Transport megaprojects in Italy. Evaluation of large infrastructural projects economic feasibility in Italy: a comparative analysis.

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Abstract

During the last decade, due to real or presumed infrastructural gaps demonstrated with indicators and general studies, the activity of transport planning in Italy has been intense. The 2nd General Plan of Transports and Logistics (PGTL) has been published in year 2000, soon followed in year 2001 by a law, the so called "Objective Law" (*Legge Obiettivo*), that includes a large number of infrastructural projects to be realised with a quicker procedure and that constitutes *de facto* a parallel "shadow" plan. The "Objective law" defines a new assessment procedure with a mandatory environmental impact analysis.

The paper derives from an on-going research project (started in year 2005) aimed to analyse the environmental impact assessments and the feasibility studies for some chosen infrastructural transport projects all over the Italian territory.

International literature, to which the work refers, already faced these kinds of problems, often demonstrating the evidence of overestimation in demand forecasts and underestimation in costs and building time predictions. While sometimes problems concern methodological or technical questions, like double counting in economic cost benefit analysis, in other cases they are related to the role played by different actors in the decisional process.

The analysis discussed in the paper uses a comparative grid that collects data derived from the economic impact assessment and feasibility studies concerning demand forecasts, definition of alternatives, cost benefit analysis and their level of detail. For the analysed projects, it is possible to recognise a low deepening in the definition and in the construction of the demand forecast model, the use of extremely standardised schemes of comparison, the presence of double counting and some theoretical errors concerning costs evaluation. Moreover, the parallel analysis of different projects on the same study-area shows, in some cases, the absence of any co-ordination among projects (and so also for the assessment and decision making process) as well as different outputs from the transport demand forecast model, creating problems of acceptability of the results of each analysis.

After a brief introduction, the literature considered and the methodology used, the structure of the paper – reflecting study objectives – is the following: first, an analysis of alternatives definition and tools used for the decision support system; second, the discussion and comparison of the demand forecasts quality; third, the approach used for the quantitative economic assessment. Then, as example, the standardised railways operator procedure has been analysed and commented. Finally some conclusions will be drawn.

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Introduction, aims and methodology

During the last decade, due to real or presumed infrastructural gaps demonstrated with indicators and general studies, the activity of transport planning in Italy has been intense. The 2nd General Plan of Transports and Logistics (PGTL) has been published in year 2000, soon followed in year 2001 by a law, the so called "Objective Law" (L. 443/2001, "*Legge Obiettivo"*). The L. 443/2001 consists in the transfer to the Government of the topic of infrastructures and national development. The Government can produce a list of public and private investments, following some own criteria and guidelines (but not declared on a plan nor in a law), like the filling of the infrastructural gap between the North and the South of the country or the increase of national competitiveness. The law declares its own coherence with the General Plan of Transport and Logistics of year 2000, but in fact the Government can freely express a list of infrastructures, as it did. Into this scheme, the PGTL, even if still in being, loose its function of planning document, overcame by the Objective Law[1]. It's significant that nothing concerning the PGTL, apart some sparse citations, is available in the Ministry of Infrastructures website, while under the page describing the planning philosophy ("impianto programmatico") only the Objective Law is cited[2].

The law 443/01 and the following decree (DLGS. 190/2002) partially reform the procedure of the Environmental Impact Assessment (EIA) [3], among other measures to make easier and quicker the approval and the start of the chosen investments.

A following decree, the L. 308/2004[4], establishes that (comma 9, letter f):

> *[…] EIA procedures […] must care of the benefit/cost ratio of the project from the point of view environmental, economic and social […].*

ANPA, the National Agency of Environmental Protection, today APAT, published a document containing the guidelines for the evaluation of EIA studies (APAT, 2001). Among the criteria of evaluation and eventual rejection of a project by the Ministry of Environment, there are the "criteria of preventive verification":

> *[…] they take origin from different evalutatory context (economic cost/benefit, technological feasibility). The EIA assessment **must simply verify** that these evaluations took place to avoid that needless or technically wrong investments produce […] unnecessary impacts on environment. […]. If the project is not justified under the socio-*

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[1] Brambilla et al (2003) reports 80 interventions in the initial phase, becoming over 200.

[2] http://www.infrastrutturetrasporti.it/page/standard/site.php?p=cm&o=vd&id=2446&PHPSESSID=8560a0421256015f87a952aa1a3fa77d describes the "Plan for Strategic Infrastructures". http://www.infrastrutturetrasporti.it/page/standard/site.php?p=cm&o=vh&id=23&PHPSESSID=404f37d319ce4a955352918b54506580 seems to be the only reference to the PGTL, as a task of one of the sectors of the Ministry. The first function is the "upgrade of the PGTL", but no reference to the still valid one is present. Both the addresses has been visited the day 11th June 2006.

[3] defined by Italian law DPCM 27/12/1988. The directive requires the articulation of EIA into three steps: program framework, design framework, environmental framework (in Italian: "quadro di riferimento programmatico", "progettuale" and "ambientale"). The article 4, comma 3 of the decree requires "for the public investments […] to illustrate the results of the economic cost benefit analisys, when required by the law, and to give evidence to the considered elements, the unitary values introduced and the internal return rate of the investment (translation by the author).

[4] "*Delega al Governo per il riordino, il coordinamento e l'integrazione della legislazione in materia ambientale e misure di diretta applicazione*"

economic profile, the produced impacts, whatever they are, must be considered unjustified. [5]

All that means that the PGTL has been, in the facts, overcome by the Government list ruled by Objective Law. The EIA, even if largely failing in this scope being a tool for verification of impacts and definition of minimisation measures, become the only moment in which a compulsory project socio-economic evaluation takes place.

The aim of this study is to verify if some key aspects of the evaluation and decision making concerning infrastructures, take place in a correct, shareable and transparent way at least in the EIAs. The research programme is still ongoing, both on the methodological side than on the case studies side. This paper represents a partial and temporary step, aiming to draw a possible comparative grid, the first results of the comparison and a comment on one standardised procedures, the one used by the rail national operator.

The projects analysed up to now are fifteen, listed in Table 1. Seven of them are road or highway projects, eight are rail lines or nodes. For all of them has been analysed the official EIA and CBA, mainly in the part of design framework ("*quadro di riferimento progettuale*"). In some cases the Ministry of Environment required integrative parts concerning the aspects analysed. When these can be considered more satisfying, this study considered the integration, not the original document.

Table 1: projects analysed

Proponent	*Short name*	*Project description*
CTM	Regione Lazio	Highway link Roma - Formia: "Corridoio Tirrenico Meridionale".
A4 Milan-Turin	ASTM	Upgrade of Turin – Milan highway.
Pedemontana	Regione Lombardia	Highway link Dalmine-Como-Varese, Gaggiolo pass and related works .
Paullese	Provincia di Milano	Upgrade of provincial road between Peschiera Borromeo and Spino d'Adda
Valtellina	ANAS	Accessibility to Valtellina valley
SS77	ANAS	SS77 Val di Chienti; Umbria - Marche road system ("Quadrilatero Umbria - Marche")
Modena - Sassuolo	ANAS	Highway link Modena - Sassuolo - Campogalliano
Brenner	BBT	Upgrade of rail link Munich – Verona and Brenner Base Tunnel.
Verona-Brenner	RFI	Railway line Verona – Fortezza, 4th track.
Foligno-Fabriano	RFI	Railway line Orte – Falconara. Foligno – Fabriano section doubling.
Falconara	RFI	Falconara (Ancona) rail node and link between Orte – Falconara line and eastern coastal line.
Terni-Spoleto	RFI	Railway line Orte – Falconara, doubling of Spoleto – Terni section.
Pontremolese	RFI	Railway line "Pontremolese"
Rho-Gallarate	RFI	Upgrade of Rho – Arona rail line, section Rho – Gallarate.
Verona-Padua	RFI	High speed/High capacity railway line Verona – Padova.

[5] APAT, 2001, page 19. The bold and the translation are by the author.

The approach used for the analysis of the projects is based on a comparison grid, including the most relevant aspects concerning the evaluation of investments. The environmental aspects, even if extremely relevant in forming the decision and the shape of the infrastructure, have been excluded from the study. The focus is thus on the aspects of alternatives definition, demand forecast and economical analysis, all concerning the decision making process and pointing out biases and errors. The grid, that will be fully detailed in next chapters, allows to compare all the projects into a general framework of good practice. The "good practice" is suggested by the experience and common sense (it's meaningless to compare only one alternative, and so on) or by the literature concerning the implementation of EIA procedures (Baccaro et al., 2005; European Commission, 1997).

The filling of the grid is, of course, a partially arbitrary operation. It's driven by the point of view of the study on the decision process, the use of socio-economic assessment and the choice of the projects in a context of scarce resources. The grid has been, for first, filled with articulate descriptive answers. Then, to be easily represented and analysed, it has been simplified using yes/no-like answers. Some graphs will illustrate in following chapters the most relevant aspects studied. The green bars represent the number of projects for which a positive answer has been given, in red the negative. For some projects it hasn't been possible up to now to answer. In this case the bar is shorter than the total number of projects (15 in total or 7 road + 8 rail). More details about methodology and assumptions will be given in the next chapters.

Alternatives definition and tools for decision

The first element giving sense to an Environmental Impact Assessment is the analysis of the chosen project, trying to minimise the environmental impacts. The study of the alternatives is, according to directive 97/11/CE (art 5, comma 2), limited to:

> *[…] an outline of the main alternatives studied by the developer and an indication of the main reasons for his choice, taking into account the environmental effects,[…]*

Nevertheless the issue of alternatives definition is very relevant and delicate. It should, in theory, has been done during the planning phase, evidencing only the winning and feasible solution and leaving to the EIA the only purpose of fine tuning on the environmental problems raised. In this sense the evaluation activity in EIA can be limited to a function of support. Nevertheless usually some path alternatives are presented in EIAs, and their purpose doesn't seem only an environmental impact minimisation. These are usually analysed, and chosen, also in terms of functionality, technical feasibility, investment cost minimisation (investment only, no life cycle total cost), coherence with planning tools and so on.

In any case a correct analysis of alternatives, to be named like that, should include or at least consider more levels of deepening. An analysis of alternatives with only one alternative is simply a nonsense. The scheme used for comparison is articulated into five main areas: the number of alternatives considered, their extent, the level of description, the use of such scenarios and the coherence with other planning instruments. Some of them will be detailed and some results will be presented.

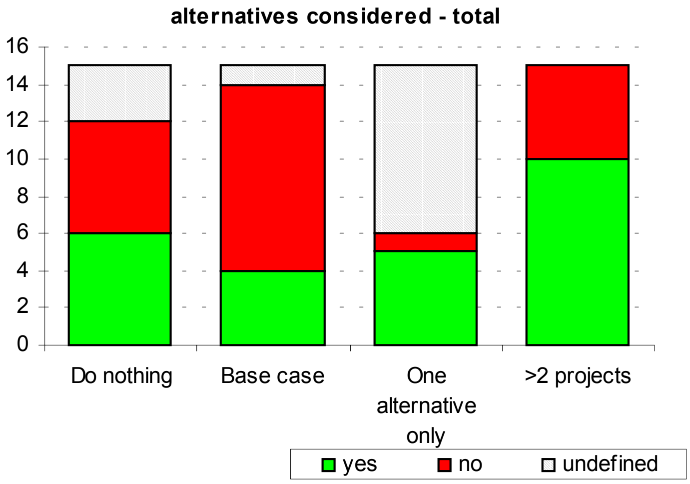
Alternatives and scenarios considered.

A consistent evaluation requires to define a base case and a number, higher than one, of alternative projects. These should be real alternatives, in the sense that one must include different alternative projects and not only minor or irrelevant alternatives (see next chapter). The grid is articulated as follows, in order to verify the presence of the following aspects.

- **Do nothing**. The do-nothing scenario is the projection of the present to a future with no changes, applying only trends or macroeconomic scenarios. This alternative, that should always be present, is in reality fictitious, since some modifications (infrastructure, services, etc.) will take place for sure.
- **Base case**. The base case is the scenario or the scenarios created applying trends and with the sure modifications to supply (new infrastructures still in construction, or the sure modifications to year zero situation). The presence of a base case is fundamental, since it's *wrong* to compare future alternatives with the do-nothing case that will never exist.
- **One alternative only**. This is the case in which no projects apart the final one are present. This case is very common, even if clearly wrong.
- **More than one project**. More than the chosen projects are analysed, with no respect to the extent or relevance of proposed alternatives.

The results of this analysis are not very positive. Only 10 projects out of 15 includes more than one alternative. Even more problematic is the absence for the majority of projects of a well built base case (4 out of 15). Rail projects are more correct when including more than one project, but largely insufficient for base cases. Road projects show the opposite.

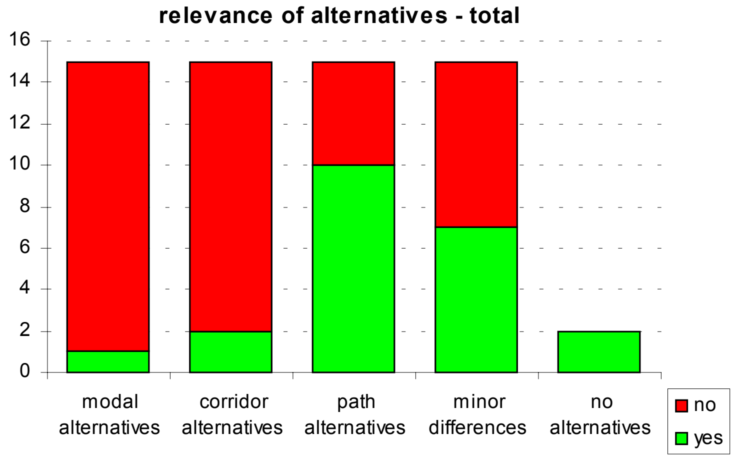
Figure 1: results, number of considered alternatives.



Relevance of alternatives

Apart the presence of alternatives, their relevance is even more important. One can consider modal alternatives, corridor alternatives, path alternatives, minor detail differences or no alternatives. One project can include more than one level. In the grid the answer has been positive even if the alternatives have not been detailed.

Figure 2: relevance and level of alternatives.

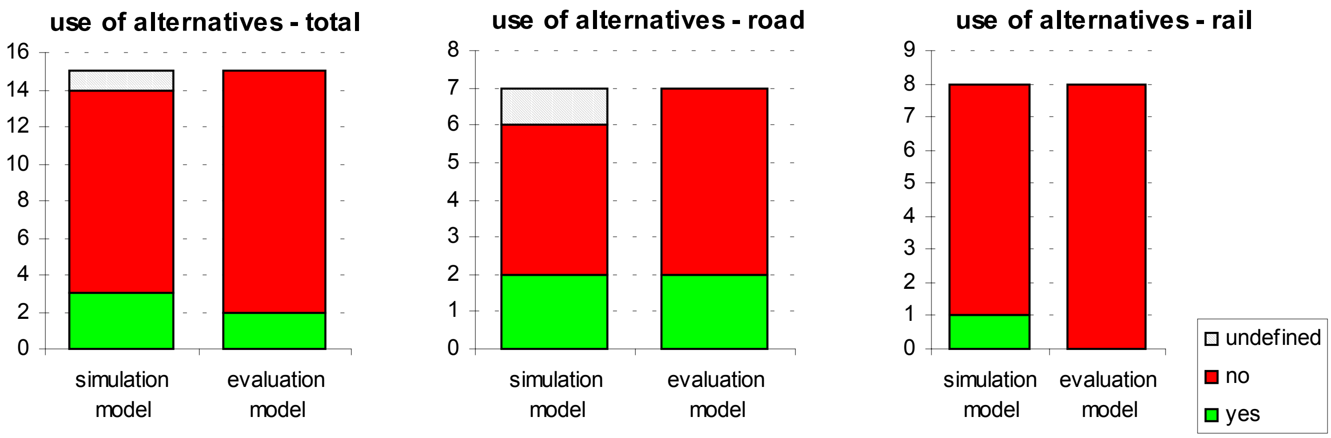


Who writes is conscious that in an EIA relative to a single project, the consideration of modal or corridor alternatives is quite difficult, being this a typical planning problem. Nevertheless the absence of modal and corridor alternatives has been verified.
Rail projects has been in general more virtuous about relevance.

Use of alternatives

Obviously, a key point is the use of the defined (and sometimes fully designed) alternatives. If such definition is irrelevant for demand forecasts and evaluation phase, the alternatives can be considered fictitious.

Figure 3: use done with defined alternatives.



Unfortunately the results are poor: the projects in which alternatives enter in the demand model and the evaluation phase are three and two, respectively, out of 15.

Demand forecasts

The demand forecasts are key elements in any transport study. An infrastructure makes no sense for itself, but only if there is a demand for it, real or presumed. A demand study is thus essential to demonstrate the sense of the project, apart any socio-economic feasibility consideration, and its impacts on ecosystem and human beings.

The Italian law requires explicitly to define and report[6]:

> *[…] b) the degree and level of demand fulfilment according to the different alternatives examined, even hypothesising the absence of the project;*
>
> *c) the forecast of evolution, in qualitative and quantitative terms, of the demand-supply ratio, according to expected economic life of the project. […]*

Moreover, one of the possible causes for rejection according to Ministry of Environment guidelines (ANPA, 2001, page 18) are:

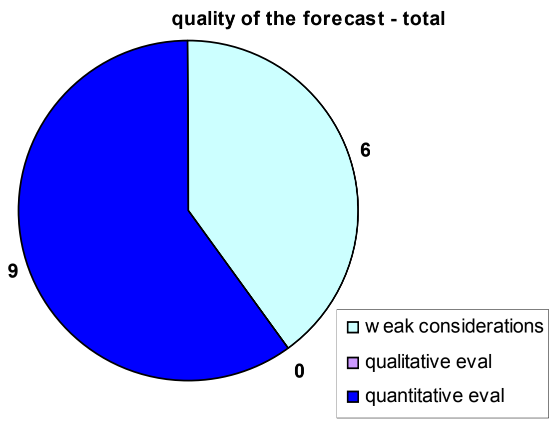
> *Unacceptability of not due impacts in case of incapacity of the project to give answer to its technical objectives. If the project is not capable of reaching its technical targets, unjustified impacts are generated. […] For example […] a large road infrastructure for which small traffic is forecasted, implies unnecessary environmental damages, and that's to avoid*[7].

The scheme used for analysis and comparison is formed by the following areas: nature of the forecasts, the methods used for the forecasts and for flows assignment, the transparency and reproducibility of the procedure, the boundaries of the analysis, some technical aspects of the models used.

Quality and nature of the forecast

Forecasts doesn't always follow a quantitative rational procedure, as the problem would suggest, but sometimes are ruled by more weak qualitative considerations.

Figure 4: quality of the forecasts



Another element that should be explicitly present and documented is the presence of traffic surveys and at least part of the simulations. Traffic surveys are necessary to dimension the infrastructure, to be the basis of forecasts, but also, in theory, to calibrate and validate the models.

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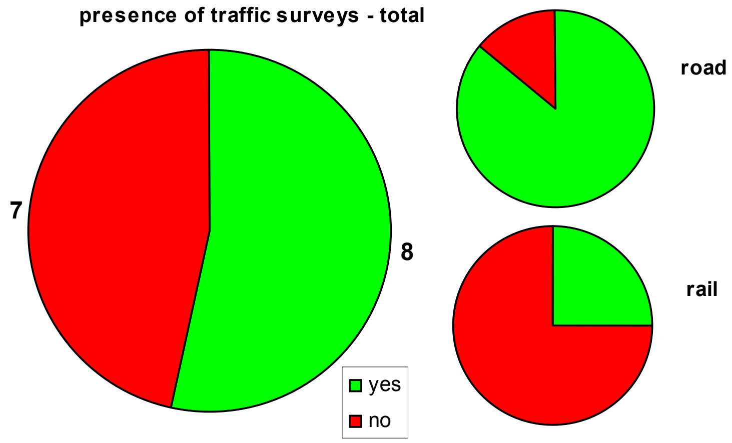
[6] DPCM 27/12/1988, Art. 4, c. 2, lett. b) and c), translation of the author.
[7] Translation of the author.

Figure 5: presence of traffic surveys in public documentation.



The analysed projetcs are not very virtuous in this sense, especially the rail ones.

Method used for forecasts

Many are the ways to produce forecasts. For simplicity's sake, only seven has been considered. These are not "methods", but ways the designer approached the problem. More than one can be used at the same time:

- **qualitative**. the future demand is quantified starting from qualitative assumptions, for example simply linking it to supply. In this case one can read sentences like the following, with no further specification:

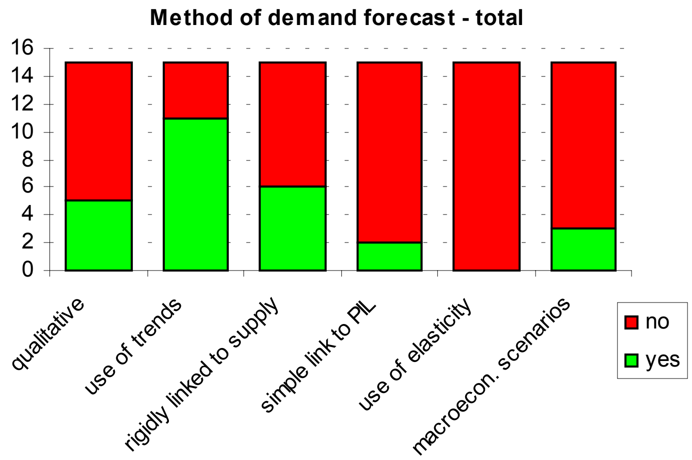
  > *the quantification of passengers and freights traffic […] has been done using a "supply side" approach* (sic!)*; commercial analyses has been elaborated analysing the actual transport demand and defining an hypothesis of a new commercially sustainable supply, based on the exercise regime hypothised after the realisation of projects.*[8]

- **use of trends**. The application of trends to actual traffic or demand is the simplest way to make forecasts. The trends can derive from various sources. The sources were not always declared.
- **rigid link to supply**. This is a variant of the first category and implies a strong hypothesis, that's to say an infinitely elastic demand. Whether the hypothesis is not declared nor verified, this represent a dangerous conceptual <u>error</u> and not an innocent simplification.
- **simple link to GNP**. A common hypothesis, up to now reasonably verified in literature, is to link the increase of demand to GNP rate.
- **use of elasticity**. Even if seldom found, the use of sector specific elasticity factors allows to link the demand to the supply, eventually according to some supply scenarios. Multi-modal models, where used, include an implicit elasticity, while in case of application outside a model it would be appropriate to report the value used.
- **macroeconomic scenarios**. The definition of scenarios, more than one, can simplify the forecast allowing to make undemonstrated hypotheses. On the other side the clear explication of all assumptions done and the use of the same scenarios until the end of the process is necessary.

[8] Cost Benefit Analysis of Orte-Falconara rail corridor. The same sentences with minimal variations can be found in every RFI CBA. The same CBA can be read as case study on Cicini et al. (2005).

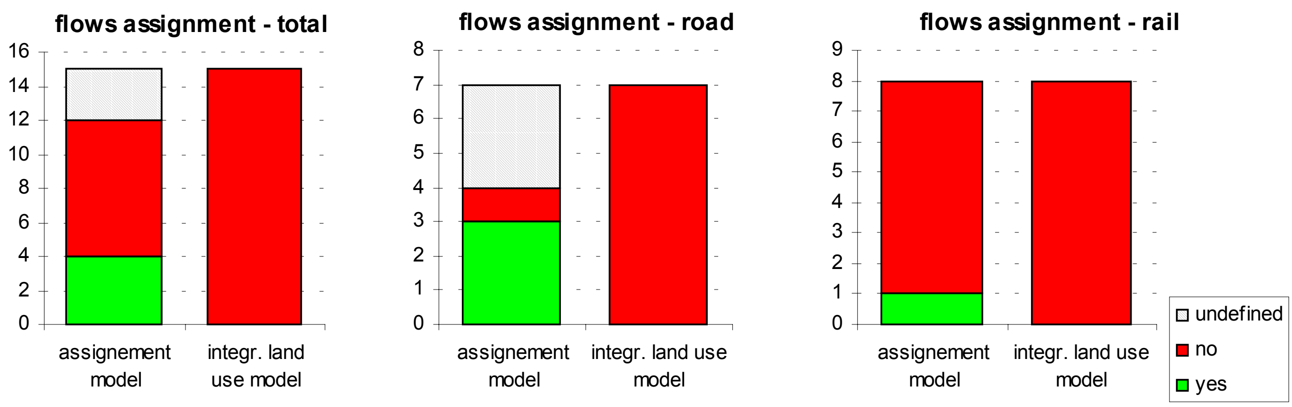
- **interviews and stated preferences** (not included nor present in the analysis). Another way of forecasting future demand, frequently used in other sectors like Local Transport, is the use of interviews together with the technique of stated preferences.

Figure 6: methods used for the forecast of the demand.



The panorama of the issue shows clearly a predilection for trends, sometimes with qualitative approaches. The large and unjustified link with supply is worrying. No project used elastcity or other economically founded method nor stated preferences.
Another issue is the presence of an assignment model, to distribute the predicted flows on the actual and future network. This approach, common in Local Transport or Road sectors, is rarely applied in analysed projects, despite its importance.

Figure 7: method used for flows assignment to the network.



Other aspects

About the other aspects, it's useful to report the scarce transparency in data used – only for 5 projects out of 14 all data are clearly specified – and the possibility to reproduce the forecasts. This is more common, but simply because of the large use of simple trends.
The elasticity is never declared, nor if infinite.
Only five road projects and two rail projects include a flows simulaiton model, at least declared. For all the projects with models traffic data are available, so one can suppose that such data has been used for a calibration phase (even if clearly declared only in some cases). Finally, no trace of

models validation is present: no one of the designer who produced a large model considered important the third part certification of his work. For only a couple of projects the model is independent from the project itself, for example built in advance for other or general uses.

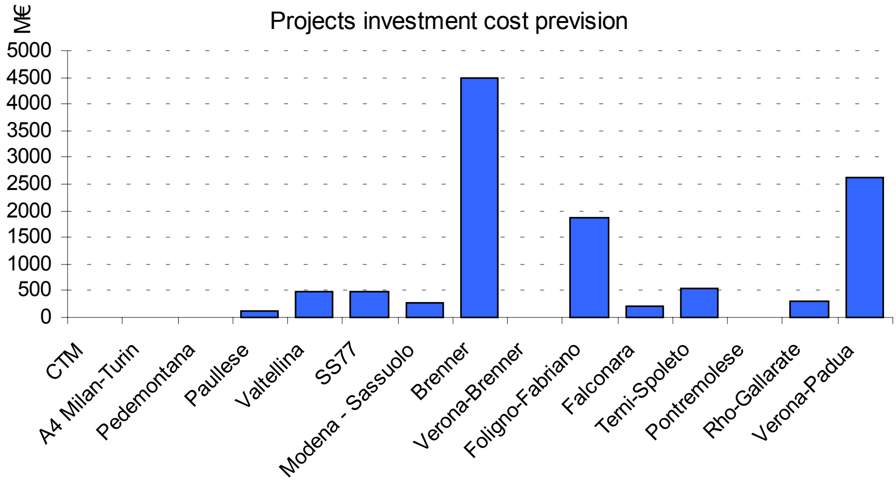
Some conclusions of this part can be drawn. The study of demand is extremely complicate and costly, especially for large projects like part of the studied ones. The impacts are regional- or national-wide and the models to be used cannot usually be produced in a while and for a single projects. But, on the other side, the analysed projects are extremely important for the country and their total cost is enormous. The costs to produce an acceptable traffic model, given its importance, would be more than justified. Moreover, often these projects came from large agencies, like RFI – National Railways and ANAS – National Road. These agencies, since one of their function is to design infrastructural investments, should have inside the structure one national scale model common for all projects and adequately set, calibrated and validated, exactly as happens for other agencies (the public transport companies of big cities, for example).

Approach to economic assessment

Within the end of the EIAs verification procedure (including integration requests), a Cost Benefit Analysis was available for the majority of the projects. For the different parts of the Orte – Falconara rail corridor (Foligno – Fabriano section doubling, Falconara rail node and Spoleto – Terni section) only one comprehensive CBA was present. Only three out of the 15 didn't have the CBA; for two of them has been analysed the CBA provided later, under request; for one of them no CBA was available at the moment of the study. So, in this section the number of assessments analysed is 12, plus one with no analysis.
The norms concerning Cost Benefit Analysis and project selection in Italy in general has been illustrated at the beginning of the paper and will be re-discussed in the conclusions.

The projects analysed can be easily classified as "large", sometimes as "megaprojects", due to the relevant amount of money required. Nevertheless the "Objective Law" is characterised by the presence in the same time of mega, large and medium projects, despite the important differences among these "categories".

Figure 8: Investment cost for projects as reported in EIA or CBA. Zero values are used for projects I haven't been able to report the estimation at the moment of the study.



The approach used for analysis and comparison among projects is structured into seven main topics: which method has been used, the consistency with the theory of CBA, the presence of less conventional and codified "improvements", the most evident theoretical errors and the recognised data errors. Finally a check has been done about transparency and the results of the assessments.

Method used

The majority of projects used a standardised CBA. Only a couple of them included also a multicriteria analysis to chose some detail issues. For three of them the EIA didn't include any socio-economic method for alternatives choice, apart technical or environmental aspects.

Excluding the multicriteria analyses, from this point on the focus is on the CBAs.

Consistency with theory of CBA

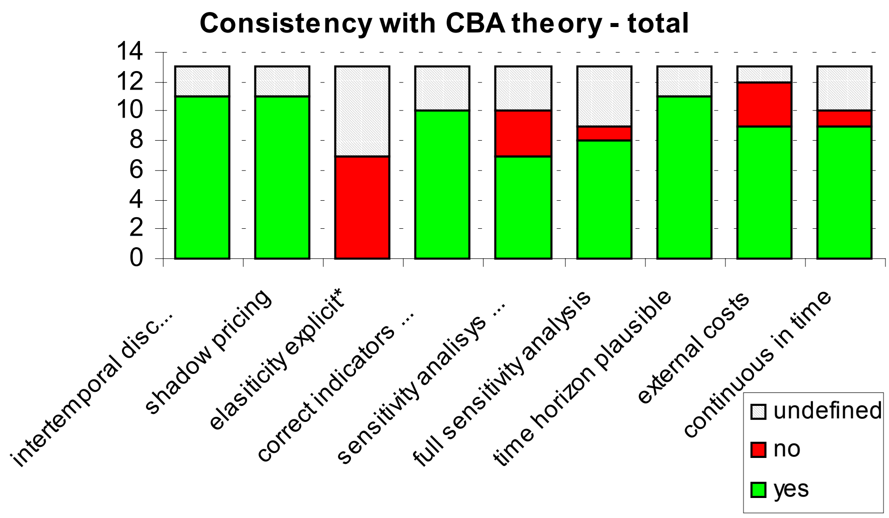
The standard procedure of CBA is quite codified and standard. Many guidelines are available (European Commission, France, Italy, Great Britain, Netherlands, etc.). For a complete review one can refer to HEATCO projects deliverables[9]. Among the possible schemes, this study refers to Florio et al. (2003). The comparison consider the presence of the following issues:

- **intertemporal discount**. The use of a social discount rate to discount future costs and benefits.
- **shadow pricing**. The use of coefficients to correct distortions in prices.
- **elasticity explicit**. The elasticity should be clearly defined and used.
- **correct indicators (NPV, IRR)**.
- **sensitivity analysis for SDR**. The presence of the sensitivity for the social discount rate.
- **full sensitivity analysis**. The presence of the sensitivity analysis for other aspects.
- **time horizon plausible**. The temporal extent of the analysis, depending on kinds of projects.
- **external costs**. The presence of environmental and non-environmental externalities.
- **continuous in time**. If the transitory periods (building phases, etc.) are, correctly, considered.

[9] http://heatco.ier.uni-stuttgart.de/. The project is recently concluded..

The results seem quite comforting. The theoretical foundations are generally respected, even if no project report the elasticity used for generated traffic and sometimes external costs are forgotten (always for road projects):

Figure 9: presence and correctness of theoretical aspects of CBA.



Improvements

Some improvements has been proposed to correct some uncovered or failing aspects of standard CBA. These are still not used in the common practice. The main are the Risk Analysis, the Option Value, the Marginal Opportunity Cost of Public Funds, the use of model integrated CBAs. No one of the analysed projects considered these aspects.

Theoretical errors

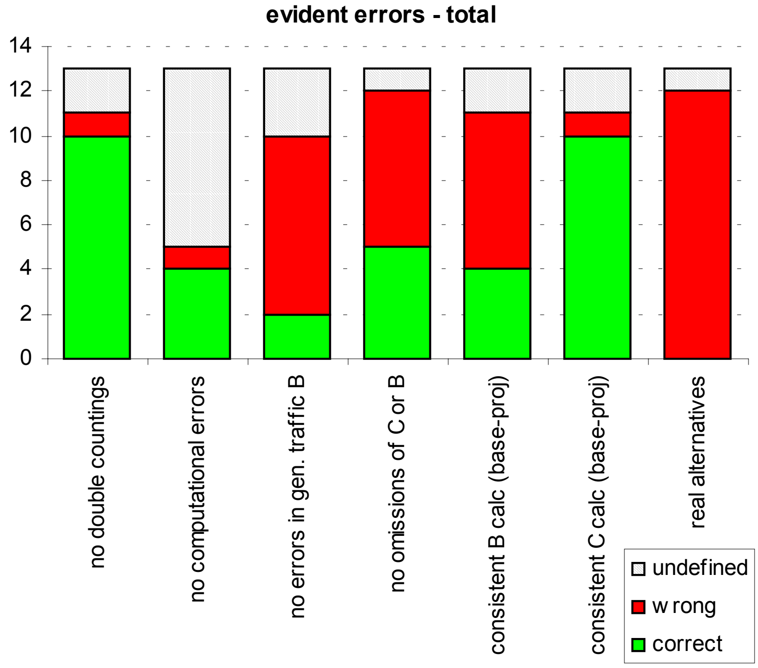
Some errors has been codified. These are quite general, and represent simply the categories of errors one can fall:

- **no double counting**. The presence of benefits (or even costs) calculated twice into two different forms. For example: the gains in real estate values due to a transport improvement together with the time gains for the inhabitants.
- **no computational errors**. In general, all the calculus errors revised.
- **no errors in generated traffic B**. The benefits of generated traffic must be calculated as surplus gain using a quantity(cost) diagram and hypothesising a demand curve. The lack of these elements suggest a wrong benefit, usually calculated as the difference between initial and final costs and multiplied for all the users. In this case the benefit is overestimated.
- **no omissions of C or B**. The lack of some standard and commonly introduced costs or benefits. For example: the lack in the analysis of external environmental costs.
- **consistent B calculus (base-project)**. This refers to the correctness of the base and project scenarios to calculate benefits. For example: it's wrong to calculate benefits as difference between the project scenario and the year-zero situation, instead of the base case projection to the analysed year.
- **consistent C calculus (base-project)**. See before.

- **use of real alternatives**. This is the most common error: the comparison is done for one alternative only or among irrelevant alternatives.

The check of these errors is extremely difficult: the documents provided were often very short and incomplete, the reproduction of the analyses to check errors is sometimes impossible or extremely difficult. That's why the errors categorised are very general and can sometimes be verified simply reading the hypotheses and the methodological descriptions. For some aspects in some projects the answer to the question (the absence of errors) was impossible. The results are in Figure 10.

Figure 10: review of the most evident errors revised in CBAs.



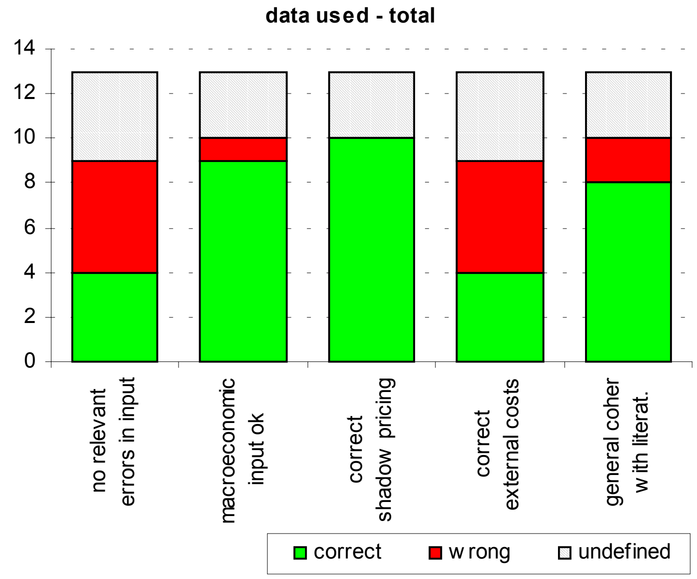
Double counting has been found in one project only, like computational errors (but only a small number of projects the verification is sure). Also the calculus of the costs is generally correct. More discouraging is the generated traffic determination, the frequent omission of relevant costs or benefits, the wrong determination of benefits. For all the 12 project the use of alternatives (also where correctly defined in the design part) is, in author's opinion, fictitious.

Data errors

This section is even more difficult to verify than the last one. That's why the answer has been positive by default, apart evident and demonstrable biases. All rail projects used a public source for external costs, but reported wrong values (see next chapters for details).

The introduction of errors in data can be obviously accidental or the sources used may be different from the ones considered correct by the author. In any case all data used should be justified or quoted, thing that sometimes doesn't happen.

Figure 11: presence of errors in the data used



Clarity and transparency

The data used are generally lacking and unclear (only 4 out of 12 projects were clearly explained). The reproducibility of the analyses in general possible, but this is due to the extreme simplicity of the used procedures.

Results

Obviously, all the analysed projects were positive in the light of the produced CBA. For 3 projects the sensitivity analysis evidenced negative results for some aspects, while 2 projects were always positive, whatever were the proposed variations of parameters.

Some concluding remarks can be useful. The CBAs showed a good coherence with theory, including almost all the parts of the shared algorithm. The problems come in the operative parts and in the transparency. Some unacceptable and even evident errors has been found, usually in favour of the project. The alternatives are always irrelevant or absent. Data errors or unclear sources has been revised. The fact that all the projects are positive is by one side obvious (the alternative is always one), by the other side worrying.

An example of Cost Benefit Analysis: the RFI standard procedure.

A good example of standardised procedure to Cost Benefit Analysis for infrastructural projects is the one used by RFI[10]. All the rail projects analysed can be classified as "large", involving an average investment of 1670 M€ (210€ the cheaper, the Falconara node, and 4.500€ the most expensive, the Brenner Basis Tunnel). For all these large, costly and impacting projects, the only and official document describing CBA is usually about 30 pages long, including the information concerning the demand forecast. An article published in the technical journal of RFI, describes briefly both the theory and an example of such approach (Cicini et al., 2005). The case study used

[10] RFI is the society, part of the national railways *Ferrovie dello Stato S.p.A.*, owner of the infrastructures and responsible of maintenance and circulation.

in the article and described in following pages, is one of the analysed projects, the line Orte – Falconara in central Italy. The official document we analysed for this study is exactly the same than the one of the article, apart some data used sometimes different from the EIA ones. There is no way to understand which value RFI consider the correct ones; furthermore both documents give, curiously, the same results.
The procedure used for all the projects is very simple and codified. The structure is summarised in Table 2.

Table 2: structure of CBA in Cicini et al. (2005).

costs	-	*benefits*
▪ incremental costs of investments ▪ incremental costs of infrastructure exercise ▪ incremental costs of train exercise		▪ reduction of road passengers transport costs ▪ time savings for actual demand ▪ lower external costs

Apart the simplicity, that may seem to be too much extreme for projects of such importance, some aspects of the procedure raise relevant **doubts**:

- the study states that the new competitiveness of the rail mode comes from the "removal of capacity constraints", even if these constraints are never demonstrated.
- the demand of the infrastructure is never calculated with a model, but "comes from a commercial study of the transport firm about the slots it would be interested to buy"[11]. Apart that this study is never included, but simply quoted, one must notice that the transport firm is part of the same holding of RFI and this statement is simply a declaration. An independent simulation would be more convincing.
- the general coherence with other projects is doubtful. Projects are analysed singularly, no comprehensive model for all the projects of the country exists[12].
- the opportunity cost of public funds is quoted, but not included in the analysis (*cit*, pag. 12).
- the necessity of a full realisation of the work to have the benefits is given as hypothesis, even if not demonstrated nor realistic. Partial realisations can generally give partial benefits (*cit*, pag 18).
- part of the surplus generated by new traffic is not considered (the time and money savings due to modal change or the surplus generated by a new displacement).

Moreover, some **conceptual errors** can be raised:

- benefits are calculated as difference between the situation without project at year 0 and the one with it at year *n*. This is wrong, since one must consider the difference between the demand at year *n* without and with project, but including the sure modifications (i.e. a new parallel infrastructure, new demand independent from realisation, etc.).
- No other relevant alternatives (use or improvements of other corridors, for example) are considered.

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[11] Translation of the author. Cicini et al. (2005), page 10.
[12] Some projects, even among the analysed ones, can be alternative: for example the access to alpine passes (Simplon, Frejus and Gotthard) are competing for freights.

- the demand is calculated as purely dependent from supply, using average (and unspecified) load factors. The idea is that the "commercially sustainable supply" is X trains per day, multiplied by the average (national?) load factor. This implies an unspecified hypothesis of completely elastic demand, clearly untrue, especially for rail mode.
- the amount of passengers·km, later used for all the marginal benefits and costs determinations, is calculated as follows: the average load factor is multiplied for all the train·km produced, as if the train were completely full for the whole path. This is particularly untrue for local commuter trains. The (positive) effect is illustrated in Table 3: the "real" pkm should be 30.000, while the document would report 40.000 pkm. The longer (and probably empty) are the trains, the best is the CBA result.

Table 3: example of pkm calculation in RFI procedure.

stations	A		B		C
distance		100 km		100 km	
real load factor		100 pax		200 pax	
real pkm		10.000 pkm		20.000 pkm	
assumed load factor[13]		200 pax		200 pax	
assumed pkm		20.000 pkm		20.000 pkm	

Finally a couple of problems and doubts can be underlined about the **data used**:

- part of the external costs used, in theory taken from international literature (INFRAS, 2000), are simply wrong. The bias is in favour of the train system.

Table 4: External costs used by RFI in the two documents, compared with the quoted source: INFRAS, 2000

		Passengers			*Freight*	
	article	*official CBA*	*INFRAS*	*article*	*official CBA*	*INFRAS*
Road	0.087	0.087	0.078	0.072	0.088	0.072
Rail	0.020	0.020	0.020	0.019	0.004	0.026

It seems strange, in author's opinion, that with such different data, the final results were perfectly same.

- the load factors, never declared, but extremely important for the estimation of costs and benefits, are very high, seeming too similar to peak load factor. For the case of the article the load factor for regional trains is 486 passengers/train and for long distance 375 passengers/train. The values are not explicitly given among the inputs, but can be simply calculated from the supplied data.

Conclusions

The study presented is still unfinished. Up to now has been defined the aims and the structure of the comparative analysis, then a first survey of some projects has been done. Some numerical

[13] the load factors used are extremely high, seeming too similar to peak load factor. See further.

information has been found, demonstrating quite clearly the inadequacy of the EIA tool for the socio-economic evaluation and the poor quality of produced analyses. The EIA in its original form doesn't aim to evaluate projects from the same point of view of this article, to make possible a selection of most welfare producing projects.

Nevertheless:

- in Italian practice no economic evaluation of alternatives, done during the planning phase, is available to the public: the law doesn't require it, since the only assessment – a standardised CBA – is requested by the EIA, concerning one single project. National and local plans, described before, generally use a strategic approach or are simple "shopping lists", lacking of a well declared methodology. The CIPE must approve the financing of single projects[14].
- the EIA comes after the phase of selection of alternatives. The cost benefit analysis of the EIAs, required by Italian normative, thus declares *implicitly* that the only possible alternatives are the considered ones. The legitimation formally comes from the upper level of planning, in form of a declaration of relevance to national objectives.

This means that the projects admitted to EIA are the chosen ones only, in their definitive form apart the aspects of environmental impacts minimisation. The mode, the corridors, often also the paths, are defined. On the other side the, EIA includes an economic assessment that, by definition, should be carried on for more than one project. The CBA produced for one single alternative is, if carefully addressed, simply confirming it. So, the EIA legitimates with a pseudo-rational and transparent procedure, the alternative and its configuration chosen a priori. Moreover, it doesn't consider other alternatives that could be less impacting, more efficient or, in general, better in socio-economic terms.

Being the EIA carried on before the definitive design, one can think at it as an ex-ante evaluation, while it is, in the facts, subsequent to the moment of choice. The analysed EIAs suggest that who wrote them thought at it as a moment of real choice (path alternatives, use of CBA, etc), even if in the reality the choice is fictitious.

One can conclude that EIA procedure is, by its nature, inappropriate for project selection and in fact the international practice doesn't attribute this function. Nevertheless, since Italian law requires some specifications typical of ex-ante appraisal, it would be fundamental that such analyses were correctly carried.

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[14] CIPE is the Interministry Committee for Economical Programming. www.cipecomitato.it

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