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Multi-criteria analysis in transport project evaluation: an institutional approach

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Abstract

We demonstrate that multi-criteria analysis (MCA), though initially developed in the operations research field, can be usefully applied within the context of the stakeholder-driven or institutional approach to transport project evaluation. We first compare the features of the institutional and neo-classical approaches to economic evaluation. We then identify a number of conditions to be fulfilled for the institutional approach to result in a social optimum that is neutral from a distributional perspective. Such an optimum may not have been intentionally pursued, but may eventually arise as a by-product of the actions of self-interested, individual stakeholder groups. We illustrate the relevance of our approach through a number of recent case studies. Policy makers can use our findings as an input for designing formal decision-making processes, geared towards including stakeholder objectives in transport project evaluation.

Keywords: Multi-criteria analysis; Multi-criteria decision aid; Institutions; Institutional approach; Stakeholder.

1. Introduction

Large transport projects usually require substantial investment funding from both public and private sources. They often also affect the economic and environmental characteristics of the locations where they are built. In many cases, large-scale projects affect individual stakeholder groups in idiosyncratic ways. Such stakeholder groups usually have a preference for voicing their views and participating in the decision-

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making processes preceding actual project approval, namely at the stage when alternative project alternatives or options are assessed.

Decision makers can choose among a large number of evaluation techniques to assess transport projects, including, *inter alia*, social cost-benefit analysis (SCBA), multi-criteria analysis (MCA), cost-effectiveness analysis (CEA), regional economic impact study (REIS) and environmental impact assessment (EIA). The basic principles underlying each of these methods are very specific.

For example, SCBA is ultimately an expression of neo-classical welfare economics, whereby marginal benefits (utility increases) are compared with marginal costs (utility losses). Values (expressed in monetary terms) are based on consumer values as expressed by the consumer willingness-to-pay or derived in another way (e.g., using revealed preference or stated preference methods).

MCA originated in the operations research field (Charness and Cooper, 1961). Here, alternatives are evaluated on a set of criteria reflecting the decision-maker's objectives, and ranked on the basis of an aggregation procedure. Scores achieved do not necessarily need to be conveyed in monetary terms, but can simply be expressed in physical units or in qualitative terms.

CEA, which stems from research in the military and space industries, aims at selecting the least-cost alternative that achieves a predefined level of effectiveness. The effectiveness measure reflects the operationalisation of a specific policy objective. However, the policy objective itself is preset, and not subject to a critical evaluation of its desirability (e.g., whether benefits actually exceed costs).

The (regional) economic impact study (REIS) bears some similarities with Adam Smith's classic economics view, which focused on the role of production. The REIS attempts to measure the additional production (or value added) causally linked to a project.

EIA became established as an evaluation tool in its own right as Goudzwaard's (1970) and Hueting's (1970) ideas of "new scarcity" were gaining ground. EIA describes the possible impacts a project may have on the natural environment (fauna, flora, air, soil, water, landscape, etc.) and on human health, so that decision makers can consider these effects when deciding on accepting, amending or rejecting a project.

In recent years, several attempts have been undertaken to enhance the "participative character" of the above evaluation methods, see Stagl (2007) for an excellent overview. In each case, the intent has been to enrich the evaluation process with a substantive injection of stakeholder, expert and/or citizen participation. Here, "deliberative monetary evaluation" involves formal deliberation techniques to assign a monetary value to environmental impacts (Spash, 2001). "Social multi-criteria evaluation" combines participatory techniques and MCA to aid decision-making, thereby taking into account conflicting interests and multiple criteria (Munda, 2004). In the "three-stage MCA", various relevant stakeholders select criteria, followed by experts presenting information and measuring impacts, and citizen panels exploring values by comparing the numerical overall results with their own holistic judgement (Renn et al., 1993). "Multi-criteria mapping" is an interview-based MCA, meant to elicit and document technical and evaluative judgements on the expected performance of alternatives (Renn et al., 1993). "Deliberative mapping" combines participatory techniques and MCA to aid decision-making (Davies et al., 2003). Finally, "stakeholder decision analysis" combines the use of group-level deliberation techniques and (qualitative) MCA (Burgess, 2000).

It should be noted, however, that participative evaluation processes can be introduced without necessarily adopting formal evaluation instruments such as MCA and SCBA. Typical examples of such participative processes include the French and Belgian systems of "débat public", as well as the Swiss confirmative referendum.

The present article focuses on the institutional theory approach to evaluation. First, we show that MCA, though stemming from operations research, can be usefully linked to the stakeholder-driven or institutional approach to project evaluation (section 2). Second, we argue that even SCBA, derived from neo-classical economics, includes some institutional features, albeit only implicitly (section 3). Third, we discuss the possibility that a stakeholder-driven approach will help achieving a social optimum (section 4). Finally, we assess the potential contribution of MCA to actually implementing a stakeholder-driven approach to transport project evaluation, building upon a number of recent case studies (section 5).

2. MCA and the institutional approach to project evaluation: stakeholders as the linking pin

There are various definitions of the "institution" concept. First, the behavioural or old Veblenian perspective (Veblen, 1919) defines institutions as "settled habits of thought common to the generality of men". Second, North (1990) defines institutions as the "rules of the game" Third, Hodgson (2006) defines institutions in more specific terms as "durable systems of established and embedded social rules that structure social interactions" (Hodgson, 2006). The approach adopted in the present paper is consistent with the second and third definitions above. We view institutions as "decision procedures", i.e., as sets of rules enabling a group or society to transform individual preferences into collective preferences. Although the three above definitions may on the surface seem rather different, they do share a number of common elements.

A first common element is that institutions are meant to reduce - or improve control over - environmental uncertainty. Here, the "environment", in the form of individual or stakeholder preferences needs to be understood and interpreted properly. The belief systems of the decision makers play an important role in the interpretative activity. Building upon this interpretative activity, an institution is established, e.g., through a sequence of actual decisions. The former activity corresponds to the internal representation of the institution in the decision makers' minds, whereas the latter can be viewed as its external representation.

A second commonality, largely the consequence of the first common element, is that institutions create both constraints and incentives guiding human behaviour (Hodgson, 2006). Institutions do limit the options available to an individual or organization, but they may also trigger new types of human and organizational behaviour. By constraining behaviour, institutions can create a situation of socio-economic stability (i.e., an equilibrium). However, by providing incentives, institutions can contribute to moulding actors' beliefs and preferences, as well as their capabilities and behaviour. Hence, institutions can trigger change and provide a pathway towards new equilibria. Indeed, through institutions, individual and collective beliefs and preferences co-evolve (North, 2005). Such co-evolution builds upon an initial equilibrium and is path-dependent (North, 2005; Amendola and Gaffard, 1998). However, it is important to

understand that the formal creation or adaptation of the institution (or in our case the application of a decision procedure to a particular decision making challenge) does not lead to a permanent equilibrium, but only to a "temporary" one. A temporary equilibrium differs from the traditional neo-classical equilibrium, i.e., the situation whereby economic agents have no incentive to change their economic behaviour. Rather, the temporary equilibrium merely reflects a state of temporary order, i.e., a state of affairs providing temporary satisfaction to economic actors. During this period in which economic actors feel satisfied, the tension to change the state of affairs is reduced (weakened). Weak tension results from "concessions" made by each stakeholder involved in the decision making process, and from the transaction costs to be incurred in order to ameliorate further the present situation through new negotiations.

The creation of a temporary equilibrium, i.e., a situation of temporary stability, can be considered as the public good component associated with the institution. We noted above that in the present paper we will focus our attention on one specific form of institution, namely the systematic application of a decision procedure, such as multi-stakeholder MCA, assuming that all affected stakeholders were considered in establishing this procedure (see infra).

The perceived beneficial character of an equilibrium situation is consistent with Commons' (1934) old-institutionalism view that society can be described as a complex cluster of multiple actors (i.e., stakeholder groups) with interests that partly conflict and partly converge. These stakeholder groups interact among each other through a variety of "trade or social relations". Such interactions trigger social conflicts and the essence of economics is then to suggest efficient ways to govern these conflicts. The second and third above views on institutions assume the presence of conflicts as well as some efficiency of institutions at managing such conflicts.

In the 1980s, the strategic management literature explicitly introduced the notion of stakeholder and stakeholder management. Freeman (1984:86) defined a stakeholder as "any group or individual that can affect or is affected by the achievement of an organization's objectives". Since then, numerous authors have expanded on the stakeholder concept, and stakeholder management has become a separate sub-discipline in the strategic management field.

Multi-criteria analysis (MCA) can be a tool for active stakeholder management in cases whereby several strategic options need to be assessed, or a specific project can be implemented in different ways (thereby also affecting stakeholders differently). Effective stakeholder management through MCA adoption can take various forms. In principle, all relevant effects should be taken into account in an MCA. An effect is considered relevant if it affects the values considered important by at least one stakeholder in the decision making process (Roy, 1985:173-174). When all effects have been studied and evaluated (using criteria, criterion weights, criterion scores and an aggregation procedure), stakeholder issues can be studied more closely (Belton, 2002:60). A first option is to design a traditional value structure, i.e., a criteria structure identical for all stakeholders, but whereby each stakeholder is given the possibility to enter his individual preferences through specific weights. This can be achieved e.g., through implementing a specific type of sensitivity analysis, called "scenario analysis", see De Brucker (2000) and Macharis et al. (2006). In conventional scenario analysis, each scenario reflects the situation whereby only the criterion weights associated with one specific stakeholder point of view (e.g., an environmental or a safety point of view) are taken into account. The other criteria receive a weight equal to zero. This approach

can then be repeated for several stakeholder points of view. A second option is to design a value structure that – as a whole – is not necessarily shared by everyone. Here, a different module in the overall model is constructed for each stakeholder, whereby all criteria contributing to the objectives of that specific stakeholder are clustered together. This is the "multi-actor multi-criteria analysis" (MAMCA) approach (see, e.g., Macharis, 2000, 2004, 2007). With this methodology, a "layer" that includes the stakeholders is added to the traditional MCA model. Each stakeholder group can then assess the different alternatives in terms of its own objectives/criteria.

According to Belton (2002:60) both above approaches are valuable, but the second approach is the most appropriate if the different stakeholder groups indeed have very different concerns, as manifested in different criteria sets. Here, substantial (potential) conflict exists among stakeholder priorities. This approach makes it possible to assess the extent to which stakeholder preferences are conflicting or converging. In this context, the MCA makes it possible to monitor and even reduce societal conflicts. Conflict resolution (or management) is the essence of economics, according to the old institutionalism view of Commons (1934). Attention to stakeholders represents the link between MCA and the institutionalism view. The applications described in section 5 illustrate this link in a more concrete fashion.

In addition, the institutional approach can be used in an evolutionary context. According to Arthur (1999) and Amendola and Gaffard (1998) economic structures are path-dependent as they can crystallize around small, random events (e.g., in the context of on-line services we can observe random interface improvements, new offerings, word-of-mouth recommendations, etc.) and lock-in behaviour, which can then trigger substantive policy changes. The application of MCA also embodies such an evolutionary element. Stakeholder preferences (and hence their priorities) are dynamic. For example, the MCA may identify a level of conflict on subsidiary aspects of project design and implementation, but with consensus arising about the principle that the project should be approved in some form. Decision makers may then decide to adopt a gradual (i.e., an evolutionary) path towards project implementation. For example, via re-design of subsidiary project features, conflicts may be reduced, and such conflict reduction can then be measured by performing a second MCA after the re-design. Indeed, in some cases, a gradual approach may be the most appropriate to managing the problem at hand. Beliefs and preferences are actually endogenous and the application of MCA has the potential to mould these further, and to create mutual understanding, as expressed in Blaug's (1992:130) statement "Decision-makers do not try to get what they want, rather they learn to want by appraising what they get". In such a situation, the decision-making context can be very fluid, and the stability created by the institution ephemeral. One may therefore move very quickly from one temporary equilibrium to another. An example of rapid moves from one equilibrium to the next, is the gradual adoption of regulations restricting smoking in Belgium.[1] An example of the other

[1] The development of smoking restrictions in public areas in Belgium represents a good example of a situation whereby temporary equilibria have followed one another very quickly. Such sequence of equilibria builds upon rapid changes in stakeholder preferences and the willingness to adapt to "good practices" from other countries. Pope Urban VII (1590) was the first to implement a smoking ban valid for Catholic churches. In 1624 a papal bull banning smoking from all catholic churches and places of worship was issued by Pope Urban VIII on grounds that tobacco use prompts sneezing, which too closely resembles sexual ecstasy. One had to wait until 1987 for such ban to be implemented for health reasons in all public buildings with the exception of the catering sector. The societal dialogue on a possible smoking

extreme (i.e., of a very stable context) is the continued survival of the essential features of civil (or Napoleonic) law. As regards decisions on transport infrastructure, the temporary equilibrium created by a decision usually lasts a number of years, typically five years until a single investment project is built and fully operational to 30 years in the context of a long-term development plan (Dooms, 2010).

A more formal and systematic application of the stakeholder-driven MCA method as described above might greatly benefit the implementation of complex projects or policy measures.

3. Institutional elements in neo-classical project evaluation

We have argued above that multi-criteria analysis (MCA) fits well with the institutional approach to project evaluation. Below, we focus on institutional aspects present in the neo-classical approach, and in particular in social cost-benefit analysis (SCBA). SCBA is a static evaluation tool and the institutional elements embodied in SCBA are largely implicit and therefore often ignored by decision makers. Nevertheless, these institutional elements may strongly affect SCBA outcomes. An extended version of the brief analysis below can be found in De Brucker and Verbeke (2007).

The traditional neo-classical approach to economics largely ignores the impact of institutions. An institution-free state is implicitly assumed in the neo-classical approach. A closer look at this approach however, suggests that the neo-classical approach builds implicitly on a set of important institutions, namely (1) private property rights; (2) markets where supply meets demand; (3) competition at the supply side (and

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ban in the catering industry led to a rapid sequence of events. First, as of 1990 an agreement was reached at the Federal level to implement partial smoking restrictions (though only rarely enforced) in restaurants and pubs. Here, smoking became limited to two thirds of the relevant commercial surface area in 1990 and half of the surface area in 1992, but only for larger catering businesses with a commercial floor surface of more than 50 m^2. This approach was augmented with a requirement for compulsory smoke aspiration systems for all catering businesses. Second, in 2006 a complete smoking ban was introduced for catering businesses that are part of a sports complex, a shopping mall or a multi-purpose room (unless the space for the catering activity was fully separated from the space dedicated to these other activities). Third, in 2007 followed a complete smoking ban in all restaurants and small snack houses, i.e., catering businesses with food cost inputs representing less than one third of total purchased cost inputs (i.e., food and beverage inputs taken together). Fourth, in 2010 the smoking ban was extended to all snack houses and a Federal law was adopted that will extend the smoking ban to all catering businesses, including pubs, by 2014 at the latest. However, on 15 March 2011, the Belgian Constitutional Court determined that the distinction made (even though only a temporary one, i.e., until 2014) between pubs serving snacks and those serving no snacks constitutes a violation of the principles of non-discrimination embedded in the Belgian constitution. As a consequence of this decision, smoking will be restricted to secluded smoking rooms within all catering businesses in Belgium, including all types of pubs, as of 1 July 2011. The smoking room will need to be completely secluded from the remainder of the business, and have four walls, a roof and a door, ànd it will need to be a self-service area only. In addition, the smoking room will need to respect specific limits regarding surface area and it will need to contain an air ventilation system. In the future, further regulatory changes are likely, as a societal dialogue may start regarding further limits to smoking, e.g., in private hotel rooms, flats for the elderly, private cars and private houses where children or cleaning staff may be present. In a final stage, severe restrictions or even a complete ban may be imposed on the sale and import of tobacco, which already exists in a few countries (e.g. Bhutan).

competition law); (4) a well-functioning price mechanism and (5) a unit of account (a "numéraire"). As SCBA is based on the concept of willingness-to-pay (to obtain a good or property), the institution of property rights is essential. Property rights can only be traded in a market. However, markets do not always emerge spontaneously, but sometimes may need to be created artificially (e.g., markets for tradable pollution rights or surrogate markets constructed just for the purpose of valuing a specific good). Even when markets emerge spontaneously, a minimum level of regulation may be necessary. Markets are only able to produce a Pareto optimal equilibrium price, if competition law safeguards the presence of competition. The presence of a generally accepted numéraire such as the Euro is also essential to SCBA.

At the project level, when performing an actual SCBA, some additional institutions in the sense of "decision procedures" or "rules of the game" implicitly play an important role. First, interpersonal utility comparisons are always made at the project level. In SCBA, the main decision criterion is usually the project's net present value (NPV) (or a criterion related to NPV). The NPV is a single, synthetic criterion, supposed to include all relevant effects expressed in monetary terms. The actual monetary values considered in the SCBA are derived from the consumers' willingness-to-pay and do not require the selection of additional weights for the different cost and benefit categories. Here, the NPV criterion directly follows from the Hicks-Kaldor criterion (Hicks, 1939:711 and Kaldor 1939:550). The Hicks-Kaldor criterion views a project as welfare increasing if the individuals experiencing an increase in utility (i.e., the "winners") *can* compensate the individuals experiencing a decrease (i.e., the "losers"), and are still left with a higher utility level than before project execution. Applying this criterion requires interpersonal utility comparisons and at the same time implicit trade-offs are performed among project effects, though policy makers are not always aware of this. In the case of public sector projects, the NPV accrues to members of society, more specifically to particular stakeholder groups. In contrast, with private sector investments, the NPV (associated with additional profit) accrues to the shareholders. Most public sector projects (save for very general projects, such as universal health care in society), have clear distributional impacts, leading some stakeholders to "win" at the expense of others, thereby being "conflict sensitive".

Another institutional element embedded here is that the decision itself to perform a SCBA has institutional significance. Many projects, though having potential net benefits, are never taken into consideration or do not even come to the conceptualization phase, precisely because the potential benefits and costs are not assessed. Conversely, projects executed without a formal SCBA may result from the political willingness to provide benefits to particular stakeholders, with the costs borne by society at large. Ex post, project execution may in turn influence the NPV of other substitute projects.

An interesting example in this context is the project regarding the upgrading and reactivation of the old international railway called "Iron Rhine"[2] linking the port of

[2] The name "Iron Rhine" stems from the fact that this railway link was once considered an alternative to navigation on the river Rhine. The "Iron Rhine" railway connects Antwerp in Belgium to Duisburg in the German Ruhr area, through the Dutch province of Limbourg via Lier (BE), Herenthals (BE), Mol (BE), Neerpelt (BE), Weert (NL), Roermond (NL) and Mönchen-Gladbach (DE). The right of transfer through the Dutch province of Limbourg (i.e., that part of Limbourg east of the river Meuse) was guaranteed to Belgium by the then major powers (i.e., France, Great Britain, Austria, Prussia and Russia) and laid down in the Separation Treaty of 1839, recognizing the independence of Belgium. The railway was opened in 1879 and continued to be a succesful and busy railway until the eve of the first world war. After the first

Antwerp in Belgium with its hinterland in the Ruhr area in Germany, through the Dutch province of Limbourg. The debate regarding this project is highly complex and touches upon international and politically sensitive issues, which have their origins in the Principles of Separation of the former United Kingdom of the Netherlands in 1830, as laid down in the subsequent Separation Treaty of 1839. A more detailed description of the history, the complexities and the nature of this issue can be found in Witlox (2006).

A SCBA was recently performed for this project (Delhaye et al., 2009). The decision to establish a commission of independent experts (and to perform this SCBA) was the consequence of a decision rendered by the Permanent Court of Arbitration in The Hague to which both countries (Belgium and The Netherlands) decided to submit their conflict. The overall result (i.e., from the international point of view) of this SCBA is negative, though the NPV from a Belgian perspective is positive. One reason for this poor result is the presence of spare capacity on competing railway routes (*inter alia*, the Montzen route), so that the project does not attract much traffic from the highly polluting road mode. In addition, the investment cost is very high because of the environmental and safety guarantees asked for by The Netherlands. However, the main reason for the negative outcome is likely that particular prior decisions were taken in the past regarding the provision of transport services and the design of a particular (rail) infrastructure network in the Netherlands, largely guided by political motives and unrelated to the NPV outcomes of specific projects. The rail links competing with the Iron Rhine rail project, namely the Montzen route,[3] the Brabant route[4] and the more recent Betuwe route[5] were implemented in the past either without formal SCBAs, or, in the case of the Betuwe route, notwithstanding serious criticism from the Dutch Court of Auditors and a number of Dutch academics. The former projects were implemented mainly to satisfy concentrated stakeholder interests, within a broader institutional

world war, it continued to be used on a rather modest scale since a competing line, namely the Montzen route (see infra) was built by the German occupying force in 1917. Finally, the Iron Rhine rail link ceased to operate, as part of the infrastructure was dismantled by the Dutch government in 1997.

[3] The Montzen route connects Antwerp (BE) to the German Ruhr area via Lier (BE), Aarschot (BE), Diest (BE), Hasselt (BE), Tongeren (BE), Visé (BE), Montzen (BE) and Aachen (DE). This line was constructed during the first world war by the German occupying force for military purposes, since this line avoids the passage over the Dutch (i.e., neutral) territory. After the first world war the latter route continued to be used, although it is about 50 km longer and more hilly than the Iron Rhine route. The reasons were that with the Montzen route one could avoid one border passage, that it generates more revenue for the Belgian railway company (as it is a longer journey) and that it passes through the Walloon region of Belgium where the handling of trains creates economic activity and jobs for that region.

[4] The Brabant route is an existing railway route south of the new Betuwe route (see infra) and connects the port of Rotterdam (as well as the more southernly located ports of Vlissingen and even partly Antwerp) to the hinterland in the German Ruhr area via Breda (NL), Eindhoven (NL), Tilburg (NL), Venlo (NL), Viersen (DE). The Brabant route is actually saturated and the construction of the new Betuwe route (see infra) reduces congestion on the former route. However, the reactivation and upgrading of the old Iron Rhine rail link would have served this same purpose, if it had been built (i.e., upgraded and reactivated) before the Betuwe route was built (which was not the case).

[5] The Betuwe route is named after the Betuwe region (i.e., a fruit-growing region in The Netherlands) through which it passes. It is a new railway link recently constructed, more or less parallel to the already existing track in the same region (which was called "Betuwe line"). The Betuwe route connects the port of Rotterdam (NL) with its hinterland in the German Ruhr area. The Betuwe route was bundled most of the time with the motorway A15 and goes over Goringem (NL), Tiel (NL), Elst (NL), Zevenaar (NL) and Emmerich (DE).

context allowing for this to occur. For instance, the recent decision of the Dutch government to implement the Betuwe route was based on strategic motives, in particular its expected benefits for the port of Rotterdam, at the expense of competing foreign ports such as Antwerp in Belgium, which interestingly would have benefited most from the Iron Rhine project. In the more distant past, the old Montzen route was built for military purposes during World War I. Hence, the Belgian government wanting to safeguard the competitiveness and the future of the port of Antwerp (in terms of providing to shippers a selection of good hinterland connections with multiple transport modes, including rail) can do little more than pushing for the implementation of the Iron Rhine project, even in the face of disappointing SCBA outcomes. Here, Witlox (2006) correctly concludes that the case of the Iron Rhine is intrinsically an issue of international (port) competition.

Any SCBA implicitly includes a number of institutional elements, but ultimately, it does remain an unsatisfactory, static evaluation tool, unable to accommodate fully the dynamics of complex decision-making processes, especially those processes that trigger institutional change through moulding beliefs and preferences.

4. Does the institutional approach guarantee a societal optimum?

In the institutional approach outlined above, stakeholders are considered the main drivers of decision-making processes. Two critical comments should be made here. *First*, stakeholder objectives are seldom converging, e.g., in the case of transport projects the objectives of the logistics sector are often opposed to those of environmental pressure groups. However, increased convergence of stakeholder objectives can occur. For example, the objectives of environmental pressure groups may converge with those in the logistics sector if an infrastructure project is re-designed to allow simultaneously for better logistics efficiency and lower externalities (e.g., as in replacing a new bridge project with high atmospheric, noise and visual pollution by a tunnel, as is the case for the present ringroad extension project in Antwerp). The question can therefore be asked whether a substantial amount of conflict necessarily acts as an impediment or can in some cases actually improve project design and implementation, i.e., improve the project and the decision-making associated with the project. *Second,* some stakeholder groups may be more powerful than others. The (temporary) institutional equilibrium resulting from the counterbalancing power of the various stakeholders' actions is not necessarily distributionally neutral. More powerful stakeholders in society may try to institutionalize a (temporary) socio-economic equilibrium that provides them a (temporary) distributional advantage. They may try to do this either directly, through the implementation of specific projects benefiting them, or more indirectly, through influencing the design and organization of the institutions meant to evaluate and decide on projects.

De Brucker and Verbeke (2007) describe in greater detail the above issues. They conclude that a manageable level of conflict can function as a catalyst for creative stakeholder involvement, learning and possibly project re-design, thereby potentially moving project implementation from a win-lose to a win-win situation, see also Mullins (2005:904-905). When applying MCA, creativity may be enhanced when value-focused thinking (Keeney, 1996) is applied. This implies that a set of relevant values (to be

measured by criteria) is made explicit at the outset. These values may be conflicting. In a following step, projects are "constructed". This means that one proactively searches for projects that are acceptable to all stakeholders. This is done through an iterative learning process. Here, projects are not considered as exogenous since they too evolve in the learning process. The learning process is at least partly driven by the concern for reducing conflict.

On the issue of the possible distributional bias of institutions, De Brucker and Verbeke (2007) described a number of mechanisms that can reduce the rent-seeking behaviour of strategically positioned actors or stakeholders (see also Knight, 1998:40ff). These mechanisms act on two levels, namely at the level of the institution itself (i.e., regarding the design of the "rules of the game") and at the level of project evaluation in particular (i.e., when "playing the game"). These general mechanisms address problems related to transaction costs, uncertainty, cross-cutting effects, competition and state intervention. In this respect, the role of a third party such as the state or a state agency is very important in order to enhance the bargaining power of weak stakeholders, especially in the context of project evaluation. This can be achieved through (1) protecting free association, (2) establishing rules or criteria for recognizing the bargaining rights of specific stakeholder groups; (3) establishing stakeholder recognition procedures to give standing to affected stakeholders.

Knight (1998:203) argues that poorly organized stakeholders typically turn to the state for formal protection, whereas powerful stakeholders prefer to negotiate in an unconstrained market. Hence, the trade-off from the government's perspective is either to design very restrictive rules that protect negatively affected stakeholders against the externalities created by new infrastructure development or, alternatively, to allow these stakeholders, such as environmental protection groups, to mobilize against project developers, to voice their concerns and possibly to influence the outcome of the project evaluation, thereby reducing the need for formal rules.

Finally, the role of sensitivity analysis should not be underestimated. Sensitivity analysis and scenario analysis can play an important role in detecting significant distributional consequences. Sensitivity analysis can be performed to identify the impact of changing policy weights. For example, one can change the weights associated with the criteria viewed important by a specific stakeholder and observe whether this has a substantial impact on the final outcome, see the next section.

To conclude, the excessive power of some stakeholders can be counterbalanced if each stakeholder can effectively participate in the decision-making process. When designing formal decision procedures aimed at accommodating stakeholders' objectives, this issue should be given special attention. The state can act as a network hub to provide and organize a forum for stakeholder discussion and debate, i.e., a forum for balancing stakeholders' power and to ensure that each stakeholder group has equal rights and opportunities to let its views be known. The role of the state as a network hub also consists of further investigating possible distributional consequences of projects (e.g., through extensive sensitivity analysis in MCA). The institutional approach has the advantage that the conflicting interests among stakeholders become more explicit ("ordered complexity") and that they can, therefore, be better controlled, monitored and moulded. As is the case with democracy, the collective benefit of this approach does not result from individual actions by stakeholders; rather, it is a by-product of a process

whereby individual actors or stakeholders pursue their own, selfish ends.[6] None of these actors or stakeholders pursues the public good, but through acting in a pluralistic forum, collective benefits may ultimately arise as a by-product of this process. The outcome of this process can be viewed as "agreed upon subjectivity" or "subjectivity made objective". A parallel can also be drawn with markets. Individual participants in markets (producers and consumers) pursue their own selfish ends (e.g., profits), but when considering all their actions together, an optimum may emerge as a by-product, provided that the price mechanism works efficiently, and that power asymmetries and other market imperfections do not arise. The institutional approach (using MCA) has the additional advantage, as compared to the neoclassical approach (using SCBA), that it can better accommodate the dynamics of complex decision processes and that it can be used as a trigger for change and for the moulding of beliefs and preferences, as well as the ensuing behaviour of actors.

5. Applications of the institutional approach to transport project evaluation

5.1 Introduction

In the sections above, we have argued that stakeholders play an important role in the institutional approach to transport project evaluation. In addition, stakeholder relations can be managed more effectively using MCA. Hence, MCA adoption can be considered an important element in the institutional approach to transport project evaluation. There are, however, a large number of MCA methods and approaches, and not all of them are equally appropriate in the context of an institutional approach. The important building blocks of an MCA method that would make it fit well with the institutional approach include (1) the possibility to design a value structure (and associated criteria) allowing effective stakeholder management, e.g., because criteria sets can be directly linked to specific stakeholders); (2) sufficient flexibility, thereby allowing interactive and constructivist processes whereby various stakeholders can truly participate in the decision making process and "construct" together a solution acceptable to all (thereby also achieving what can be called "subjectivity made objective") and (3) high transparency to policy makers, stakeholders and the public at large, in terms of how applying specific values, criteria and impact measures have led to a final outcome ("ordered complexity").

In the following sections, we present a few case studies, with a focus on the issue of stakeholder management, which is critical to the institutional approach. For technical details on the MCA adopted, see Macharis et al., (2007).

[6] This way of thinking is consistent with the view on institutions underlying Schotter's (1981:5) definition of economics: "Economics is the study of how individual economic agents pursuing their own selfish ends evolve institutions as a means to satisfy them". In this definition, intentional design and the pursuit of distributional advantage are assumed to exist on behalf of the stakeholders. It is, therefore, the task of an external actor (such as the state or a state agency) to organize a pluralistic forum where the powers of various stakeholder groups effectively counterbalance each other.

5.2 Case study 1: the IN-SAFETY project

The IN-SAFETY[7] project is an EU funded research project under the sixth framework programme in which 29 partners from 12 different countries participated. A number of work packages were carried out by the authors of this article whose contribution consisted of prioritising a number of highly innovative alternatives (or tools) aimed at increasing road safety by creating a more forgiving road (FOR) and more self-explaining road (SER) environment. A self-explaining road (SER) is a road that is constructed in such a way that it evokes and stimulates correct driving behaviour and therefore diminishes the chance on driver errors (Theeuwes and Godthelp, 1992). A forgiving road (FOR) is designed in such a manner that it counteracts or prevents driving errors and minimizes the negative effects of those driving errors (Wegman and Aarts, 2005). In the IN-SAFETY project, a number of proposals that can contribute to the development of a more SER and FOR environment were compared and ranked in order to determine their implementation priority.

As the main objective of the present contribution is to illustrate how the objectives of stakeholders can be adequately captured and assessed in a MCA, we will mainly focus on (1) the design of a stakeholder-driven value structure; (2) the generation of alternatives based on value-focused thinking; and (3) the exploration of the (diverging) stakeholder priorities. For other, more technical issues such as the technical aspects of the alternatives studied, the actual generation of priorities (deriving criterion scores, weights and aggregating these), see the entire project deliverable (Macharis et al., 2008) and some chapters in a book dedicated to this topic (De Brucker et al., 2011 and Dangelmaier et al., 2011).

- The design of a stakeholder driven-value structure

After a number of technical workshops and extensive discussions with experts, policy makers and representatives from stakeholders, a value (criteria) structure as shown in Figure 1 was developed. This hierarchy of criteria was constructed according to the principles of the analytic hierarchy process (AHP) of Saaty (1977, 1986, 1988, 1995). However, it was the policy makers (and stakeholder representatives) who ultimately had the last word in the decision regarding the final structure of the criterion tree.

The top level of the evaluation tree shown in Figure 1 represents the focus or overall objective, namely creating benefits by making the road environment more forgiving and more self-explanatory. At the second level, three groups of main stakeholders are considered, namely (1) the users, (2) society/authorities and (3) manufacturers. Within each group of stakeholders, a number of subcategories was identified, such as drivers, fleet owners and emergency centres (for the main category "users"), road managers and authorities (for the main category "authorities") and vehicle manufacturers, equipment manufacturers, system providers and content providers (for the main category "manufacturers"). As regards these subcategories, it turned out to be unnecessary to include them as separate groups, since the preferences of these subgroups were not substantially different from each other and since some of these subgroups did not feel compelled to organize themselves so as to exert a substantial influence on policy

[7] IN-SAFETY is the abbreviation for "INfrastructure and SAFETY".

making. On the third level, the criteria are listed that are considered relevant by these main stakeholders. The lowest level shows the alternatives to be prioritised.

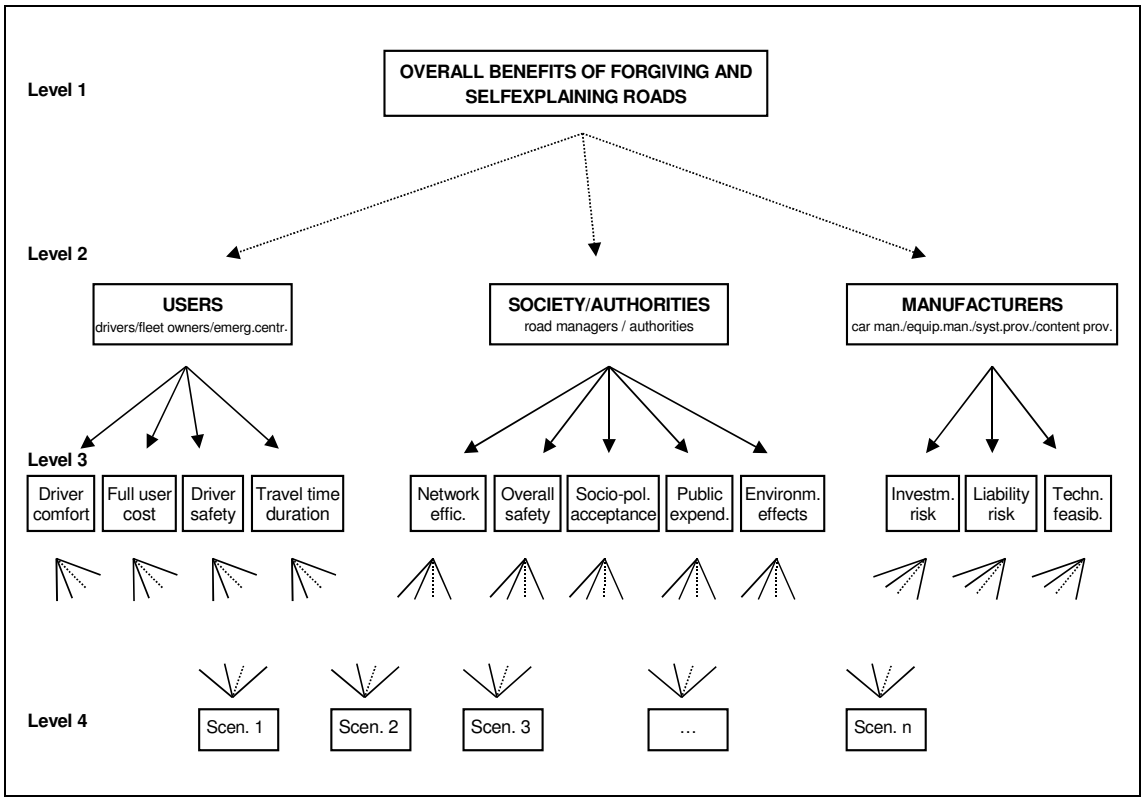

Figure 1: Decision hierarchy for the prioritisation of FOR and SER scenarios.
Source: The authors and IN-SAFETY project team, based on the AHP (Macharis et al., 2008:23).

It should be noted that the second stakeholder (at level 2) in Figure 1 in fact represents the point of view of public policy makers in general. The subsystem that is formed by this stakeholder and all its lower level elements is the most important one, since it represents the overall societal point of view. The two remaining subsystems, formed respectively by the users (i.e., the demand side of the market) and the manufacturers (i.e., the supply side) and their lower level elements, are also important, but in another context. Successful implementation of alternatives by public policy makers (i.e., the middle subsystem) is indeed only possible if the decisions made or the options chosen by these public policy makers are in accord with, at least to a certain extent, with the interests of the other stakeholders. If this is the case, then the pursuit of public policy objectives will be facilitated by the actions taken by the other stakeholders and it will be easier for public policy makers to have their preferences implemented. This way of using stakeholder management as facilitating (or hindering) public policy implementation is fully in line with the actual definition of the concept of "stakeholder" by Freeman, as referred to in section 2 above. The MCA to be performed, therefore, needs to be designed in such a way, so as to be able to investigate the extent to which the solutions chosen within the second subsystem (public policy view) are compatible with the solutions preferred by the users and the manufacturers, and whether this compatibility needs to be improved (or not), using a specific implementation path designed for this purpose. The essence of this approach is that the priorities derived from the public policy perspective are taken as the starting point for further analysis. In

the further analysis, differences are explored, and a comparison is made with the other two stakeholders' priorities. However, there need not be a formal aggregation of the different stakeholders' priorities, e.g., through calculating some average. In a perfect market (which is the standard assumption in neo-classical economics), the priorities derived at the demand side of the market would be expected to be fully consistent with the ones derived at the supply side, and government or public policy intervention (this is the middle subsystem in Figure 1) would not be an important issue. It is thus assumed that what would be good for individual users would also be good for society. This is definitely not the case here and several reasons can be identified for this situation. *First*, there are a number of external effects, such as effects on safety (including third party safety effects, such as effects on pedestrians and cyclists) and environmental effects, etc. *Second*, infrastructure and also safety have the character of a public good, which can only be financed with government funds, to be allocated by public policy makers. *Third*, there may be bounded rationality challenges, and consumer preferences may be inconsistent over time. When deciding on the type of goods to buy, consumers often have a preference for goods resulting in immediate but short-lived benefits, and associated with large costs or sacrifices in the future (e.g., road accidents). These future costs or sacrifices are often underestimated at the time the decision is made. This means that market intervention by public policy makers is required here. *Fourth*, the tools or systems analysed are highly innovative and the market for them still has to be developed. In such cases, government incentives or an active supply side policy by government can be instrumental to stimulating and forming the institutional structures of this evolving market. The decision-making problem public policy makers are confronted with is, therefore, not a simple but a complex one and the hierarchical structure developed here (Figure 1) should be viewed as an attempt to order this complexity.

- The development of a set of alternatives

The development of a set of alternatives to be prioritised was done using a two-step procedure. Given the highly innovative character of the alternative systems to be developed, a type of value-focused thinking (Keeney, 1996) was applied in the first phase. In this first (or conceptualisation) phase a set of preliminary alternative scenarios was generated, by combining the six main causes for accidents, namely (1) excessive speed in unexpected sharp bends, (2) speeding in general, (3) violation of priority rules, (4) wrong use of the road, (5) failure when overtaking and (6) insufficient safety distance, with three dimensions, along which scenarios can be developed namely (1) the vehicle, (2) the infrastructure and (3) the vehicle-infrastructure interface. By doing so, a total of 18 generic categories of potential alternatives were obtained. These should be considered as alternative venues for the design of innovative systems. For each category, some typical examples were identified, as shown in Table 1. The first row of Table 1 represents the three dimensions; the first column reflects the six top errors and the remaining cells represent typical examples the 18 alternative ways of developing potential alternative scenarios.

Table 1: Generation of alternatives by combining errors and dimensions along which tools can be developed.

Dimension Error	***In-vehicle***	***Infrastructure-based***	***Cooperative (vehicle-infrastructure)***
Too fast in unexpected sharp bends	Unexpected sharp bends registered red in a digital map of the navigation-system are presented to driver	Vehicle is 'analyzed' (e.g., speed), VMS signals the danger of the bend depending on the actual speed	Electronic beacons (special reflection posts) give additional information on displays in the vehicle about the road (e.g., warning: sharp bend)
Speeding	Speed alert system functioning by recognition of traffic signs	Speed limit is presented to driver by VMS under consideration of special environmental circumstances	Speed alert system, based on digital maps containing legal speed limits with additional info on recommended safe speed
Violation of priority rules	Traffic sign recognition	Traffic signs	Traffic light status information emission to car
Wrong use of the road	LDWA (Lane Departure Warning Assistant)	Audible delineation	Adaptive LDWA; Sensitivity of LDWA is adapted in special conditions (road works,tunnels)
Failure when overtaking	Blind spot detection warning driver if a vehicle is approaching from behind	Separation of lanes by rumble strips where overtaking is forbidden	Cooperative system warning of oncoming vehicles by vehicle-to-vehicle communication
Insufficient safety distance	Advanced Cruise Control (ACC)	Fog detection warning system; VMS warning	ACC set by local on-site weather system: Dynamic ACC

Source: IN-SAFETY project team (Macharis et al., 2008:21).

On the basis of a preliminary prioritisation of these potential systems in terms of stakeholder objectives (see below) and after extensive discussions with experts, a set of more concrete implementation scenarios[8] was selected for final prioritization in the step 2. These systems are shown in Table 2.

[8] We adopt the term "scenario" because each system studied is described in terms of a number of parameters such as road type, traffic conditions, etc., as compared to a "reference scenario", see Macharis et al., (2008:38ff).

Table 2: Summary of a detailed scenario description.

No./ Name	*Description*	*Type of system*	*Data needed for operation*	*Data collection for operation*	*Condition requirement*	*Reference scenario for evaluation*	*Main contributing factor for target accidents*	*Pilot studies*
1. In-car Variable Message Signs (VMS) info (dynamic legal speed limit motorways)	Self-explaining system Dynamic speed limit based on weather and traffic conditions	Roadside VMS Warning into vehicle	Current speed, environmental data, traffic volume/flow	Vehicle sensors, roadside sensors	Reliable detection systems, algorithms for calculating safe speed	(A) Current state (B) Roadside VMS, dynamic speed limit (no info into vehicle)	Inappropriate speed on motorways	Greek, Italian, German pilots
2. In-car school bus ahead warning	Self-explaining system Warning when school bus stops ahead	Warning from bus into vehicle	Vehicle location, school bus location	Vehicle equipment for vehicle-to-vehicle communication	Reliable detection systems, reliable radio transmitter & receiver	No in-vehicle warning	Not detecting school children after leaving or before entering a school bus	Swedish pilot
3. In-car curve speed warning (rural roads)	Self-explaining system Safe curve speed calculated based on curve geometry and weather conditions	Vehicle autonomous	Current speed, curve geometry, environmental data, vehicle characteristics	Digital maps, vehicle sensors	Reliable updated data basis for infrastructure conditions, algorithms for calculating safe speed	No in-vehicle warning	Inappropriate speed in curves on rural roads	-
4. In-car lane departure warnings (LDWA) (motorways)	Forgiving system Lane departure warnings based on lane markings + road side beacons in work zone	Warning into vehicle	Lane markings, speed, local conditions (e.g., road works)	Vehicle sensors (LDWA) Road side beacons (adaptive LDWA)	Lane markings, reliable detection systems	(A) No lane departure warning (B) Rumble strips no measures at road works	Lane departure on motorways	Swedish, German, Greek pilots
5. Overtaking assistant "blind spot vehicle detection" (more than 1 lane per direction)	Forgiving system Warning when overtaking while vehicle approaching from behind	Vehicle autonomous	Position and speed of vehicle approaching in blind spot, current speed	Vehicle sensors for detection of vehicle behind	Reliable detection systems	No overtaking assistance	Overseeing vehicle approaching from behind while overtaking	-
6. Overtaking assistant oncoming vehicle detection (1 lane per direction)	Forgiving system Warning when overtaking with oncoming traffic	Vehicle-to-vehicle communi-cation	Location and speed of own vehicle and oncoming traffic	Vehicle sensors, equipment for vehicle-to-vehicle communication	Reliable detection and communication systems	No overtaking assistance	Overseeing oncoming traffic while overtaking	-

Source: IN-SAFETY project team (Macharis et al., 2008:37).

- Deriving and exploring the stakeholder priorities

Stakeholder priorities were derived in both steps of the IN-SAFETY project according to the criteria set shown in Figure 1. Experts derived scores at the lowest level of the value structure, i.e., when comparing actions (at level 4) in terms of their contribution to criteria (shown at level 3). As regards the level of the criteria (level 3), priorities or weights (i.e., the relative importance of the stakeholders' objectives) (shown at level 2) were derived by the stakeholders themselves. To this end, the pairwise comparison mechanism of the analytic hierarchy process (AHP) of Saaty (1977, 1986, 1988, 1995) was used. This is an interactive tool whereby respondents (i.e., stakeholder representatives) compare the elements at a lower level (i.e., the criteria) in terms of their

contribution to a higher-level element (i.e., stakeholder objectives) using a nine point scale. These pairwise comparisons are then aggregated so as to obtain local and global relative priorities. This was done using the eigenvector method underlying Saaty's AHP method.

At the end of the first step (which was related to the evaluation of alternative venues for the design of the innovative systems), we obtained a prioritisation in terms of the three actors or stakeholders. By doing so, it was possible to assess the degree to which the preferences of the stakeholders (users and manufacturers) are conflicting or converging and to which extent they are compatible with the priorities in terms of a public policy point of view (stakeholder "society"). The conclusion from the latter point of view was that alternatives focused on speeding are considered the most desirable. However, these systems are not considered desirable from the point of view of the manufacturers or users. Manufacturers consider the autonomous, infrastructure-based alternatives (e.g., traffic signs, separation of lanes by rumble strips, VMS signalling the danger of the bend, audible delineation, etc.) to be the most desirable. This is mainly caused by the liability problems involved in vehicle alternatives, which is the most important criterion for the manufacturers. Users most often rank the vehicle-related alternatives (e.g., advanced cruise control, lane departure warning assistant) at the bottom (with the exception of alternatives regarding bends and failure while overtaking). To a large extent, this is caused by the costs accruing to the user, and also to the relatively smaller effects on driver safety, as these are the most important criteria for the user.

The insights obtained at the end of the first phase were then used to select a set of more concrete implementation scenarios. These were also submitted to a prioritisation in terms of the different stakeholder objectives (in step 2). The most striking conclusion from the final prioritisation in step two is the high discrepancy among stakeholder priorities for some scenarios, whereas for other scenarios this discrepancy was rather low. For instance, for scenario no. 6 (overtaking assistant with oncoming vehicle detection) and scenario no. 3 (safe curve speed warning), discrepancy is high. These scenarios are considered to be good in terms of societal objectives, but not in terms of manufacturers' objectives. Manufacturers consider the risk associated with these scenarios as too high, in particular the liability risk, but also the investment risk and the risk of technical non-feasibility. Although this scenario has some market potential, it is not likely to hit the market in the near future. Further research is, therefore, needed to make this application more reliable and to reduce the risks associated with it. Here, policy makers should consider what measures could be taken to address the manufacturer's hesitations with respect to the possible liability risks.

A scenario receiving a good overall priority from the various stakeholders is, however, scenario no. 1 (VMS info into vehicle). This scenario will, therefore, more easily be implemented in the market through market forces, without the need for substantial governmental intervention.

Another striking conclusion is obtained regarding the scenario no. 2 (school bus ahead warning), ranked at the bottom from society's point of view. Accidents with children running out of a school bus only represent a small portion of the total number of accidents. Manufacturers, however, consider this scenario as being low risk.

5.3 Case study 2: the DHL project

Another interesting case study is the possible operating and infrastructural extension of the air freight carrier DHL[9] at Brussels (Zaventem) International Airport (Dooms et al., 2007a; Dooms et al., 2007b). This case was a highly conflictual one and was discussed extensively in the Belgian press during the period spanning September and October 2004. The Province of Flemish Brabant commissioned the study, and wanted to use the results as an input into a strategic decision-making process regarding the location of DHL's future activities. A multi-stakeholder perspective was explicitly pursued, as the decision to be taken would have a substantial impact on the economic and natural environment. The stakeholders identified below were in a position to influence substantially the achievement of the company's objectives.

The alternative strategies to be evaluated using a multi-actor MCA were: (1) a pan-European consolidation strategy with Brussels (Zaventem) airport as a super-hub, concentrating all European traffic at Brussels airport, whereby an environmental permit allowing for 35,000 night flights per year would be required, (2) a West-European expansion strategy with Brussels as one of the multi-hubs (requiring a permit for 25,000 night flights per year), i.e., with the continuous existence of capacity in other regional sub-hubs in Europe; and (3) the further development of DHL in an external super-hub, which implied the relocation of the DHL hub from Brussels International Airport to e.g., Leipzig in Germany and a downgrading of the Brussels airport to a spoke in the DHL network (requiring only 13,000 movements a year).

The stakeholders identified in this case study were: (1) the air freight carrier DHL; (2) the airport operator BIAC (Brussels International Airport Company); (3) the Belgian Government; and (4) the local community affected by the project. DHL was interested in criteria such as proximity to the market, market share growth and international logistics optimization. BIAC was interested in profitability, diversification of the traffic portfolio, high value-added activities, balanced growth and positioning of the airport. The government was interested in socio-economic criteria (value added, employment, regional competitiveness) and ecological objectives (health costs for government). The local community was interested in local employment and minimizing health impacts.

A prioritization of the three alternative strategies in terms of each separate stakeholder was performed through the MCA. The application of this methodology clearly highlighted the conflictual nature of the decision-making context, in particular regarding the role of the Belgian government. As regards the super-hub position, the ranking in terms of the local community's objectives turned out to be diametrically opposed to the ranking in terms of DHL's objectives. The final results of this study turned out to be highly sensitive, which means that changing the weights of the criteria (or changing the stakeholder perspective) resulted in a vastly different final ranking. An interesting conclusion was related to the introduction of different time horizons into the analysis. With a 2012 time horizon, the global preference[10] was for the multi-hub expansion, whereas a time horizon expanding to 2023 meant a shift of the global preference towards the super-hub choice. Such a shift was due to the capacity constraints faced by

[9] The abbreviation DHL stands for "Dalsey, Hillblom and Lynn", founders of the DHL company.

[10] In this case, the global preference was simply measured as the unweighted average preference of the various stakeholder groups considered.

DHL and BIAC in the short run that could be alleviated in the post-2012 period. On the basis of these findings it was concluded that the government had to provide a legal-institutional framework with a time horizon stretching to 2023 that could secure the long-term growth of DHL's activity (in terms of number of night flights allowed), especially after 2012. Without such a framework, the hub-activities of DHL would be relocated to another airport. In the short run, towards 2012, the MCA showed that Brussels airport had to be protected as a node in DHL's multi-hub network.

Another complication in this case was that "the government" in fact consisted of several layers of public agencies, namely the Belgian federal government, the governments of the Flemish and Brussels regions, the province and various municipalities. As it took too long to achieve a consensus among these different governments DHL finally decided to opt for the external super-hub choice in Leipzig.

When interpreting the DHL case through an institutional lens, as outlined in earlier sections of this paper, it becomes obvious that the absence of an adequate institutional framework was an essential factor in this case. The key problem regarding night flights in Europe is that the institutional framework (in particular as regards acceptable noise level standards) is not uniform across countries or regions within countries. Each country and region applies different standards. Such differences in standards are even used by some governments to attract airport activities to their region. Once again, this is an example (just like in the Iron Rhine case referred to in section 4) of the institutional framework influencing the performance of a company as well as the results that would be obtained by using neo-classical evaluation instruments such as private investment analysis (PIA) or social cost-benefit analysis (SCBA). On a more positive note, it should be emphasized that the institutional framework is subject to change, and that neo-classical concepts such as (changes in) marginal utility can influence the institutional equilibrium in the future. For instance, in the case of the DHL company, which relocated its main hub to Leipzig, the extra activity (and ensuing income and jobs) were very much welcomed by the local population and the government of that region, as income levels per capita are rather low there. However, as income levels rise in the Leipzig region in the future, it can be expected that the preferences of the local population and government may change. The marginal utility of a higher income will decrease (as income becomes less scarce), whereas the marginal utility of enjoying environmental amenities may increase (as these become more scarce). Here, changes measured in terms of neo-classical concepts (or instruments) also affect the broader institutional context.

6. Conclusions

We have shown that multi-criteria analysis (MCA), and in particular the multi-actor multi-criteria analysis can be usefully applied within an institutional approach to project evaluation. Stakeholders represent the linking pin between MCA as an evaluation tool and the institutional approach to project assessment. Institutional aspects are also present in the conventional, neo-classical approach to project evaluation, in particular when applying social cost-benefit analyses (SCBA), but only implicitly, so that they are usually neglected. In the MCA, however, institutional aspects are made explicit. This holds especially for the degree to which stakeholder preferences are conflicting or

converging. A well-designed implementation path (e.g., based on government incentives or a social marketing campaign) for alternatives characterized by diverging stakeholder priorities can increase the implementation potential of these alternatives. Indeed, stakeholder preferences are mostly dynamic and path-dependent. Hence, from an evolutionary perspective, the level of conflict may be lower in a second-round application of the MCA. In order to guarantee that the institutional approach, in particular the application of MCA, would lead to a social optimum that is distributionally neutral, state intervention is important. The latter should, *inter alia,* increase the bargaining power of weak actors. Only in such a case will a collective benefit or public good emerge (as a by-product) from the individual actions of self-interested stakeholders. We illustrated this stakeholder-driven, institutional approach through the use of some recent case-studies.

The more systematic application of a carefully designed, stakeholder-driven MCA as described in this contribution can improve substantially the quality of decision-making processes. Large transport projects associated with substantial conflicts in terms of diverging stakeholder objectives would greatly benefit from a more systematic application of such a method. Indeed, just as it is now a legal requirement to assess a project's impact on the natural environment, one could argue that it should be mandatory to assess its impact on stakeholder objectives. In the realm of environmental project effects, the tool of (strategic) environmental impact assessment (S)EIA aims to "create" more effective alternatives that provide a better fit with the natural environment. Stakeholder impact analysis could have a similar effect on the "environment" (or community) of stakeholders. By bringing together all stakeholders in a carefully designed forum, and through applying the method presented in this paper, it may become much easier to construct and implement solutions acceptable to the community of stakeholders, thereby creating value added for society as a whole.

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