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COST BENEFIT ANALYSIS IN THE DECISION MAKING PROCESS

SILVIA MAFFII TRT TRASPORTI E TERRITORIO SRL, MILAN, ITALY
RICCARDO PAROLIN TRT TRASPORTI E TERRITORIO SRL, MILAN, ITALY

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Silvia Maffii TRT Trasporti e Territorio srl, Milan, Italy

Riccardo Parolin TRT Trasporti e Territorio srl, Milan, Italy

ABSTRACT

The high-speed/high capacity rail corridor project between Turin and Lyon is highly controversial. Since the initial phases of the project there has been a strong opposition.
A transparent and open assessment of the project could have helped in building a common ground for the dialogue of the stake holders. The cost benefit analysis carried out at the end of the project design, it was completed only in 2011 has proven to be useless.
The analysis was full of lacunae, extremely optimistic, quite on opaque on several aspects. It was not helpful neither to legitimate the decision already taken to proceed with the investment, nor to reduce knowledge asymmetry. The analysis was carried out too late in the process, when the project was already decided and the political positions already entrenched. It has not even helped in identifying a better and more solid way to tackle the problem of freight transit along the corridor, as no other alternatives were taken into consideration. As a result after years since the establishment of an Observatory the positions of the parties in favour and against the project still remain very distant knowledge asymmetry remain high.

Keywords: Cost-Benefit Analysis, Decision making process

INTRODUCTION

The TEN-T high-speed rail corridor project between Turin and Lyon is highly controversial. Since the initial phases of the project there has been a strong opposition, and no real dialogue has been established between the stakeholders in favour and against the project. Despite the establishment of an “Observatory” for the debate of the various aspects related to the project - environmental impacts, traffic forecasts, economic and social impacts - after more than six years the positions of the parties in favour and against the project still remain very distant. The paper discusses what went wrong with the approach followed by the Observatory and suggests a different use of cost-benefit analysis in order to facilitate the public debate around large infrastructures by also reducing knowledge asymmetry.
The paper relies on the results of the discussion held within the Observatory as summarised in a number of Reports, as well as on the analysis of both traffic forecast and applied

assessment methodology for the evaluation of the direct and indirect impacts of the project (including transport externalities) during the construction phase and after its completion.

THE PROJECT BACKGROUND

The Lyon Turin high capacity railway has a long history. The project was conceived and designed in the early '90s, when the long distance traffic of both passengers and freight were rapidly increasing. At the Nice Summit (First of June 1990) the two governments of Italy and France decide to undertake a study of a new rail connection. A year and a half later, at the Italian-French summit of Viterbo, the two governments decide to appoint the railways to carry out a feasibility study of the new line. At the Essen Summit of the 1994 the project becomes part of the TEN-T priority network and is nowadays part of the Priority Axis n.6 Lyon- Trieste – Ljubljana- Budapest - Ukrainian border. Two years later, January 1996 the French and Italian Governments established the Intergovernmental Commission (CIG) made up of French and Italian members representing different ministries of the respective countries, with the scope of keeping the two governments informed about the progresses of the study and the project. The specific objectives to be achieved on the route Turin-Lyon, as repeatedly expressed by the French and Italian Transport Ministers in the various meetings held in recent years can be briefly recalled:

> To put in place all necessary measures to achieve a modal shift from road to rail to reach in the next ten years, 20 million tons and quadruple in the long term the share of rail freight traffic (Modane, May 15, 2000).

With the Treaty of Turin of 2001, the two Governments decide to proceed with the project. The line is divided in three stretches, the French, the Italian and the one common, and the design of this common part is given to a new company Lyon Turin Ferroviaire (LTF) while the design of the two national parts were in charge to the Italian RFI and French RFF railways.
According to the project presented in 2010 by LTF, the New Lyon Turin railway Line will connect Lyon with the city of Turin (linked to Milan by a high speed line already in operation) crossing the French Savoy and the Italian Susa Valley. The new line is made of four sections, two on the French side and one the Italian side and a cross border section. The first section is made of a High speed line connecting Lyon to Chambery and a mixed line connecting the freight by-pass of Lyon to the Sillon Alpin (including the Chartreuse Tunnel of 20 km), a second section will reach the French Maurienne Valley through the Belledonne tunnel (21 km); the cross border section is made of a tunnel 57 km long and the last section will connect Susa with Turin along the lower part of the Susa Valley and includes a fourth Tunnel (Orsiera) of 19 km.
The construction costs of the different components of the project (tunnel, new line in the Italian section, excluding the investment in the two nodes of Turin and Lyon and the freight by pass of Turin) were estimated in € 23.6 billion Euro 2010.
Contrary to the French side where the project is supported by the local community of the Rhone-Alp region, on the Italian side the project has faced and still face a strong opposition, particularly of the population and some Municipality of the Susa Valley. It is interesting to

underline that the opposite happen when we look at Governmental side, where the Italian Government is highly in favour and the French one seems more sceptical (see for instance the results of the audit launched by the Prime Minister Raffarin in 2002 (Inspection Generale des Finances, Conseil General de Ponts Chaussées, 2003) and some recent statements for instance appeared recently in the press). The Susa Valley is claiming to have already paid a significant tribute to the long distance traffic thanks to two infrastructures of international value, the Frejus Tunnel opened in 1980 and the motorway link Turin Bardonecchia, completed in 1994. The opponents feared not only the environmental impacts of the project, but also the impacts on the economy of the valley and in general of paying the costs of a project that was benefitting other users, the long distance ones. In addition the so called “no Tav” movement started questioning also the overall rationale of the project, the very high cost of investment compared to the expected benefits and started raise the issue of the underutilization of the existing line.
The assessment of the project, including the environmental issues, the distribution of costs and benefits among different subjects was therefore becoming a central issue for the project future.
Following the strong reaction of part of the population in 2004 and 2005, the Italian government established a Technical Observatory, with the involvement of all the national and local authorities and the railways (Ministries, Piedmont Region, Turin Province and municipality, the municipalities of the valley and the local districts). Scope of the Observatory was to examine and discuss all the controversial issues highlighted by the project opponents and or by those simply sceptical or only concerned with some specific aspects.
The Observatory was an innovative approach, and at the beginning was successful in analysing some controversial issues and even in building some consensus and proposing some improvement to the original project. But after a while it started to lose appeal some of districts left, the issues to be treated were limited, it became clear that the project was not under discussion and alternatives, like the one developed by some municipalities based on a proposal of “phasing the investment” following the development of the demand (Beria, Debernardi Grimaldi, 2012), were not taken into consideration.

The Working group on Cost Benefit Analysis [1]

As of March 9, 2010 the Observatory established a special working group called "Cost Benefit Analysis and Demarche Grand Chantier" that interacted with the experts responsible for drafting a report containing recommendations that were discussed in the Working Group and, in part, in the Observatory, and then largely implemented by the team of experts of LTF and RFI. The Working Group had different functions. It first helped in aligning the knowledge and technical expertise in project evaluation and economic analysis through a set of meetings in spring 2010 on methodological and operational aspects. In addition, the Group formulated a set of questions and recommendations to LTF and RFI on how to conduct the cost-benefit analysis. Subsequently, after having co-opted an independent expert, the group entered in the discussion of the cost benefit analysis carried out on behalf of the proponents by a group of experts. The activities of the Working Group ended in July 2011, the Cost

[1] In Summer 2010 Silvia Maffii has been appointed as independent expert in the Working Group

benefit Analysis and the comment of the participant were made public only ten months later, in spring 2012. The following part of this paper relies on the discussion held in the Observatory within the working group and with the experts nominated by RFI and RFF in charge of carrying out, among other things the cost benefit analysis of the project.

The assessment

The assessment of the project has been carried out at a very end stage of the feasibility study, and only for the proposed solution without taking into consideration possible alternatives. It was completed in 2011 at a time when the decision to proceed with construction of the infrastructure was already taken. The results of the cost benefit analysis at that stage could have been just a go or no go. It was therefore important for the legitimacy of the decision to demonstrate that the project was scoring well in CBA terms and that benefits exceeded the costs. The cost benefit analysis became a “Damocles sword” (Beukers, Bertolini, Brommelstroet, 2012) without any possibility to positively contributing to the project design and the planning process. The analysis was limited to the economic assessment; nothing is said on the financial sustainability of the project, even though the financial analysis normally precedes the economic analysis. Several data were not made available, due to confidentiality or to the complexity of the tools applied (particularly the transport model).

SOME CRITICAL ASSUMPTIONS

Contrary to all the recommendations in the literature, the analysis was based on a number of highly positive assumptions. In the next paragraphs we discuss the most relevant ones from the point of view of the cost benefit analysis.

The expected demand

The evidence (Flyvebrg, Skarris, Buhl 2005) that for large infrastructure projects, and particularly for the railway ones the demand forecasts have proved to be often overestimated has not led to greater caution in the case of Turin-Lyon. Looking at the recent trends the demand forecasts appear overoptimistic. The expected traffic at the opening of the project is estimated in more than thirty million tons, when the actual railway traffic (Alp Transit, 2009) is only 2.4 million tons and appears in sharp and steady decline. The road and rail traffic along the route has seen a decline of 40% between 2000 and 2009, from 34.4 to 20.1 million net tons; the rail has lost 70% of the traffic (from 8.6 to 2.4 million net tons). The decline is partly due to the ongoing works in the existing line that have imposed some restriction on train circulation and in general worsen the level of service. Nevertheless the fact the overall volume of traffic is declining should have raised some caution.
As stated at the beginning the project was conceived and designed in the early '90s, when the international and medium-long range movements of goods showed a substantial increase, thanks to various circumstances, including the opening of the markets promoted by

the EU. Given the trends it was estimated that in less than 15 years (1997 2020) the volume of traffic of approximately 10 million tons would have doubled rapidly saturating the capacity of the existing line (estimated at around 20 million tons). But since 1997 traffic has started to decline, and this decline has never stopped. Today the existing line would be able not only to satisfy the rail demand but also to absorb the flows going by road (approximately 10 million tons per year, which is also in constant decrease) without significant additional costs.
The expected flows of 34, million tons are estimated on the basis of some questionable assumptions:

1. the overall demand crossing the Alps is calculated by applying an elasticity of transport demand to GDP very high (1.5), much higher than that recorded in recent years for the project area (around 1); this elasticity were associated to GDP growth forecasts of the countries in the region very optimistic, in the light of recent trends;
2. this scenario of high demand growth is combined with assumptions on modal shift extremely favourable for the railways. It has proven impossible to clearly identify what were the assumptions behind the expected modal shift; the future railway charges and user tariffs are not known, nor the elasticity or the value of other variables considered (time, reliability, etc.). But even in the absence of this information it is highly questionable that such a modal diversion could be achieved by simply reducing the travel time by train. Recent surveys (see for instance Maggi and Masiero, 2011) show a strong inertia of goods passing the Alps to remain on the road. Furthermore, no assumptions are made on the likely reaction of the motorways operators, for instance, that will see their income significantly reduced thanks to the shift of good traffic from road to rail, but from other railway operators which according to the demand forecast would witness a haemorrhage of traffic and revenues.

The diverted traffic

Traffic diversion is the main objective of the project as stated by the promoters, and the benefits derived from this diversion are the major sources of benefits of the project. Contrary to what expected it is not clear how this diversion was calculated, costs, elasticities and time savings are explicitly stated in the report. Particularly important is the fact that, as discussed later in this paper, the main information about the costs the users will pay for using the new railway line were not made public.
Also the approach followed in the calculation of the benefits of the diverted traffic from road to rail does is questionable and according to the authors leads to a significant overestimation of benefits. The approach followed, in fact, is not based on the differences of consumer surplus, as would be have correct, but on the differences of generalised costs between the transport mode of origin and the transport mode of destination. This issue has been discussed in a separate paper (Maffii S. Parolin R. 2012). The central point is what are the benefits of the modal shifters. In our opinion the benefits are given by the difference between the consumer surplus with the project and the consumer surplus in the absence of the project of the destination mode. Considering the costs of the mode of origin is a mistake. The demand curve for a specific mode, the new rail line represents the willingness to pay for the characteristics of this mode taking into account all the characteristics of competing modes of transport (including travel time, comfort, reliability, monetary costs, etc.). The mode of origin

has no longer has relevance for the purposes of cost-benefit, and therefore it does not matter what are the costs the users would pay on the competing mode, or if the travel time is less than (or greater than) that of the new mode or any other gain or losses in which the consumer may incur by changing the mode of transport. By using as the basis for the calculation for the benefits of the modal shifter the difference of the generalised cost of the two modes could lead to a significant overestimation of the benefits.

The benefits of safety

A major share of the benefits of the project comes from reduced accident rates, thanks to the shift of traffic from road to rail. But the accident rate applied seems unreasonably high.
The benefits of lower accident rates were calculated by multiplying country specific accident rates for the respective values attributed to human life. The accident rates used for the calculation of the benefits referred to the entire networks, including densely populated areas. But the vast majority of the road traffic diverted to the new railway line is most likely coming from the motorways, being long distance international flows. The accident rates for motorways are much lower than the one on the non motorway. The routes of access and egress to the long-distance networks, rail or road, will not change so much with the project, and even if some changes might be expected the direction of such changes is rather doubtful, access roads to railways services are often longer than the one to the motorway networks, which are more widespread and therefore more easily accessible. Finally, these rates do not take account the trends in accident reduction of accidents nor the policies promoted by the European Commission for increasing road safety.
In addition to this high expected impact in terms of life saved, a particular benefit has been attributed to the reduction of accidents in tunnels, by applying a multiplying factor of the monetary benefits of accident reduction equal to twenty-five time (afterward this benefit has been reduced). Thanks to this the overall benefits due to the external cost of accidents increases by 50% at least in the first years of the project, those weighing more on the final result.

The expected costs

While all the benefit of the entire project were included in the calculation of the economic performance indicators some cost were missing. The investment considered were not including "the investments more strictly related to the railway nodes," even though such investments, as appears from the analysis, were considered to be necessary for the operation of the project. It is assumed that these investments were part of the reference solution, but the amount is not known. Doubts about the realism of this assumption are more than legitimate, the investments on the nodes represent a considerable component of the project and assuming that this investment would be undertaken in any case, even in the absence of the new railway line does not seem realistic. Particularly if one consider the actual budgetary constraints. Why should the French and Italian railway finance an investment of several billion Euros in the absence of the project?

A second issue concerns the operating costs, operation and maintenance of the line and services. The analysis on this is quite vague: revenues and costs for operating the freight services are not available probably because are considered sensible information. But this information are an important part of the analysis, because what the users are expected to pay are an important variable in the demand forecasts. On this the only statement is that freight operators will be able recover their own costs, except for some services for which there might be a limited subsidy

THE RESULT OF THE COST BENEFIT ANALYSIS

Despite these highly optimistic assumptions the project proved to be only marginally feasible: the Internal Rate of Return showed a value comprised between 4.72 and 5.09 (the first one is calculated by applying the Italian approach for the externalities and the second is obtained applying the French approach). What is even more interesting is that this only slightly positive result was entirely due to the benefits of the reduced accidents. This positive externality was responsible for the switch from a highly negative to a barely positive result. A less optimistic approach concerning only one of the previous mentioned critical assumptions, would have change the result from positive to negative.

Table I – Turin- Lyon new railway line – appraisal results

	French approach	Italian approach
NPV without externalities	1.142	81
NPV of the externalities	13.149	11.891
NPV	14.291	11.972
IRR	5,09%	4,72%

Given the dimension of the investment, the high degree of uncertainty inherent to this type of projects, one would have expected an in depth sensitivity and risk analysis, as recommended by the literature on large transport infrastructure projects (Salling, Banister, 2009) but at the time of the preparation of this article the risk analysis was still missing. The only “sensitivity” is an evaluation with high and low demand scenarios.

Table 2 – Appraisal results with low -Permanent shock- and high –Rebound- scenarios

	Low Fr	Low I	High Fr	High I
NPV	-1.156	-3.235	27.055	24.818
IRR	3,51%	3,09%	6,12%	5,78%

A MISSED OPPORTUNITY

Robust economic assessment is a prerequisite for infrastructure project development, but it cannot be intended as a yes or no. As it is evident from the result of the appraisal of the Turin Lyon new railway, the use of the appraisal to justify a decision already taken has weakened the legitimacy of the project; the results are so weak that they cannot stand any investigation

about the uncertainties of the parameters and assumption. But it has also not helped in structuring the stakeholders' participation, in the interaction with the public debate and in balancing the expert knowledge with the perspectives of the various actors. Under this point of view the appraisal of the Lyon – Turin new railway line can be considered a missed opportunity to make a rational and legitimate investment choice and to take advantage from the existence of the Technical Observatory to use the appraisal to facilitate the stakeholders' dialogue.

In order to help the decision making process the project appraisal must not only be employed before the decision is made, but must start at the very beginning of the project design and accompany all phases of the definition of the project. It must be flexible, easy to be updated and applied to different solutions.

The original sin behind these unsatisfactory results of the appraisal of the Turin Lyon, that helped also resize the experience of the technical observatory, is the failure to consider since the set up of the Observatory other possible alternatives to the project layout. Closing the door to the possibility of putting into discussion the project and exploring alternatives, like improving the existing line or phasing the project has had a severe impact on the entire project with consequences on the appraisal and on the credibility of the participatory approach. The lack of alternatives has forced to ignore the changes in the traffic trends along the corridor, and indirectly to overestimate some positive impacts, particularly the capability of the new infrastructure to attract traffic from the road. On the other hand, by excluding the possibility to explore other solutions, it has reduced the contribution of the stakeholders to role of passive observers, at best.

It is not possible to demonstrate that a different approach would have lead to better outcome in terms of stakeholder involvement and dialogue, but results from a previous analysis of a number of case studies (Maffii S. Parolin R. 2012a) have highlighted that a dynamic use of the appraisal, carried out with different levels of detail along the project design life, would have represented an extremely useful approach for the discussion of the most controversial issues and would have helped to avoid asymmetrical distribution of knowledge between the experts and the promoters on one side and the stakeholders on the other.

An appraisal approach that aims at really supporting the decision making process and a participatory approach must adapt to the different stages of the project. The more detailed is the definition of the project, the more detailed must be the analysis. This calls for the need to consider the whole decision process as a continuous process with different stages each stage, each time the project is refined, modified etc a new appraisal must be carried out and discussed with stakeholders. Given that the time period necessary to design and assess a large infrastructure project may last several years, as it is the case of the Lyon- Turin new railway line, demand forecast must be regularly and continuously update, not only considering the modification of current demand; but also considering those factors having an impact on the expected demand, such as the trends of socio economic variables, and the modification in the transport context, i.e. what is going on the competing modes and/or routes as well as in the policies field (regulation, pricing, but also new infrastructures etc.). The approach followed in the Lyon Turin, to build an extremely detailed simulation tool has ended up to be counterproductive as it has be impossible to use it to test different assumptions or project alternatives.

CONCLUSIONS

Large transport infrastructures are increasingly copying with acceptability-related problems. This is due to the lack of confidence that nowadays characterises the relations between public administrations and their citizens, as well as between citizens and the project promoters. Moreover, the subjects that take advantage from the project implementation and those not often do not coincide, whereas the latter are not compensated for the damages they bear. A sound cost-benefit analysis supporting the entire decision-making process may be a valuable tool for fostering the dialogue with all concerned subjects, provided that a set of basic conditions is met. Firstly, cost-benefit analysis has to be credible as far as the effects generated by the project are concerned. Therefore, it shall: (i) secure transparency of: results achieved by the evaluation (including the assumptions and criteria that led to such results), and procedures embedded into the evaluation process; (ii) be performed by independent evaluators rather than those sponsoring the project; (iii) be as much robust as possible, and finally (iv) deliver structured and thorough risk analyses. In order to reinforce credibility and soundness of the analysis and the evaluations undertaken, previous project experiences shall be duly taken into account, which implies fine-tuning ex-ante evaluations upon the basis of the results obtained by ex-post analysis of projects already implemented. Additionally, the evaluation shall be dynamic, as it shall back since the very beginning the whole process of infrastructure designing, and until the project is finalised. Transparency of such process is then a key pre-requisite.
The second condition refers to the fact that stakeholders interested into the project shall be actively involved into the planning process. Further major token is that the economic evaluation at the level of approximation featuring the various steps of the project cycle feeds and frame the public debate on the project implementation.

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