguration of the system of actors. The aim of this paper is to define the impact of this reconfiguration on negotiations between stakeholders.

Keywords—High-speed train, innovation, governance, sustainability.

I. INTRODUCTION

THE reflation plan implemented today in the majority of the European States start again major infrastructure projects, being based on the keynesian argument according to which the increase of public expenditure contributes to the economic revival. In French reflation policy, TGV projects are particularly well funded. The Inter-ministerial committee of planning and competitiveness of territories (CIACT) is meeting on February 2nd, 2009 to update the list of the most

priority large infrastructures projects, among which the East-European LGV (2nd phase to Strasbourg) appears, with the Bretagne - Pays de la Loire LGV (prolongation of the Atlantic LGV towards Nantes and Rennes), and the Southern Atlantic Europe LGV (towards Bordeaux and Spain). The impact of such measures which is accompanied by an enumeration of corresponding funds raises the question always in debate of the link between transport investment and economic growth [1].

If projects of high speed line are still a topical subject, it doesn't mind they are less controversial. From this point of view, the TGV Mediterranean, which connects Valence to Marseille, is an exemplary study case. It is undoubtedly the high-speed line which was the more disputed in France, since the appearance high-speed [2]. Paradoxically it is today a huge success, as well as commercial, technical and architectural. The project was characterized by a decision-making process particularly controversial, uncertain and chaotic. Nevertheless, the paradox persists there, since the line was carried out relatively quickly compared to other projects in progress. The construction of this line was also the occasion to realize several innovations, as well technical as organizational. This study case thus deserves that we pay more attention in details to the lessons which could be drawn from this experience.

This study was done from semi-directive interviews with actors involved in this project, and a documentary work on the whole of available data (archives and studies). The aim was to rebuild the decision-making process within the framework of an international comparison of mega transport projects.

We will return on the main innovations which emerged in this process, according to which methods and in which context? Then we will analyze the lessons which were drawn from this experience and the way in which these lessons were translated in legislation. Finally beyond this example we will raise the question of the evolution of governance in transport projects, around a new system of actors.

II. THE HIGH-SPEED RAILWAY POLICY

A. A Logic of Network

France is the first country to have developed a high-speed network, as from 1981. The line Paris-Lyon (LN1 or South-Eastern TGV) was the first opened to traffic, and prolonged until Valence in 1994. Then other lines are put into service, the Atlantic TGV (1989, 1990), the Northern Europe TGV (put into service in 1993), then the Ile-de-France

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Stéphanie Leheis is PhD student at Université Paris-Est, member of LATTS Laboratoire Techniques, Territoires et Sociétés (6-8, avenue Blaise Pascal, 77455 Marne la Vallée Cedex 2, France ; stephanie.leheis@enpc.fr).

interconnection to connect the South-eastern line to the Northern line while passing by Eurodisney and Roissy-Charles-de-Gaulle airport (brought into service between 1994 and 1996), and finally the TGV Med in 2001. The last inauguration goes back to March 2007 and relates to the LGV East-European stage 1 (until Baudrecourt, with an extension towards Strasbourg and Germany in progress).



The decision which starts the project of a high-speed line to Marseille dates from January 31st, 1989. At the end of a meeting of the Council of Ministers, the government launches *“the studies on layout and conditions of realization concerning an extension of the South-Eastern TGV towards Marseille, Italy and Spain”*. Two years earlier, in 1987, the government announced the decisions concerning the Northern LGV and the Ile-de-France interconnection. Thus it means that at the beginning the European scale was determinant in this project, which aims at connecting the Mediterranean arc to the North-South line. We leave for the first time a purely Parisian logic, which characterized all the history of transportation networks construction in France (from the royal roads radiating like a star from Paris [3], to the railway lines from Legrand plan in 1842 also with radial lines from Paris [4]).

The project so contributed to the development of a European and national high-speed network. This policy is supported at the European level by a transport policy which attaches a growing importance to high-speed railway [5]. From the Treaty of Maastricht (1992), Europe has identified the main European axes of high-speed, Trans-European Networks (TEN-T). As the conferences was going by (Prague, Crete, Helsinki: 1991, 1994, 1997), these priority axes were completed, until identifying a list of 22 priority infrastructures spring from the group Van Miert's work in 2003 [6].

Nonetheless, in spite of this political ambition, the project loses its European dimension quite quickly. The TGV Med which today stops in Marseille was composed at the beginning

of two sub-projects: a project Provence - Côte d'Azur divided itself into a branch towards Marseille and a branch towards Fréjus and the coast (with an exceptional profitability rate of 12%), and a project Languedoc Roussillon towards Spain (with lower profitability rate of 5%). In the first sub-project, the branch towards Fréjus and the French Riviera is quickly deferred between 1990 and 1991, following the pressure of associations and the lack of support from elected people. This project reappears today with the LGV PACA project and by the way makes revive oppositions. The second sub-project, towards Spain, is also abandoned in 1995 for financial reasons. In 1990, SNCF in his first stage report [7] considered the rate of internal financial profitability (TRI) of the whole project at 9.80%. In 1995 with modifications of the layout and many adjustments, the TRI is gone down to 6.80%. The State being engaged to guarantee to SNCF a profitability rate of 8% to limit its debt, then SNCF has asked for an increase of its subsidy. The mission of expertise ordered by the State and entrusted to the Inspection of Finances and the CGPC (Conseil Général des Ponts et Chaussées) [8] concluded that the abandonment of the Nîmes-Montpellier branch raised the TRI to 7.3% and would limit the necessary subsidy. At the end of these negotiations, the project retains nothing more than a line towards Marseille and a junction towards Nîmes.

B. The Principles of TGV System

This new transversal structure, placed directly under the dependence of the Head office, proposes in C03 project the definition of a new transport system for interurban service, TGV system. Its first application was the connection between Paris and Lyon [10]. As explained by J. Lolive [11] two conditions lead to this innovation: the rise of air and road competition; the competition with the hovertrain and the liberal turning in transport policy, which leads SNCF to find a solution to get out the crisis. J.M. Fourniau [10] identifies four parameters which allow to understand the role of TGV in the competing system of transport: its speed, its frequency, its capacity and its price. The TGV runs at a speed between 250 and 300 km/h, which put it in competition with the plane for a journey between two towns of less than 1000 km, on the condition of limiting stops to keep a high-speed. It rolls at a high frequency, in particular to allow the return ticket in one day, which supposes trains with less capacity but more frequent departures. Its price is slightly higher than a traditional train but especially lower by half than a plane ticket.

These are the principles which governed the realization of the first line, bringing to SNCF an undoubted commercial success. That's why these same principles were renewed for the Mediterranean TGV, as testifies the main objective of the project expressed by SNCF in the first drafts of the project: *“to put Marseille at 3 hours of Paris”*. So the first layout suggested by SNCF corresponds to the shortest and fastest route, according to the principles of TGV system. However the early rejection of this layout, refused by the President as of July 1990, leads SNCF to propose other alternatives. Thus another project is added to the construction of new line, which is a project of modernization of the existing line between Paris

and Lyon in order to increase the operating speed on this section and to maintain the 3 hours objective between Paris and Marseille despite the route extension.

By the way, the principles of TGV system were at the heart of the conflict between SNCF and the main opponents to project [11]. From December 1989, the dispute is extended to the 6 departments concerned by the layout. Associations then call into question the TGV system, in particular by criticizing the role and positioning of SNCF and its capability to manage the project by itself. For residents concerned by the project, it is about a project of company, and not of town and country planning. The analysis proposed by J. Lolive [12] made it possible to understand the work performed by associations, to come off the nimby and open discussions to a general level, in order to be heard and integrated in the negotiation process. This paying strategy allowed associations to pass from the local and specific dispute to a reformulation of general interest, and to induce a democratic debate on the infrastructure project.

III. THE REALIZATION OF TGV MED, A CHAOTIC AND INNOVATING PROCESS

A. A Tortuous Storyline

The TGV Med project is a large-scale project characterized by: construction of 250 km of new line with 3 new stations (Valence, Avignon and Aix-en-Provence); construction of 500 structures including 7 exceptional viaducts and 13 kilometers of tunnels. The project contains several elements: construction of the new line; modification of the existing line Paris-Lyon according to the standard of 300km/h (instead of 270 km/h before); modification of the railway infrastructures of the front-station at Marseille-Saint-Charles (and modernizations of stations).

Recent publications of comparison on mega infrastructure projects [13] - [16] point out that this kind of project is characterized, in addition to their cost and size, by an extreme complexity related to the multiplication of actors involved and stakes to be taken into account. These mega projects are also defined by a very large uncertainty as for their completion, and a high level of risks. The chaotic decision-making process of TGV Med is in that meaning particularly symbolic. In this case study, the stakeholders succeed to answer this complexity by a strong capacity to innovate and adjust themselves, to make evolve their practices and to achieve the project.

The project begins in January 1989 when the government of Mr. Rocard asks to SNCF to prepare a strategic scheme of high-speed lines including an extension of the South-Eastern line. In this way, SNCF starts the preliminary studies and implements a prior consultation with the main elected representatives of regions crossed by the project from July to December 1989. During this phase of preliminary studies, the layout is unique and direct. It plans: a common section from Valence to Saint-Cannat (177km) on the Rhône left bank; then two branches divided one towards Marseille and the other towards Fréjus-Saint-Raphaël. In the North of Avignon a

connection makes it possible to join the existing line and thus to ensure the service in Languedoc-Roussillon. The new high-speed line joins the old Paris-Lyon-Marseille line at the Estaque, at 9.5km from the central station Marseille-Saint-Charles. This reference layout, provided at a precise scale (1/25000th) in order to estimate costs and environmental impacts, is presented by SNCF without any alternative. December 15th, 1989, Mr. Walrave, Assistant general manager of SNCF, exposes his proposals in front of the main elected officials gathered at Marseille, before transmission of the project to the government. The main elected people (presidents of the general and regional councils, mayors of big cities) declare themselves in favour of the project.

The situation changes very quickly, due to the diffusion into the press of SNCF internal documents which was presented during the meeting of December 15th, 1989. At this stage, the population and the small elected officials discover a layout already advanced, quite mature and negotiated without them. This event triggers the conflict. From January 1990, many associations are created everywhere and the anti-TGV demonstrations punctuate all the process, with more or less violence. Some dates can be keep in mind: the night of August 4th, 1990, associations manage to organize the complete blocking of the Paris-Marseille line with occupancy of tracks in Babentane, Orgon and Villeneuve-lès-Avignon, and occupancy of the station of Avignon the following day. August 18th, 1990, the Union of the 6 departments concerned by the TGV, called the Union of the 6 which joins together all the associative networks, organizes demonstrations to paralyze the Rhône valley. September and August 1990 are the months of stronger extension of the anti-TGV protest movement. September 26th, 1990 protestors go up to Paris and organize an important demonstration. September 29th, 1990 demonstrators occupy the Avignon city hall during a session of the municipal council, the mayor Guy Ravier brings an action against demonstrators. October 13rd, 1990 demonstrations are organized by the CARDE with occupancy of the tracks and road blocks, 2 demonstrators are hurt during the evacuation of the Salon station by the police. The debate concerning the TGV route is focused on 3 questions: the triangle of Avignon, the layout in Drôme and Vaucluse, the layout in the north of Bouches-du-Rhône.

In front of this protest movement, SNCF proposes alternatives which are presented to the elected officials in April 1990 and are summarized in the stage report of July 1990. The alternatives are divided into three major options of passage in Drôme (layouts East, median or West); 3 major options for the triangle of Avignon (Large triangle, small triangle western, or route on the edge of Rhone prolonged in the south-west of Avignon by a triangle on the right side of Arles); 4 families of layouts for the branch Côte-d'Azur (in the south of Venelles or north, the north of Meyrargues or in the Durance Valley) and 2 options of passage around Lambesc and Eguilles. In total the different propositions will represent until 7 times the length of line to build. This situation amplifies the conflict by increasing the number of residents

concerned with the layout.

The situation will be also made more controversial with the State engagement to remove the reference layout, preferred by SNCF. The association Très Grande Vigilance, lobbying structure of wine-producers in Côtes-du-Rhône appellation, made pressure via some important elected people close to the President François Mitterrand (Henri Michel, Guy Penne and Jean Garcin) to make give up the passage of the TGV in the East of the Rhône valley, in the vineyard and in the middle of estates belonging to these friends of the President. François Mitterrand gives his opinion against this reference layout during his speech of July 14th, 1990: *"And I was still yesterday with Mr. Fournier, SNCF President, to say him: your layout over there starting from Valence and of Montélimar, to go to Fréjus, it will not cross a bit too much vines, in these splendid vineyards of Côtes-du-Rhône"*. This sentence provokes the anger of associations of residents which see here the influence of the wine lobbying and a negation of democratic debate to the profit of the President and his friends. The intervention of the President has however the expected effect, i.e. the rejection of the East and reference layout which is directly removed from studies by SNCF. The State then creates a mission of study and consultation entrusted to Claude Querrien, State Adviser, to propose the most favorable layout within the remaining options. The mission is going on from August 1990 to December 1990. It results in a definition of a new reference layout (Querrien layout). From this point, SNCF realizes a project defined by the State by adjustments due to environmental constraints.

Despite this definition of one layout, associations are still mobilized against, and tackle the justification of the project by proposing the passage of TGV in the existing railway corridor. During the negotiations, it is the legitimacy of SNCF to produce reliable studies which is disputed. Associations require a counter-evaluation then. The State answers this demand favorably by creating a College of Experts, in May 1992. This college of expert has a specific role: to appraise the studies realized by SNCF; to evaluate SNCF answers; to order complementary studies if necessary to specialized firms (the English research consultancy Ove Arup and Partner International Limited is charged to appraise the traffic studies produced by SNCF and to study 6 scenarios in order to integrate the existing lines in the environment). The 8 experts are jointly selected by the State and associations. The report concludes that it is necessary to choose between 2 systems: the improvement of frequencies and speeds on the current lines, solution which can partially satisfy needs for the next 10 to 15 years but would pose problems beyond; or the high-speed system which imposes the construction of a new line as suggested by SNCF. From this report most of the oppositions are stopped.

The public survey is opened on October 8th, 1992 in the 5 departments and 105 communes concerned with the layout. Envisaged at the beginning for 6 weeks, the investigation is prolonged by 2 weeks. It is held in a normal way, except in the area of the plain of Marsanne where the mayors of 14

communes refuse to take part in its official survey to protest against the refusal of the ministry to put in the investigation an alternative layout to the Querrien layout. The file of public survey weighs 26 kg, it comprises 4 enormous volumes and 3 additional books, a total of 1700 pages.

The Declaration of Public utility which confirms the realization of the project by engaging the State decision takes place on May 31st, 1994. It intervenes at 3 days of the validity deadline (June 3rd, 1994 it means a 18 months deadline following the public survey closure), which testifies to the many hesitations on the side of the State to confirm this project. Until this date the project achievement was still very uncertain for all the actors involved.

Works begin in September 1995, for an opening to traffic the June 10th, 2005.

B. A Controversial Situation

The extent of protest movement marked the minds and that's what each actor interviewed retains from this story. It is due to on the one hand a broader social evolution, a general increase of environmental protest movements as from the 1970's [17]. This situation can be explained by a rise of concerns related to the environment, an increasingly strong requirement from civil society to call into question a technocratic decision-making process, in aid of a more democratic decision [18].

To talk about controversial situation, it is to refer to the mobilization against TGV project, because it is well the TGV as socio-technical device which is called into question in this project. This situation of controversy cannot be understood without analyzing the precise conditions of its emergence. The context of implementation of TGV Med is very different from those of previous lines.

The constraints of site initially induce many difficulties to cross this territory. The site has very strong constraints: mountain of Lubéron and Durance valley at East, chains of Alpilles and plain of Crau in South, tormented relief between Salon-de-Provence and Silvacane in South-east. The favourable sites to the establishment of line (zones of plains, stable geological grounds) are very few. The corridor of the Rhône valley is already saturated by heavy infrastructures: highway, national road and railway, which makes of it a harmful corridor for residents.

To these site constraints correspond landscape characteristics, strongly pronounced, formed by independent landscape units. Among the most emblematic natural environments crossed by the high-speed line we can mention: humid zones of the plain of Durance, forest massif of the Arbois plateau. Associations try to mobilize a quite old discourse on the landscape protection of Provence.

This landscape also corresponds to a specific mode of space occupation characteristic of Southern France, defined by: a very spread out settlement, a large number of medium-sized cities, an agriculture of small farmers, and small cadastral lots. The plain of Durance for example is characterized by a very fertile environment, with market gardening and arboricultural

produces, an open space swept by the mistral with compartmental lengthened cadastral delimited by hedges windshield.

The crossed territory is thus very different from that met by SNCF during the realization of previous lines, concentrated in the Paris basin. For the project manager who leads the first studies, the difficulty is huge: *"We arrived in front of a territory much more complex than what we have seen before. Previously we had crossed Morvan, Beauce, Brie, there were certainly some difficulties but concentrated on a few kilometers of linear only. There to be clear we found ourselves in a situation in the South of Valence where we just wondered: but where we will be able to pass!"*. This time it is a question of getting through a strongly urbanized zone.

It is also necessary to add technical constraints related to the increase of operating speed selected compared to the previous lines. Thus the radius of curvature envisaged for TGV Med line is of 8330m (whereas it was of 3750m for the South-Eastern TGV, and 6000m for the Northern TGV and Lyon-Valence). Even standard of constraint for the tunnels, their diameter is the double of that of the Atlantic TGV: 100-120m² against 55-72m² for the Atlantic TGV. Environmental protection measures will be added gradually to the project, according to the lawful evolutions. These measurements are all the more important as the layout selected contains some major black marks. It passes on 40% its length to flooding zone and inside river banks; it also passes near the nuclear center of Tricastin.

C. An Innovating Procedure

Many researches on innovations concentrate on the technical innovations, in particular in transport. However there exist other types of innovations, in particular organizational or of services [19]. The first definition of innovation is given by Schumpeter into 1939 which distinguishes innovation, invention and diffusion. Interrogation on innovations results in wondering how these innovations are born. Sociology of sciences and technology contributed to renew the approaches to make emerge an interrogation on the process which allows the translation of an idea or invention in innovation. In particular some authors such as B. Latour, Mr. Callon or Mr. Akrich [20], underlined the fundamental place in this process of complex evolution between science and society, of the art of profit-sharing and the choice of spokespersons. Thus innovation is defined as a process of interesting a growing number of allies, and art to choose good spokespersons. In the case of TGV Med, the recourse to architects and landscape designers in the case of exceptional structures is equivalent to this process of profit-sharing, which will make it possible to SNCF to gradually federate associations around its project.

We will not reconsider the technical innovations here, even if TGV Med is the one of all records for SNCF, which developed new competences, symbolized by some spectacular structures [21], [22].

According to the LOTI assessment realized a posteriori by SNCF and RFF [23], the main innovations made by TGV Med

are the following ones: limitation of noise level to 62 decibels it means a reduction by half of the allowed sound power hitherto, and an additional limitation to 60 decibels at the time of the renewal of old rolling train stock; compensation for residents by the possibility offered to any owner domiciled in a band of 300m centered on the project axis to obtain acquisition of its house under certain conditions; landscape and architectural studies of insertion systematically and throughout the project; installation of follow-up committees of the State engagements chaired by the regional prefect in front of whom SNCF must justify the implementation of the State engagements.

Thus to answer protest movements, several innovations are introduced, the ones related to improvement of the project insertion in environment, and the others related to the project governance.

- Concerning innovations related to the territorial insertion of the project, several environmental measures are taken. Limitation of the allowed noise level, development of hydraulic studies to avoid to worsen the swellings of crossed rivers, belong to the improvements add to the preliminary draft. Thus on the Durance, we count three viaducts and 60 structures of discharge which allow the re-establishment of natural drainage system. All these measures are detailed in the RFF report [24]. The most important innovation is probably the State engagement on a certain number of environmental protection measures. During negotiations between SNCF, the State and residents, SNCF began to implement protection measures against the noise, risks of floods, for the fauna and flora protection, etc. all these measures were negotiated on the ground, case-by-case and throughout the layout. Very quickly face to the scale of these negotiations, the State and SNCF decide to put down all these measures in writing. The Minister for Transport at that time, J.L. Bianco, proposes in the circular of December 15th, 1992, to reform the procedure by founding a "file of the State engagements". The implementation of these engagements will be controlled by a follow-up committee, composed by the socio-economic leaders, elected officials, local associations of defense of the environment. SNCF implements for the first time this procedure. The file is prepared after with the declaration of public utility. 464 engagements of the State were listed; 421 are located and 43 apply to the whole of the layout. On the whole, SNCF estimates a posteriori that 455 were respected, so 98%. Follow-up committees are organized in each department concerned: Drôme, Vaucluse, Gard, Bouches-du-Rhône. In September 1999, RFF sets up still for the first time an observatory of the environment of LGV Med (until 2006) where were returned the studies, experience feedback and the final synthesis.

The realization of this file plays an important and strategic part in the decision-making process, because it will make it possible to seal/fix the agreements which were negotiated between residents and SNCF throughout the layout. This procedure which aims at integrating the project in territories is also a way of integrating it socially and mentally. The SNCF thus agrees to make considerable concessions, to grant additional protective measures, in order to interest an increasingly large number of residents. By insert them in the

negotiation process, SNCF manages to reduce the oppositions. Moreover residents understand rather quickly in this context that more quickly they enter the negotiation process, larger will be their room for maneuver to obtain what they want. The evolution of the CARDE association illustrates this tendency quite well. Created in December 1989 the CARDE (Coordination of regional action and defense of the environment) federates associations of Bouches-du-Rhône, around the agricultural trade unions and elected people. It carries a criticism citizen, by rising up against the nondemocratic character of the decision-making process and the insufficient taking into account of urban and land planning. The principal demand of the CARDE is the study of a passage of the TGV in the existing railway corridor (on the existing lines or near). From January 1991, following the ministerial decision which approves the Querrien layout, the members of CARDE open a second front line, this one legal by creating the Legal Union Rhone-Mediterranean. The UJRM calls upon lawyers, land experts gathered for an action of consulting. For the CARDE spokesperson, the stake was clearly to anticipate a possible negotiation if the project would be realized on this layout. This structure assists residents in their negotiations with SNCF.

The extension of the band of compensation to 150m on both sides for the line is also an innovation which contributes to a better territorial insertion of the project. It is also a way to engage residents as soon as possible in the negotiation process to limit the conflicts. The decision of extension of this band intervenes on October 6th, 1992 during a press conference of P. Izard, project manager of TGV Med, announces the SNCF decision to buy their property to all the residents within this large band of 300m, this up to three years after the opening date to traffic. This new measure intervenes a few days before the opening of the public survey. There still it is a question of answering the protest and proposing new initiatives to advance the project.

The third innovation, always in this effort of territorial integration of the new line, corresponds to the exercise of co-operation between the SNCF engineers, and architects and landscape designers, who were requested to carry out works for exceptional structures. Until there the recourse to these professionals was limited to some interventions very downstream from the process, to choose for example the shape and the color of railings. For the first time SNCF has recourse to architects and landscape designers from the design stage of these structures. For one member of the TGV Med mission who sets up this collaboration, it is a big first: *"It is something which revolutionized our ways of doing, we made work the research department structures with architects from the design stage, so that they design these objects hand in hand. With the SNCF at the time it was really a cultural revolution"*. This collaboration results punctually in "exceptional" structures, according to the SNCF terminology, and the design of new stations. More largely, the whole of linear profited from a landscape scheme, giving him a visual identity, while treating the landscape units crossed differently. For SNCF, this collaboration with architects and landscape designers is something unusual and risky. It implies a certain drift of costs. But he effect on conflicts is an extremely

positive. There still, for SNCF the objective is to federate a maximum of residents in the project. Commissions of architectural judgment of the project are organized to evaluate the proposals from engineers, architects and landscape designers. The local elected people are invited to express themselves on these proposals. They leave the opposition thus to enter in negotiation process and dialog. Besides, SNCF communicates largely on this new initiative, by equipping the TGV mission with a person in charge of communication. A newspaper of follow-up is published for the first time by SNCF and is diffused with the public. During works, the realization of exceptional structures is relayed in press, and gives place to exhibitions, events, etc which gather a growing number of people progressively according the project acceptance by population.

- A second set of innovations relates to the project governance. TGV Med marks a turning point in the great infrastructure project governance. The SNCF which had studied and carried out alone the previous lines, is confronted in this project to the opening of actors system, on two fronts which are the State and residents.

If the State keep the capacity of final decision, with the declaration of public utility which officializes the starting of a project, the intervention of the President which leads to the withdrawal of the first layout suggested by SNCF, changes the situation. In the case of the Northern TGV, SNCF had to deal with the political will of one elected, Pierre Mauroy, mayor of Lille and also Prime Minister, to obtain the passage of the TGV in Lille. The SNCF had then given up a direct passage by the west of Lille. Nonetheless, the alternative by Lille was already considered by SNCF, and the crossing by city-centre involved a financial participation of the State and Urban community of Lille [25]. In the case of TGV Med, SNCF must completely re-examine its copy following the President request. This time is different, SNCF can continue alone all the studies without external control. The creation the Querrien mission deeply changes the situation. The alternatives are analyzed during the debates organized by the Querrien mission, between SNCF, elected people, prefects, trade-union representatives and economic leaders. During these meetings, the Querrien mission orders studies to SNCF, which plays a role of technical adviser. The mission leads to the selection of one single layout. It is well this mission which negotiates the layout of the project. Contrary to the Northern TGV during which a commission, chaired by the civil engineer R. Rudeau, had examined the various possible layouts by using the SNCF studies; in the case of TGV Med, it is a State Adviser, Mr. Querrien, who is sent, to meet the various actors of the project and to negotiate the layout. The State takes again a decisive place in the actors system.

On the other part of the political scale, the decisional game is also opened to the small elected officials hitherto excluded from negotiations. Until the creation of the Querrien mission, SNCF carried out the participation process only with the major elected officials of the areas crossed, according to its usual procedure. Elected people from small cities were strongly opposed to this practice, and participate in many associations from July 1989 to protest against this exclusive procedure. The rural elected of Bouches-du-Rhône area for

example creates in May 1990 an association Solidarity of Elected officials 13, and take part in demonstrations. However the Querrien mission organizes departmental and communal meetings to meet all the protagonists. Almost all the mayors concerned with the layout have been heard by the mission. The meetings are organized by sectors and on the various alternatives. The mission is maintained four months and leads to integrate the local elected people in the game of negotiations.

Always within the framework of the emergence of new governance, SNCF is confronted in the case of TGV Med with a concurrent expertise for the first time. Following the requests of associations to study their proposal for a passage of the TGV in the existing railway corridor, the State makes the decision to set up a college of Experts to slice the debates. Jean-Louis Bianco announces the creation of this college on May 14th, 1992 the objective is to prepare the public survey. This college of expert has a role of appraising studies proposed by SNCF, and ordering complementary studies if necessary. The SNCF monopoly of expertise is called into question for the first time. The college is composed of 8 members, who are negotiated between the State, SNCF and associations. The college has recourse to an English consulting society *Ove Arup*, charged to appraise the traffic studies and to analyze the scenarios of existing ways. On the whole this society concludes on the validity of the SNCF figures and proposals, and confirms that the best option is to create a new line.

Finally the project governance is shaken by the arrival of a new actor: the resident. This insertion is done by demonstrations, but also thanks to civil actions of mobilization around themes of transport policy. Associations for example organize conferences on the link between high speed and town and country planning. Associations play a fundamental role in this process to become interlocutors like the others in a negotiation process. Traditionally the project was negotiated only between SNCF, some large elected people, and the State. The public was consulted on the project only during the public survey. With the creation of a College of experts, associations are now able to address their observations, around 4 sets of themes: procedure, the layout, planning and regional development, natural environment. And especially the extent of demonstrations forces the State to make evolve the legislation to introduce public debate into the transport project process.

IV. LESSONS FROM TGV MED

Innovations made by TGV Med were renewed in certain cases and were given up in others, which raises the question of the lessons which were drawn from this experiment. We can interrogate the process which has lead from innovating practices to a new rule of game. It is the case in particular for the State with the legislative evolution to introduce the public debate in procedure.

A. Evolution of Procedures in Transport Planning

Traditionally, at the project starting point, the procedure was the following one [26]. At the national level, the most

important political organizations decide main trends and options of layout, by publishing a national strategic scheme of infrastructures. At the regional level, preliminary studies isolate with the main elected people a large zone of study from 10 with 20km then a stripe from 1 km is retained by ministerial decision. At the local level, the APS or Pre-Project Summary establishes in collaboration with the mayors concerned various alternatives within this stripe. Lastly, the people deliver their opinion during the public survey in a perimeter of utility of 300m. This procedure will be modified thanks to the TGV Med, but not only. Other debates take place at the same time on great projects of infrastructure (on A16, A51, A89, A8bis, etc).

In November 1990, the Superior council of Transport (which becomes the National council of Transport with the law LOTI in December 1982) delivers a favorable opinion to the national strategic scheme of TGV lines submitted by SNCF. This organization of consultation is composed by representatives of the State, local authorities, professionals of transport and users. They compare the procedure of TGV projects with that of highway projects. They conclude that in the case of TGV, the procedure show a overcost and an addition of protests. From these conclusions, is set up an administrative working group to think about the development process of high-speed lines, which is not for the moment clearly defined. Until now the procedure was regulated by the law of July 12th, 1985, law MOP, which give a general framework to the relation between public and private contractor for any building, industrial equipment or infrastructure. Following this law a procedure was published more specifically for the road projects, by describing the stages of planning and design, realization, operation. The working group created at the end of 1990 produces a comparable guide of action specific to high-speed line. This reflection leads on August 2nd, 1991 to the Gressier circular which regulates the procedure of TGV projects. The circular defines a procedure in 3 times: preliminary studies (choice of a stripe of 1km of width); the APS (study of a layout to the 1/25 000th scale); detailed preliminary draft APD (study of a layout to the 1/5 000th scale). Each stage makes it possible to feed 3 files: a technical file, an environmental file, an economic and social file. The Department of transports refuses nevertheless to strictly apply this directive to TGV Med, considering that the Querrien mission acted as a study of APS.

The protests against TGV Med lead to this evolution of procedure, by reorganizing the stages from design to realization, but also by introducing a larger place to the public debate [27]. Already during the autumn 1991, the government starts a national debate on transport infrastructures. The debate is animated by G. Carrère, and bring to a final report published in July 1992, *Transport, Destination 2002*. TGV Med constitutes the trigger element to encourage the State to go further, and create new rules. The violent oppositions to the project put SNCF in a position of weakness, at that moment the State was in position to take advantage and to take again the control of high-speed line project. These new

initiatives are the creation of the college of experts, and his legal application with the Bianco circular of December 15th, 1992. This circular takes again most of the proposals made by the Carrère report and founds a consultation procedure on the mega project opportunity before the design stage. It's a way to answer the polemic of TGV Med where the opportunity of a high-speed line is clearly contested and not only its route. The circular envisages the creation of an independent commission, designed by the Prefect who stays in charge of the debate organization. It also envisages the creation of the file of the State engagements, which list all the measures taken by the State to guarantee the respect of environmental protection by the society which realize the project.

This circular will be supplemented in February 1995 by a law on environmental protection, law Barnier, which creates the National Commission of public debate, whose secretariat is ensured by the ministry in charge of the environment. The law Barnier makes legal the obligations of public participation and consultation for the whole of mega infrastructure projects. The law Barnier also testifies to another lesson drawn from TGV Med, related to the positioning of public investigators (for public survey). In the case of TGV Med, following the public survey, the public investigators give a favorable opinion with the project, but under certain conditions. The project should avoid the nuclear site of Tricastin, not cross the plain of Marsanne, and not modify the risks of floods. For SNCF, the study of an alternative which would avoid the site of Tricastin showed that these conditions would inflate the cost of the project. The layout is preserved, with however a small shift (approximately 40m) which makes it possible to leave the Seveso perimeter. Even thing for the passage in the plain of Marsanne, which is negotiated in returns with farmers. As for the risk of flood, for SNCF it is impossible to guarantee to not modify this risk. In reaction to this decision which scandalizes the public investigators, H. Bouchardeau presents a report to the Minister of environment in December 1993, relating to the reinforcement of the weight of the public investigators opinion. The law envisages thus that in the case of unfavorable opinion from public investigators, a new deliberation is necessary. Nevertheless their opinion is still advisory and not prescriptive.

Finally the passage in floodplains leads to a confrontation between the Ministry of the Environment and the Ministry of Equipment. On the 295km of new line, the layout selected crosses 138km of floodplains. During these debates, the Ministry of the Environment elaborates the law on water, of January 3rd, 1992. This one forces any project to preserve the aquatic environments and to ensure the free water run-off, the conservation of the fields of flood. For the Ministry, the stake is to make apply this law to project TGV Med, which would imply considerable adjustments. The Ministry of transport refuses the required adjustments, which increase the project cost once again. The serious floods of October 1993 in the Rhône valley make evolved the situation. Associations opposed to the project organize demonstrations in boats on the spot of the layout. The Ministry of the Environment benefits

from it to write on January 24th, 1994 a circular relating to the law on the water which prohibits all new construction in the most dangerous zones and any damming up or new fill which would not be justified by the protection of strongly urbanized places.

The TGV Med leads thus to important legislative evolutions, which testify that the State has learn the lessons from this project.

B. Organizational Transformations within SNCF

On the SNCF side, which are the lessons which were drawn? To answer the dispute, we saw that the SNCF set up new practices guaranteeing a better insertion of the project in the territory and making evolve/move the governorship of the project. Among these measurements, much were not taken back, like the collaboration pushed with architects and landscape designers, or the widening of the band of compensation. These measurements primarily aimed reducing the oppositions and at making return associations in the negotiation process. Environmental measurements were taken again in conformity with the legislative evolutions which regulated the levels of harmful effect related to the infrastructures of this type.

For as much it seems to us that the principal lesson induced by the TGV Med for the SNCF is due to organizational transformations, which then accompanied the SNCF reorganization. In 1989 at the beginning of the project, the organization set up by SNCF is very simple: it is Central management Department in Paris which launches the studies and manages the project, by collaborating with Parisian research departments. People from SNCF are sent there only at the beginning of works, which leads to the creation of a Direction of new line, responsible for manage operations on works zone. Territorial divisions can be created at a local level, in order to carry out works. It is this organization which was used as model for the realization of the previous high-speed lines. In the case of TGV Med, the distance of the ground from Paris and especially the intensity of the debates and protest movements, encourage the SNCF to delegate a project manager on the spot. P. Izard is thus named on April 10th, 1990 as Project Manager of TGV Provence Côte d'Azur. He doesn't install his offices within the regional management department of SNCF in Marseille, but in Aix-en-Provence initially, before to choose Marseille (but not in the same building). This small structure, independent and directly attached to Central management department, brings together at the beginning 3 people. From September 1990 this number double and will not stop growing bigger until to gather nearly 500 people at the time of the launching of work and the evolution of the structure in Direction of new line. With the beginning of the year 1991, the decision is made to create territorial divisions, equivalent to sub-directing of project, which are distributed along the 4 great sections of the project. We count a territorial division in Montélimar, in Avignon, in Aix-en-Provence, and in Nîmes or Montpellier. These divisions include at beginning 5 to 6 people. They are attached directly to the Management of project, and are distinguished again from the traditional model of management at SNCF

which is strongly integrated and hierarchical. Territorial divisions, like the department of project management, have their own study unit, landproperty unit, and market unit. They negotiate the project on the ground with residents and the elected officials. They function with a relative autonomy and return account directly to the project manager. At the time of the launching of works, they are supplemented by a work unit to manage the operations. This system of project directing and sub-directing is characterized by a separation of the structures compared to the traditional organizational diagram of SNCF, and by autonomy of initiatives and management. The objective was of course for the SNCF to show reactivity, to answer at requests from associations and the elected representatives on the ground, which make impossible a strictly Parisian management of the events. This decentralized structure studies the alternatives, to answer at the additional requests of studies made by the Querrien mission, then the College of experts.

These transformations towards a decentralized project management come with evolutions related to the change of status of SNCF. In 1997, with the creation of RFF which becomes owner of the network, SNCF keeps 2 missions: management and maintenance of the network (mission for which it is remunerated by RFF), and network operating (mission which implies on the contrary to pay a rent to RFF). The SNCF organization evolves little by little to a clearer separation of functions between "maitrise d'oeuvre" and "maitrise d'ouvrage déléguée" [28]. The first stage of this process appears in 1998 with the creation of a direction of engineering, beside a direction of operating and maintenance. The SNCF also creates a direction of delegated operation, since it preserves by the means of an agreement with RFF the management of operations in progress, in particular the TGV Med under construction. This direction of delegated operation becomes the direction of new operations in 2003. Nevertheless the direction of new operations, the direction of engineering and the direction of operating and maintenance, stay associated within the same Infrastructure and operating Department. From 2006 there will be clarification of the functions with the reorganization of SNCF in branches, and the creation of subsidiary company. Engineering become independent with the creation of Inexia a subsidiary company. It is not insignificant to find today at the head of this subsidiary company, G. Cartier, which was number 2 of the direction of project of TGV Med, then the director of the new line.

V. TOWARDS A NEW GOVERNANCE AT 5, 10, 15...?

The TGV Med symbolizes really a decisive stage in the evolution of TGV project governance. It introduces into the decisional game: small elected representatives, residents, and environment. It leads to an evolution of practices for SNCF, towards a structured and territorialized project management. Nevertheless deep modifications renew this system of actors today. TGV Med is first of all the last project of TGV entirely produced by the SNCF. It is also the last TGV line funded entirely by the SNCF (apart from a State subsidy to guarantee the rate of profitability). The Atlantic TGV had already

benefited from a subsidy equivalent to 30% of the construction cost of the line [29]. In the case of the TGV Med, this subsidy accounts for 10% in the capital cost of infrastructure [30]. The major financing was carried out by the SNCF, with borrowing. With the creation of RFF, the terms of financing evolve. The law of February 1997 which separates the activities from management and those of operating, in agreement with the European directive, makes it possible to clarify the accounts of SNCF. The debt is registered in RFF liabilities (23.5 billion Euros in 1997). However the decree of May 5th, 1997 on RFF structuration creates a principle of financial balance within RFF accounts, which leads to stop the degradation of its accounts [31]. "The share of investment remaining to RFF in the case of a future investment must be covered by the futur gross operating profit (*exédents bruts d'exploitation*) updated at the rate of 8% from flow in current Euros, in other words the financial internal rate of investment for RFF must be 8%". Thus the engagement of RFF in new projects of infrastructures is largely constrained and limited, which implies a stronger participation of the State and local authorities to provide funds. In the case of the TGV East for example, the RFF financing share represents only one quarter of the total investment costs.

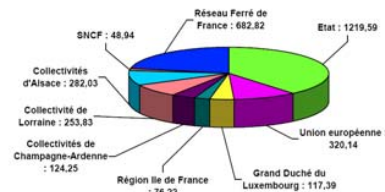


Fig. 1 Distribution of the financing contributions for TGV East phase 1, in million Euros (source: RFF)

This new distribution of financings is mainly related to a drift of costs in TGV projects [32]. The complex process of realization leads to a cost per kilometer of the lines almost doubled, according to A. Bonnafeous, passing from 5.03 Euros million by kilometers to 9.91 Euros million by kilometer [33]. The costs increase on a side, and profitability lowers on another side. The strategic scheme of high-speed lines classified the projects according to their economic and socio-economic profitability, which determined at the same time their set of priorities [34]. The lines which were built in first were also most profitable.

These evolutions once again modify the system of actors by reinforcing the weight in particular of local authorities which become an important funder for new infrastructures projects. TGV East is the first line where the contribution of local authorities is systematized. However in a so complex arrangement, we have to expect that each community negotiates its participation in exchange to adjustments related to the layout. It is what occurred on the TGV East, with the threat of Alsace region to leave the table of negotiations if the State did not assure the realization of a phase 2 to Strasbourg.

In the same way, we can find this type of behavior from local authorities in the negotiations around the layout of LGV PACA, which should prolong the TGV Med to Italy. The General Council of Bouches-du-Rhône threatens to withdraw from financing arrangement if the layout skirted Marseille.

For what can we expect from now? The relative withdrawal of RFF, which is today nothing than a funder among others, can let think that the project governance tends to be more political. It is not any more RFF or SNCF which dictates the project according to profitability criteria, but the State and local communities, which are in charge of town and country planning. Nonetheless inevitably, the public participation in the various consultation authorities does not make the decision more democratic, as testify the many studies on the limits of public debate [35]. The withdrawal of RFF to the profit of the State and local communities doesn't mean that the final decision is less reduce to economic criteria. The State as the local authorities have reduced financing capacities, often not at the level of their ambitions as regards town and country planning. Those which will be able to negotiate will be also those which have capacities of taking part in the funding. It will also remain to convince the local authorities to take part in funding of TGV line which does not pass necessary by their territory.

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