Multi-criteria decision analysis for use in transport decision making

1 Introduction

The most common methodology applied so far to the evaluation of transport systems has been conventional cost-benefit analysis (CBA) (Janic, 2003), which supported by traffic- and impact model calculations provides the decision-makers with a monetary assessment of the project’s feasibility. A socioeconomic analysis is in this respect a further development of the traditional CBA capturing the economic value of social benefits by translating social objectives into financial measures of benefits (Wright et al., 2009). Internationally seen there has been a growing awareness over the recent years that besides the social costs and benefits associated with transport other impacts that are more difficult to monetise should also have influence on the decision making process. This is in many developed countries realised in the transport planning, which takes into account a wide range of impacts of also a strategic character (van Exel et al., 2002). Accordingly, appraisal methodologies are undergoing substantial changes in order to deal with the developments (Vickerman, 2000) that are varying from country to country and leading to different approaches (Banister and Berechman, 2000). It is, however, commonly agreed that the final decision making concerning transport infrastructure projects in many cases will depend on other aspects besides the monetary ones assessed in a socio-economic analysis. Nevertheless, an assessment framework such as the Danish one (DMT, 2003) does not provide any specific guidelines on how to include the strategic impacts; it merely suggests describing the impacts verbally and keeping them in mind during the decision process.

A coherent, well-structured, flexible, straight forward evaluation method, taking into account all the requirements of a transport infrastructure project is for this reason required. An appropriate ex-ante evaluation method for such projects can be based on multi-criteria decision analysis (MCDA) (Tsamboulas, 2007; Vreeker et al. 2002), which in most cases can be combined with a CBA (Leleur, 2000). Scanning the literature (Belton and Stewart, 2002; Goodwin and Wright, 2009; Keeney and Raiffa, 1993; von Winterfeldt and Edwards, 1986) it is found that the use of MCDA in the decision process usually provides some or all of the following features:

1. Improvement of the satisfaction with the decision process
2. Improvement of the quality of the decision itself
3. Increased productivity of the decision-makers

MCDA can in this respect be seen as a tool for appraisal of different alternatives, when several points of view and priorities are taken into account to produce a common output. Hence, it is very useful during the formulation of a decision support system (DSS) designed to deal with complex issues. The literature on DSS is extensive, providing a sound basis for the methodologies employed and the mathematics involved. Moreover, there are numerous systems covering several disciplines, policy contexts and users’ needs for specific application environments (Janic, 2003; Salling et al., 2007; Tsamboulas and Mikroudis, 2006). The use of DSS for solving MCDA problems has among others been treated by Barfod (2012), Chen et al. (2008) and Larichev et al. (2002), where it is shown that a DSS can effectively support a decision making process making use of appropriate MCDA methodologies.

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