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Public engagement in strategic transportation planning: An analytic hierarchy process based approach

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ABSTRACT

The aim of this paper is to investigate whether and how multiple-criteria decision analysis, based on the analytic hierarchy process (AHP) approach, may support the participatory process of the public in the whole transportation planning process, especially in strategic planning and at the initial stages during which planning options are drawn up and the public are rarely involved. The AHP makes it possible to consider the multiple objectives of decision makers and allows public engagement to be deliberative, participatory, dynamic and flexible, which is independent of planning options. The method was specified and calibrated starting from a specific stated preferences survey, and its parameters were calibrated with respect to two scenarios: without any transport options and with real transport options. Different criteria (accessibility, travel safety, comfort, environment, landscape), subcriteria and corresponding indicators (qualitative, quantitative and dichotomous) were considered, and reciprocal weights were calibrated. Finally, a real planning scenario was implemented. Calibration results gave interesting insights into the public desires and expectations, made it possible to rank the different chosen criteria and sub-criteria and to understand the biases between preferences stated with or without transport options. The method can be easily updated and can be easily transferred to any case study.

1. Introduction and motivations

The increase of environmental issues and constraints, the world-wide financial crisis and the numerous interactions of the transportation system with the social and economic contexts mean that strategic transportation planning is now more than ever a fundamental support to a rational and sustainable development of the territorial system and of the transportation system itself.

The transportation planning process may be simplified into three main macro-activities (Fig. 1): (a) definition of objectives, constraints, critical points and general strategies; (b) identification of the most effective planning option (strategies, policies and regulations); (c) realisation of the planning options. In all these macro-activities decision-makers need to be supported in order to rank/weight (i) the objectives to achieve, (ii) the strategies or the policies to carry out, (iii) the planning options, (iv) the priorities between different intervention options. If the identification of the best planning option is usually carried out through less or more consolidated evaluation techniques (multi-criteria/cost-benefit analysis/cost-effectiveness analysis), by contrast, the task related to objectives, strategies, policies and priorities is usually left to the decision-maker or to the analysts experience; whereas public collectivity and/or the stakeholders are predominantly involved (PI) when the options have been already defined and/or must be realized (PI_1, PI_2). Therefore, the public plays a negligible role and whose feedback (FB) is usually limited to minimal modifications (FB_1) and/or to favour the realisation of the projects (FB_2). In this case, ideological/political positions, and/or the corresponding ideological/political scales of importance, might prevail over public needs and/or over public perceptions.

Following such an approach, one main risk may occur: the planning options may not be coherent with the needs/desires of all of the involved subjects.

The consequences are straightforward: the public (part of) and/or the stakeholders do not feel represented by the decision-maker, they do not feel part of the decision process, and they might be averse to the planning solutions. Furthermore, the decision maker has to identify and evaluate new and different planning options. By contrast, considering the public from the beginning of the process may help to better understand the needs of those people for whom the planning process is carried out and it may help to build coherent planning options. Furthermore, it may help to render the final options more acceptable since they have been determined by the public's needs, and it may help to simplify the actualisation of the planning process itself since public needs have

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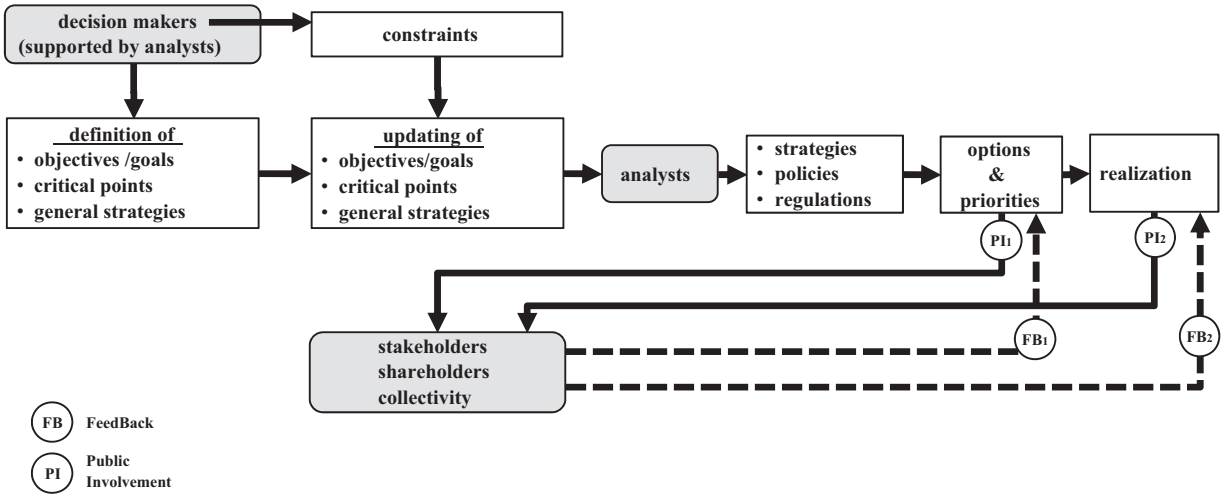

Fig. 1. The planning process and typical (yet not usual) public involvement feedbacks.

been preliminary quantified and have driven the entire decisional process.

In such a context, subjects directly or indirectly involved – the public, but also the stakeholders – should be engaged and should give their feedback from the beginning of the planning process and throughout the entire process.

Public engagement is widely interpreted as involvement in decision-making with the purpose of influencing the choices being made (O'Faircheallaigh, 2010). Nevertheless, although the use of partnership between government agencies and the public has been encouraged by Agenda 21 since 1992 and the European Union has been recommending constant and continuous dialogue with all relevant stakeholders since 2005, public engagement in transportation planning cannot yet be considered a consolidated, successful and fully shared practice in any stage of the transportation planning process (Bickerstaff et al., 2002; Innes and Booher, 2004; Bartholomew, 2007; Banister, 2008; Gil et al., 2011; Ibeas et al., 2011; Quick and Zhao, 2011).

Against this background, there emerges the need for quantitative methods to support engagement of the general public in the initial stage of the planning process and to drive the entire process towards shared visions and shared solutions. In this context, several aspects seem worthy of interest: how to engage the public in the early stage of the planning process; how to be easily comprehended; how to provide quantitative, solid and well-documented input to the planning process; how to make the process dynamic and flexible (easy to update) and independent of any specific (predetermined) planning option.

In this paper an approach to support public engagement in all the above cited aspects is proposed. We specified and calibrated a multiple criteria decision analysis (MCDA) approach based on the analytic hierarchy process (AHP) framework (Saaty, 1980) that could be used to measure and include the public's perceptions and wishes in several stages of the strategic planning process. The AHP method may allow public engagement to be deliberative, participatory, dynamic and flexible, methodologically sound, and independent of the planning option concerned.

The main aim of the paper was to investigate the operational and the methodological feasibility of the AHP method to measure desires, needs and perceptions of the public in order to support public engagement.

The AHP has typically been applied to the evaluation of transport projects (Vaidya and Kumar, 2006; Sipahi and Timor, 2010) rather than to the evaluation and identification of the public viewpoints regarding transportation planning policies and/or general planning strategies. In this sense, no similar contributions exist in literature for supporting the transportation planning process. Moreover, unlike the typical implementation of the AHP method, which uses weight values exogenously defined by the analysts (or estimated in the presence of a small group of experts), the paper proposes an endogenous estimation. In fact, the AHP was implemented at group level, rather than at individual level, and this is an increasingly interesting research field and still an interesting open issue (Bernasconi et al., 2013). Finally, though the AHP method is a consolidated method, different methodological insights are proposed and may be extended to any case study. Besides, the case study was founded on a number of observations which are not usual in the application of AHP to group-decision problems, and besides.

AHP implementation consisted in the previous definition of a hierarchical architecture made up of general criteria and general sub-criteria (indicators), then in the estimation of criteria and sub-criteria reciprocal weights from two different ad-hoc surveys carried out in the province of Salerno, southern Italy (4917 kmq, 1109,705 residents). Both surveys consisted in pairwise comparisons among the previously identified criteria and sub-criteria. The first survey (250 respondents) was based on stated preferences independently of real transport options; in the second survey (250 respondents), respondents tackled the same pairwise comparisons but they were introduced to a set of real transport options defined beforehand (as in common practice). The weights obtained, other than allowing a quantitative interpretation of public needs and perceptions, were compared in order to understand if (and how much) results might be biased if transport options are previously proposed to the respondents or if respondents are aware of the potential options. Though logical when different real options must be evaluated, such an approach can affect user perceptions and relative weighting when no option has yet been defined. In particular, the aim was twofold: (i) to understand if weights calibrated "with planning options" could be used for supporting Public Engagement in the initial stages of the planning process; (ii) if weights calibrated "without planning options" could be used for preliminary evaluation analysis in the final stage of the planning process.

Finally, an application was implemented in order to compare the ranking among the transport options obtainable by applying each set of weights (with and without options) to a real case study. The comparison should be interpreted as a sort of validation of the methodology. As a matter of fact, it made it possible to comprehend if similar ranks are obtained, thus if the AHP architecture calibrated without transport options can also be used to support preliminary evaluations on realistic, but not yet well defined, options.