

Enhancing Stakeholder Participation in Urban Mobility Planning: the NISTO Evaluation Framework

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1 ABSTRACT

Public participation and stakeholder involvement have become core prerequisites of a comprehensive and fair transport planning process. In this paper, we show how the multi-actor multi-criteria analysis (MAMCA) methodology can enhance urban and regional mobility planning and decision-making by considering conflicting stakeholder objectives and helping to identify synergies and disagreement between different stakeholder groups. We suggest the application of MAMCA as part of the NISTO evaluation framework that offers tools to appraise small-scale mobility projects through a toolkit of multi-criteria analysis, MAMCA and target monitoring. MAMCA provides a tool to appraise the preferences of the stakeholders involved or affected by a project. It is based on assessing the evaluation criteria of the different stakeholder groups rather than appraising the project based on a set of common criteria agreed on with all stakeholders at the beginning of the process. Therefore the evaluation shows which implementation alternatives or scenarios each group would prefer and allows for a straightforward comparison of preferences across all stakeholder groups. The application of the MAMCA is demonstrated through the initial results of the evaluation of five demonstration projects in North-West Europe. We show that MAMCA is suitable for a range of mobility projects since it can handle the diversity of stakeholder groups and their objectives. In addition it offers the practitioner a well-structured way of carrying out the whole evaluation process. The application of MAMCA also has the added value of broadening the evaluation process to a wide range of stakeholders instead of limiting it to experts. As opposed to previous approaches, the MAMCA methodology aims to provide a balanced evaluation process where the stakeholders have equal weight, i.e. no priority is given to decision makers, users groups or experts. Our analysis of the process of the identification of stakeholders and their objectives also suggests that there is no generic recipe for the range of stakeholders to be involved in different projects, their objectives and the data that needs to be collected for the evaluation. The MAMCA methodology will be offered to practitioners as a simple-to-use web-based software tool that can collect stakeholder objectives and weights, as well as the input of experts and monitoring data for the evaluation of the alternatives and display the outcome on graphs. Therefore we hope that the tool will improve participation in urban decision-making and evaluation through the better integration of diverse stakeholder preferences.

2 INTRODUCTION

Public participation and stakeholder involvement have become core prerequisites of a comprehensive and fair urban transport planning process. A shift towards participative planning and evaluation has been detected, with stakeholders integrated into different stages of the decision-making process (Booth and Richardson 2001). The latest Urban Mobility Package of the European Commission states that Sustainable Urban Mobility Plans (SUMP) should promote citizen and stakeholder engagement, as urban mobility is about the people that live and work in cities (European Commission 2013).

Current guidance documents offer a range of tools to practitioners to involve stakeholders in various stages of the planning process including evaluation and monitoring. These tools (e.g. newsletters, web based forums, focus groups, workshops), however, only offer generic participatory instruments and no concrete techniques and methodologies are offered for a pragmatic approach to involve stakeholders in ex-ante appraisal and ex-post evaluation.

The NISTO (New Integrated Smart Transport Options) project aims to develop an evaluation framework and toolkit for small-scale mobility projects. The evaluation framework is based on the principles of sustainability, enhanced stakeholder participation and ease of use.

A combination of multi-criteria decision analysis techniques and participatory methods have been shown to be particularly well-suited for the involvement of stakeholders (Macharis, de Witte, and Ampe 2009). The

MAMCA methodology developed by Macharis (2000; Macharis, Verbeke, and De Brucker 2004) combines traditional multi-criteria decision aid (MCDA) techniques with explicit stakeholder participation. It allows for the consideration of conflicting stakeholder objectives as well as tangible and intangible evaluation criteria.

The objective of this paper is to present how the NISTO framework integrates stakeholders into the evaluation process through the multi-actor multi-criteria analysis (MAMCA) methodology. The next sections briefly introduce the NISTO evaluation framework, present the MAMCA methodology and its application on the NISTO demonstration projects. Since the project is still ongoing it is only possible to show the results of the identification of stakeholders, their objectives and criteria as well as the weighting. The results of the evaluation of the alternatives will be available in the second half of 2015.

2.1 The NISTO project

NISTO is a collaboration between academic institutions (Vrije Universiteit Brussel, Belgium; Cardiff University, UK; NHTV – Breda, the Netherlands), as well as regional and local stakeholders in mobility planning (Boulogne Développement – Boulogne-sur-Mer, France; MOBIEL21 – Leuven, Belgium; Regionalmanagement Nordhessen – Kassel, Germany; CENTRO – Birmingham, UK). The project partners are developing an appraisal and evaluation framework for small-scale urban and regional mobility projects. It is being tested on five demonstration projects, which reflect a wide variety of mobility-related projects from across North-Western Europe: intelligent information provision for transport users in Wolverhampton (UK), a bicycle rental scheme in Boulogne-sur-Mer (France), improving cycling connections in Noord-Brabant (the Netherlands), mapping and influencing travel behaviour through a smartphone app in Leuven (Belgium) and an integrated tourist ticket in Kassel (Germany).

2.2 The NISTO evaluation framework and toolkit

It is intended that the NISTO framework will be used by a wide range of professionals (including transport planners, policy and strategy developers), therefore it combines tools that are already known to the potential users. At the same time the framework also goes beyond the state of the art by extending stakeholder involvement and enhancing evaluation through the application of the combination of these tools. The framework also intends to adapt these tools or the combination thereof to urban mobility projects, by developing a set of evaluation criteria and indicators specific to urban and regional mobility and involving the stakeholders that are relevant for this theme.

The NISTO framework is composed of two main elements:

- (1) A set of evaluation tools to assess projects based on the general NISTO objectives of smart and sustainable urban transport, and
- (2) A set of criteria and indicators, including:
 - (a) a set of predefined core criteria and indicators that are used to assess project sustainability; and
 - (b) a set of optional criteria and indicators that reflect local project characteristics and are used in the evaluation based on stakeholder preferences.

NISTO includes four evaluation tools (Fig. 1)

- (1) Assessment of sustainability by multi-criteria decision analysis.
- (2) Assessment of stakeholder preferences by multi-actor multi-criteria analysis.
- (3) Assessment of policy achievement by monitoring project targets.

3 A STRUCTURED AND PRAGMATIC APPROACH TO STAKEHOLDER PARTICIPATION

3.1 The MAMCA methodology

To enable the structured participation of a wide range of stakeholders in the evaluation (e.g. citizens, transport users, different levels of governments, transport operators, local businesses etc.) we propose the application of the multi-actor multi-criteria analysis (MAMCA) in the NISTO framework. MAMCA allows the consideration of conflicting stakeholder objectives and helps to identify synergies and disagreement between different stakeholder groups (Macharis, Verbeke, and De Brucker 2004). It is based on assessing the

evaluation criteria of the different stakeholder groups rather than appraising the project based on a set of criteria agreed on with all stakeholders at the beginning of the process. Therefore the evaluation shows which implementation alternatives or scenarios each group would prefer and allows for a straightforward comparison of preferences across all stakeholder groups.

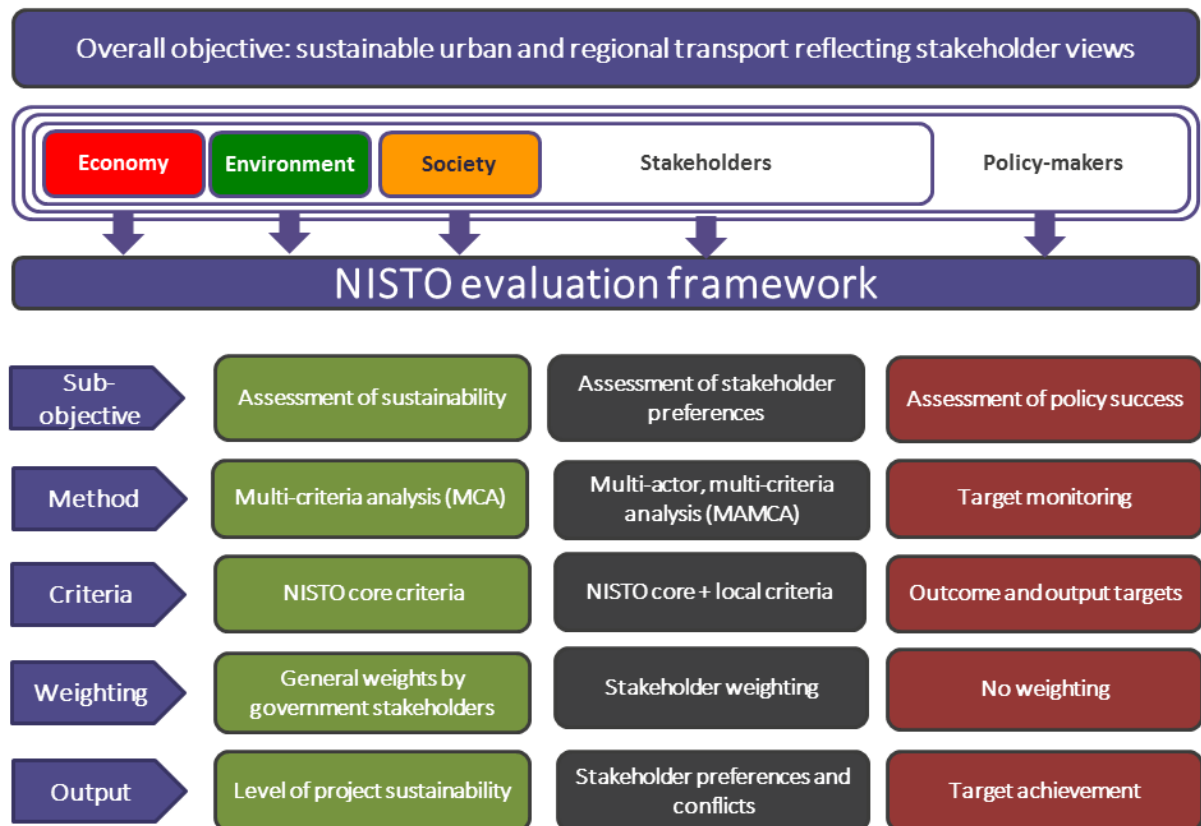


Fig. 1: The NISTO evaluation framework

The MAMCA methodology has seven steps as shown in Fig. 2. First, the alternatives that are to be evaluated are defined by consulting relevant decision-makers or experts with knowledge of the problem. Then the stakeholders and their objectives are identified by the decision analyst. At this stage stakeholders may provide additional ideas for the alternatives. In the third step, evaluation criteria based on the stakeholder objectives are identified for each stakeholder group with direct involvement of the stakeholders. Next the stakeholders are asked to weight the relative importance of their criteria. In the fourth step, criteria are operationalised by the decision analyst through indicators that provide a way to measure the contribution of each alternative to the stakeholder criteria. In the fifth step, alternatives are evaluated by experts and an evaluation matrix is constructed; the contribution of each alternative to the objectives of the stakeholders is also aggregated. In the sixth step, alternatives are ranked for each stakeholder group based on the evaluations. The last step is the implementation of the project, taking into account the views of the stakeholders, which potentially provides a feedback loop to the definition of alternatives (see the first step) (Macharis, de Witte, and Ampe 2009).

3.2 The MAMCA in NISTO

3.2.1 Identification of stakeholder groups

Initially, we identified relevant stakeholder groups for urban mobility planning based on a review of 14 guideline documents for stakeholder consultation as well as scientific papers. The following main groups have been identified: government, the public and citizens, transport operators, businesses (e.g. retail and offices) and transport users.

Then we investigated how these groups can be assigned to each demonstration project. As generic groups did not provide sufficient coverage of the stakeholders involved or they provided too general categories of stakeholders, new groups were added and some of the above categories were subdivided depending on the characteristics of the projects (transport modes affected, spatial extent, target groups etc.).

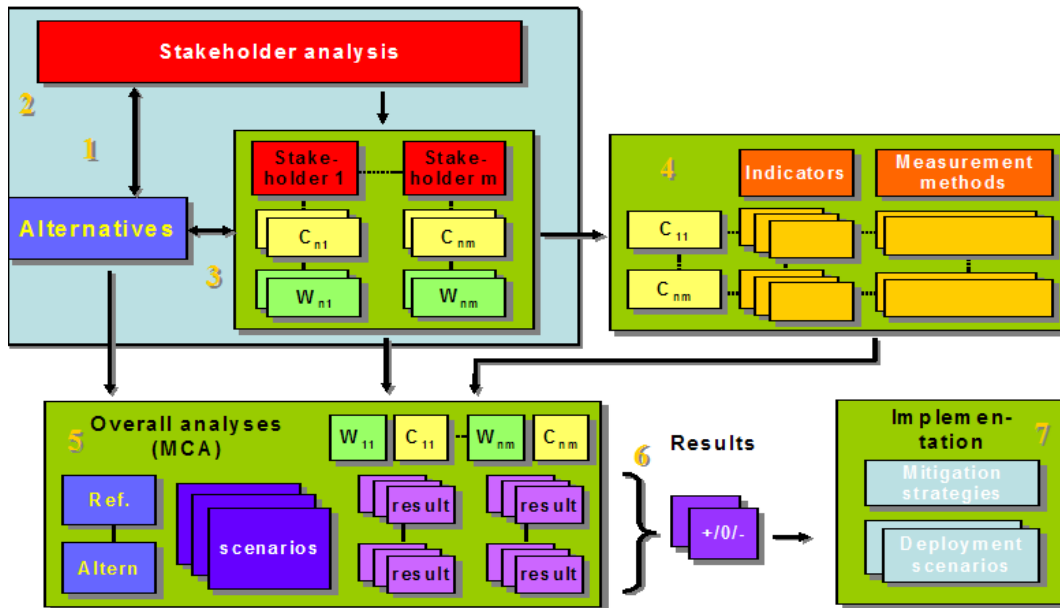


Fig. 2: The steps of the MAMCA (Macharis, Verbeke, and De Brucker 2004)

Table 1 presents the stakeholder groups identified for each demonstration project. The initially identified five groups were expanded with tourists in Boulogne where the project specifically aims to promote the use of bicycles (Boulogne) by them. Also experts were added as an additional category in Leuven since the project’s secondary objectives is to provide travel data collected by smartphones for transport planning. Employees were consulted in Boulogne and Wolverhampton since the project aims to decrease local unemployment by providing jobs to young people in Boulogne and the public transport improvements target employees of a large employment site in Wolverhampton. The diversity of stakeholder groups demonstrates that the identification of stakeholders need to consider the project objectives and the groups that are most affected by the project. Therefore generic categories have to be reviewed to adapt the consultation process to local circumstances.

3.2.2 Definition of stakeholder objectives and criteria

Objectives are derived from the goals of the project. They are short-term actions to be taken in order to achieve long-term goals (Dziekani et al. 2013). Therefore objectives need to be closely related to the expected output and outcome of the project. They should be clear, concise and achievable (Kaparias and Bell 2011). In traditional multi-criteria analysis the stakeholders agree on a set of common objectives at the beginning of the evaluation. In MAMCA, however, the often diverse objectives of the stakeholder groups are preserved and used throughout the evaluation process.

In order to ease the selection of objectives a list of the most important potential objectives of urban mobility projects have been compiled based on the review of relevant literature:

- Support a competitive economy
- Improve cost-effectiveness of transport
- Provide access to key destinations and services
- Reduce air pollution
- Reduce noise pollution

Stakeholder group	Wolverhampton	Boulogne	Nord-Hessen	Noord-Brabant	Leuven
Tourists					
Local tourism organisations					
Employees at the demonstration site					
Local residents					
Local and regional government					
Local businesses (shops, hotels, leisure facilities, restaurants)					
Other businesses (businesses in the vicinity of the demonstration site)					
Public transport operators					
Public transport authority					
Public transport users					
Experts					
Citizens (users of the smartphone app)					

Table 1: Stakeholder groups identified for the NISTO demonstration projects

- Reduce greenhouse gas emissions
- Reduce energy consumption
- Enhance the quality of the urban environment
- Promote equity (fairness and affordability)
- Improve safety
- Improve security
- Improve public health

These objectives were then translated into criteria and they were grouped under the three pillars of sustainability (Table 2). In a traditional multi-criteria analysis, criteria reflect the potential impacts of an alternative. In the MAMCA methodology, however, criteria indicate the objectives of the stakeholders (Macharis, de Witte, and Ampe 2009).

Economy	Environment	Society
Economic activity	Land consumption	Safety
Cost effectiveness	Greenhouse gas emissions	Security
Reliability and travel time	Air quality	Health of citizens
Public funding of transport	Resource use	Liveability
	Noise	Equity
		Socio-political acceptance
		Accessibility for people with special needs

Table 2: The general NISTO criteria grouped under the three pillars of sustainability

Stakeholders were invited to select their objectives from the predefined list and also to propose additional objectives that they could not find in the list. We then consolidated the list of objectives and criteria in order to avoid any overlaps between them and also to ensure that they relate to the outcome (e.g. improve liveability in the city centre) of the project rather than outputs (e.g. reduction of car traffic in the city centre).

Each stakeholder group chose 4-6 objectives. We demonstrate the diversity of the evaluation criteria of the stakeholder groups in Table 3, where criteria identified for the governmental stakeholders in each demonstration project are summarised. Seven of the criteria have been selected from the NISTO criteria list (Table 2), while additional criteria were added for quality of data for transport planning in Leuven and for parking problems in Boulogne. Within the seven NISTO criteria the focus of the various governmental stakeholders was also different. Air pollution, socio-political acceptance were applied in four out of five demonstrations, equity, economic activity, efficient public funding of transport and greenhouse gas emissions were used at two demonstration sites respectively.

Criteria	Wolverhampton	Boulogne	Nord-Hessen	Noord-Brabant	Leuven
Economic activity					
Public funding of transport					
Greenhouse gas emissions					
Air quality					
Health of citizens					
Equity					
Socio-political acceptance					
Improve quality of data for transport planning					
Reduce problems due to the lack of parking spaces					

Table 3: Evaluation criteria of the government stakeholder groups for each NISTO demonstration project

3.2.3 Criteria weighting

In the MAMCA methodology, stakeholders are given the opportunity to express their preferences concerning the relative importance of their evaluation criteria. This is facilitated by eliciting weights to each criteria by each stakeholder group (Macharis, de Witte, and Ampe 2009). In the NISTO project we used The Analytic Hierarchy Process (AHP) to elicit the weights, since it offers an easy-to-understand method. Stakeholders compare two criteria at a time and give their relative preference between the two criteria using a 5-point scale (Table 4). Stakeholders were asked which of the two criteria is more important for them with respect to the demonstration project. Then they chose the appropriate rating on a scale that ranges from ‘equal importance’ of the two criteria to ‘extreme importance’ of just one of the criteria. The demonstration partners organised local workshops or meetings with stakeholders in order to discuss the weights and carry out the weight elicitation.

Equal importance	Crit. A					x					Crit. B
Criterion A is very important, criterion B is unimportant	Crit. A	x									Crit. B
Criterion A is slightly more important than criterion B	Crit. A			x							Crit. B

Table 4: Example of the AHP method to elicit weights for two criteria

The weights elicited by each member of a stakeholder group have been aggregated by weighted geometric mean. The weights express the importance attached by the stakeholders to their own criteria. We demonstrate the outcome of the weighting procedure with the NISTO demonstration in Nord-Hessen, Germany, where an integrated tourist ticket is being trialled. Hotel guests who book a special offer of the hotels receive the Meine Card + that provides free access to leisure facilities and free public transport in the region around Kassel. 40 stakeholders in the region were asked in a survey to weight their criteria. The aggregated results are shown in Figure 3. The weights express the different priorities of hotel owners and leisure facilities. While leisure facilities expect a higher number of visits (weight 0.44), hotels gave a high weight to longer stay of the guests (e.g. higher number of nights) (weight: 0.34). Gaining new target groups through the MCP card came as second for both stakeholder groups (weight 0.27). The criteria of these two stakeholder groups also demonstrate that transport planning and evaluation often requires an interdisciplinary approach since the objectives of some stakeholders are not directly related to transport. Hotel owners and leisure facilities are primarily interested in increasing the number of guests or the length of their stay in order to increase revenues and they do not have any transport related objectives.

For the public transport authority the most important criteria (weight 0.51) is to increase equity, i.e. the accessibility of rural areas and affordability of public transport. Interestingly, cost efficiency only comes as second (weight: 0.26). The reason for this is probably that the weighting was carried out by the representative of the regional transport association (Nordhessischer Verkehrsverbund) and not by a transport operator. The tourism organisation attached the highest weight to equity, in the sense of making tourism and travel affordable in the region (weight 0.49). On a similar note better accessibility of attractions by public transport was given a relatively high weight (0.25).

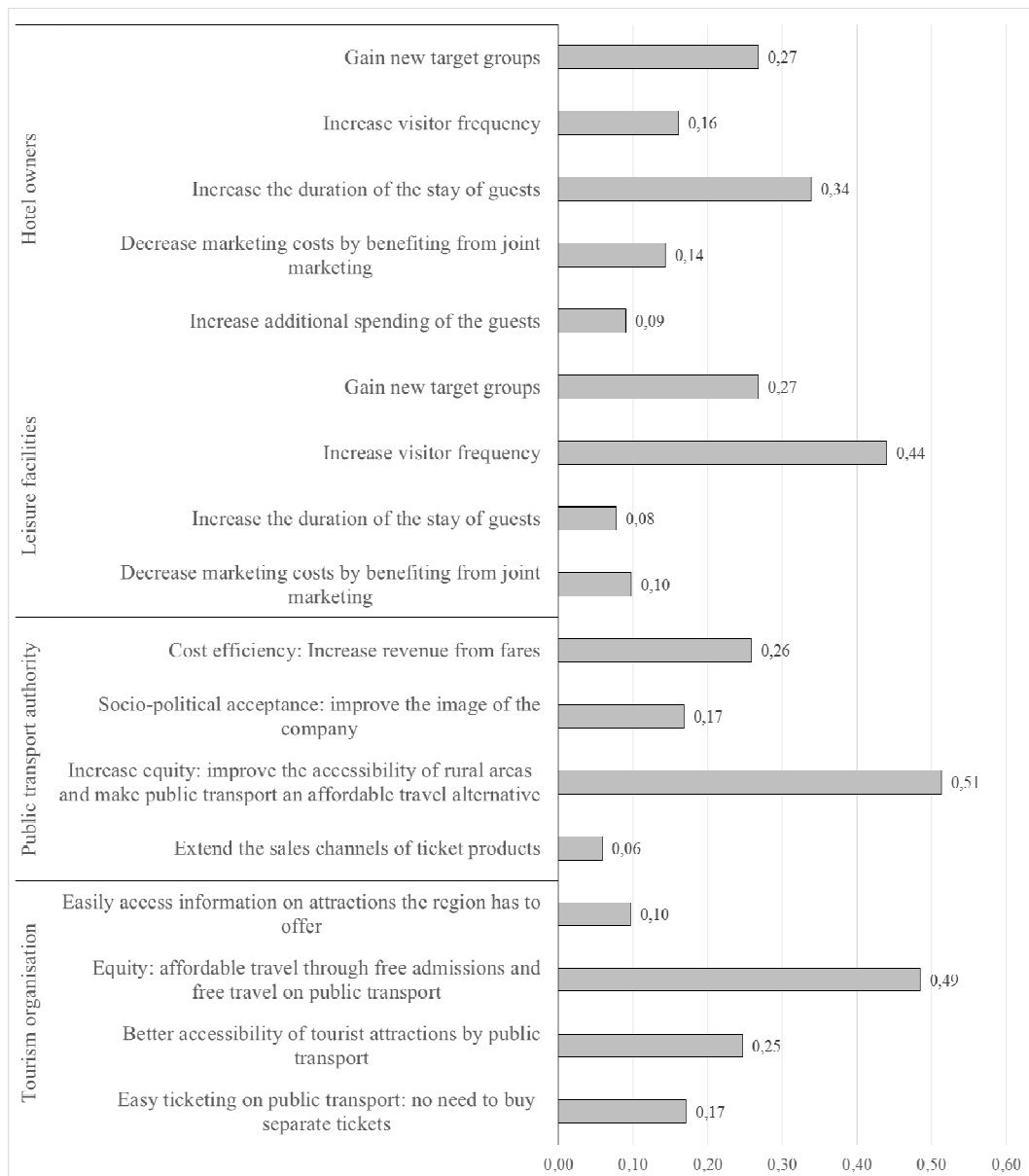


Fig. 3: Scores of the weights per stakeholder (the weights for the government stakeholders are still being collected)

3.2.4 Definition of indicators

Indicators are used to measure the performance of each alternative on each criterion. One or more indicators can be linked to each criterion. Both qualitative and quantitative indicators are possible. Quantitative indicators (e.g. number of accidents, noise emission) are based on measurement or modelling, while qualitative ones (e.g. equity, socio-political acceptance) are outcomes of qualitative surveys or expert evaluation. The measurement method for each indicator is also defined in this step (Macharis, de Witte, and Ampe 2009).

For criteria that are included in the NISTO criteria list, indicators have been pre-defined based on a review of best practice of evaluation of 19 urban mobility projects from North-West Europe. For any new criteria proposed by a stakeholder in addition to those included in the NISTO criteria list the appropriate indicators have been defined in a data collection plan based on a discussion with the project partners about the feasibility of data collection and the budget available.

3.2.5 Evaluation of alternatives

In the further stages of the evaluation the project alternatives will be evaluated on the criteria of the stakeholders based on data we are collecting at each demonstration location. The evaluation is based on the comparison of baseline data on the indicator (e.g. level of air pollution before the implementation of the project) with either the forecast data on the same indicator (in case of ex-ante appraisal) or actual

measurements (in case of ex-post evaluation). The performance of the alternatives will be assessed through pairwise comparisons or direct rating depending on the availability of data from the demonstration sites (Macharis, Turcksin, and Lebeau 2012). This step will be carried out by experts who have extensive knowledge of the specific field or problem.

3.2.6 Overall analysis

In this step, an evaluation matrix is constructed that aggregates the weights assigned by the stakeholders to each criterion and the scores of the scenarios from the previous step. Several MCDA methods can be used for the overall analysis. In the NISTO framework we apply the PROMETHEE method to construct the evaluation matrix (Brans 1982) since it avoids trade-offs between scores and simplifies the evaluation procedure (Macharis et al. 2004).

This analysis produces a ranking of the scenarios for each stakeholder group displayed on the multi-actor view, which shows which scenarios are supported or opposed by a particular stakeholder group (Macharis 2007; Macharis 2004). It highlights the strong and weak points of each scenario and indicates the potential points of conflict or synergies. In addition, the strengths and weaknesses of each alternative or scenario are also indicated for each stakeholder group. Based on this information it is easier for the decision-maker to find consensus or revise the original project alternatives. The stability of the ranking is assessed by sensitivity analysis in order to see if the results change when the weights are modified.

Since the evaluation of the alternatives will only be carried out at a later stage of the project Fig. 4 shows an example of the multi-actor view from a previous case study where four scenarios to improve sustainable mobility in the city centre of Leuven, Belgium were appraised. The horizontal axis represents the stakeholder groups involved while the vertical one displays their preference scores. The coloured lines represent the scenarios. The graph shows that car users as well as retail and businesses have significantly different preferences compared to the other stakeholders. Therefore while the car-free city centre scenario is preferred by the most stakeholder groups it does not offer the highest level of consensus since it scored as the least favourable scenario for car drivers. Smart road user charging appears to be a better solution since it was chosen as a second best alternative by most stakeholders.

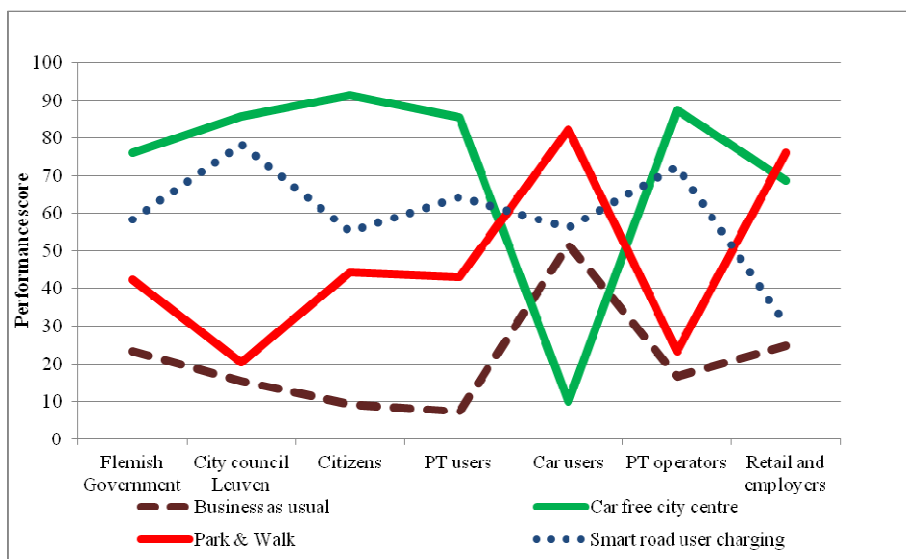


Fig. 4: Multi-stakeholder view of MAMCA

4 CONCLUSION

The MAMCA methodology integrated into the NISTO evaluation framework presented in this paper offers a structured methodology to appraise urban and regional mobility projects based on the objectives of stakeholders and by collecting data for project-specific indicators. Since urban and regional mobility projects have a wide range of stakeholders who have diverse objectives, MAMCA provides a methodology that takes all these different interests into consideration instead of relying primarily on the evaluation of experts. As opposed to previous approaches, the MAMCA methodology aims to provide a balanced evaluation process where the stakeholders have equal weight, i.e. no priority is given to decision makers, users groups or

experts. As we showed through our demonstration projects, the methodology can easily be adapted to the specific requirements of projects in terms of range of stakeholders involved, diverse stakeholder objectives and criteria and availability of qualitative and quantitative data for monitoring.

On the one hand the methodology can show how the different stakeholder groups view the importance of their objectives through the weighting procedure. This step highlights which criteria are the most significant ones for the stakeholder groups. In the further stages of the evaluation, the overall analysis will highlight similarities and differences in the preferences of the stakeholders based on the monitoring of indicators and evaluation of experts.

Our analysis of the process of the identification of stakeholders and their objectives also suggested that there is no generic recipe for the range of stakeholders to be involved in different projects, their objectives and the data that needs to be collected for the evaluation.

In the next stage of the research, the ex-post evaluation of the performance of the alternatives identified for each demonstration project will be carried out based on the data that is currently being collected at each partner location. The results of the evaluation will provide guidance to decision makers for the further development of the NISTO demonstrations and similar mobility projects. The results of the MAMCA will be compared to the outcome of the sustainability assessment (MCA) in order to highlight possible differences and synergies between the different evaluation methods. At the same time we hope to be able to give recommendations concerning the application of each method to small-scale mobility projects.

The MAMCA framework will be offered to practitioners as a simple-to-use web-based software tool that can interactively collect stakeholder objectives and weights, as well as the input of experts and monitoring data for the evaluation of the alternatives and display the outcome on graphs. We hope that the tool will improve participation in urban decision-making and evaluation through the better integration of diverse stakeholder preferences.

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