



LEARNING LOOPS IN THE PUBLIC REALM

WP3. Co-creation framework and platform

T3.3. Linking co-design with evaluation

Deliverable D3.3

INTEGRATING EVALUATION TOOLS IN THE LOOPER PLATFORM

Version: 1.0

Date: 31 October 2018

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The project is supported by the Brussels Capital Region – Innoviris (Belgium), Ministero dell'Istruzione dell'Università e della Ricerca (MIUR) (Italy), the Economic and Social Research Council (UK) and the European Union.

EXECUTIVE SUMMARY

These guidelines on integrating evaluation tools in the LOOPER platform are a deliverable within LOOPER (Learning Loops in the Public Realm), a JPI Europe funded research project with Living Labs in Brussels, Manchester and Verona. The aim of this project is to build a participatory co-creation methodology and platform to demonstrate 'learning loops', bringing together citizens, stakeholders and policy-makers to iteratively learn how to address urban challenges such as road safety, traffic calming, air and noise pollution.

This deliverable provides guidelines to introduce formal evaluation methods i.e. multi-criteria analysis (MCA) and multi-actor multi-criteria analysis (MAMCA) into the co-creation process. MCA is used to define how sustainable (in an economic, environmental and social sense) the co-created ideas are, the MAMCA shows the stakeholder support for the different ideas. Using evaluation techniques can make stakeholder preferences more explicit, which could positively impact reaching consensus between stakeholders and lead to the implementation of a co-created idea with the highest level of support from the various stakeholders. This deliverable introduces the two evaluation methods, explains how these methods are applied in the co-creation process in LOOPER, and provides practical guidelines to carry out the analysis with the help of the online MAMCA software.

DOCUMENT CHANGE RECORD

Version	Date	Status	Author	Description
0.1	14/08/2018	Draft	Jesse Pappers (VUB-MOBI)	Draft for internal review
0.2	31/08/2018	Draft	Jesse Pappers (VUB-MOBI); Imre Keserü (VUB-MOBI); Cathy Macharis (VUB-MOBI)	Draft for internal review
0.3	07/09/2018	Draft	Jesse Pappers (VUB-MOBI); Imre Keserü (VUB-MOBI); Cathy Macharis (VUB-MOBI)	Draft for internal review
0.4	18/09/2018	Draft	Jesse Pappers (VUB-MOBI); Imre Keserü (VUB-MOBI); Cathy Macharis (VUB-MOBI)	Draft for internal review
0.5	21/09/2018	Draft	Jesse Pappers (VUB-MOBI); Imre Keserü (VUB-MOBI); Cathy Macharis (VUB-MOBI)	Draft for internal review
0.6	27/09/2018	Draft	Jesse Pappers (VUB-MOBI); Imre Keserü (VUB-MOBI); Cathy Macharis (VUB-MOBI)	Draft for consortium review
1.0	31/10/2018	Final	Jesse Pappers (VUB-MOBI); Imre Keserü (VUB-MOBI); Cathy Macharis (VUB-MOBI)	Final version

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1. INTRODUCTION

This deliverable specifies how multi-criteria analysis (MCA) and multi-actor multi-criteria analysis (MAMCA) can be integrated into the LOOPER co-creation process. Both are methods used to ascertain the optimal alternative among a range of alternatives by using criteria to compare scores. Whereas MCA shows how sustainable (in an economic, environmental and social sense) the co-created ideas are, MAMCA gives an overview of stakeholder support for each idea. Together, these two methodologies facilitate reaching consensus between the different stakeholders on a co-created idea that is both sustainable and has support from (most) stakeholders.

This deliverable is part of LOOPER work package 3 'co-creation framework and platform' and corresponds to task 3.3 'linking co-design with evaluation'. Other deliverables that this document links to are deliverable 4.2 'report on the framework for monitoring and evaluation of the urban living labs' and deliverable 3.1 'guidelines for the co-design of alternative solutions'.

This document is structured as follows. In the next section, MCA, and MAMCA are explained. This section also includes relevant examples of MCA and MAMCA. Section 3 then explains how MCA and MAMCA are integrated into LOOPER. This is followed by section 4, which provides practical guidelines to use the MAMCA software programme. The key points of this deliverable are summarised in the conclusion. The appendices provide Living Lab coordinators with practical tools to use and evaluate formal evaluation methods.

2. LITERATURE REVIEW

2.1. Project Appraisal Techniques

Policy or project appraisal techniques allow decision-makers to choose the optimal among a range of alternatives. The method used depends on the type of the policy or project, as well as the approach to decision making. In cases where experts set objectives (plan-led decision-making) or where stakeholders are involved in all stages of the decision-making process (consensus-led decision-making), project appraisal techniques can be useful tools to solve problems or reach consensus (May, 2005). Cost-benefit analysis (CBA), cost-effectiveness analysis (CEA), and multi-criteria analysis (MCA) or multi-criteria decision analysis (MCDA) are often used methods to appraise transport policy or projects (Browne & Ryan, 2011).

2.1.1. Cost-Benefit and Cost-Effectiveness Analysis

In a CBA, the economic costs and benefits of alternatives are compared in order to ascertain which is most effective. Social cost-benefit analysis (SCBA) is a variation of CBA where social and ecological costs and benefits are included into the calculation. This method also requires the quantification of the social and ecological costs, which can be difficult and sometimes impossible. Cost-effectiveness analysis (CEA) is also closely related to CBA but it does not require the quantification of the researched effects. Its goal is to analyse which alternative can be realised as efficiently as possible (cost minimalization) or how a given sum of money can realise as many of the envisaged effects (effect maximalisation) (Wesemann, 2002).

2.1.2. Multi-Criteria Analysis

Multi-criteria analysis (MCA) or multi-criteria decision analysis (MCDA) is a method used to ascertain the optimal alternative among a range of alternatives by using criteria to compare scores (Vermote, Macharis, & Putman, 2014). Compared to CBA and CEA, MCA can more easily incorporate economic, environmental and social impacts of alternatives (Browne & Ryan, 2011). The UK government uses a combination of CBA and MCA for the appraisal of infrastructure project (see **textbox 1**).

Textbox 1. WebTAG: combining CBA and MCA

In the United Kingdom, an appraisal process must be carried out for infrastructure projects that require government approval. The Department for Transport has therefore developed an appraisal toolkit called [WebTAG](#) (Web-based Transport Analysis Guidance), which combines Cost-Benefit Analysis (CBA) and Multi-Criteria Analysis (MCA). The methodology takes into account economic, environmental, and social impacts of a transport project, as well as impact on public accounts (i.e. indirect tax revenues). The criteria and values in WebTAG are predefined by the Department of Transport and can be found in the [WebTAG data book](#). The outcome of this appraisal process informs decision-makers on different alternatives and their impacts (Department for Transport, 2014, 2018a, 2018b).

Although different definitions of stakeholders exist, it can be defined as “Any group of people, organised or unorganised, who share a common interest or stake in a particular issue or system; they can be at any level or position in society, from global, national and regional concerns down to the level of household or intra-household, and be groups of any size or aggregation” (Grimble & Wellard, 1997, pp. 175–176).

MCA techniques have become more frequently used for the evaluation of transport projects, which often have complex decision-making processes due to the effects they will have (i.e. economic, social, environmental), the wide range of possible alternative solutions, and the large number of stakeholders involved (Macharis & Bernardini, 2015).

A MCA generally has six steps, shown in **Figure 1**. First, the problem is identified and analysed, which is followed by the generation of alternatives or scenarios. In the third step, criteria are developed that are relevant to the alternatives. Criteria make it possible to provide a quantitative or qualitative score for each alternative. Because not every criterion is of equal importance, the criteria are also assigned weights. Fourthly, the evaluation matrix is completed. This means the alternatives are evaluated on the basis of the criteria and the weights. The results of this matrix are then shown in step five. This step can be done with different ranking methods, of which the Analytical Hierarchy Process (AHP) and PROMETHEE are two often-used examples. These results of the evaluation inform decision-makers and can be integrated in the decision-making process (step 6) (Brucker, Verbeke, & Macharis, 2004).

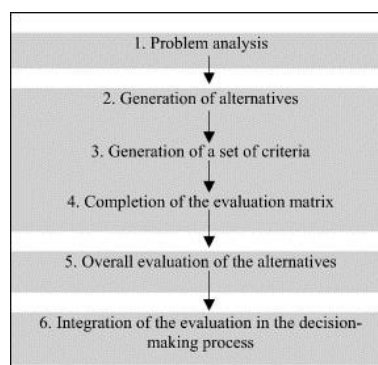


Figure 1. The six steps of multi-criteria analysis (Brucker et al., 2004)

MCA is process-oriented rather than result-oriented. This means the results of an MCA often inform stakeholders about the different preferences or priorities rather than giving a clear best solution (Browne & Ryan, 2011). Furthermore, the structured approach of MCA generates knowledge about the problem and the stakeholders’ objectives. Due to the process being transparent, fair, and understandable, MCAs are often considered legitimate by stakeholders (Nordström, Eriksson, & Öhman, 2010).

It should be noted that stakeholder participation in MCA is often lacking or limited to defining the alternatives, criteria and/or weights. Moreover, MCAs often use a common set of criteria and common weights for the different stakeholders. As transport projects can be controversial, achieving consensus between stakeholders on a common set of criteria and weights may be impossible (Macharis & Bernardini, 2015; Macharis, Turcksin, & Lebeau, 2012).

2.1.3. Sustainability Assessment by Multi-Criteria Analysis

Following the definition of sustainable development in the “Brundtland report”, sustainability has three pillars: economy, environment, and society (WCED, 1987). Although mobility activities can have positive effects on these pillars (i.e. being able to reach your job), they can also have negative external effects (Browne & Ryan, 2011). Traffic congestion, poor accessibility, infrastructural implementation and maintenance costs, and external costs from external effects (i.e. accidents) are negative economic impacts of mobility activities. Mobility also creates negative impacts on the environment, such as greenhouse gas emissions, fragmentation of natural landscapes and ecological habitats, noise and chemical pollution. The negative impacts on society include traffic collisions, illness and mortality due to air pollution, excessive road traffic noise levels, and social exclusion from mobility activities (Vermote et al., 2014).

When investing public funds into transport projects, governments have to balance government expenditures with improving sustainability. MCA can be a useful tool to measure the sustainability impacts of different alternatives as it “is suitable for addressing complex problems featuring high uncertainty, conflicting objectives, different forms of data and information, multi interests and perspectives, and the accounting for complex and evolving biophysical and socio-economic systems.” (Wang, Jing, Zhang, & Zhao, 2009, p. 2265). However, it should be noted that accurately estimating sustainability is impossible due to external factors and uncertainties that can influence the outcome of an MCA. A sustainability MCA therefore indicates the movement towards the best possible solution(s) rather than *the* best solution (Keseru, Bulckaen, & Macharis, 2016).

2.2. Multi-Actor Multi-Criteria Analysis (MAMCA)

Multi-actor multi-criteria analysis (MAMCA) is a methodology developed by Macharis (2000, 2004) that assesses stakeholder preferences. As it explicitly takes the stakeholders into account, MAMCA can be seen as an extension of MCA (Macharis et al., 2012). MAMCA differs from MCA in that it explicitly introduces stakeholders before the criteria and weights are defined, which can increase the acceptance of the proposed solution by the different stakeholders (Macharis, 2004; Walker, 2000). Another important effect of the MAMCA methodology is that it forces stakeholders “to reflect on what they really want and on the rationale for these wants” (Macharis, de Witte, & Ampe, 2009, p. 197), which can facilitate reaching consensus.

The MAMCA approach was developed for the evaluation of transport projects, in which stakeholder inclusion can balance competing and conflicting interests and thereby achieve a better integration of environmental, social and economic considerations (Baumann & White, 2012). Examples of stakeholder groups in transport projects are the users, the investors, the operators, society as a whole, and the government (Macharis et al., 2009).

The MAMCA methodology consists of seven steps that are shown in **Figure 2**. A MAMCA starts with the identification and classification of possible alternatives that will be evaluated. This is followed by a stakeholder analysis, in which the groups whose opinions should be taken into account are identified and contacted. In step three, each stakeholder group defines their criteria and gives weights to the criteria. The weights reflect the importance a stakeholder gives to each criterion. In step four, the criteria identified by the stakeholders are ‘operationalised’ by constructing indicators in order to measure the impact of an alternative on each criterion. Then, the alternatives are analysed and ranked, the results of which are shown in step six. This step also includes consensus making between stakeholders. If no consensus is found, new alternatives can be created and a new MAMCA is performed. Lastly, the results of the MAMCA inform the implementation of the alternative once it has been chosen (Macharis et al., 2009).

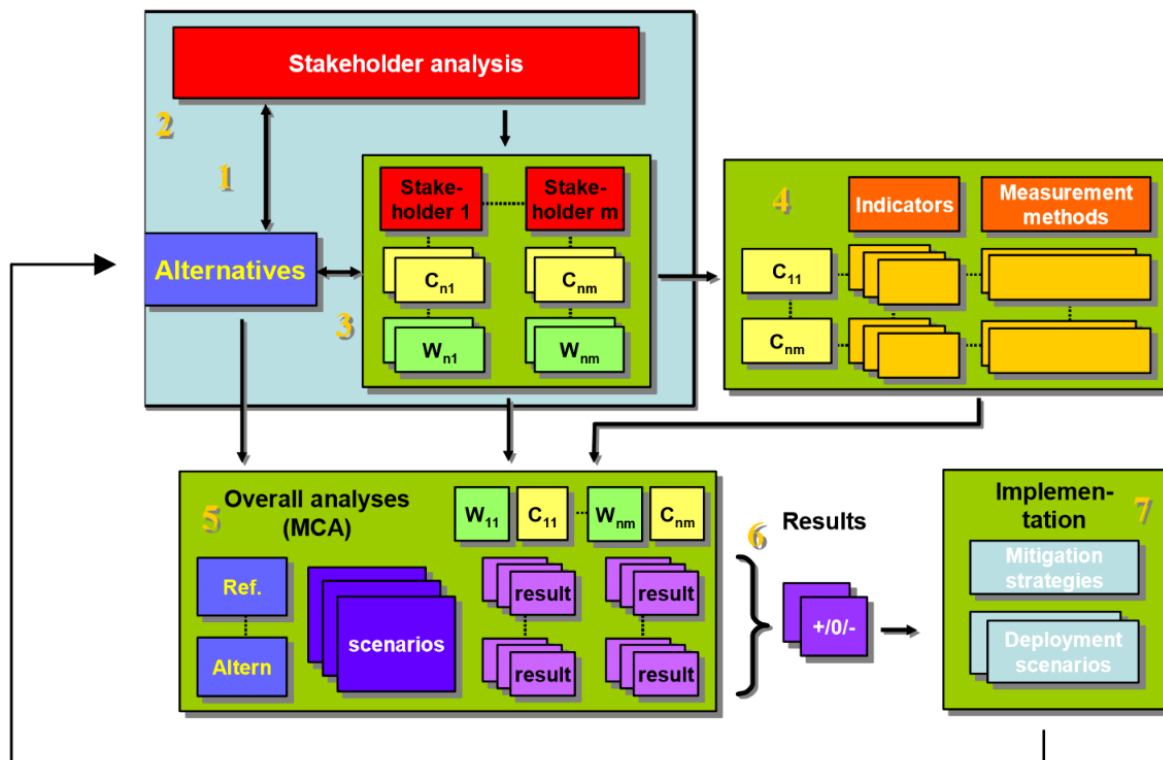


Figure 2. The steps of multi-actor multi-criteria analysis (Macharis et al., 2009)

The MAMCA methodology has been used to evaluate different transport projects and policies, such as the improvement of mobility in the city centre of Leuven (Keseru et al., 2016); the choice of location for intermodal terminals in Belgium (Macharis et al., 2009); the possible extension of a logistics operator at Zaventem International Airport (Macharis et al., 2009); and policy measures that can improve mobility and logistics in Flanders (Macharis, De Witte, & Turcksin, 2010).

2.3. Integration of MCA and MAMCA

The [NISTO](http://www.nisto-project.eu)¹ (New Integrated Smart Transport Options) research project developed a [set of tools](http://www.nistotoolkit.eu)² to evaluate the sustainability as well as stakeholder preferences on small-scale mobility projects. These tools – a sustainability MCA and a MAMCA – were tested on five urban transport projects in the UK, Germany, Belgium, the Netherlands, and France. The test cases included an integrated transport tourist ticket; a mobile app to collect travel behaviour data; real-time travel information for buses; investments in bicycle infrastructure; and a bike rental scheme. The researchers used the results of the stakeholder assessment by the MAMCA and the outcome of the sustainability appraisal by the MCA to identify solutions that were both sustainable and supported by the majority of the stakeholders (Keseru, Bulckaen, Macharis, Hadavi, & Mommens, 2015).

The sustainability MCA was based on the three pillars of sustainability (economy, environment, society), which were given equal weights. The criteria were developed by the researchers and based on case studies, a review of transport evaluation schemes, and the ranking of potential criteria by 214 stakeholders from the NISTO partner regions in a survey. The weights of the criteria were based on the answers of 93 governmental representatives in North-West Europe (see **Table 1** for an overview).

¹ www.nisto-project.eu

² www.nistotoolkit.eu

Economy (0.33)	Environment (0.33)	Society (0.33)
Economic Activity (0.21)	Land consumption (0.20)	Safety (0.20)
Cost effectiveness (0.24)	Greenhouse gas emissions (0.21)	Security (0.11)
Reliability and travel time (0.31)	Air quality (0.22)	Health of citizens (0.16)
Public funding of transport (0.24)	Resource use (0.20)	Liveability (0.18)
	Noise (0.17)	Equity (0.13)
		Socio-political acceptance (0.09)
		Accessibility for people with special needs (0.13)

Table 1. Criteria and weights of the NISTO sustainability MCA

3. SUSTAINABILITY MCA AND MAMCA IN LOOPER

The integration of evaluation tools such as MCA and MAMCA into the co-creation process are tested in LOOPER in order to find out whether knowing the impact of co-designed alternatives on sustainability as well as the stakeholder preferences for different alternatives has an impact on the co-creation process. From previous research we can conclude that using evaluation techniques makes stakeholder preferences more explicit, which can facilitate detecting where stakeholder preferences converge. This, in turn, can positively impact reaching consensus on an alternative and could lead to implementation.

3.1. Co-Creation

It is useful to define co-creation before integrating it with MCA and MAMCA. Co-creation is an umbrella term for a wide range of participatory and open-design processes. It is an approach to creative practice by moving beyond consultation towards collaboration between the citizens impacted by an issue. The LOOPER guidelines for the co-design of alternatives (Deliverable 3.1) define co-creation as “as the overall joint process of tackling an issue” (Wiegmann, Pappers, Keseru, & Macharis, 2018, p. 7). A subsection of co-creation is co-design, which has been defined as “the process of designing a solution from an initial idea to a product ready to be implemented” (Wiegmann et al., 2018, p. 7).

The LOOPER co-creation process follows seven steps in three planning stages, which are shown in **Figure 3**. The aim of the first stage is to identify the problems of a local community through a three-step process: a problem is identified; data is collected on the problem; and the collected data is visualised on the LOOPER online platform. In the second stage, citizens can propose solutions to the problems defined in the first stage. This is done via an online platform as well as via face-to-face meetings with citizens. These solutions are then evaluated using MCA and MAMCA. After the evaluation, stakeholders will decide which solution(s) will be implemented. The impact of the co-designed solutions is then monitored by citizens. This three-stage process will be conducted twice in each Living Lab to demonstrate their iterative character, as well as the ongoing processes of contextualisation, deliberation, decision-making, and implementation.

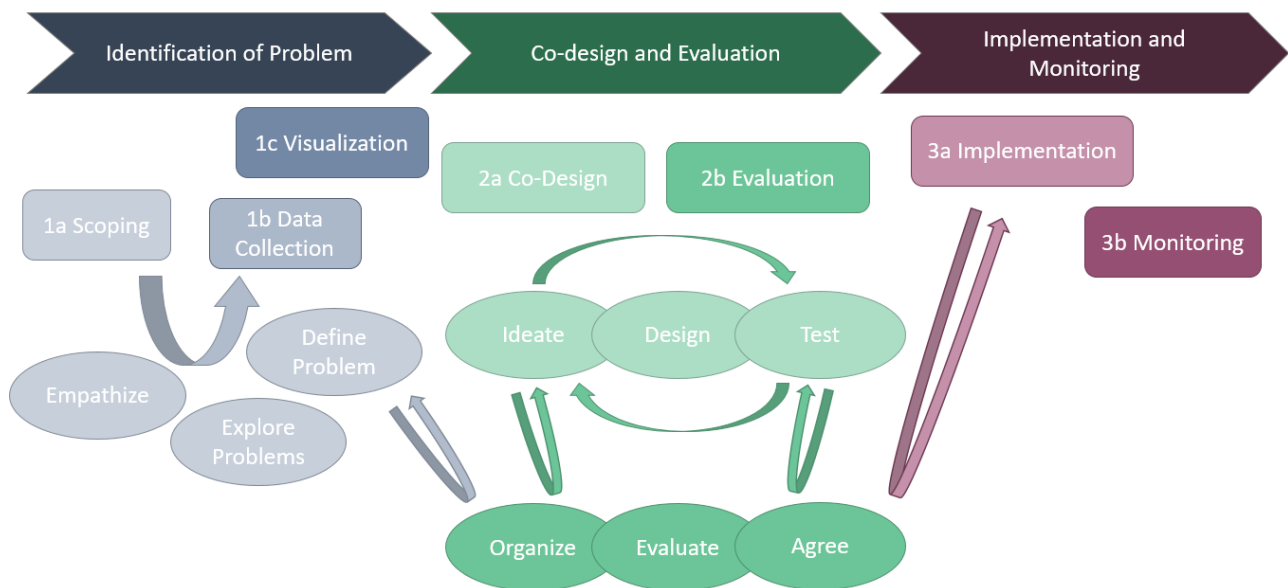


Figure 3. The LOOPER co-creation process

3.2. Integrating Co-Creation and MCA/MAMCA

To our knowledge, little literature in which co-creation is integrated with MCA/MAMCA is available³, especially in the fields of participatory science and mobility. In previous research on MCA and MAMCA, it has been suggested that there is a lack of linkage between stakeholder participation tools and evaluation tools, both in scientific literature as well as in practical guidelines for decision-makers (Bulckaen, Keseru, & Macharis, 2016). Combining stakeholder participation methods such as co-creation with evaluation tools such as MCA and MAMCA could potentially improve the stakeholder acceptance of co-designed solutions as well as their sustainability, and thereby increase the possibility of implementation. It is therefore relevant to bridge the gap between MCA/MAMCA and co-creation.

Citizens co-create alternatives to the status quo. It is, however, unknown whether these alternatives have a positive effect on sustainability (in the economic, environmental, and social sense) and it is unknown what the other stakeholders think of the co-created alternatives. An illustration: citizens propose several alternatives that would improve traffic safety in an area. The decision-makers – in this case the municipality – find the alternatives too extreme and do not implement them. The municipality argues that it does not believe other stakeholders (i.e. the police; public transport operators; businesses) would support the alternatives. The measures end up in a drawer, and the citizens feel disempowered and disengaged from the planning and decision-making process. The added value of MCA and MAMCA is the structured approach that goes beyond traditional stakeholder participation and that can help find consensus between stakeholders.

In the situation described above, a MAMCA would have been able to show the municipality as well as the other stakeholders how much support each alternative has. Furthermore, a sustainability MCA would show the stakeholders the effect each alternative would have on the economic, environmental, and social indicators. Should the MAMCA show that all the alternatives are unpopular with other stakeholders, the citizens know *why* their alternatives have not been implemented. In the same vein, the municipality might discover that one of the proposed alternatives has more support from the other stakeholders than previously thought and decides to implement it.

³ Based on the Google Scholar search “(“MCA” OR “MCDA” OR “PMCA” OR “MAMCA” OR “Multi Criteria Analysis” OR “Multi Criteria Decision Analysis” OR “Participatory Multi Criteria Analysis” OR “Multi Actor Multi Criteria Analysis”) AND “co-creation””

We have defined two research questions in the context of the application of MCA and MAMCA in LOOPER:

1. How can citizen monitoring and co-design enhance the use of MCA and MAMCA?
2. How can MCA and MAMCA enhance citizen monitoring and co-design?

MCA and MAMCA will be applied in the second stage of the LOOPER co-creation process. This stage, called co-design and evaluation (see **Figure 3**), includes the evaluation of the co-designed alternatives by citizens. The sustainability of the co-designed alternatives will be evaluated by using MCA; stakeholder preferences and acceptance of co-designed alternatives will be evaluated by using MAMCA. This evaluation process should lead to a co-designed alternative that is supported by the majority of stakeholders and ensures the highest possible level of sustainability. This alternative will be implemented and monitored in the third and final stage of the co-creation process.

In order to answer these research questions, Living Lab coordinators will note down their own experiences and will survey stakeholders that participated in one or more steps of the MCA or MAMCA. For the first research question, stakeholders will be surveyed about the usefulness of co-design for the definition of alternatives as well as the usefulness of citizen monitoring to collect data (see **Annex 1 – Stakeholder Survey Co-design and Evaluation**). This survey also contributes to an answer to the second research question by asking stakeholders that participated in the evaluation process if they found the used evaluation methods useful. In order to give an answer to both research questions, the Living Lab coordinators will also write down their experiences in the Living Lab logs (see **Annex 2 – Evaluation in Living Lab Logs**).

4. PRACTICAL GUIDELINES

The practical guidelines of this deliverable are structured according to the steps of MCA and MAMCA. These guidelines are written for Living Lab coordinators that will guide the evaluation process of the co-designed alternatives. The content of these guidelines should be a start in their understanding of the evaluation process in LOOPER. See the **MAMCA Software User Guide** in the next section for instructions on how to use the evaluation software.

The text below gives instructions for each step of the MCA and MAMCA. These instructions are based on the answers to the following questions:

- What does this step do?
- Why is this step relevant?
- How is this step executed?
- Who executes this step?

4.1. Alternatives

The first step when conducting an MCA or MAMCA is to define alternatives. The goal of the evaluation procedure is to find an alternative that improves the current situation on sustainability and that has support from most or all stakeholders. Within LOOPER, the problems and alternatives are defined by citizens through co-creation. The co-design phase should result in several alternatives as well that can be evaluated on their sustainability (MCA) and stakeholder preferences (MAMCA). A do-nothing alternative should also be evaluated in order to see how the impact of the alternatives compare to the current situation. This alternative is sometimes also called the status quo or baseline alternative.

Guiding citizens through the co-creation process and having alternatives that can be evaluated is the responsibility of the Living Lab coordinators. Problem analysis is the first stage of the LOOPER co-creation process, which is described in Deliverable 4.1: Guidelines for the Living Labs. Guidelines on the methodology for the co-design of alternatives can be found in Deliverable 3.1.

4.2. Stakeholders

During the stakeholder analysis, the stakeholders that are affected by or can affect the implementation of alternatives are defined. Including these stakeholders in the evaluation process improves the chance of implementation of (one of) the co-created alternatives. The identification of stakeholders is only relevant to MAMCA; for no separate evaluation per stakeholder is done in the sustainability MCA.

Stakeholder groups are distinguished on the basis of their objectives. If stakeholders have a different set of objectives, they should belong to a separate stakeholder group. An objective for a local government could be “to decrease the number of traffic accidents”. It is possible that different and/or conflicting objectives exist within a stakeholder group. For example, initially you may identify *citizens* as a distinct stakeholder group. Nevertheless, citizens that use a car as their primary mode of transport may have a different objective (better accessibility for cars) than those that mainly use a bike.

All stakeholders are assumed to be equal, regardless of the size of a stakeholder group. This means that even though the stakeholder group *car drivers* has a larger population than the stakeholder group *cyclists*, the weights of these stakeholder groups are equal. Assigning different weights to different stakeholder groups is difficult if not impossible: who would decide which stakeholder group is more important and which is less important?

The analysis of stakeholders is carried out by citizens as well as the Living Lab organisers. Throughout the stages of the LOOPER co-creation process, citizens can suggest stakeholders that they think could affect or be affected by the implementation of the alternatives. During the problem identification stage, for example, citizens may already think ahead about which stakeholders may not agree with the alternative they think would solve the problem. Living Lab coordinators are responsible for taking note of these suggestions in the Living Lab logs (see Deliverable 4.2).

The input of citizens can then be combined with the thoughts and ideas from the Living Lab coordinators, who may have a better overview of the stakeholders that should be involved. Suggestions for stakeholders can also be found in academic literature. Moreover, new stakeholders might emerge during the following steps, in which case those new stakeholders need to be contacted and interviewed in order to determine their objectives, define their criteria and the importance they attach to these objectives.

Below is a list of stakeholder groups that have been identified from previous research on MAMCA within the realm of transport and mobility. Living Lab coordinators are free to define stakeholders that are not in this list.

- Government (local, regional or national)
- Public transport operators
- Police
- Businesses (e.g. local shops, employers)
- Citizens (often subdivided into public transport users, pedestrians, cyclists, car drivers)

Living Lab coordinators will report the outcome of the identification of the stakeholders in a document with a list of stakeholders, their definitions and contact details (e.g. name of the organisation that represents the stakeholders). A template can be found in **Annex 3 – Stakeholder Identification Form**, which should be included in the report on the outcomes of the problem identification phase (Deliverable 5.2 for Brussels; 6.2 for Verona; and 7.2 for Manchester).

4.3. Stakeholder objectives, criteria and indicators

Both in MAMCA and MCA the criteria allow us to evaluate the impact of alternatives on these criteria. The criteria for the sustainability MCA allow us to evaluate the sustainability of each alternative.

The criteria for the MAMCA allow us to evaluate the preference of each stakeholder for each alternative. In this evaluation, each stakeholder defines their own criteria. This means that each stakeholder group can have a different set of criteria, unlike in the sustainability MCA where there is only one set of criteria defined by the decision maker.

Criteria are defined based on the *objectives* of stakeholders. The objective of a stakeholder can be found by asking what they would like to see changed within a certain timeframe. Within LOOPER, this timeframe is a year. Once the objective of a stakeholder is clear, it can be translated into criteria. For example, the objective of a government could be “to reduce the number of traffic accidents in an area”. One of their criteria would then be ‘safety’, of which ‘number of accidents per year’ could be an indicator.

In order to determine the impact of the alternatives on the criteria, indicators and measurement methods need to be selected. For example, an indicator for the criterion air quality can be NO_x emissions, while for traffic safety the number of serious accidents is an indicator. Living Lab coordinators can use the criteria and indicators from the sustainability MCA in the [NISTO toolkit](#)⁴ (see **Annex 4 – NISTO Core Criteria**), research academic literature, or have an expert validate their chosen indicators.

The 16 criteria for the LOOPER sustainability MCA come from the [NISTO project](#). They are divided into three groups: economy; environment; and society. These criteria were developed to assess the impacts of small-scale urban and regional mobility projects and are based on academic literature, a stakeholder survey, feedback from stakeholders during workshops, and the analysis of assessment procedures for mobility projects (Bulckaen et al., 2016). Therefore, for the MCA, there is no need to define objectives, criteria and indicators.

For the MAMCA, the Living Lab coordinators are responsible for collecting and defining the stakeholder objectives, criteria, indicators, and weights by interviewing stakeholder representatives. Living Lab coordinators will have to contact these stakeholders in order to conduct the interview, either via phone or in person. An interview usually starts with an introduction to the project and a description of the MAMCA methodology. The stakeholder is then asked to define their objectives and to formulate possible criteria. In order to facilitate the consensus-making process at the end of the evaluation phase, the coordinator can also ask the stakeholder to rank its preference for the alternatives. The Living Lab coordinator can assist the stakeholder in defining their criteria and converting the criteria into indicators.

Because in the next step the stakeholders need to weight all possible combinations of criteria, it is recommended to limit the number of criteria per stakeholder. For example, whereas 6 criteria result in 15 pairwise comparisons, 10 criteria result in 45 pairwise comparisons (the formula is $(n*(n-1))/2$).

In order to take as little as possible time of the stakeholders, defining objectives and criteria can be done via e-mail or phone. This allows the Living Lab coordinator to come prepared to the physical meeting with the stakeholder’s criteria loaded into the MAMCA software, allowing the stakeholder to immediately do the weighting. If it is not possible to do this via e-mail or phone, the Living Lab coordinator will have to insert the criteria into the software during the physical meeting with the stakeholder.

In case a stakeholder group is large (i.e. citizens group which has many representatives), Living Lab coordinators will collect the objectives and criteria for citizens via a survey in which respondents can validate a pre-defined set of objectives/criteria and can add missing ones. This step can be skipped in case the objective(s) of citizens are very clear and can be defined by the Living Lab coordinators. Living Lab coordinators are responsible for promoting the survey, for example via emails, social media, or connections with citizen or community organisations. Objectives and criteria can also be defined and collected during offline workshops. Another way to collect the objectives and criteria of citizens is to interview citizens or community representatives.

In the Brussels Living Lab, citizens could state their preferences regarding mobility in a survey (see **Figure 4** and **Annex 5 – Brussels Survey Objectives/Criteria**). Respondents could validate or add up to four objectives and criteria. The criteria in **Figure 4** were defined by the Living Lab coordinators and are based on the input from citizens during workshops and meetings.

4

<http://nistotoolkit.eu/apps/docs/NISTO%20Core%20criteria%20description%20document%20for%20MCA%20module.pdf>

Which of the aspects related to mobility below have your personal preference? Give max. 4 answers.

- | | |
|---|--|
| <input type="checkbox"/> Reaching my destination quickly | <input type="checkbox"/> Safe streets in which children can play |
| <input type="checkbox"/> Reaching my destination safely | <input type="checkbox"/> Less traffic noise |
| <input type="checkbox"/> Bike paths and parking in the area | <input type="checkbox"/> More green |
| <input type="checkbox"/> Parking place close to home | <input type="checkbox"/> Better air quality |
| <input type="checkbox"/> Parking places close to services
(bank, doctor, post office...) | <input type="checkbox"/> Easier access to public transport |
| | <input type="checkbox"/> Other: _____ |

Figure 4. Example of question on stakeholder objectives

4.4.Weights

Assigning weights to criteria allows us to understand the importance of each criterion compared to other criteria. Whereas stakeholders will assign weights to their criteria for the MAMCA, the weights of the criteria in the sustainability MCA have been predefined. These weights are based on answers of 93 governmental representatives from Belgium, France, Germany, the Netherlands and the United Kingdom. **Annex 4 – NISTO Core Criteria** shows the NISTO criteria and corresponding weights.

Different methods can be used to assign weights to the criteria. Within LOOPER, Saaty’s (1988) Analytical Hierarchy Process (AHP) is the preferred method with which stakeholders can assign weights to their criteria. This method uses a pairwise comparison mechanism, which allows stakeholders to indicate which criterion of two is the more important one by adjusting a slider (see **Figure 5**). If a stakeholder has a very strong preference for one criteria (air quality) over another (safety), they would adjust the slider to the 9 that is closest to their preferred criteria (air quality). If a stakeholder prefers the two criteria equally, the slider remains in the middle.



Figure 5. Pairwise comparison in the MAMCA software

Living Lab coordinators have to set up a meeting with each stakeholder in order to assign weights to the criteria. Instructions on how to assign weights in the MAMCA software can be found in **section 5.2.4**. Assigning weights to the criteria of the stakeholder group(s) citizens can be done by sending out a survey to citizens in which they can do the pairwise comparison. Another option is to have a citizen organisation representative assign the weights, or using a pen-and-paper version of the AHP pairwise comparison mechanism during a workshop (see **Annex 6 – Pen and Paper AHP Pairwise Comparison** for a template).

4.5.Evaluation

In this step, the impact of alternatives on the stakeholders’ and the MCA criteria are evaluated. The question that evaluators need to answer is: “What impact will an alternative have on a criterion compared to the do nothing alternative?” In order to carry out an independent evaluation, the evaluation should be carried out by experts (who can be part of LOOPER) or by an external person with expertise in a specific area (e.g. traffic safety or noise pollution). Since stakeholders may be biased towards one or another alternative, they do not take part in the direct evaluation.

Various MCA methods can be used to evaluate the alternatives, but PROMETHEE is the preferred method within LOOPER. This method assesses the impact of each alternative on each criterion by means of a seven-point scale (very negative; negative; slightly negative; neutral; slightly positive; positive; very positive) in a qualitative evaluation table (see **Table 2** Error! Reference source not found.). The method also makes it possible to enter actual indicator values (e.g. number of accidents) in the evaluation table

whenever quantitative data is available for a certain criterion. It should be noted that although in the LOOPER project stakeholder objectives are defined by asking what stakeholders would like to see changed within a year, the longer-term impacts of an alternative on a criterion can be taken into account during the evaluation.

Evaluation steps	Explanation
Very negative	The scenario would have a very negative impact on the criterion compared to the situation today.
Negative	The scenario would have a negative impact on the criterion compared to situation today.
Slightly negative	The scenario would have a slightly negative impact on the criterion compared to situation today.
Neutral	The scenario would have no impact on the criteria compared to the situation today.
Slight positive	The scenario would have a slightly positive impact on the criterion compared to the situation today.
Positive	The scenario would have a positive impact on the criterion compared to situation today.
Very positive	The scenario would have a very positive impact on the criterion compared to situation today.

Table 2. Explanation of the evaluation scores

Annex 7 – Evaluation Table shows the evaluation table that can be used for the evaluation of the impact of the alternatives on a criterion. This table should be filled in for each criterion. It is important that the experts also provide a justification and sources for this justification (e.g. studies, reports, statistics).

4.6.Results

Once the stakeholders’ weights and the evaluation scores have been determined, the MAMCA software calculates the evaluation scores for each alternative and stakeholder as well as for the sustainability assessment. This step therefore allows the Living Lab coordinators to rank the alternatives on sustainability (MCA) and see the preferred alternative of each stakeholder (MAMCA).

The results of the sustainability MCA rank the alternatives on their sustainability scores. This allows the Living Lab coordinators and stakeholders to see which alternative is the most or least sustainable. For example, **Figure 6** shows the sustainability scores of different alternatives for a new bicycle highway in the Netherlands (A; B; B1; C; A-). Here, alternative A has the highest sustainability score, whereas alternative B1 has the lowest score.

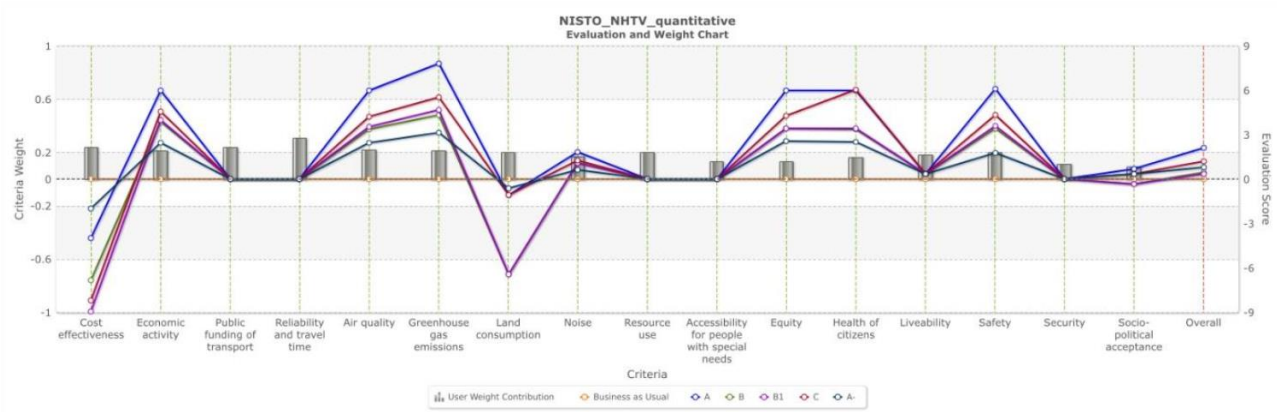


Figure 6. Results sustainability MCA in NISTO

The results of the MAMCA show for each stakeholder their ranking of alternatives. **Figure 7** shows the stakeholder preferences for the alternatives for a new bicycle highway. Here, three out of the four stakeholder groups (citizens, government, employers) support alternative A, which is in line with the outcome of the sustainability assessment. In this example, public transport operators prefer business as usual because a new bicycle highway would attract current bus passengers, thereby decreasing the revenue of the bus operator.

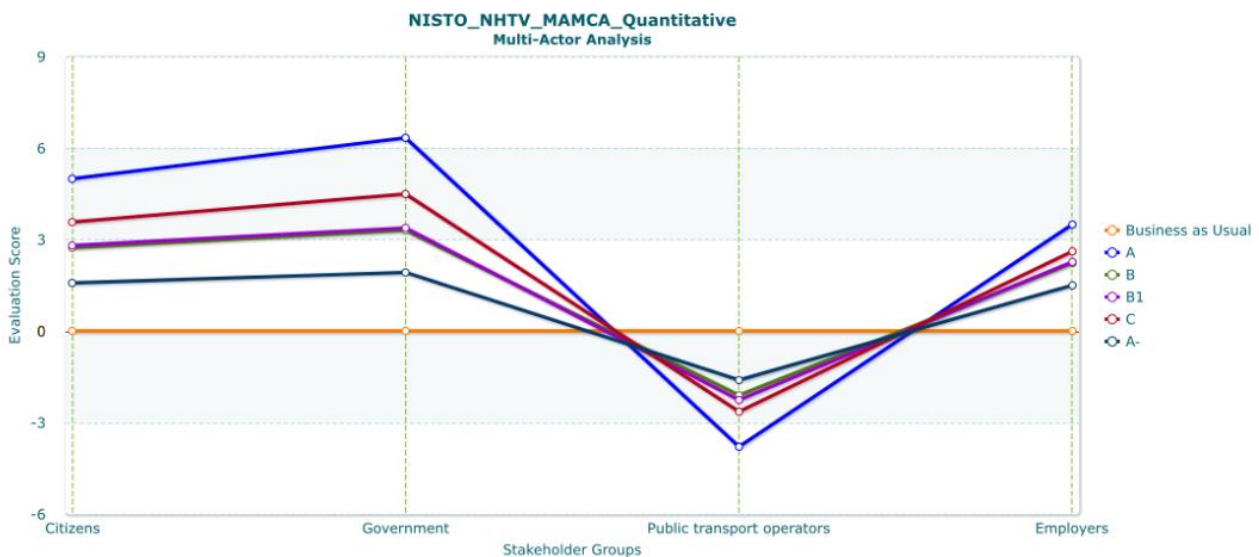


Figure 7. Results MAMCA in NISTO

The output of both the MCA and MAMCA should be used as a blueprint to reach consensus among stakeholders. This can be done by ranking of the alternatives based on their sustainability as well as stakeholder preferences. The coordinators should analyse each alternative and see how and why stakeholder support for the alternatives differ. Highlight criteria that cause (a lack of) stakeholder support for an alternative and use this as input for a discussion between stakeholders. The MAMCA software can visualise stakeholder preferences and evaluation scores. The visualisations that can be used for consensus-making are described in **section 5.2.6**. The analysis of alternatives should include possible ways to reach consensus on one (or more) alternative scenario(s).

In order to proceed to the third and last stage of co-creation – implementation and monitoring – Living Lab coordinator should organise a consensus-making workshop. Here, the task of the Living Lab coordinators is to facilitate the consensus-making process. During this workshop, stakeholders will determine which alternative(s) will be implemented. The Living Lab coordinators will present the results of the sustainability MCA and MAMCA as well as suggested way forwards. The Living Lab

coordinators should formalise the pathway to implementation of the alternative(s) with input from the stakeholders. New options can also be identified during this process, which requires the Living Lab coordinators to do the analyses for the new alternative. The results of both the evaluation and the workshop should be published on the websites of the Living Labs.

4.7. Stages of evaluation process

This section shows the structure of the evaluation process in a Living Lab. Coordinators are of course free to plan the evaluation phase as they see fit.

1. **Living Lab coordinators:** prepare draft shortlist of alternatives. These are likely to be uncoordinated, at different scales, have different feasibilities, and can vary between bottom up and top down approaches.
2. **First meeting of stakeholders:** discuss the shortlist of alternatives; identify stakeholders affected; define stakeholder criteria; identify possible sources of expertise for the evaluation of impact of alternatives on criteria. Further co-design is possible at this stage, i.e. turning loose ideas into practical proposals.
3. **Living Lab coordinators:** put the information together in the MCA & MAMCA format (online as well as offline), with summaries for each alternative. Get further comments and responses from the community, in particular from those not technical or online, or present at the meeting.
4. **Second meeting of stakeholders:** present and discuss the sustainability scores and the stakeholder support for the different alternatives. Also discuss the feasibility, time and costs of the alternatives. Then decide on next steps for interventions.
5. **LLL coordinators:** set up the implementation in consultation with key stakeholders. Internal discussion and report on how the process worked or not, with evaluation lessons for the future.

5. MAMCA SOFTWARE USER GUIDE

This MAMCA software user guide is written for the Living Lab coordinators that will perform the sustainability MCA and MAMCA. The coordinators will receive their login details for the evaluation software from the VUB.

5.1. Sustainability MCA

In order to evaluate the co-created alternative on their sustainability, a new project needs to be created for the sustainability MCA in the MAMCA software. This can be done by clicking 'Create a Project'. Living Lab coordinators should then add a name, a description, and a goal. The project type should be 'MCA' and the evaluation type 'PROMETHEE (see **Figure 8**). Click 'Create Project' to finish setting up the project. Users can access the project anytime under 'My Projects' in the top-left corner of the window. Please note that this project is only used for the sustainability MCA; the MAMCA is a separate project within the MAMCA software.

Create New Project

Project Name: *

Project Description:

Project Goal:

Project Type:

Project Evaluation Type:

Figure 8. Creating a new project in the online MAMCA software

The navigation bar at the top of the screen shows the stage of the MAMCA the user is (see **Figure 9**).

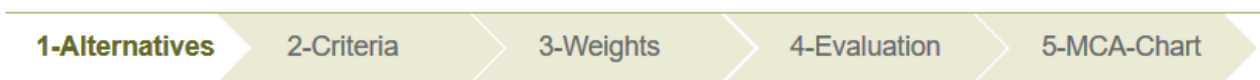




Figure 9. The navigation bar in the MAMCA software

5.1.1. Alternatives

After having set up a project in the MAMCA software, users can add the co-created alternatives by clicking 'Add Alternatives' in the box on the left-hand side of the window. A box will pop up in which a name and description of the alternative can be filled in (see **Figure 10** Error! Reference source not found.). Repeat this step for every alternative. A 'do-nothing' alternative should also be added. This alternative represents the status quo, meaning the current situation. Tick the box under 'select baseline' in the list of alternatives for the alternative that is represents the current situation (see status quo **Figure 11** Error! Reference source not found.). Every alternative can be edited by clicking the  icon and deleted by clicking the  icon.

Alternative Name:

Alternative Description:

Figure 10. Adding an alternative







List of Alternatives			
No.↕	Alternative Name	Select Baseline↕	Action
1	Pedestrian zone	<input type="checkbox"/>	 
2	Replace parking with bike lane	<input type="checkbox"/>	 
3	Status quo	<input checked="" type="checkbox"/>	 

Figure 11. List of alternatives

Click on '2-Criteria' in the navigation bar to proceed to the next step: adding the criteria.

5.1.2. Criteria

The criteria for the sustainability MCA are predefined. The criteria, which can be found in [this Excel-file⁵](#), will already be added to the accounts of the Living Lab coordinators. If the criteria have not yet been added, users can download the Excel-file to their device and click 'Import Criteria' in the left-hand textbox to upload the criteria for the MCA (see **Figure 12** Error! Reference source not found.).



Figure 12. Importing criteria

Once the criteria have been imported, click on '3-Weights' in order to assign weights to the criteria.

5.1.3. Weights

The weights of the criteria for the sustainability MCA are also based on the weights from the NISTO project. Like the criteria, the weights will be already have been added to the account of the Living Lab coordinators. If the weights have not been added, users can do so by clicking on 'Enter Weights Manually' (see **Figure 13** Error! Reference source not found.) and fill in the weights from **Table 3** below. Click on 'Save' once all the weights have been entered. Users will receive a pop-up with the warning that the total of the weights does not sum up to 1 (see **Figure 14** Error! Reference source not found.). Click 'OK'.



⁵ <http://looperproject.eu/wp-content/uploads/2018/09/Criteria-sustainability-MCA.xlsx>

Figure 13. Menu of 'weights'

Economy		Environment		Society	
Cost effectiveness	0.24	Air quality	0.22	Accessibility for people with special needs	0.13
Economic activity	0.21	Greenhouse gas emissions	0.21	Equity	0.13
Public funding of transport	0.24	Land consumption	0.2	Health of citizens	0.16
Reliability and travel time	0.31	Noise	0.17	Liveability	0.18
		Resource use	0.20	Safety	0.20
				Security	0.11
				Socio-political acceptance	0.09
	1		1		1

Table 3. Distribution of weights sustainability criteria

The total of the weights entered must sum up to 1, otherwise the weights will be normalized during the alternatives evaluation. Press OK to Continue or Cancel to update the values

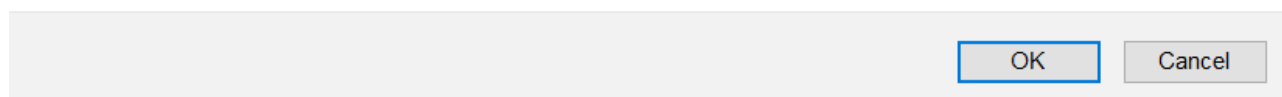


Figure 14. Warning when entering values that do not sum up to 1

Users can proceed to the next step by clicking on '4-Evaluation' in the navigation bar at the top of the window.

5.1.4. Evaluation

The evaluation of the impact of the alternatives on the criteria is done under '4-Evaluation' in the navigation bar. The question that evaluators need to answer is: "What impact will an alternative have on a criterion compared to the do nothing alternative?"

Fill in the evaluation table by selecting the impact each alternative has on the criteria (see **Figure 15**). The Living Lab coordinators are responsible for filling in this table in the MAMCA software, but the evaluation of the impact is done by experts who are specialised in a certain field (e.g. traffic safety or noise pollution). Since stakeholders may be biased towards one or another alternative, they do not take part in the evaluation of the impact each alternative has on the criteria.

There are seven possible answers in the evaluation table: very negative; negative; slightly negative; neutral; slightly positive; positive; very positive. Please note that for criteria such as air quality, a *decrease* in emissions is a *positive* impact. Click 'Save & Validate' once the evaluation table has been filled in. Different visualisations of the evaluation can be found under 'Evaluation Analysis' in the left-hand textbox.

Evaluation Table								
Alternative	Cost effectiveness	Economic activity	Public funding of transport	Reliability and travel time	Air quality	Greenhouse gas emissions	Land consumption	Noise
Status quo	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
Replace parking with bike lane	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
Pedestrian zone	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral

Figure 15. Evaluation table

5.1.5. MCA-Chart

Once the evaluation table has been completed, click '5-MCA-Chart' to see the results of the sustainability evaluation. The first image shows which alternative has the highest score on the evaluation criteria (see **Figure 16**). The menu in the left-hand textbox provides an overview of other visualisations. One important visualisation is the Criteria Group Evaluation Chart (see **Figure 17**), which shows the score of each alternative per criteria group (economy; environment; society) as well as the total evaluation score of each alternative.

In the Criteria Group Evaluation Chart, the bars represent the sustainability score of each alternative. The evaluation score can be read on the y-axis. The alternatives are placed on the x-axis, and for each alternative there are three bars for the three criteria groups (economy; environment; society). In the fictional example in **Figure 17**, the alternative with the highest evaluation score is 'replace parking with bike lane', followed by 'pedestrian zone'. The 'do-nothing' alternative (status quo) is the least attractive option as it has the lowest evaluation score.

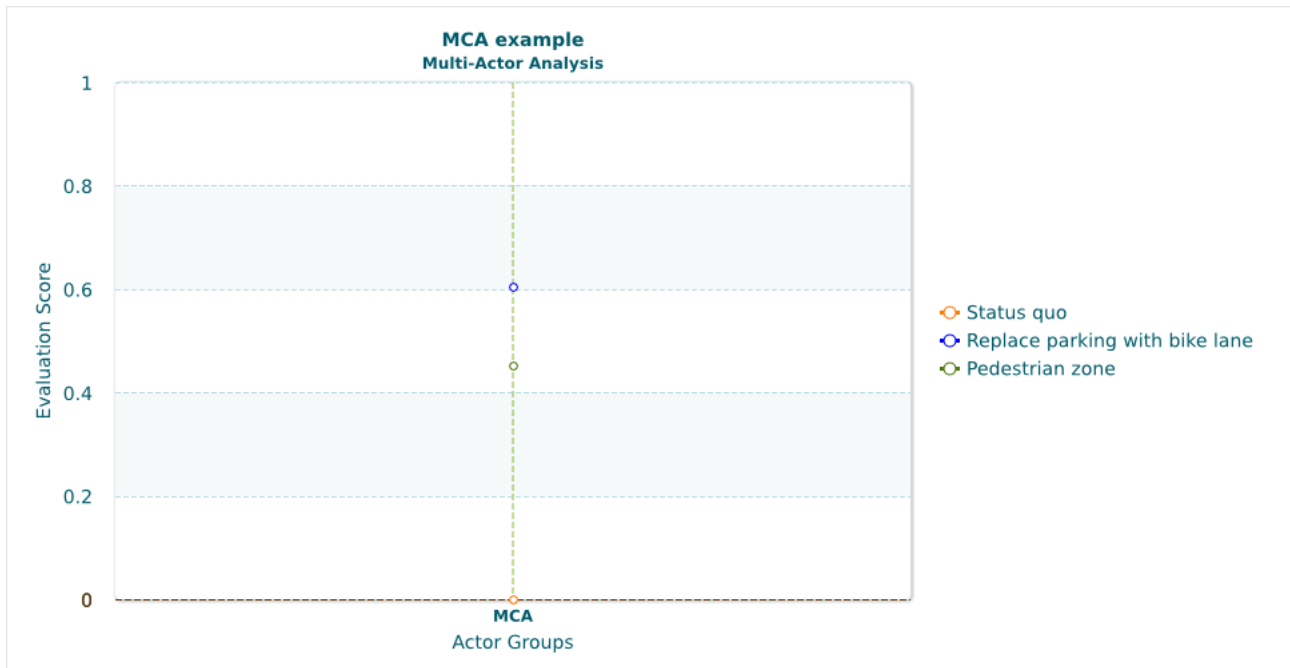


Figure 16. The evaluation scores of the alternatives

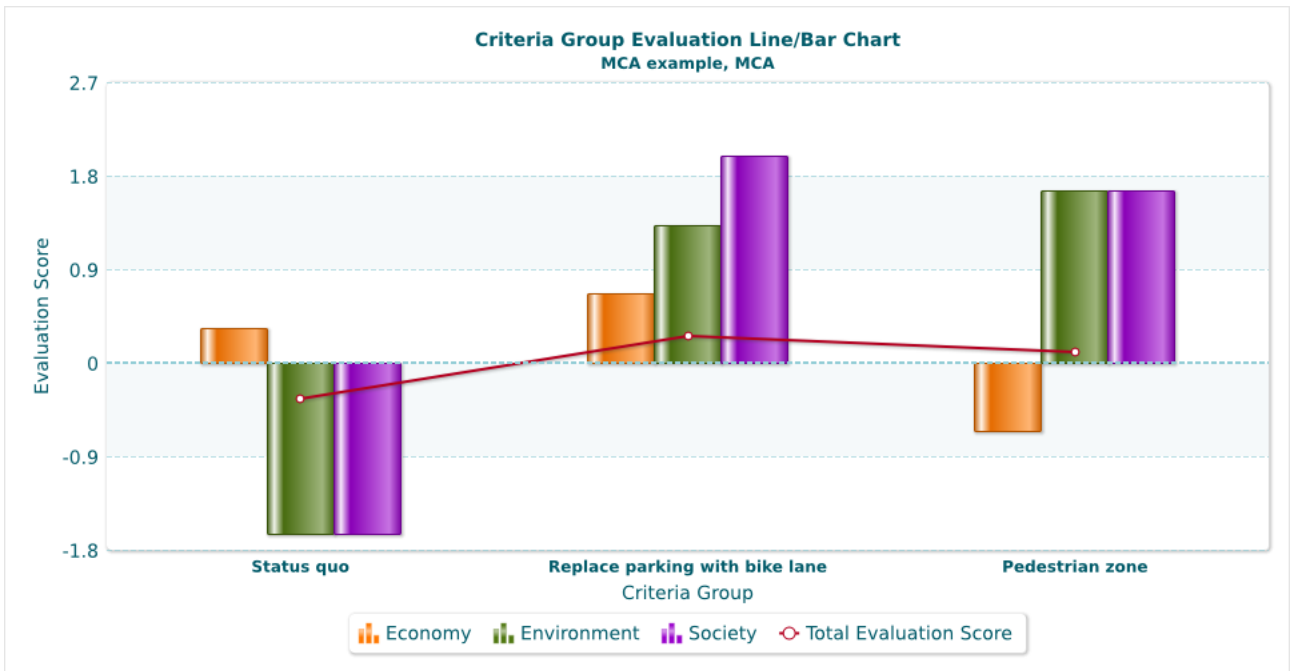


Figure 17. The criteria group evaluation line and bar chart

5.2. MAMCA

The evaluation of co-created alternatives begins with adding the alternatives to the online MAMCA software by clicking 'Create a Project'. Living Lab coordinators should add a name, a description, and a goal. The project type should be 'MAMCA' and the evaluation type 'Promethee' (see **Figure 18** Error! Reference source not found.). Click 'Create Project' to finish setting up the project. Users can access the project anytime under 'My Projects' in the top-left corner of the window. Please note that this project is only used for the MAMCA; the sustainability MCA is a separate project within the MAMCA software.

Create New Project

Project Name: *

Project Description:

Project Goal:

Project Type:

Project Evaluation Type:



Figure 18. Creating a new project in the MAMCA software

The navigation bar at the top of the screen shows in which MAMCA stage the user is (see **Figure 19**).



Figure 19. The navigation bar in the MAMCA software

5.2.1. Alternatives

After having set up a project in the MAMCA software, users can add the co-created alternatives by clicking 'Add Alternatives' in the box on the left-hand side of the window. A box will pop up in which a name and description of the alternative can be filled in (see **Figure 20**). Repeat this step for every alternative. A 'do-nothing' alternative should also be added. This alternative represents the status quo, meaning the current situation. Tick the box under 'select baseline' in the list of alternatives for the alternative that is represents the current situation (see status quo **Figure 21**). Every alternative can be edited by clicking the  icon and deleted by clicking the  icon.

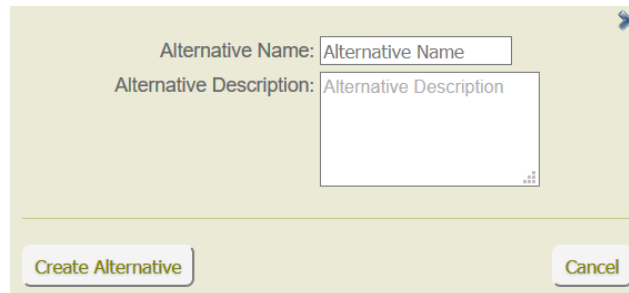


Figure 20. Adding an alternative







List of Alternatives			
No. ↕	Alternative Name	Select Baseline ↕	Action
1	Pedestrian zone	<input type="checkbox"/>	 
2	Replace parking with bike lane	<input type="checkbox"/>	 
3	Status quo	<input checked="" type="checkbox"/>	 

Figure 21. List of alternatives

Click on '2-Actors' in the navigation bar to proceed to the next step: the stakeholder analysis.

5.2.2. Actors



Stakeholders can be added to the MAMCA software by going to the Actor page and clicking on 'Add Actor Group' under 'Actors' (see **Figure 22**). Information about the stakeholders needs to be added in the textbox that pops up. Per stakeholder group, select who is defining the criteria, who is entering the evaluations, and the weight of the group (see **Figure 23**). For LOOPER, the Living Lab coordinators define the criteria and provide input for the evaluation. 'Group Weight' should be left blank as all stakeholders are considered equal. Click 'Save and Add Another Group' until all stakeholders have been entered. Once all stakeholders have been entered, click 'Save and Finish'. Every stakeholder group can be edited by clicking on the  icon and deleted by clicking on the  icon.



Figure 22. Adding stakeholders

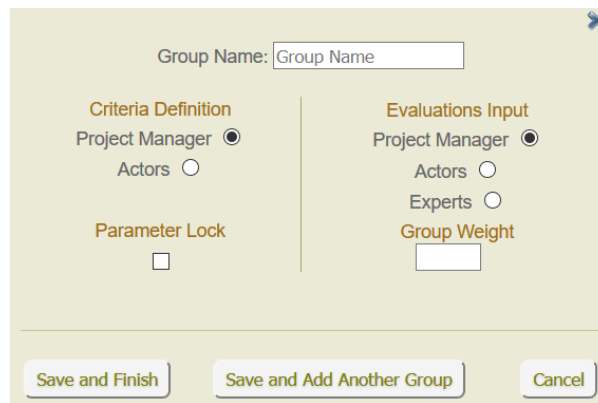


Figure 23. Defining stakeholders

Users can proceed to the next step by clicking on '3-Criteria' in the navigation bar at the top of the window.

5.2.3. Criteria

In the MAMCA software, criteria can be added for each stakeholder group by clicking 'Add Criterion'. A textbox pops up in which the criteria can be named and grouped (see **Figure 24**). Fill in the name of the criteria but leave blank 'Group Name'. Click on the names of the stakeholder groups to navigate between them.

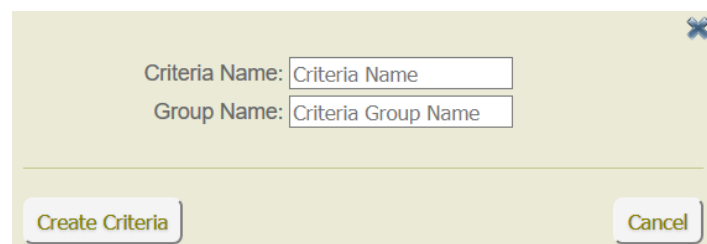


Figure 24. Adding criteria

5.2.4. Weights

Once all the criteria of all the stakeholders have been added, click on '4-Weights' in order to assign weights. For each stakeholder, click on 'Pairwise Comparison' under 'Weigh Criteria' in the left-hand textbox (see **Figure 25**). This allows stakeholders to identify weights for their criteria by indicating which of the two shown criteria they find more important and to what extent. If weights have been

collected using pen and paper AHP pairwise comparison sheets, the average weight per criterium can be calculated using [this Excel-file](#)⁶. The instructions for the file can be found [here](#)⁷.

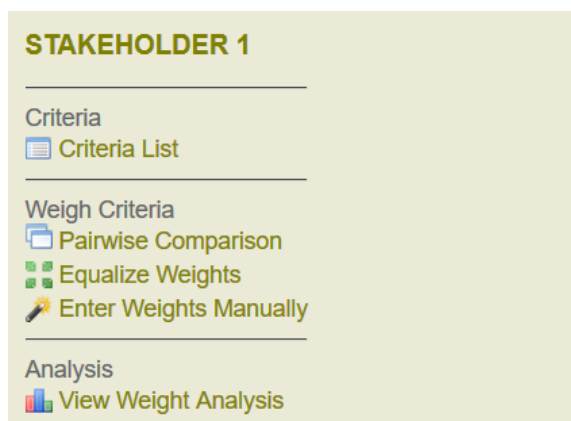


Figure 25. Weighing of criteria

In the MAMCA evaluation software, pairwise comparison is done by indicating which criterion is the more important one by adjusting a slider (see **Figure 26**Figure 25). If a stakeholder has a very strong preference for one criteria (air quality) over another (safety), they would adjust the slider to the 9 that is closest to their preferred criteria (air quality). If a stakeholder prefers the two criteria equally, the slider remains in the middle. Repeat this step for all the criteria per stakeholder.



Figure 26. Pairwise comparison

Users can proceed to the next step by clicking on '5-Evaluation' in the navigation bar at the top of the window.

5.2.5. Evaluation

The evaluation of the impact of the alternatives on the criteria is done under '5-Evaluation' in the navigation bar. The Living Lab coordinators are responsible for filling in the evaluation table (see **Figure 27**) in the MAMCA software, but the evaluation of the impact is done by experts who are specialised in a certain field (e.g. traffic safety or noise pollution). Since stakeholders may be biased towards one or another alternative, they do not take part in the evaluation of the impact each alternative has on the criteria.

There are seven possible answers in the evaluation table: very negative; negative; slightly negative; neutral; slightly positive; positive; very positive. Please note that for criteria such as air quality, a *decrease* in emissions is a *positive* impact. Click 'Save & Validate' once an evaluation table has been filled in. Different visualisations of the evaluation can be found under 'Evaluation Analysis' in the left-hand textbox.

⁶ <http://looperproject.eu/wp-content/uploads/2018/10/AHP-calculator.xlsx>

⁷ <http://looperproject.eu/wp-content/uploads/2018/10/Instructions-AHP-calculator.docx>

Evaluation Table					
Alternative	Economic activity	Reliability and Travel Time	Accessibility	Liveability	Evaluation Score
Pedestrian zone	<input type="text" value="Very Negative"/>	<input type="text" value="Negative"/>	<input type="text" value="Very Negative"/>	<input type="text" value="Slightly Positive"/>	
Replace parking with bike lane	<input type="text" value="Negative"/>	<input type="text" value="Very Negative"/>	<input type="text" value="Negative"/>	<input type="text" value="Slightly Negative"/>	
Status quo	<input type="text" value="Slightly Positive"/>	<input type="text" value="Slightly Positive"/>	<input type="text" value="Neutral"/>	<input type="text" value="Slightly Negative"/>	

Figure 27. Evaluation table

5.2.6. Multi-Actors

Click on '6-Multi Actors' in order to view the stakeholder preferences. Different visualisations of stakeholder preferences can be found under 'Multi-Actor Line Chart' in the left-hand textbox. All the charts show the preferences of each stakeholder group for each alternative, based on their criteria and weights. For example, the multi-actor line chart in **Figure 28** shows the evaluation score (preference) of each stakeholder group for the status quo and for two alternatives. The stakeholders are on the x-axis, their scores for each alternative are on the y-axis.

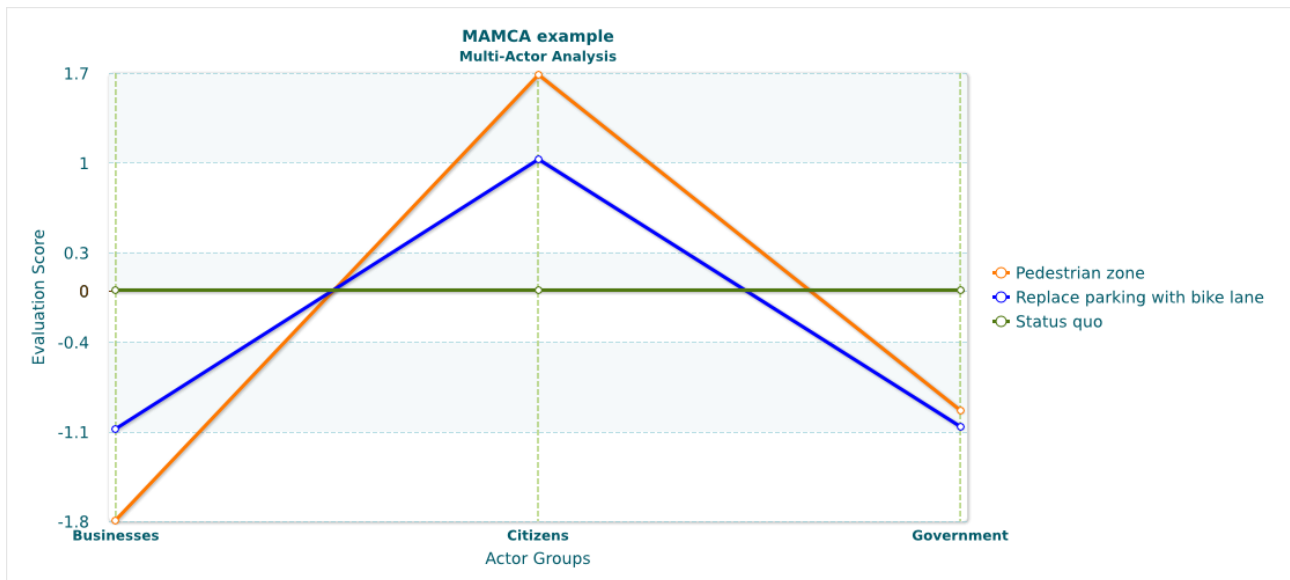


Figure 28. A multi-actor line chart

In the fictional example in **Figure 28**, citizens show great support for the two alternatives: both the pedestrian zone and replacing parking with a bike lane have a high score. These two alternatives have a low score for both businesses and government. Especially businesses do not like the two alternatives, as can also be seen in **Figure 29**. This figure shows that the total evaluation score for businesses is highest for the status quo, followed by the bike land and the pedestrian zone.

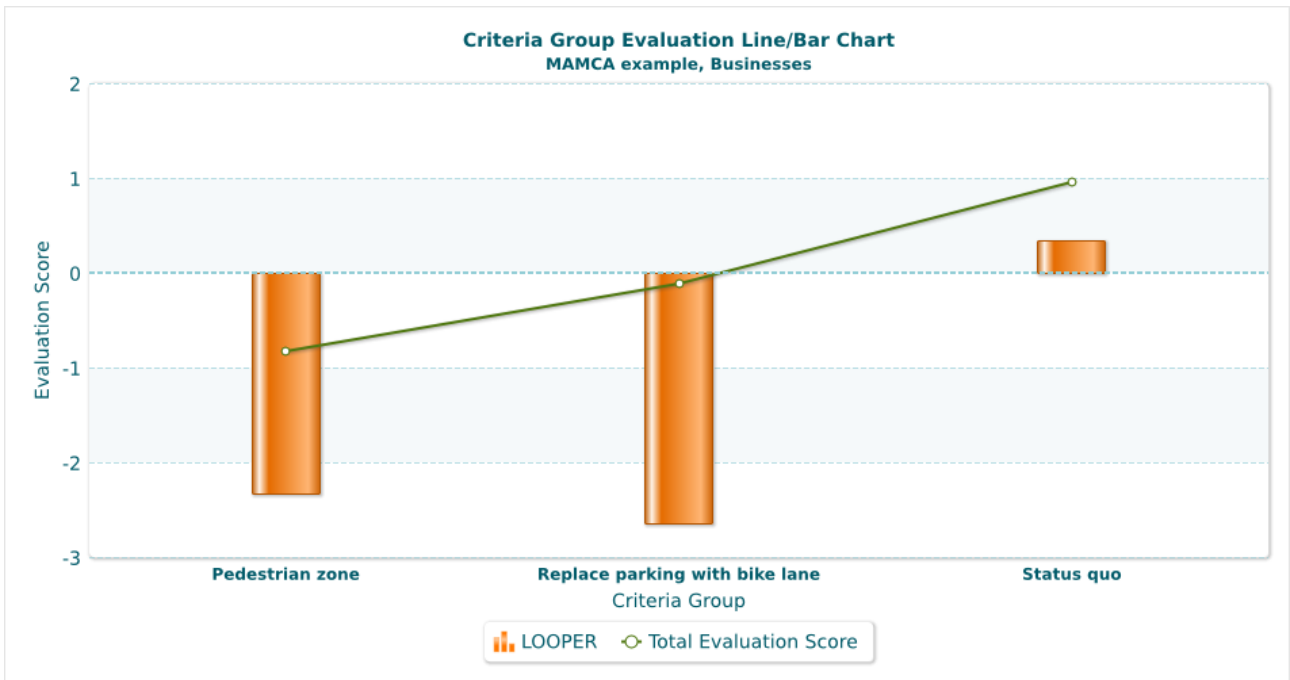


Figure 29. MAMCA line/bar chart for businesses

The function 'Evaluation and Weight 3D chart' under 'Stakeholder Chart' in the menu on the left of the page visualises the criteria weights and evaluation scores per stakeholder, as shown in **Figure 30**. Comparing the evaluation and weight chart of each stakeholder gives an insight in what criterium/criteria causes a stakeholder to (not) support an alternative.

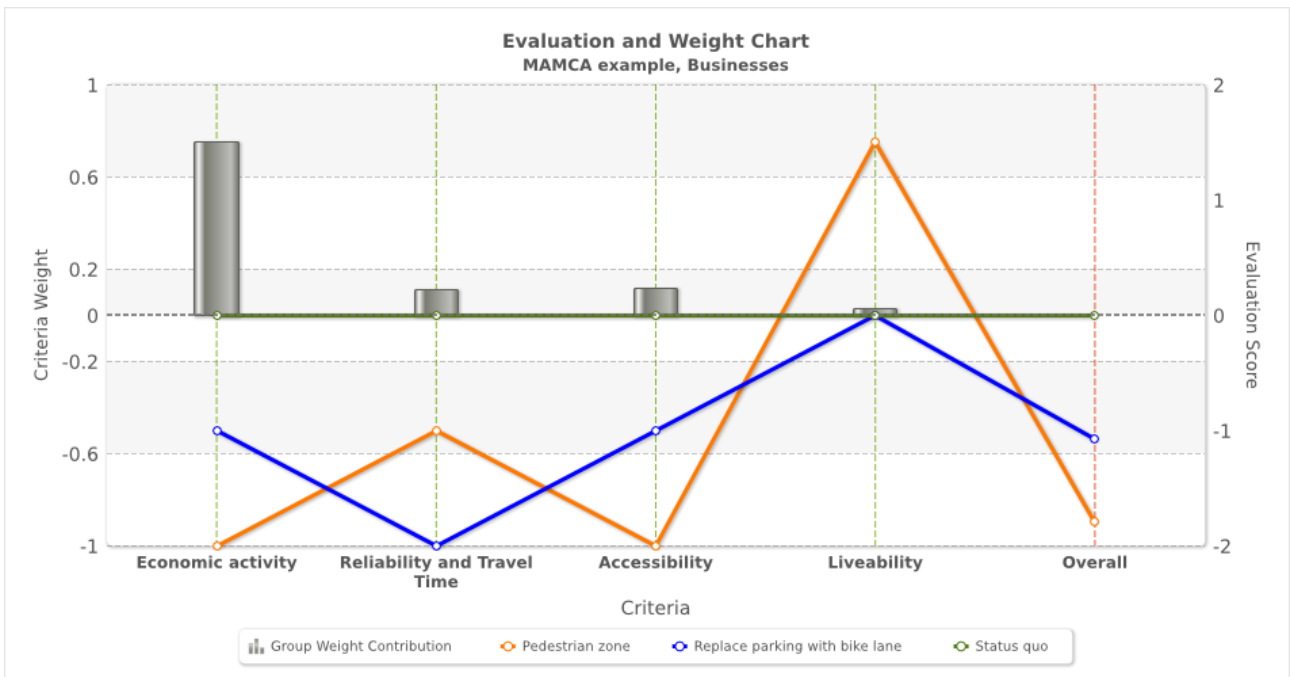



Figure 30. Evaluation and weight chart

The MAMCA software also allows users to perform a sensitivity analysis which shows the effect a change in the weight of a criterium has on the chart that shows the preferences of each stakeholder groups (such as in **Figure 28**). This can be done by clicking 'Sensitivity Analysis Using Chart' under 'Analysis'. Tick the box of the stakeholder group whose criteria you wish to change. The sensitivity analysis allows users to easily show if the result changes when the weights are changed.

A complete report with all the visualisations can be downloaded as a PDF-file by clicking on 'Download Project Report' under 'Multi-Actor Chart' in the left-hand textbox. Visualisations of the criteria and weights per stakeholder can be found under 'Stakeholder Chart'. Individual visualisations can be downloaded by clicking the  icon in the top-right corner of an image. A PDF-file with all the visualisations can be download as a PDF-file by clicking on 'Download Report' in the same textbox.

6. CONCLUSION

Combining evaluation methods such as MCA and MAMCA with co-creation is uncharted territory. This deliverable intends to give Living Lab coordinators guidelines on how to integrate multi-criteria analysis (MCA) and multi-actor multi-criteria analysis (MAMCA) into the LOOPER co-creation process. The goal of these methods is to show how sustainable and how much stakeholder support each co-created idea has. Together, these two methodologies can facilitate reaching consensus between the different stakeholders on a co-created idea that is both sustainable and has support from (most) stakeholders. This allows the LOOPER project to proceed to the third and final stage of the learning loop: implementation and monitoring of a co-created idea. The experiences of the LOOPER Living Lab coordinators and stakeholders will be used as to research the added value of combining evaluation with co-creation.

7. ACKNOWLEDGEMENTS

The support of Brussels Capital Region – Innoviris (Belgium), Ministero dell'Istruzione dell'Università e della Ricerca (MIUR) (Italy), the Economic and Social Research Council (UK) and the European Union is gratefully acknowledged.

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ANNEX 1 – STAKEHOLDER SURVEY CO-DESIGN AND EVALUATION

Which stakeholder group do you belong to?

	Completely agree	Agree	Agree nor disagree	Disagree	Completely disagree	Not applicable
I understand how the co-created ideas have been evaluated						
I trust the evaluation process						
The evaluation of co-created ideas has improved my understanding of the viewpoint of other stakeholders						
The evaluation of co-created ideas has improved my understanding of the effects on sustainability that the different co-created ideas have						
I am satisfied with the outcome of the evaluation of co-created ideas						
The evaluation of co-created ideas was too time-consuming						
The evaluation process increased my knowledge on sustainability						
The evaluation process improved the quality of the ideas						
Selecting my preferred criteria through the online survey was straightforward						
The consensus-making workshop was helpful in reaching a solution which is agreed by most stakeholders						
I understand the visualisations of sustainability and stakeholder preferences						

Since when are you a participant in this LOOPER Living Lab?

Did you participate in (a) workshop(s) of the LOOPER Living Lab?

Yes, I participated in ... workshop(s)

No

How would you rate the evaluation of co-created ideas?

very good

good

good nor bad

bad

very bad

How could the evaluation of co-created ideas be improved?

ANNEX 2 – EVALUATION IN LIVING LAB LOGS

The following questions should be considered when Living Lab coordinators write down their experiences combining co-creation with evaluation in the Living Lab logs:

- How did stakeholder selection take place? Who was responsible for the selection?
- How easy was it to engage stakeholders to participate in the evaluation process? What was the cause of this?
- Do you believe stakeholders understand the methodology behind MCA and MAMCA?
- Do you believe stakeholders trust the methodology behind MCA and MAMCA?
- Do you believe the sustainability MCA and MAMCA had an impact on the selection of the alternative(s) that will be implemented?
- Does MCA and MAMCA add extra value to the co-creation process?
- What would you improve if you had to do another evaluation using MCA and MAMCA?
- Do you believe the online MAMCA software was useful?
- How easy was it to weigh the criteria of stakeholders?
- How easy was it to evaluate the impact of alternatives on criteria?
- How easy was it to use and explain visuals/results from the online MAMCA software?

ANNEX 3 – STAKEHOLDER IDENTIFICATION FORM

Living Lab coordinators will report the outcome of the identification of the stakeholders in a document with a list of stakeholders, their definitions and contact details.

Stakeholder group	Definition	Representative	Contact details
<i>Name of the stakeholder group, i.e. government.</i>	<i>Description of the stakeholder group. In the example of the stakeholder group government: which level of government? What are their competences and responsibilities?</i>	<i>Name of person(s) that will be interviewed to collect the criteria and weights for the sustainability MCA and MAMCA.</i>	<i>Name, position, e-mail address, and phone number of the representative(s) that will be interviewed.</i>

ANNEX 4 – NISTO CORE CRITERIA

Criteria	Explanation	Indicators	Explanation
ECONOMY	The 3 pillars (Economy, Environment and Society) are equally important		
Economic activity (0.21)	Economic (and business) change due to the realisation of the project	Shop occupancy in the city	The proportion of occupied shops is used as a simple way of determining how the local economy is performing.
		Hotel occupancy in the city	The actual occupancy of hotel rooms (monthly average) is an indicator of economic activity in the city.
		Employment opportunities	How many new full time equivalent (permanent) jobs will be created by the project internally (within the implementing organisation) and externally.
Cost effectiveness (0.24)	The overall balance of costs and revenues of investments and operations	Investment costs	These are the public and private costs for the initial set up of the scheme or project that is monitored. They can include for example construction costs, purchase of rolling stock, back office and website design etc.
		Operating costs	These are the public and private costs for maintenance and running the scheme, including for example repairs, staffing costs, fuel and other consumables.
		Revenues	These are the revenues for both public and private parties, generated by the project, e.g. by ticket sales, membership, user fees, subsidies, advertising.
Reliability and travel time (0.31)	Impact on the costs and punctualities of goods deliveries; impact on the travel time of business travellers	Cost of deliveries and pickups	The average amount of money paid by the shipper for shipping a product or service unit or entity to the receiver in the city.
		Punctuality of deliveries and pickups	Punctuality is defined as the percentage of pick-up and/or delivery times that are within an acceptable time slot or time window.

		Travel time of business travellers	Average travel time of travellers travelling for business purposes
Public funding of transport (0.24)	The level of public subsidies provided for transport investment and operation	Level of transport subsidies for investments	Percentage of public funding for investments, related to the project.
		Level of transport subsidies for operating costs.	Percentage of public funding for operational costs related to the project.
ENVIRONMENT	The 3 pillars (Economy, Environment and Society) are equally important.		
Land consumption (0.20)	The proportion of land which is occupied by transport infrastructure contributing to the loss of green areas, habitats and causing visual impact	Extent of land consumption by project implementation	The proportion of land, which is occupied by transport infrastructure.
Greenhouse gas emissions (0.21)	Level of CO2 emissions	CO2 emissions	What are the Carbon Dioxide (CO2) emissions for the project, also including any indirect effect like change due to modal shift from/to cars?
Air quality (0.22)	Concentration of particulate matter and NOx	PM2.5 emissions	What are the particulates (PM2.5) emissions for the project?
		NOx emissions	What are the nitrogen oxides (NOx) emissions for the project?
Resource use (0.20)	Energy efficiency of transport vehicles	Energy efficiency of vehicles	What is the energy consumption of vehicles that are used in or affected by the project?
		Proportion of alternative energy sources used	What percentage of the fuel/energy used in the project comes from alternative sources (biofuel, electricity, hydrogen, non-fossil methane, natural gas)?
Noise (0.17)	Exposure to transport noise	Perception of transport noise	What is the perception of residents of transport related noise levels in their local area?
		Exposure to transport noise	Percentage of population exposed to traffic noise levels affecting well-being (greater than 40dBA)
		Produced noise	The overall noise produced by transport related to the project.

SOCIETY		The 3 pillars (Economy, Environment and Society) are equally important.	
Safety (0.20)	The risk of a person using the transport network being killed or seriously injured	Number of accidents	Total number of accidents per year per 100 km travelled for each transport mode (including walking and cycling)
		Perception of safety	How do transport users perceive safety when participating in traffic? (qualitative evaluation)
Security (0.11)	Crimes committed against transport users or transported goods	Perception of crime and security	What is the perception of crime per mode, including public transport, personal transport, walking and cycling?
		Reported crime	Reported crimes or incidents relating to public transport, car and bicycle theft and pedestrians
Health of citizens (0.16)	Physical and mental wellbeing of citizens	Level of health of citizens	The percentage of walking and cycling trips for travelling compared to the total amount of trips by all modes.
Liveability (0.18)	How well citizens and visitors feel in the public areas of the city	Walkability and pedestrian friendliness	Total length of pedestrian areas (walking paths, pavements) in % of the length of the whole transport network (roads)
		Quality of urban space	What are people's perception of the urban realm or character of the town? (qualitative evaluation)
Equity (0.13)	Provision of access to jobs and basic services for affected population groups, over which the projects' effects are distributed (like citizens and visitors), irrespective of social and economic background	Accessibility of employment	The working age people living within 30 minutes travel time to nearest employment centre
		Accessibility of services	The percentage of people living within 30 minutes travel time to nearest town centre or shopping centre
		Accessibility of public transport stops and stations	Percentage of people living within 5 minutes walking to public transport stop or station
		Level of service from the nearest public transport stop or station	How frequent is the daytime service from the nearest station or stop (number of services per hour during regular service)?
		Cost of mobility	The percentage of a person's income that is spent on transport. Calculated on a monthly basis.

Socio-political acceptance (0.09)	Citizens' satisfaction with the mobility policy or project	Citizen's approval of/satisfaction with the mobility policy or project	Overall level of satisfaction with mobility policy or the project by the citizens (qualitative evaluation).
Accessibility for people with special needs (0.13)	Accessibility for people with special needs (disabled, elderly and people with small children)	Level of fully accessible services	Proportion of fully accessible services/stops /stations

ANNEX 5 – BRUSSELS SURVEY OBJECTIVES/CRITERIA

Which of the aspects related to mobility below have your personal preference? Give max. 4 answers.

- | | |
|---|--|
| <input type="checkbox"/> Reaching my destination quickly | <input type="checkbox"/> Safe streets in which children can play |
| <input type="checkbox"/> Reaching my destination safely | <input type="checkbox"/> Less traffic noise |
| <input type="checkbox"/> Bike paths and parking in the area | <input type="checkbox"/> More green |
| <input type="checkbox"/> Parking place close to home | <input type="checkbox"/> Better air quality |
| <input type="checkbox"/> Parking places close to services
(bank, doctor, post office...) | <input type="checkbox"/> Easier access to public transport |
| | <input type="checkbox"/> Other: _____ |

I believe traffic safety is a problem in Helmet.

Completely disagree 1 2 3 4 5 Completely agree

Speeding traffic is a problem in my street.

Completely disagree 1 2 3 4 5 Completely agree

Name of my street (number is optional):

Speeding traffic is a problem in my street, especially on this time of day:

- | | |
|---|---|
| <input type="checkbox"/> Morning (8h-10h) | <input type="checkbox"/> In the evening (19h-22h) |
| <input type="checkbox"/> During the day (10h-16h) | <input type="checkbox"/> At night (22h-6h) |
| <input type="checkbox"/> Evening (16h-19h) | <input type="checkbox"/> In the weekend |

If you could invest €10.000 in mobility, which measures would you want to test? Choose max. 4 options.

- | | |
|--|--|
| <input type="checkbox"/> Improved crossings for pedestrians | <input type="checkbox"/> More speed bumps |
| <input type="checkbox"/> Increase the number of parking spots or garages | <input type="checkbox"/> More speed checks by the police |
| <input type="checkbox"/> Decrease the number of parking spots or garages | <input type="checkbox"/> More space for pedestrians |
| <input type="checkbox"/> Awareness campaigns about safe driving | <input type="checkbox"/> More bike paths |
| <input type="checkbox"/> Signs and other visual aids to encourage reduced speeds | <input type="checkbox"/> Other: _____ |

Where (street or intersection) is an intervention urgently needed, according to you and why?

Is there anything else you wish to state about traffic safety in your area?

- Yes, keep me posted about future actions surrounding traffic safety in Helmet!

My name:

My e-mail address:

My phone number:

ANNEX 6 – PEN AND PAPER AHP PAIRWISE COMPARISON

Dear LOOPER participant,

Your opinion matters in the LOOPER project. By filling in the table below, we can define the **preferences of LOOPER participants**. A similar analysis will be made for other stakeholders, such as the municipality and businesses. We will use this data to find out **which solution is preferred by (most of) the stakeholders**.

You fill in the table by indicating per line which of the two criteria is more important to you.

Example:

Equal importance	Crit. A <table border="1" style="display: inline-table; text-align: center; width: 100px;"><tr><td> </td><td> </td><td> </td><td> </td><td> </td><td>x</td><td> </td><td> </td><td> </td><td> </td></tr></table> Crit. B						x				
					x						
Criterium A is very important, Criterium B is not important	Crit. A <table border="1" style="display: inline-table; text-align: center; width: 100px;"><tr><td>x</td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr></table> Crit. B	x									
x											
Criterium A is slightly more important than criterium B	Crit. A <table border="1" style="display: inline-table; text-align: center; width: 100px;"><tr><td> </td><td> </td><td>x</td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr></table> Crit. B			x							
		x									

Please fill in the table below

	Much more important	More important	Fairly more important	Slightly more important	Neutral	Slightly more important	Fairly more important	More important	Much more important	
Criterion 1										Criterion 2
Criterion 1										Criterion 3
Criterion 1										Criterion 4
Criterion 1										Criterion 5
Criterion 2										Criterion 3
Criterion 2										Criterion 4
Criterion 2										Criterion 5
Criterion 3										Criterion 4
Criterion 3										Criterion 5
Criterion 4										Criterion 5

ANNEX 7 – EVALUATION TABLE

Evaluator	<i>Please fill in name</i>		
Stakeholder group		Criterion	Indicator
Alternative	Evaluation score	Justification	Sources
Alternative 1	<i>Choose an item.</i>		
Alternative 2	<i>Choose an item.</i>		
Alternative 3	<i>Choose an item.</i>		
Alternative 4	<i>Choose an item.</i>		