Transport Policy 16 (2009) 200–212

Contents lists available at ScienceDirect

Transport Policy

journal homepage: www.elsevier.com/locate/tranpol

The uses of cost–benefit analysis in public transportation decision-making in France

Sébastien Damart [a,*], Bernard Roy [b]

[a] M-Lab (DRM, UMR CNRS 7088), University Paris-Dauphine, Place du Maréchal de Lattre de Tassigny, 75775 Paris Cedex 16, France
[b] LAMSADE, University Paris-Dauphine, Place du Maréchal De Lattre de Tassigny, 75775 Paris cedex 16, France

ARTICLE INFO

Available online 25 July 2009

Keywords:
Cost–benefit analysis
Transportation decision-making process
Stakeholders participation

ABSTRACT

Cost–benefit analysis (CBA) is a tool used to evaluate the potential socio-economic impact of public investment choices. In many countries, particularly in France, this tool is used to support decision-making related to transportation infrastructure. In the context of difficult budgetary arbitrations, taking the multiple effects of the different choices into account makes choosing among transport infrastructure investments a two-fold problem. On the one hand, public decision-makers have limited resources that they must use in the best way possible. On the other hand, when choosing among alternative investment projects, the decision-makers reveal their priorities (based on the importance they assign to the different projects), and these priorities must be perceived as legitimate. Based on a case study of how French institutions use the CBA method, this paper examines how the use of cost–benefit analysis interacts with the use of public debate and stakeholder participation in France today. This French case illustrates the difficulty of striking the right balance between the expert knowledge produced by CBA methods and the knowledge produced by the participation of various stakeholders in the decision-making process.

1. Introduction

Cost–benefit analysis (CBA) is a tool used to evaluate the potential socio-economic impact of public investment choices. In many countries, particularly in France, this tool is used to support decision-making related to transportation infrastructure (see Bristow and Nellthorp, 2000 for a complete survey on transport policy evaluation procedures used in European countries). Unsurprisingly, when public resources are limited, questions related to the pertinence of specific infrastructure projects and the validity of the various potential alternatives arise continually. Trying to take all the implications of public transportation infrastructure projects into account, as public decision-makers customarily do, is thus quite difficult: it is not only the financial costs (e.g., investment and maintenance costs) of the competing infrastructures that must be considered, but also the potential positive and negative impacts on the community (e.g., travel time, security, and living environment) as well as the possible environmental changes that could affect future generations. The environmental impacts alone are multiple and varied, including air and noise pollution, and the effects on the landscape and on the living conditions of the inhabitants. The difficulty of taking all of the above into consideration requires the use of complex methods and sophisticated evaluation tools.

A report of the EU Commission confirms the complexity of analyzing the impact of public transport infrastructure projects: "Atmospheric pollution is not just a local nuisance but is hazardous both to human health and the environment. In excess of critical levels, global air pollution creates significant costs. The transport sector is a major source of strategic pollutants, producing approximately 60% of total European NO_X and between 21% and 38% of total carbon dioxide emissions in EU countries. There are however considerable difficulties in attributing strategic pollutant burdens to individual road investments. Indeed unless the scheme generates considerable amounts of traffic, it is difficult to justify including strategic pollutants at the individual project level." (E.C., 1996).

In fact, the difficulty of comprehending the challenge of pollution raised above illustrates the problem of making both rational and legitimate public investment choices. In the context of difficult budgetary arbitrations, taking the multiple effects of the different choices into account makes choosing among transport infrastructure investments is a two-fold problem. On the one hand, public decision-makers have limited resources that they must use in the best way possible. Thus, the "rational" evaluation of infrastructure investments should include the multiple effects of the projects, even those that are difficult to

* Corresponding author. Tel.: +33 6 21 24 20 90; fax: +33 1 31 31 44 83.
E-mail addresses: damart@mlab.ens-cachan.fr (S. Damart), roy@lamsade.dauphine.fr (B. Roy).

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doi:10.1016/j.tranpol.2009.06.002

evaluate. On the other hand, when choosing among alternative investment projects, the decision-makers reveal the priority they have assigned to the different stakes, and these priorities must be perceived as legitimate. Thus, decision-makers must both spend their limited resources with special care and make the most acceptable decisions possible.

In France, over the last several decades, attempts to use public funds optimally have led to the widespread development of cost–benefit analysis (CBA) methods for transportation infrastructure investments. Based mainly on the recommendations of the *Commissariat Général au Plan* (CGP),[1] a wide range of methodologies has been developed in order to monetize the gains and losses of an evaluated project. At the same time, public legislators have tried to institute an institutional framework designed to facilitate the participation of stakeholders in the transportation decision-making process. The French case illustrates the difficulty of striking the right balance between the expert knowledge produced by CBA methods and the perspectives of the various stakeholders. This difficulty is not specific to the French context but it aims at being a support for a more general thought.

In this paper, we will examine how the use of cost–benefit analysis (CBA) interacts with the practice of public debate and stakeholder participation in France today. After a brief reminder of general CBA principles (cf. Section 2), we will describe how it is carried out in France. (cf. Section 3). Then, we will examine how stakeholder participation has been progressively regulated in France and what this regulation has led to (cf. Section 4). Next, we will highlight some technical difficulties in using CBA methods to rationalize public investment choices (cf. Section 5) and evaluate the legitimacy of CBA, as it is used in France today (cf. Section 6). Finally, we will offer some suggestions for conciliating legitimacy and rationality in decision-making processes related to public investments (cf. Section 7).

2. A brief presentation of cost–benefit analysis

The idea of cost–benefit analysis was first originated by French economist Jules Dupuit in 1844. In the 1930s, the American Congress indicated that the federal government should improve navigable waterways by considering flood control disposals whose expected benefits exceeded the estimated costs (Flood Control Act of 1936).

After the Second World War, and a long period of economic growth and prosperity, decision-makers in Western countries began in the 1960s to rationalize the use of budgetary resources. Cost–benefit analysis began to be used extensively as part of the Planning Programming Budgeting System (PPBS), introduced in the USA in 1962 (Schick, 1966; Agard, 1970). CBA has influenced most budgeting practices based on the idea that rationalizing expenses in order to reach previously defined objectives is possible. In France, it has led to what is called rationalization of budgetary choices (RBC) policies. PPBS was not developed exclusively as a response to a crisis in public funds. It was also intended to counter 1960s domestic criticisms against traditional American practices during construction projects and the subsequent budgetary follow-ups. The critics argued specifically that lack of coherence, as well as lack of time and lack of coordination among government departments, was a major problem. The American government gradually implemented a variety of solutions to the problems raised, some of them being inspired by private-sector budgetary practices (e.g., those used at the Ford Motor Company, among others). PPBS was one of those solutions. The popularity of RBC, in France as a doctrine for decision-making in public finance began in 1968.

CBA is a technique for evaluating public spending, which aims to avoid inappropriate distribution of public resources. In theory, it helps public decision-makers to invest only in those projects that will be the most profitable from the viewpoint of the community.

To function correctly, CBA must be employed before the decision is made so that the potential of the various project proposals can be compared and evaluated. It "aims to evaluate the set of direct and indirect effects of a project, its financial and non-financial effects on the set of economic agents concerned with the investment. These effects are then synthesized, after monetary evaluation, to insure a socio-economic balance which establishes the return on the investment, with this return being estimated on the basis of specific indicators" (Auzannet, 1997). CBA considers many types of technical issues, specifically those connected to:

(i) *The evaluation in appropriate units of an investment project, taking all the financial or non-financial, positive and negative, effects into consideration*. For example, in evaluating a road infrastructure project, a variety of positive effects must be taken into account: time savings for those using the transportation network, decreased use of private cars, improved security conditions, fewer problems related to parking, improved traffic conditions, decreased road maintenance costs, and potentially positive environmental impacts.

(ii) *The evaluation in monetary units of the very diverse and sometimes non-market-related effects of the project*. For many years, the CGP has studied these effects and has made recommendations for developing CBA methodologies. In terms of the monetary evaluation of non-market effects, the CGP report produced by a group chaired by Marcel Boiteux has become a reference in the domain (CGP, 2001). In the introduction, Boiteux mentions that monetary evaluation "is in keeping with the general preoccupation with valuing the non-market benefits and drawbacks of a project, in order to provide the decision-makers with a complete assessment of the benefits and costs generated by the various operations and alternatives among which they have to choose". The monetary evaluation of non-market effects is therefore an important issue and raises major questions (see Section 3.1).

(iii) *The evaluation of the synthetic indicators provided by CBA*. The existence of these indicators leads decision-makers to use CBA in different ways. The results can be expressed in terms of the internal rate of return or the overall benefit that the community may obtain from a project. Calculating these indicators entails defining the following elements:

- A reference situation in terms of the transportation offer and demand. In fact, the monetary evaluation of the benefits and costs involves a change in the state of a system. The choice of the reference situation (see Section 3.2) is very important because it has a direct impact on the results in terms of returns and benefits.
- A reference period during which the analysis and the discounting are performed. The choice of reference period is also quite important and in fact has been the subject of many key studies. Choosing a long time period, for example, implies the integration of long term effects, such as the variation of fuel prices or future penalties for pollution. A schedule (i.e. a cash stream of the monetary values corresponding to the benefits and costs of the

[1] A French advisory board for economic and social issues that organizes thematic working groups bringing experts and the stakeholders involved in that field together.

investment) must also be established for the reference period.

As shown above, CBA is a complex technique. The next section will explain how it is put into practice.

3. How is cost–benefit analysis performed?

Cost–benefit analysis in the public domain applies the same reasoning found in prevailing economic theory in the private domain. The concept of return mentioned in the previous section can be exploited in public decision-making since, as it is true for private investments, resources are scarce and comparing resources to costs helps to optimize the use of the former. However, the complexity of the analysis and the justifications of the approach in the private domain make CBA particularly difficult in terms of:

- integrating the monetary evaluation procedures of non-market elements into the assessment of costs and benefits; and
- choosing the reference situation and the reference period, thus allowing some future state of the system to be compared with the situation if the project is not implemented (i.e., allowing competing projects to be evaluated).

3.1. The procedure for monetary evaluation of external and non-market effects

The monetary evaluation procedure is crucial because it defines the value assigned to each effect taken into consideration in CBA. This procedure is structured in three phases.

The *first phase* consists of identifying the advantages and the disadvantages so that the effects to be taken into account can be measured. For each measurable effect, a physical measurement scale must first be specified. Then, an appropriate procedure for measuring the quantity of the effect to be evaluated must be conceived and applied to each competing project. The difficulties of this phase are illustrated below for the case of air pollution.

The impact of transport-related air pollution is one of the costs of road infrastructure projects. To measure this impact, transport-related air pollution must first be assigned a physical measurable dimension before it can be evaluated and expressed in monetary units. As CGP (2001) pointed out, this is not a simple task because a variety of factors must be taken into account.

Measuring transport-related pollution is intrinsically difficult. Air pollution is also produced by several sources unconnected to transportation (e.g., heating plants and industrial facilities), thus the quantity of pollutant emissions that is directly attributable to transport must be determined. In addition, pollution rarely affects a well-defined geographic area alone. Though the emission source may, in fact, be local, the impact of the emissions can be global, as is the case for the greenhouse effect.

Added to the instrinsic difficulty of measuring air pollution itself, there is the difficulty of measuring its impact. Clearly, air pollution has multiple effects. It has an impact on human health and on the capacity of industrial and agricultural production; it deteriorates our landscapes and sometimes produces unpleasant odours. Each different type of impact requires a different evaluation procedure. As this was not enough, there remains the question of the relationship between the amount of air pollution absorbed and its physiological impact, which has not yet been elucidated.

Despite the lack of consensus, particularly pertaining to the impact of air pollution on health, a couple of assumptions are accepted for impact calculations.

1. The health-related impact of air pollution is not the same today as it has been in the past because of technological progress, especially in the car industry.
2. The environmental impact of pollutant emissions in an urban setting with a highly concentrated population is not the same as the impact in a less urbanized locale, making it important to consider differences between town and country.

Thus, a correcting coefficient should be applied when evaluating the pollution-related impact associated with an investment project. This coefficient depends on the type of occupation (rural/urban), the type of vehicle (light or heavy vehicle) and the type of terrain where the infrastructure will be located (see Table 1).

The *second phase* begins by making a list of the available appropriate procedures for assigning a monetary value to each physical unit identified in the first phase. These procedures may be based on surveys known as stated preference or contingent valuation, emphasizing willingness to pay or receive. Since observing human behavior can reveal certain preferences, the procedures may also be based on the behavior exhibited by existing markets, allowing indirect estimates of the impact resulting from the benefits accrued or problems caused. For example, the procedure for evaluating the monetary value of noise is based on the behavior of the property market. Certain studies have shown (CGP, 2001) significant relationships between the level of exposure to noise and the depreciation of property values (see Table 2).

In order to express noise in monetary values, CGP (2001) recommends that this depreciation be applied to the average price of rental housing, explaining "the unitary cost of noise is defined by the depreciation of average rental prices per m^2 of occupied surface exposed to noise levels exceeding a certain threshold, according to monthly rents per m^2 nationally as published by INSEE" (Chapter 8 of the report).

In the *third phase* of the monetary evaluation procedure, the future changes of a certain number of reference values considered in CBA calculations should be determined precisely. Therefore, it is necessary to plan for the future, an activity which leads to forecasting the reference values, particularly those concerning air pollution, noise or the implicit value of a human life. For example, CGP (2001) recommends a yearly reduction in the reference values for transport-related air pollution at a rate of 6.5% per year

Table 1
Correcting coefficient for impacts related to air pollution (in CGP, 2001).

Correcting coefficient	Interurban or flat valleys	Interurban or hilly valleys (slight slope—2–4%)	Interurban or very hilly valleys (slight slope—4–6%)
Light vehicles	1.1	1.1	1.1
Heavy vehicles	0.95	1.5	2.1

Table 2
Coefficient of property value depreciation as a function of noise at façade (in CGP, 2001).

Noise level at façade (db)	55–60	60–65	65–70	70–75	Over 75
% of depreciation/ decibel	0.4	0.8	0.9	1	1.1

for heavy vehicles and 9.4% per year for private vehicles and light utility vans. The report recommends increasing the value of human life at a rate equivalent to the per capita household consumption rate.

3.2. Monetary values, the discount rate and the reference situation

The monetary values described in Section 3.1 are used in CBA to evaluate every type of infrastructure project. CBA employs physical variables to take into account any changes in the costs or benefits born by a community due to a project. All the direct and indirect effects endured by a community are converted into monetary units by means of reference values—not only those effects that entail monetary expenses or revenues, but also those that do not, including noise pollution, air pollution, changes in safety and living conditions, as well as the impact on future generations, to name a few.

Evaluating the costs and benefits of an investment project requires that the reference situation be characterized accurately. It is essential to define this situation because the advantages and disadvantages to be taken into account are in fact the differences between this situation and the one that will occur if the project is implemented, and the reference situation is the one that would prevail in the absence of the project or the competing projects. For example, the benefits in terms of the reduced congestion associated with a road infrastructure project can only be evaluated if the traffic situation at present and its predicted future evolution without this infrastructure can be compared. A 1994 report by the CGP explains that the reference situation rarely corresponds to a status quo situation (i.e., a stagnant situation in which nothing is done). Indeed, even if the project is not implemented, investments must be made not only to preserve the present quality and quantity of transportation possibilities, but also to maintain the existing transport infrastructures. Characterizing a reference situation in the context of CBA sometimes requires considering investments known as "eluded" because they are not made if the project is implemented. On the other hand, the reference situation may also correspond to a situation that deteriorates precisely because the investment project was not implemented. In either case, the benefits and costs of a project can only be evaluated if the costs of eluded investments, or every aspect of the deteriorating situation, are carefully integrated into the reference situation so that they are included in the calculation of the corresponding rate of return. Thus, the characterization of the reference situation is a fundamental and delicate exercise because "in many cases, the way it is defined is the main source of uncertainty about the return of the projects (reference traffic level, for example)" (CGP, 1994).

Sometimes, it is difficult to distinguish clearly between the reference situation and the situation resulting from the investment project. Obviously, it is possible to evaluate intermediate options in which the precise definition of the reference situation is even less easy. Finally, the evaluation of the reference situation cannot be completely separated from other investment projects that have already been evaluated and have a high probability of being implemented. In such circumstances, it may be necessary to create several reference situations taking into account the various scenarios. However, this may lead to a loss of significance in the computation of a project's return, which is an important step in CBA.

Two types of indicators can be used to express this return:

(1) the first year rate of return, which is defined as the ratio between the stream of social benefits in the transport infrastructure's first year and the sum of discounted construction costs; and

(2) the internal rate of return, which measures the social discount rate for which the sum of discounted benefits equals the sum of the discounted costs of the investment project.

CBA can also be performed in terms of net social benefits, which accounts for all the costs and benefits over a previously defined time horizon. Using this indicator requires that a social discount rate be defined in order to make it possible to compare present and future costs and benefits. In France, over the last 50 or so years, discount rates have represented several things: in the sixties, the discount rate was principally based on capital market evaluations: the rate reflected the balance between investments and savings. In the seventies, the rate increased, passing from 7% to 10% as funds became more rare. In the eighties, the French government implemented a growth strategy, and the CGP proposed reducing the rate to 7%; in the end, an 8% rate was approved by the government and maintained during the nineties. In 2005, in view of inter-generational equity and long-term considerations, the CGP proposed reducing the discount rate to 4%. The rate of discount is highly important. Depending on the structure of the present and future costs and benefits calendar, a rate of 4% rather than 8% can have an enormous impact on the calculation of the net social benefit indicator.

Generally, CBA procedures require defining many reference values and specifying a great number of assumptions, thus giving the impression that these procedures are formal and highly technical. In Section 6, the question of the pertinence of integrating such procedures into public debate is raised, particularly given that participatory practices in public transportation infrastructure decision-making have been introduced very gradually.

4. Legislation, instruments and stakeholder participation

Public debate needs to be carefully structured and organized in order to be useful. In France, the idea of public debate was a long time coming, particularly in the case of decisions related to the environment and to transport infrastructure, and this practice is still not widespread in public decision-making. In fact, until relatively recently, French law did not regulate the practice much at all. Now, however, the legislature has introduced a variety of tools for encouraging public debate; unfortunately, these tools are not very useful, as is illustrated by our examination of two of the tools: the Public Inquiry Procedure (Section 4.2.1) and the National Commission for Public Debate (Section 4.2.2). The case of the third Parisian Airport (Section 4.3) provides an edifying example of how difficult it is to integrate public debate into the process of public decision-making, in our opinion, mainly due to a general lack of expertise in participatory democracy.

4.1. What the law says about public debate

Even before it became a subject of growing media coverage, the questioning by the general public of the choices made by their duly elected officials, particularly with regard to decisions about the environment and transportation infrastructure, had exposed a weakness of the system of representative democracy in France, notably a lack of public input prior to the decisions being made. The legal measures requiring public debate about public decisions, a characterizing feature of participatory democracy, are a relatively recent addition to the body of French law. These measures are the result of a progressive historical process, in which three main periods can be identified (Plottu, 1998).

The *first period* includes the 1960s and 1970s. Without actually institutionalizing public debate, this period does mark the incorporation of new citizen concerns into the law. The act of 10 July 1976 is particularly important because it requires environmental impact studies be completed prior to making major transportation infrastructure decisions, which is completely new at this time. However, implementation is somewhat limited and, in practice, economic studies predominate. Public decision-makers clearly favor projects that minimize direct costs and maximize the direct positive consequences for the user. In any case, there is no place for public debate. "Nothing in the Public Inquiry Procedure is really appropriate: publicity, deadlines, choice of the investigating commissioner, and presentation of the case certainly do not allow a decision to be made. Between passive acceptance and militant refusal, there is no place for democratic search for a better solution" (Flaque, 1987, cited by Plottu, 1998).

The *second period*, spanning the 1980s, was marked by the Domestic Transport Orientation Law (LOTI: *Loi d'Orientation sur les Transports Intérieurs*) of 30 December 1982, which is probably the most important law regulating public decision-making related to transportation. Even today, this law governs many of the public transportation decisions in most French regions. In terms of public debate, LOTI has mainly contributed to more transparent decision-making procedures. This law requires an economic and social assessment, which constitutes a reference document that accompanies the project through all phases of the decision-making process. Three types of studies are specifically associated with infrastructure and transport projects: technical studies, environmental impact studies and traffic or socio-economic studies, whichever is more appropriate. Though these different studies were already used in the 1980s, they never really provided *multiple viewpoints*. Public participation in the decision-making process is also required by the Bouchardeau Act of 12 July 1983. However, in practice, this participation only takes place once the decision about a given project has been made and confirmed by the technical studies.

The 1990s marked the third period of progressive change in perceptions of the need for public input into decision-making. During this period, serious consideration was given to the idea of involving stakeholders in the discussion and debate related to public decisions. The Carrère Report (1992) recommended that public decision-making processes related to infrastructure and transport be rooted in discussion and negotiation occurring long before the final decision-making. This recommendation is included in the following legal texts. The Bianco Circular (1992) imposes a phase of debate prior to studying alternative infrastructure layouts. The Government circular of 27 September 1993 outlines the objectives for environmental impact assessments: "aiding, (…), enlightening the decision-maker about the nature and content of the decision to be made, informing the public in order to allow them to assume their role as knowledgeable and vigilant citizens". Finally, the section of the Barnier Law of 2 February 1995 pertaining to the participation of the general public and associations in matters related to the environment establishes a national commission for public debate responsible for organizing debates with the underlying objective of encouraging public input prior to decision-making. Some authors considered optimistically that the creation of this commission marked the beginning of a new era in public decision-making (Blanc, 1998), while at the same time drawing attention to the difficulty of defining the starting phase of a decision-making process with any real precision.

The Barnier Law did attempt to institutionalize public debate using tools developed to encourage stakeholder input during the decision-making process. The directive (*instruction cadre*) of March 2004 (DTT, 2004) updated some of the government policies regulating inland transport. Intended by legislators as a reference guide, this directive specifies measures for linking the socio-economic evaluation phase of a project with the public debate phase. (In the following sections, this connection will be mentioned several times.)

4.2. Current institutions and instruments for encouraging public debate in France

The two tools that we find to be the most representative of the evolution of the last two decades—the Public Inquiry Procedure and the National Commission for Public Debate—are presented below.

4.2.1. The public inquiry procedure

First enacted in 1833, the Public Inquiry Procedure (*la procédure d'enquête publique préalable*) had almost no democratic motivation. It was intended to protect the landowners' right to private property, and thus applied only to cases of expropriation. For a very long time, the public inquiry procedure remained the privilege of landowners. It was only in the 1970s and 1980s that it became an instrument of environmental protection. The Bouchardeau Act of 1983 instituted an obligatory public inquiry prior to any project likely to cause significant environmental impact, giving the population concerned—all the stakeholders—the possibility of consulting all the information related to a given project, including the environmental impact assessments. Following the inquiry period, an independent investigating commissioner (*commissaire enquêteur*), nominated by the courts, collects the comments, suggestions and propositions.

However, public inquiry is not really a tool for participatory democracy and has been sharply criticized (Blanc, 1998). Though the inquiry certainly takes place before the final decision is made, it occurs late in the game once the overall project has already been defined, thus insuring that only minor changes can be considered. For this reason, a public inquiry is more of a consultation tool used to convince the stakeholders of the worthiness of a project than a way to encourage public input into the project's development. In addition, the information put at the public's disposal is hardly usable. According to Molines (2003), in order to be admissible, the criticism of a project "must be made by a person directly concerned by the project, but must not be linked to the defence of a particular interest". Given such a paradoxical context, it is not surprising that project opposition tends to be violent and generally leads to a gridlock situation that is far from the objective of real dialogue. The final result is a general public that is likely to be suspicious of a procedure from which it feels excluded.

4.2.2. The national commission for public debate

The National Commission for Public Debate (CNDP: *Commission Nationale du Débat Public*) was instituted by the Barnier Law of 1995 and modified by decree in 2002. Today, it constitutes a privileged legal and institutional tool for structuring public debate. High stakes projects having a significant potential impact on the environment must be subjected to public debate before the final decision is made. The CNDP acts in a variety of ways to insure that this public debate is conducted properly. The commission is always responsible for projects whose economic stakes attain a specific threshold. It can also organize a public debate at the request of a government Ministry. It can be called upon by a group at least 10 members of parliament or by the regional councils of the area(s) concerned by the project to verify that the project(s) is (are) in accordance with the law. In certain cases, registered

environmental associations can call upon the Commission to verify some aspect of a project, and the Commission may, or may not, accept the request. If it accepts the request, the CNDP compiles a report on the project and creates a sub-commission to monitor the situation. The Commission does not make judgements on the content of the report; it simply organizes public debate. In cases when it is not legally responsible for organizing the debate—and if it has been called upon to do so—it acts to verify that any public debate is conducted properly.

4.3. The example of the public debate pertaining to the third Parisian airport

In France, the difficulties faced in institutionalizing public debate is clearly due more to the general ineptness and lack of expertise of public decision-makers than to any desire to muzzle public opinion. The case of the third Parisian Airport is exemplary.

At the beginning of 2001, the authorities launched a procedure that was supposed to be grounded in the principles of participatory "grassroots democracy" ("*démocratie de proximité*"). As part of this procedure, a public debate concerning the choice of a site for a third Parisian Airport was organized. This debate was exceptional in that it took place much earlier than was usual in most public investment choice procedures. A commission known as the DUCSAI (*Démarche d'Utilité Concertée pour un Site Aéroportuaire International*) was responsible for organizing the debate with the objective of identifying the various possible alternatives. Since the government announced that no alternative had already been evaluated, the procedure really seemed to be a collaborative effort. However, in fact, many observed that this phase of the process revealed a great number of ambiguities (Fourniau, 2002).

First of all, the government commitments were not very clear. In 1997, in a speech by the French Minister of Transportation, the government promised to limit the traffic at Roissy and Orly Airports. A third Parisian Airport was supposed to relieve the gridlock at these two airport sites and then allow the traffic limits determined by the government to be respected. However, the experts indicated at the time that these limits would be reached long before the third airport was in operation. Therefore, the government commitments could not be reasonably kept.

Second, despite government promises that it would not evaluate any of the proposed projects before the public had had its say, the civil aviation administration prepared three site proposals prior to the debate. In addition, the local communities and economic stakeholders had also made proposals taking into account local stakes contrasting with this issue that was obviously of national importance. So, the legitimacy of their proposals was called into question.

Third, the airport authority that made the decision only considered traffic forecasts, and did not really take into account the questions raised during the debate.

Fourniau (2002) notes that the role itself of the DUCSAI Commission in the debate was also ambiguous. The chairman of this commission was also chairman of the National Commission for Public Debate, which was being reformed at the time. In addition, despite its very flexible and "upstream" appearance, the mandate of the DUCSAI Commission was limited to six months. The poor quality of the available data should have, at least in theory, required that preliminary studies be undertaken, so that a structured and well-argued debate could take place. Due to time constraints, this was not done (Barraque, 2002). Furthermore, the initial assumption of the whole debate—namely the utility of the third Parisian Airport—was not questioned in spite of the public demands, presumably also due to lack of time. Finally, following the attacks on 11 September 2001, passenger traffic decreased considerably, thus calling obviously into question the real utility of the third airport.

The above observations make it possible to argue that the DUCSAI Commission was not a tool designed to promote a true dialogue that would take all viewpoints into account, and in fact, it was perceived as an instrument with which the government authorities sought to legitimize their choice (Lascoumes, 2002).

As the case of the third Parisian Airport shows, beyond the difficulties of implementing instruments or institutions designed to promote public debate, public decision-makers must accomplish the difficult task of changing the logic and the routines that structure the way transport infrastructure decisions are made.

It is interesting to note that no CBA procedure—a procedure that is widely associated with traditional public decision-making—seems to have been applied to the case of the third Parisian airport by the DUCSAI Commission. Given that CBA is designed to take into account all the benefits and costs to the community produced by an investment project in order to determine the best possible use of public resources, then one important question must be asked: Why did not the DUCSAI Commission use the CBA tool to satisfy the community and determine the most acceptable airport site? This leads us to question the possible connection between CBA and public debate.

Before exploring this question (Section 6), we would first like to draw attention to the limitations of CBA as a method for insuring the best use of public resources, because of course CBA is not a panacea.

5. The limitations of CBA in terms of the rationalization of public choices

The limitations of CBA reveal that it is a conventional evaluation instrument. Provided these evaluations are considered the result of applying conventions, they can play a very useful role in the decision-making process.

The CBA procedure aims to identify the infrastructure investments that, from the viewpoint of the community, give the highest return. This procedure is frequently judged capable of scientifically revealing objective elements that will justify a decision to implement or abandon an investment project. But, in fact, this capacity is limited as is explained in Sections 5.1 and 5.2, and introducing bias into the CBA procedure reduces the capacity even more as is shown in Section 5.3.

5.1. The objectivity of the CBA procedure

One of the most important aspects of CBA is its ability to integrate the costs and benefits of phenomena that do not really exist in a monetary or quantitative form into return calculations, by using such monetary equivalents as the value of a human life (Is it justifiable to adopt different values for public and private transport?), the value of saved time (Which factors should be taken into consideration when appraising this? Geographic zone? Profession? Social status? Travel purposes?), the value of the discount rate (Does a preference for the present not depend on the considered effects?) and the value of noise pollution. This use of equivalents leads to the adoption of tutelary values, whose objective character is often open to debate. They correspond to constructed values and not to realities that can be converted directly into monetary units. Thus, they appear to be largely arbitrary and sometimes even seem to reflect political positions. Given the possible bias, the objectivity of return assessments made on such a basis seems questionable.

The CBA procedure takes long periods of time into account but assign a very low weight to the distant future. However, human perceptions of the future are always highly controversial. In particular, time gain assessments are based on traffic forecast models that, according to CGP (2001), "provide a great variety of results[.] … Moreover, the errors of traffic forecasts are high, sometimes reaching 10–20% of the total traffic for a given infrastructure. There are many situations in which the error is much higher". On the same subject, Cahen and Colombo (1999) have written: "The traffic models are not convincing. At the very most, they can give non-improbable results. The models are not suited to proving or asserting a result though they do constitute plea studies". Thus, the objectivity of CBA is quite relative especially because society and behaviors continue to evolve. Social change and behavioral evolution remain constants.

It follows that the values used in the forecasts are assigned for convenience, and they are frequently arbitrary: see the variations between European countries for the values assigned to human life, saved time, land use or discount rates. These have been highlighted in Odgaard et al. (2005), for example. In spite of these disparities, the values are presented, if not as exact, at least as good approximations of an objective reality. As Jean-Michel Charpin writes in the foreword to CGP (2001), "It is a matter of agreeing on the monetary values to be assigned to phenomena that are difficult to evaluate monetarily: health impacts of traffic noise, harmful effects of air pollution, human lives saved, time gained[.] … The obtained estimates are inevitably imperfect and therefore debatable." Such a point of view implies that somewhere, there are exact values that can be approximated. The expression 'revealed value' is indicative of this perception. In fact, "knowing how to reveal a willingness to pay for the environment in the transport sector" is the problematic that guides many those who seek to assign a value to these weighting coefficients (see Verhoef, 1994 or Andan et al., 1995).

Yet imperfect measurements are not attributable to lack of information alone. They are also due to the impossibility of obtaining intrinsic values for phenomena in our society at a given point in time. Such values would necessarily be independent of the model and of the way that the value is apprehended. But, in fact, do phenomena for which there is no direct market price really have an immanent value in our society, and can that value be revealed by CBA? The multiple refinements recommended in the different chapters of CGP (2001) show that it is much more a matter of establishing patterns than approximating existing values.

5.2. Scientific character of CBA procedures

The neutral scientific character of CBA procedures is supposed to confer the legitimacy of a referee, particularly as concerns public choices related to transport infrastructure investments. The scientific character of CBA is justified if the hypotheses of economic evaluation based on the orthodox liberal paradigm are accepted. The Domestic Transportation Administration (DTT, 2004) mentions that "economic balance is the best criterion for evaluating the socio-economic effectiveness of a decision in the optimal conditions that the theory has specified, which are certainly never achieved in reality but provide a rational approximation". In particular, it is necessary to accept that the community has only one objective, that of maximizing a collective surplus. The community is considered as a monolithic block of identical and perfectly rational individuals that economic theory refers to as *homo oeconomicus*. It is a matter of modelling a representative individual who is able to optimize resources and make optimal choices regarding the allocation of these scarce resources so as to satisfy stated needs. According to economic theory, in the case of a public investment, maximizing the collective surplus is of some worth only if the benefits that this investment represents for certain individuals are redistributed to the individuals for whom it represents a cost.

Furthermore, *homo economicus*'s rational optimizing program of economic evaluation is only feasible if, on the one hand, the optimum really exists and, on the other hand, the evaluation procedure effectively leads to determining what is better and what is worse. In terms of the CBA procedure, this can be concretely translated as follows: CBA allows to identify the best projects for the community if—based on an exhaustive (and completely unbiased) study of the costs and benefits of every investment project—only those projects with the best net social benefit emerge. We find the requirement of exhaustiveness unrealistic. The government itself has agreed to include in the decision-making process of some elements not taken into account in CBA socio-economic evaluations (DTT, 2004). Though other arguments against the scientific character of CBA procedures exist, we have discussed them in another paper (Roy and Damart, 2002) and will not reiterate them here.

5.3. Bias in the practice of CBA

CBA procedures are not exempt from important biases which can distort the choices resulting from the socio-economic evaluation of investment projects. The choice of the reference situation, for example, is obviously subject to bias. Determining a reference situation (see Section 3.2) involves making an assessment that may be subjective, thus introducing bias. Indeed, as we have pointed out, the evaluator must make some hypotheses that are not always easy to explain, though their impact may be significant. This is particularly the case for investments that will not be implemented if the project under consideration is accepted. In this case, the evaluator must take into account the investments that have already been planned, which will have an impact on the reference situation, for example by modifying traffic forecasts and transferring travel by the population from one transport mode to another.

In that CBA plays a crucial role in guiding a country's strategic transport infrastructure decisions, the potential bias in the method can pose a problem. The following example from the domain of rail transport, specifically piggyback transport, is used to illustrate this point (Hammiche and Denant Boemont, 1997).

The SNCF, the French national railway company has long wanted to reinforce its competitive position in the goods transportation market. The present context seemed to favor a move in this direction. Indeed, road traffic has been increasing steadily for many decades. By 2010, the major roads and motorways will be completely congested, with trucks transporting goods representing a significant part of the total traffic flow. Piggyback transport—consisting of carrying trucks loaded with goods (either the tractor and the trailer or only the trailer) in railroad cars over long distances—is midway between road and rail transport. When the tractor and the trailer are carried together, load splitting is avoided by permitting the transport of goods to the points that can only be reached by truck. In addition, the high speed of the train (120 km/h according to Hammiche and Denant-Boemont) compensates for the transport of a dead load (the tractor). Loading/unloading times are reduced through innovative technical solutions. Moreover, though the transport is accomplished by train, this type of railway is nevertheless closer to the concept of motorway since the rail lines are linked to motorways at hubs, which can be compared to road junctions.

However, after examining the CBA studies carried out to compare the feasibility of road or rail infrastructure projects, Hammiche and Denant-Boemont concluded that the biases inherent to this procedure have led systematically to overestimating the return of road infrastructure projects and, conversely, to underestimating the return of rail transport projects using piggyback. The types of bias are many. They concern the external effects of road transport and the hypotheses about the pricing of road and rail transport, as well as its implications in terms of modal transfer.

First, assessments of rail transport projects often do not take into account certain effects of the project, which may increase their return. The authors mention notably the negative effects of transporting goods by road, which can be avoided by using piggyback rail transport, and thus should be counted as benefits.

Second, return calculations are based on transport pricing hypotheses that are structurally unfavourable to rail transport. In fact, rail transport evaluations usually consider a price of about 0.45 € per kilometre. Though raising this price would increase the return of the rail alternative noticeably, a higher price would also increase the attractivity of road transport, making it too difficult for rail systems to be competitive. In addition, the government has systematically encouraged goods transport by road through a fiscal policy offering incentives, notably the absence of an increase in the truck tax since 1971. Furthermore, the sharp competition in the sector has led many hauliers to set prices for goods transportation that will not even allow them to break even. In other words, the comparison between the returns of "road transport" and "piggyback rail transport" projects is strongly biased: on the one hand, road prices are lower than they should be in order to insure the return of the service; on the other hand, the road transport projects benefit from fiscal advantages offered by the government, and this aid biases the return calculations.

Given the limitations of CBA highlighted in this section, this type of analysis is not sufficient for determining the best investment choices for the community. In spite of these limitations, can CBA legitimize public transport infrastructure investment choices and make them acceptable to the general public? Or, in other words, can CBA be useful in the context of a public debate designed to produce the most acceptable and legitimate investments? In the following section, we attempt to provide elements that will help to answer these questions.

6. Economic evaluation and public debate

The practice of public debate is rooted in the desire to identify the most acceptable choices for the community through a collaborative process involving government representatives and community stakeholders—without the bias of a representative system looking for legitimacy.

Public debate as a mode of governance has had difficulty establishing itself in France, as was shown in the example of the third Parisian Airport (see Section 4.3). Recourse to public debate is partly justified by the limitations of CBA to determine investment choices in accordance with general public interest. On the other hand, can the risks associated with implementing the various phases of public debate, which are necessarily difficult to structure and formalize, give some added value to the structured economic evaluation procedures?

Encouraging stakeholder participation inevitably entails dealing with the inherent difficulties of structuring the participation of multiple actors in a process which must be organized so as to avoid any "free-for-all"-type deviations. CBA procedures have the advantage of providing a very formal and structured framework. However, if CBA is considered as a method for obtaining a scientifically-objective optimal solution, then identifying stakeholders and encouraging their participation in the process does not serve the purpose of participative democracy. Indeed, an economic evaluation yielding an optimum obtained on the basis some pre-defined objective produces a result that is, by definition, independent of the actors participating in the process. In this context, given the inherent difficulties of organizing the participation of multiple actors, there is good reason to question the appropriateness of promoting the participation of different actors if the result is just the rubber-stamping of the CBA findings. Thus, it seems to reasonable to conclude that the only objective of a collaborative action involving community stakeholders should be to justify a decision that deviates from the optimum approximation, which served as the starting point for public debate.

Likewise, the objectivity and scientific character of cost–benefit analysis could be used to make public decision-makers seem more responsible and attentive to the stakeholders' expectations. However, even if one accepts that it is advisable to "make the socio-economic evaluation not a criterion, but rather the core of the assessment of a project's value (…)" (CGP, 1994), it is necessary to admit that the CBA value assigned to the project cannot be reduced to a simple figure, but must incorporate an uncertainty interval. Many times, this interval is likely to be quite large. In such conditions, the relevance of the assessment must be questioned. According to CGP (1994), CBA is relevant because it allows an analysis of the reasons that lead deciders to deviate from the solution that CBA would have produced, and then to be able to assign a value to the additional cost of the decision. This reasoning only make decision-makers seem responsible if the project that emerges from the "unquestionable" assessment is judged reasonable not only by them, but also by the other stakeholders.

For those who consider that CBA produces optimal solutions, any eventual non-conformity by the decision-makers to the solution stipulated by CBA should be interpreted as a deviation from that which is dictated by the purest rationality. Such a deviation, which can only entail additional costs, thus needs to be justified. In this sense, cost–benefit analysis could help to make stakeholders aware of their responsibilities. In order for a procedure that proposes an optimum as an anchor point to play this role, it is necessary that the various stakeholders conform to the procedure sufficiently. This implies that they are:

- able to understand the general rules;
- willing to admit that, in spite of its imperfections, it produces a good approximation of an objective optimum; and
- convinced of the pertinence of the data used to determine this approximation.

Given the limitations that are described in Section 5, the above conditions appear to be difficult to satisfy if all the stakeholders are to be represented.

In our opinion, it is above all necessary that all the actors involved really understand the decision-making procedure and apply it assiduously because this is determinant in legitimizing the result. Legitimacy comes from whether or not the actors see the value of the procedure. A decision-making procedure is credible when the actors are able to judge the merit of what the procedure recommends or prescribes. The complexity of the methods for calculating, weighting, discounting and monetizing helps to make CBA procedures comprehensible only to technical experts. Thus, elected officials, as well as the other stakeholders, such as associations of transport users or concerned residents, often find it difficult to understand them.

The long list of recommendations made by the *Syndicat des Transports d'Ile-de-France* to public decision-makers regarding the use of CBA, as well as those given in CGP (2001), highlight the complexity of this mode of analysis. The opacity of the CBA procedures reinforces the technocratic nature of decision-making, in part due the fact that the instruments and the language used in the procedures are adapted to the type of reasoning and accounting common in the value systems of a particular category of actors, frequently making both instrument and language unintelligible for the majority of the other actors.

For the reasons evoked above, the process of public decision-making related to transport infrastructures should be conceived so as to surmount two kinds of difficulties: the difficulty of instituting a structured public debate that can serve to legitimize the decisions made, and the difficulty of providing appropriate instruments for evaluating investment projects that are transparent for all. Resolving these difficulties will lead to choices that are both relevant in terms of the rational use of public resources and acceptable from the point of view of the community.

7. Searching for new connections between rationality and legitimacy

The difficult institutionalization of public debate in France communicates a historical absence of expertise in *concertation*,[2] or the art of reasoned public discourse, which hinders the effectiveness of such forums in increasing the legitimacy of the decisions made in. Likewise, investment choices are evaluated using a very structured and formal instrument that calls for specific knowledge; this necessity makes the instrument fairly incompatible with the practices of public debate. These two elements of public decision-making highlight two potential risks of deviation when making transport investment choices:

- a technocratic deviation characterized by the predominance of evaluation tools that are badly adapted to public debate and *concertation*; and
- a ''free-for-all'' deviation characterized by a non-structured and unplanned debate, which allows the initial objective to be reached only with difficulty and leads to questioning the legitimacy of decisions or even to no decision at all.

The above analysis led us to wonder how the process and tools could be adapted in order to avoid these two potential risks while simultaneously achieving the goals presented in the introduction: rationalized use of public resources and acceptable choices from the standpoint of the community. In other words, how do we reconcile rationality and legitimacy to obtain decisions that are both rational and legitimate.

In order to succeed, it is essential to remember that transportation engineers generally have a profound knowledge of the projects they have helped to design. The same is true for the professionals in charge of the project's evaluation. This depth of knowledge creates an asymmetry between the technical experts and the other stakeholders who were not involved in the design and evaluation phases in the same way. Such an asymmetrical distribution of knowledge can hinder or even block the debate. Managing the phase preceding the public debate as proposed by the DTT (2004) is doubtless one way to reduce the negative effects of this asymmetry, but this method requires that the following conditions be respected:

- having tools necessary to structure the debate; and
- integrating both the socio-economic evaluation and the economic evaluation phases into the phase of public debate.

In the next several sections of this paper, we offer diverse propositions for reconciling rationality and legitimacy in the public decision-making process. Some of our solutions may seem utopian, but we hope the reader will bear with us. We suggest possibilities for managing the investment choice process and attempt to integrate new better adapted evaluation tools into the proposed process. We also take a look at CBA itself, examining its place and role before and after the process that we propose.

7.1. Managing the process and revamping the tools

Socio-economic evaluation, as we have mentioned above, is not highly compatible with the rituals of public debate, though it does have the advantage of offering a well-structured and formal framework that can be used as a reference guide to standardize the procedures. In fact, standardization was one of the primary goals of the CGP working group chaired by Boiteux (in CGP, 2001) which hoped to propose a common frame of reference for the procedures, which at the time differed considerable from administration to administration. Economic evaluation is also falls short of the mark, essentially due the asymmetrical distribution of knowledge between CBA experts and the other stakeholders, which eliminates some of the benefits of public debate and reduces the choice among projects to a consideration of the economic costs and benefits.

Neither process is highly compatible with the objectives of public debate, which makes it difficult for effective concerted action to take place. It seems to us that the concerted action is at the center of the problematic related to the evolution of the decisional contexts described above. As we will explain, this concerted action should allow the different viewpoints about the objectives and general features of the projects under discussion to be expressed and collected as early as possible. In this initial phase, the *concertation* should obviously be compatible with the requirements of the economic evaluation, but it should also use evaluation tools other than CBA.

7.1.1. Implementation of a "concertation round table"

The brief reference (Section 4.1) to the historical evolution of the institutionalization of public debate in France demonstrates that legislators have tried to meet the requirements of the new decision-making contexts. DTT (2004) is partly devoted to the search for a ''better way to organize the complementary aspects of evaluation and *concertation*''. This objective led us to think about how this worthy goal could be achieved, and we came up with the idea of a ''*concertation* round table''. This term, already in use in Quebec, is used here to underline that it is a matter of organizing something differently than the public debates organized in France at present. The concertation table should be an instrument for achieving the following objectives (Damart, 2003):

- fostering and organizing the participation of all or most of the actors with a stake in the decision/problem under consideration;
- implementing a process allowing all the concerned actors to express themselves and all of their viewpoints to be taken into consideration;
- identifying the value systems and the objectives of each stakeholder;

[2] The French word ''*Concertation*'' does not have any real equivalent in English. It designates a participative decision process where the various stakeholders are able to express their point of view and have it taken into account in the decision-making process.

- highlighting elements of consensus despite the different viewpoints and objectives and making choices which have the approval of all the actors.

If these objectives are accepted as constituting the definition of *concertation*, then procedures that associate evaluation with *concertation* must be established, which in turn leads to many new concerns.

First, because implementing a *concertation* round table is an activity with specific stakes, some support organization, called a facilitator in Quebec, should be charged with insuring that the abovementioned objectives of a *concertation* round table are reached. The issue then is to determine how this facilitator would be nominated and by whom. The nature of the facilitator's role, with its obvious requirement of neutrality, requires that the facilitator, as the authority responsible for the organizing the *concertation* table, be completely independent from the transport authority whose investment project has been submitted for evaluation. The two roles can not be played the same actor and the former can not be nominated by the latter. *A priori*, given its mission, it would seem reasonable for the National Commission for Public Debate (CNDP) to assume this role. Still, the weaknesses of this commission (described in Section 4.2.2), added to the highly limited conditions in which it can presently be convoked, do not, in our opinion, justify the systematically delegation of this role to the CNDP.

Second, the participation of multiple actors in a *concertation* table requires thinking about the actors who will be involved and the manner in which they can or should be represented in advance. This deliberation phase is important because stakeholder participation is the keystone of *concertation,* and inadequate or incomplete identification or representation of the stakeholders could partially discredit the process. Given the importance of the task, it seems reasonable that facilitator be assigned the responsibility for determining the extent of the participation and the actors to be involved. Other questions must also be answered, for example: "Should the extent of stakeholder participation remain invariable throughout the process?" or "Is it necessary to anticipate possible evolutions in the structure of the *concertation* round table?".

Finally, it is necessary to determine to whether the *concertation* round table should be used exclusively in the initial phase of the overall public investment decision-making process. In order to be coherent with our previously-stated desire to create a stronger link between public debate and the evaluation process, we think it would be opportune to employ a sliding scale for the *concertation* and evaluation procedures, thus allowing the importance and nature of the procedures to vary throughout the overall process. At the beginning, *concertation* would take the lead, perhaps linked to a suitable CBA procedure (see Section 7.2.1) or perhaps to other evaluation tools that are easier to exploit at this stage of the process. Clearly, at this stage, it is appropriate to focus the debate on the elements that CBA cannot elucidate: for example, the answers to the question, "Why this project and not some other ?" and information about the general characteristics, general objectives, main constraints and/or alternative layouts of the projects being developed. Subsequently, *concertation* would take a backseat, making more room for socio-economic evaluation but still reserving the right to influence or even question the results of the evaluation of the more qualitative and quantifiable aspects, such as environmental impact or the attractiveness of the landscape.

7.1.2. Instruments for the first stages of concertation

Concertation entails the participation of multiple actors and supposes that their varied views are somehow taken into account. Thus, before beginning the project evaluation phase, the preliminary stage of the *concertation* process must introduce the tools needed to structure the exchanges between actors and to insure that all the actors involved are able to express their viewpoints. The slow pace with which public debate has been institutionalized has significantly delayed the introduction of suitable tools. Nonetheless, tools exist to facilitate the organization of the *concertation*, thus also facilitating the interactions among the actors. Cognitive mapping is one such tool. This technique has been used successfully in numerous public decision making processes (e.g., Eden and Ackermann, 2004; Özesmi and Özesmi, 2004; Sahin et al., 2004), particularly in France in the context of public decision-making related to land use planning and sustainable development. Cognitive maps are simplified graphic representations of how the actor perceives a decision-making problem and are based on the ideas that the actors have about the problem (Eden, 1988).

In the context of transport infrastructure choices, this graphic representation may portray the different perceptions of the effects of the project and the corresponding causal links. This visual representation of the preferences and viewpoints of the different stakeholders thus facilitates problem formalization and can serve as the basis for structured debate.

Other tools for organizing *concertation* and facilitating the interactions among the actors exist (Damart, 2003). (Though we will discuss only some here, we encourage interested readers to seek out the referenced article for more information about the others.) One such tool is the Group Decision Support System (GDSS), typically composed of an organizer or facilitator, a methodology and one or many computers with ad hoc software. A GDSS essentially aims to facilitate group decision-making. Recent developments in information and communication technologies have contributed noticeably to the expansion of research into these types of tools (see Dennis et al. (1988) or De Sanctis and Gallupe (1987) for some typologies of GDSS) and their widespread application in numerous decision-making contexts. These new technologies have an enormous potential for structuring and organizing debates. One notable French example of this is the creation of a multimedia training platform for *concertation* in the context of transport infrastructure decision-making to deal with problems related to the French motorway known as the "*Francilienne*" (De Carlo and Choulet, 2003).

This type of tool allows actor exchanges to be structured, thus allowing the different viewpoints to be formalized. Such work highlights the merits of the concertation procedure and encourages the construction of criteria database that can be used for project evaluation in initial phase.

7.1.3. Evaluation tools for the initial phase

One of the strong points of cost–benefit analysis is that it constitutes a homogeneous frame of reference for evaluating investment projects. However, such as it is applied nowadays, the highly technical character and the formalism of CBA is a disadvantage that makes the method difficult to integrate into public debate. In addition, because the legislature has explicitly expanded the project evaluation process to include elements that are, by nature, difficult to quantify and value in monetary terms, evaluation tools other than CBA can now be considered. Ideally, such complementary tools will be able to achieve two goals simultaneously: they will encourage public debate and thus *concertation*, and they will allow the consideration of the effects of a project that cannot be assessed using CBA.

Multicriteria analysis offers such tools and many contributions may be cited (see Sayers et al., 2003; Macharis et al., 2009). This type of analysis is quite different from the CBA procedure, in

which it is essential to quantify everything that will be considered and to assign a monetary value to every measurement unit. (See Section 3.2 for more details.) Neither of these requirements is necessary in a multicriteria evaluation procedure, which takes all relevant viewpoints into account by forming a coherent family of criteria (Roy, 1999).

In this procedure, each criterion in the family must be designed so that the projects to be evaluated either in terms of a concrete unit that is clearly understood by the actors (e.g., number of deaths, hours, CO_2 equivalent tons), or in terms of a qualitative scale that is appropriate to the viewpoints considered.[3] The multidimensional evaluation thus obtained does not prematurely block discussion of the diverse consequences that must be taken into account in order to shed light on the decision. Furthermore, the elements of uncertainty, inaccuracy and arbitrariness that can affect the evaluation of each criterion can be easily made explicit by using indifference and preference thresholds (Roy, 1999). At the beginning of the initial phase, the evaluation tables thus constructed can be only partially filled in. Despite this handicap, the evaluation tables can still be useful to the *concertation* table.

Many tools have been developed to explore this evaluation table in order to facilitate project comparisons. These tools can essentially be divided into two groups, according to approach. The first approach consists of using the multicriteria evaluation to generate a synthesizing criterion. This can be the net present social value or the internal rate of return used in CBA (see Section 3.2). However, unlike CBA, multicriteria evaluation goes on to specify the coherent criteria family and the respective evaluation tables (with their own units), as well as the indifference and preference thresholds.

The second approach employs pairwise comparisons of the proposed projects according to the different criteria. Certain methods using this second approach consider the criteria as "voters" expressing viewpoints on each comparison. In this type of approach, it is not necessary to quantify the evaluations of the criteria at all. Nor is it necessary to express the evaluations in the same unit (monetary unit, for example).

In the context of *concertation* procedures, multicriteria tools could contribute to legitimizing decisions in a better way. In justification of this position, please consider the following points:

- Multicriteria tools explicitly take into account several criteria, even those that are very different in nature, without resorting to excessive formalism. The pairwise comparison of projects can be carried out by evaluating the projects according to quantitative and qualitative criteria. It is even possible to eliminate the numerical scaling of the qualitative criteria.
- The amount of information about preferences and parameters that allows such tools to work is relatively small, thus limiting the arbitrariness inherent to decision-making tools.
- Use of multicriteria tools is not incompatible with socio-economic evaluation. Though qualitative criteria do not have to be quantified or priced out (criteria assessing the impact of a project on the environment or on the attractiveness of a landscape, for example), this feature should not be interpreted as diminishing the importance of the financial or economic aspects of the assessment.
- Methods of multicriteria decision-making can be easily understood and used by multiple actors, including those who are not technical experts. From this standpoint, it constitutes a tool that can be relied on to structure *concertation* or debate about the stakes involved in different projects (see notably Froger and Oberti, 2002).
- In some methods of multicriteria decision-making aid, the final aggregation of the different viewpoints about two projects not only reflects the position of the majority (via a weighting system), but, given the possibility of a veto, can also reveal the position of a strongly opposed minority.[4] Such methods suggest a principle of reasoned democracy that could contribute to legitimizing decisions in a better way.

7.2. Revamping the use of existing expertise tools

The multicriteria tools discussed above could be used together with CBA tools for economic evaluation. However, how this complementary use will be conceived both depends on the identified objectives and evolves throughout the *concertation* process. The next two sections present our ideas for the use of the two types of tools. Although, as we have already mentioned, there is no clear division between the phases of the process, to facilitate the discussion, we have distinguished between use in the initial phase (Section 7.2.1) and use in the subsequent phase (Section 7.2.2).

7.2.1. Using CBA in the initial phase

The drawbacks of CBA tools in the context of *concertation* should not lead to a total rejection of CBA. This tool provides a necessary frame of reference and formal support for the evaluation of projects for all the administrations involved in a public decision-making process. Nevertheless, the evolution of decision-making contexts should provoke profound reflection about the way CBA is applied and how it can be used to couple debate with evaluation.[5] The legislature has recently argued for strengthening the links between public debate and the socio-economic evaluation of projects. However, it has not specified how this should be done, nor has it provided clear objectives for what it expects public debate to contribute to socio-economic evaluation.

Thus, it seems appropriate to consider debate and evaluation (not just CBA) as a single entity. In this way, public debate is not reduced to a formality designed to verify the social acceptability of projects that have already been evaluated. Likewise, the information provided by a formal evaluation of projects is also seen to have consequences for debate and *concertation* since both are explicitly intended to take all the viewpoints into account, including those related to the economy. To insure that debate and evaluation are not separated in practice, we suggest that CBA's socio-economic evaluation be envisaged as a gliding procedure taking place throughout a process of concertation in which other more appropriate tools are integrated.

In the initial phase, a simplified version of CBA could be used to avoid an asymmetrical distribution of knowledge between economic experts and the other stakeholders. In this phase, broad categories of effects to be considered could be discussed. Multicriteria tools could play a major role at this point by allowing the different viewpoints to be formalized and a preliminary project evaluation to be carried out. This part of the process would serve to promote the direct participation in the evaluation of competing projects of stakeholders who traditionally do not have the opportunity to express their point of view at this point in time. In other words, such an organization of the initial phase would reconcile the requirements of rationality by providing technical

[3] In this case, the difficulties encountered when defining what is covered by the levels of such a scale helps to clarify what is really in question.

[4] In these methods, the consideration of minority positions is not the simple compensation of disadvantages by advantages of another nature, as is the case in CBA (Roy and Damart, 2002).

[5] This is encouraged by DTT (2004).

expertise and those of legitimacy by allowing public debate. The fact that there is debate about the way the evaluations will be conducted and formalized within the framework of a coherent family of criteria appears to make the process easier to understand and thus makes it easier for participants to accept the way the results obtained are integrated into CBA. At the same time, this organization increases the relative importance of evaluations that cannot be integrated into CBA. CBA nonetheless loses none of its pertinence provided that the techniques are enhanced as explained in the next section.

7.2.2. Enhancing the use of CBA techniques in the subsequent phase

The information provided by CBA is rich because the number of effects generated by a project and subsequently taken into account in the evaluation is large. The corollary of this richness is the need to define a great number of parameters (see Section 3.2). However, as shown previously, assigning numerical values to the parameters can introduce an element of arbitrariness into the evaluation. This drawback does not put the usefulness of CBA into question as long as the problem is acknowledged. However, as CBA is currently carried out, the notion of arbitrariness is denied or, at best, is reduced to a lack of accuracy that is not really taken into account. In particular, the sensitivity analyses proposed by the legislature and/or recommended by the *Commissariat Général au Plan* do not permit the arbitrariness of CBA procedures to be adequately dealt with. Indeed, as they are applied nowadays, these measures call for varying different parameters of the socio-economic evaluation, one parameter at a time: for example, by varying the rate of discount in situations when the project deadline is far away in order to see if the return rate of a project varies and reaches an unacceptable value. The arbitrariness of the parameters could be better taken into account by instead performing robustness analyses, which involve simultaneously varying different parameters of the socio-economic evaluation. Consider the example of two projects, A and B. A robustness analysis of these projects might, for instance, compare the worst case parameters and the reference situation for project A with the worst case for project B, observing whether or not the preferences in terms of net present value would invert in comparison with the preferences ensuing from mid-values or the most favorable values. Other kinds of analysis such as simulation could provide richer exploitations of CBA results (see for example, Monte Carlo simulation as an alternative method such as shown in Vose, 1996)

Another way of enhancing the use of CBA in a subsequent phase of a similar process would be to explicitly identify the most determinant effects of a project in monetary units (e.g., as is very often the case, the number of hours supposedly saved), and then express them again in their own physical units in order to make the project evaluation accessible to the different stakeholders. Along the same lines, it would be interesting to highlight the non-monetary impact of certain factors that appear to be considered "negligible" (e.g., pollution, noise, disruptions, or safety) because, in fact, the monetary valuation obscures the questionable manner in which these types of disadvantages are compensated. For example, they are often deemed to be offset by such advantages as time saving q, which is moreover a disputable factor. We believe that enhancing the practice of CBA as suggested above consolidates the link between debate and evaluation.

8. Conclusion

The evolution of the transport infrastructure decision-making context now obliges public decision-makers to worry about two new elements in the decision-making process: rationalization of public resource use and stakeholder acceptance of the choices made. Evaluating the socio-economic significance of projects using cost–benefit analysis techniques takes care of the first element. For this reason, we have described the principles of cost–benefit analysis and tried to show how it is performed in France. The second element has pushed the French legislature to progressively institutionalize the practices and tools that permit public debate. To illustrate this change, we presented the objectives and operating principles of the Public Inquiry Procedure and the National Commission for Public Debate.

In this paper, we support the thesis that cost–benefit analysis, as it is carried out today in France, is not compatible with relevant and constructive debate. In fact, in order to deal with the two concerns mentioned above, it is necessary to create a closer link between the processes of evaluation and debate. As we have attempted to show, this link can be improved relatively simply. In general, what is really at issue is the relationship between the requirements of rationality that the actors would like to see in every decision-making process and the requirements of legitimacy that are accrued through the collaborative process of public debate. These two requirements are not incompatible. In our opinion, the two can be reconciled by revamping the socio-economic evaluation tools and changing the way that economic evaluation is carried out.

Acknowledgements

The authors would like to thank MM. Sven-Olov Larsson and Roger Vickerman for their precious comments on this work. They gave us an enriching personal perspective on the issues discussed in this article. The authors also would like to thank Maria Lucia Galvès for her precious help in preparing the English version of this paper. She made possible a real discussion of notions that are specifically French and difficult to translate in English, but are nonetheless interesting for English-speaking peoples everywhere.

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