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SPADE

Assessment method and guidelines – Concept

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Author(s) this deliverable:

Ivo Hindriks, Panteia, Netherlands

Jan Kiel, Panteia, Netherlands

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Executive summary

Introduction

Decision-making in the planning of infrastructure and spatial development projects is a complicated matter. Current planning processes are facing two major challenges. First, all impacts associated to infrastructure planning are insufficiently taken into account in current planning practices, in particular with regards to multi-interpretable and hard to grasp impacts such as wider-economic effects or social impacts. Second, stakeholders who are impacted by policy measures are insufficiently involved in the planning process. The second issue is closely related to the first issue, because if the impacts of an infrastructure investment are widespread, so are the stakeholders that are affected by these impacts.

Against this background, CEDR asked the central question: *How to achieve integrated project development of infrastructure and its spatial surroundings?* Specifically, CEDR set out the challenge to develop an integrated assessment method that that can be used in the planning process to overcome these challenges. The method should addresses the following topics:

- Stakeholder identification and involvement;
- Inclusion of both passenger and freight transport;
- Applicable on different spatial scales (international, national, regional and local);
- Assessment of direct and indirect benefits on the economy, society, environment and on public accounts;
- Applicable at different time horizons (short, medium and long);
- Inclusion of different types of data or information;
- Considers different paces of spatial planning at the different stakeholders;
- Systematization of stakeholders' interests and strategies:
- Classification of impacts distinguishing between efficiency and distributional impacts;
- Inclusion of weights of different impacts.

The method introduced in this report is called the SPADE method and seeks to address these topics. This report presents the first version of the SPADE method based on literature findings. It builds forth on the previous deliverable, a literature review on transport impacts and transport impacts assessment methods (see Bogh Holmen et al., 2019).

Background

To arrive at this method, we first identify various techniques that help in addressing the two aforementioned challenges. We highlight various methods, because there is no consensus in the literature about the best mix of planning methods that address these shortcomings.

First we consider the CBA and MCA. These two ex-ante policy assessment methods are well suited to give an accurate picture of the costs and benefits involved in an infrastructure or spatial development project. There is a large volume of literature dedicated to how these two assessment methods deal with the first challenge. For a discussion on this we refer to the previous deliverable (see Bogh Holmen et al., 2019). The CBA and MCA perform less well when considering the second challenge, the inclusion of stakeholders, because the methods do not take into account different perspectives of the same criterion nor is stakeholder involvement part of the method

To deal with the second challenge, we examine collaborative planning methods. We find that, in contrast to assessment methods like CBA and MCA, many different collaborative methods exists, with each of them complying to the following general criteria: allowing for stakeholder input according to some form of pre-determined structure, such as computer facilitated support tools or decision support methods. Since our aim is to deliver a method that should be applicable to many different planning contexts we consider the best approach

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to be to choose the basic and best known collaborative planning methods. Therefore, the workshop and e-participation is suggested as techniques for stakeholder involvement. We advocate for the usage of computer-facilitated tools in both methods as this has proven to speed up and enhance collaboration and communication. Moreover, digital tools allow for basic statistical analysis with stakeholders which helps with incorporating the CBA and MCA into the process.

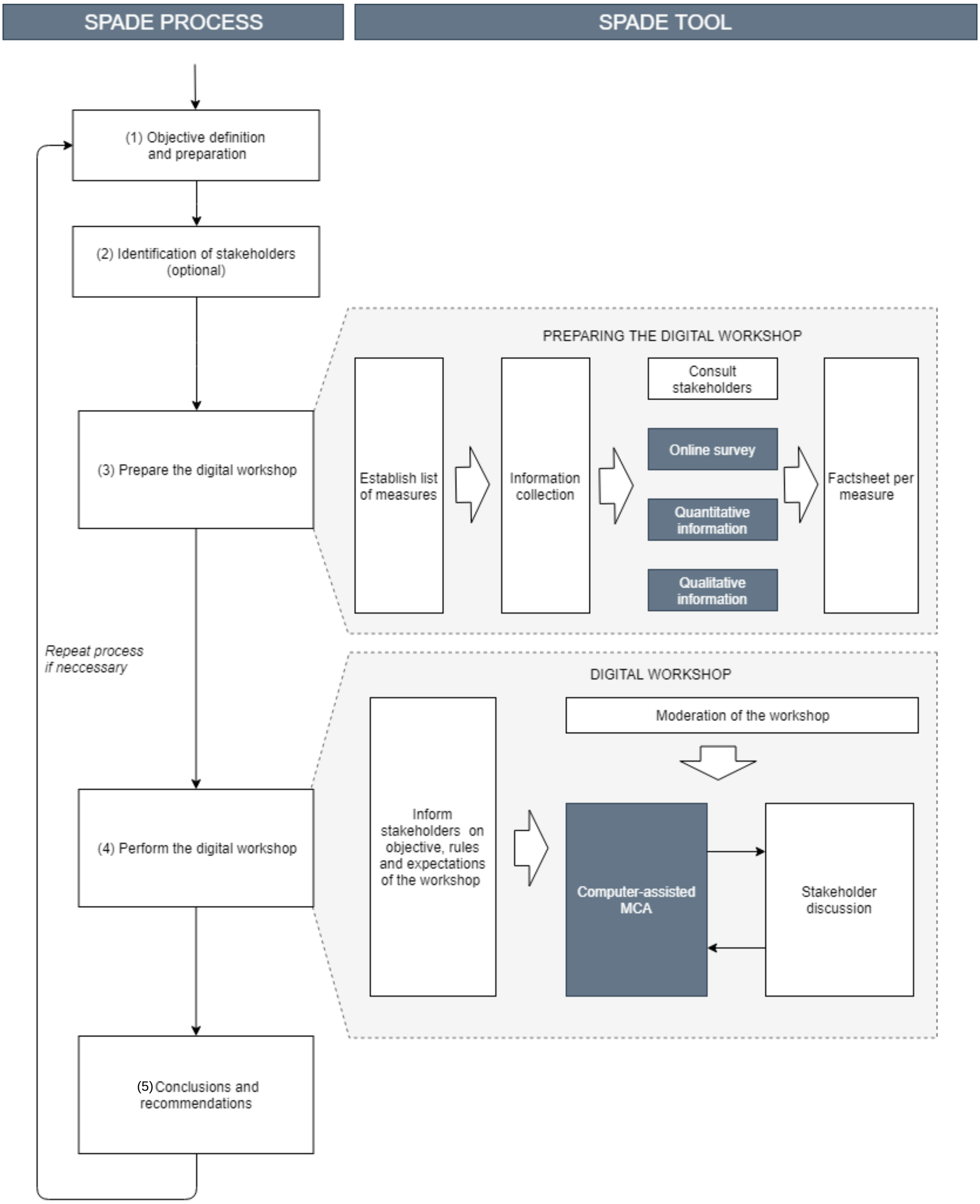

Figure I: Visual depiction of the SPADE method, showing the SPADE process and SPADE tool, including the four methods (CBA, MCA, digital workshop and online survey, indicated in color) used in the workflow

The SPADE method: an overview

Having identified the major components of the method, we subsequently link the methods together in one process. Figure I gives an overview of the workflow of the SPADE method.

The method is divided into two parts, the SPADE process and the SPADE tool. The SPADE process contains the necessary steps to include the main component, the SPADE tool, into the planning process. The SPADE tool involves a one-day workshop in which stakeholders meet in a focus group-like setting and discuss various policy measures or alternatives by means of conducting a computer-facilitated MCA. All the steps shown in Figure I are described in more detail in chapter 4.

Application and expected results

The added value of the method is twofold. It helps with collecting information on policy measures from different stakeholders while at the same time stakeholders are involved in the planning process. The method increases the information available to the planners and helps in narrowing down the potential solutions from many to a few preferred solutions.

The method is multi-purpose. It can be applied in spatial and infrastructure projects from various sizes, multiple contexts, including projects focussed on spatial planning and it can be performed at multiple stages in the planning process. The method is flexible, giving freedom to the planner to tailor the method to the needs of the planning process. Figure II**Error! Reference source not found.** shows the application of SPADE in the planning process and its expected effects.

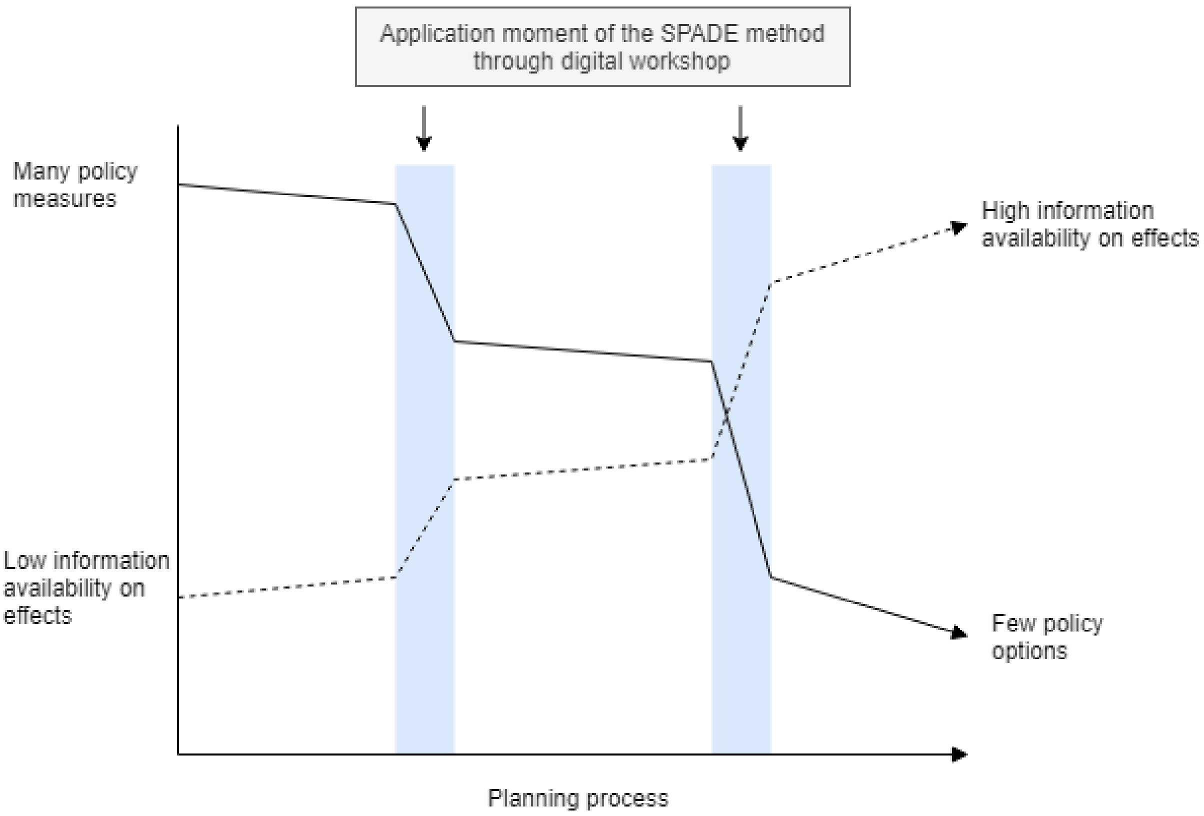

Figure II: Suitable application moments of the SPADE method and its effects on the planning process. The method helps in narrowing down the policy options while increasing stakeholder support and knowledge on the effects of different policy measures.

SPADE method response to CEDR challenges

The overview below describes how each challenge set in the introduction is addressed by the method.

Challenge	The SPADE-method
Stakeholder identification and involvement;	Stakeholder identification is optionally done according to a Social Network Analysis. This ensures that all stakeholders are involved, including those that are less vocal and have fewer resources available to them. Large groups of stakeholders are involved through an online survey, whereas the digital workshop allows for close interaction with a few representative stakeholders.
Inclusion of both passenger and freight transport;	The method is flexible. The digital workshop is a standard research technique used in many disciplinary fields to gather opinions from stakeholders. This setting allows for any topic to be discussed. Similarly, the MCA can be tailored to the needs of the planning process by including the criteria that are relevant.
Applicable on different spatial scales (international, national, regional and local);	The flexibility of the method as described above likewise allows for including projects from various scales. Larger projects are often more complex than local projects, making the SPADE method longer or decreasing the level of detail. The planners needs to be aware of this.
Assessment of indirect benefits on economy, society, environment and public accounts;	The method is particularly suited for assessing the 'unconventional' indirect effects because it gathers opinions from stakeholders through an online survey and a digital workshop. The usage of an MCA simplifies these complex and intersubjective effects into a comparable number, making assessing these effects easier. The workshop allows for the stakeholders to provide context to these simplified numbers, avoiding that the complexity of indirect effects are reduced to a number.
Applicable at different time horizons (short, medium and long);	The flexibility of the method as described above likewise allows for including projects with different time horizons. In fact, the method is particularly suited to be used at multiple stages in the same planning process.
Inclusion of different types of data or information;	Thanks to the combination of four methods and tools, CBA, MCA, the online survey and the digital workshop, all kind of data types can be included, from subjective data to financial data. The CBA is best suited for handling financial data, whereas the workshop is best suited for handling subjective data, with the other two methods laying in between.
Different paces of spatial planning at the different stakeholders;	The structure provided in the digital workshop via the moderator and the computer-assisted MCA helps the stakeholders in finding consensus about the best fitting planning pace.
Systematization of stakeholders interests and strategies:	The Stakeholder Analysis performed under the first step of the SPADE process constitutes a systematization of stakeholders and their background.
Classification of impacts with distinction between efficiency and distributional impacts;	This is an important challenge. The method stresses the need to present the effects *according to stakeholder groups*. Decision-makers are most interested in these trade-offs instead of the composite number resulting from CBA and MCA. Moreover, showing the effects per stakeholder group facilitates discussions and consensus finding better than composite numbers.
Inclusion of weights of different aspects.	Standard to an MCA is the inclusion of weights. The computer-assisted MCA conducted during the workshop enables the stakeholders to pick their own weights.

Further development of the method

To further develop the SPADE method, the concept will be tested in three different settings, one in the Netherlands, one in Norway and one in Austria. These tests will be evaluated in order to gain a better understanding of how the method performs and under which situations the methods work well.

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1. Introduction

The CEDR Transnational Research Programme was launched by the Conference of European Directors of Roads (CEDR). CEDR is the Road Directors' platform for cooperation and promotion of improvements to the road system and its infrastructure, as an integral part of a sustainable transport system in Europe. Its members represent their respective National Road Authorities (NRA) or equivalents and provide support and advice on decisions concerning the road transport system that are taken at national or international level.

The participating NRAs in the **CEDR Call 2017: Collaborative Planning** are **Austria, Finland, Netherlands, Norway, Sweden** and the **United Kingdom**. As in previous collaborative research programmes, the participating members have established a Programme Executive Board (PEB) made up of experts in the topics to be covered. The research budget is jointly provided by the NRAs as listed above.

1.1. Background

The planning process in the (re)development of infrastructure is a complicated one. Planners, decision-makers and different stakeholders need to assess various policy measures and narrow down the list of potential solutions until one remains that will be implemented.

Selecting the right policy measure or a package of policy measures, either early on or later on in the planning process, requires a thorough understanding of the impact that each measure or package has on transport, environment, economy or society. Having knowledge about these impacts, enables planners, decision makers and other stakeholders to weigh different scenarios and pick the best option. More accurate views on potential impacts lead to more informed decisions, which in turn leads to better quality projects and more satisfied stakeholders, ultimately making society better.

Therefore, having a deeper understanding of the impacts associated with a proposed infrastructure project is critical for a project to be successful. However, the ex-ante estimation of impacts is often far from straightforward.

Even more so, the failure of taking into account all relevant impacts associated with policy measures or packages has been problematic for infrastructure (re)development projects throughout Europe, with many projects suffering from quality issues and legitimacy issues, leading to dissatisfaction among stakeholders (Heeres, Tillema, & Arts, 2016).

The reason for the lack of quality of projects is partly due to inaccurate input into the decision making processes. Firstly, infrastructure projects cause a multitude of effects in many domains of society that are interpreted differently by different stakeholders. In current decision-making processes, these impacts are not always sufficiently taken into account. Secondly, often some stakeholders are left out of the policy or decision making process who are safeguarding their interests. Stakeholder inclusion in the planning process is necessary to fully capture all effects, in particular those effects that are more qualitative or contested.

Hence, there is a need for a better support of the planning process. Better methods are needed to overcome the issue of inaccurate input to the decision making process. There is a need for a more integrated and more collaborative planning method.

1.2. Objective of this deliverable

The aim of this deliverable is to provide a method that improves the planning process. The method proposed is an integrated assessment method that captures all impacts associated to policy measures or packages of policy measures, while also allowing the involvement of different stakeholders. The development of such an inclusive method comprises various challenges:

- How to gain a better understanding of the relation between spatial and multimodal infrastructure development?
- How to assess the societal value of combined multimodal infrastructure and spatial development for decision making on investments?
- How to capture the added value from combined infrastructure and spatial development?
- How to map the consequences of an inclusive assessment?
- How to utilize stakeholder information without suffering from information skewness?
- How to identify and distinguish between vested interests and the interests of society?

Different instruments and methods already exist to carry out assessments. Some are tailor made, while other instruments and methods have a wider range of application. Often these are part of guidelines for infrastructure development and comprise topics such as cost-benefit analysis (CBA) or multi-criteria analysis (MCA). Yet, these guidelines might not capture or focus on all impacts that stakeholders have in mind, for example when it comes to the social impacts and distributional concerns. Moreover, collaborative planning is usually not part of these guidelines. Given the challenges as set out by CEDR, the SPADE assessment method comprises the following topics:

- Stakeholder identification and involvement;
- Inclusion of both passenger and freight transport;
- Applicable on different spatial scales (international, national, regional and local);
- Assessment of direct and indirect benefits on the economy, society, environment and on public accounts;
- Applicable at different time horizons (short, medium and long);
- Inclusion of different types of data or information;
- Considers different paces of spatial planning at the different stakeholders;
- Systematization of stakeholders' interests and strategies:
- Classification of impacts distinguishing between efficiency and distributional impacts;
- Inclusion of weights of different impacts.

This report provides a *draft* guideline of a method that takes into account the aspects mentioned above. The methodology presented in this report is hereinafter referred to as the SPADE method. The SPADE method consists of two components, the SPADE process and the SPADE tool.

- The SPADE process describes a collaborative planning process, in which stakeholders from different backgrounds with different wish lists and different planning procedures need to work together. The process ensures that resourceful and resource poor groups are heard on equal basis, reveal vested interested and ensure as broad stakeholder participation as possible.

- The foundation of the SPADE tool –and partly the process– is described in (Taale, Kiel, & Muizer, 2016). The tool is improved based on the outcome and findings of the literature research (see Bogh Holmen et al., 2019). The tool supports the SPADE process and consists of a combination of a digital workshop and an assessment tool, which combines a multi-criteria analysis with a cost-benefit analysis and e-participation. The digital workshop offers room for the stakeholders to enter into a discussion with each other about the policy measures or packages of policy measures. The workshop is led by a moderator who ensures that the discussion remains structured and that each stakeholder is heard on an equal basis.

This report presents the *first version* of the SPADE method. It builds on the previous deliverable, a literature review on transport impacts and transport impacts assessment methods (see Bogh Holmen et al., 2019). The method presented in this report will be tested in practice in three case studies. Any further suggestions for improvement from these cases will be included in the final version of this report.

1.3. About the Spade Project

CEDR defined three important and mutually related issues that need to be addressed in the context of collaborative planning:

- *Exploration* of an integrated spatial and infrastructure development;
- *Design* of an integrated spatial and infrastructure development;
- *Assessment* of an integrated spatial and infrastructure development;

This paper addresses the third topic on the assessment of an integrated spatial and infrastructure development. For this topic, CEDR seeks an inclusive method for assessing costs and benefits of combined infrastructure and spatial development, building upon existing knowledge and including specific spatial contexts such as nation-wide, urban or rural regions. The SPADE project (Assessing the added value from SPAtial DEvelopment as a factor in infrastructure planning) is providing this method.

A consortium consisting of Panteia (lead), TØI, HaCon and AIT has taken the challenge to develop an assessment method, based upon a literature review and existing knowledge.

1.4. Structure

The second chapter describes the need for an integrated planning method. This chapter considers existing attempts to create and apply integrated planning methods. Lessons from these attempts are used to construct the SPADE assessment method. Chapter three introduces the SPADE method, its purpose, its application and the expected results.

The SPADE method consists of two main components, the SPADE process and the SPADE tool. Both components are explained in depth in chapter four.

Chapter five concludes the report by answering the challenges as set out in the introduction. Moreover, the next steps for further development of the method are given.

2. Background for an integrated assessment method

The SPADE method is based on an earlier an integrated assessment method called the Assessment Method for Demand and Traffic Management (AMDTM). This method, developed by Kiel, Muizer and Taale (2015), is introduced and discussed in the first section. Considering the limitations of AMDTM, we take a closer look at the current issues in planning processes in order to examine where the method can be improved. A related questions is., ‘What are the planning-related issues that the method needs to address?’ Secondly, we take a look at various methods that help to overcome these issues. These methods are used to construct the SPADE method, which is presented in the subsequent sections.

2.1. Origin of the method

The SPADE method is based on an existing method developed by *Rijkswaterstaat*, the directorate-general for public works and water management in the Netherlands.

The original method is called the Assessment Method for Demand and Traffic Management (AMDTM) and is developed by Kiel, Muizer and Taale in 2015. The method has been refined in a later publication in 2019 and was applied to four test cases (Kiel & Taale, 2019). AMDTM is developed to address the same issue as SPADE seeks to address. The method is designed to make planning more collaborative and to allow for the inclusion of a wide range of impacts, including accessibility, safety and sustainability (Kiel, Muizer, & Taale, 2015). AMDTM is mainly a tool and combines an assessment in 10 steps with a digital workshop. In the workshop various policy scenarios can be assessed with stakeholders using a computer-assisted MCA. A visualization of AMDTM is shown in Figure 2.1.

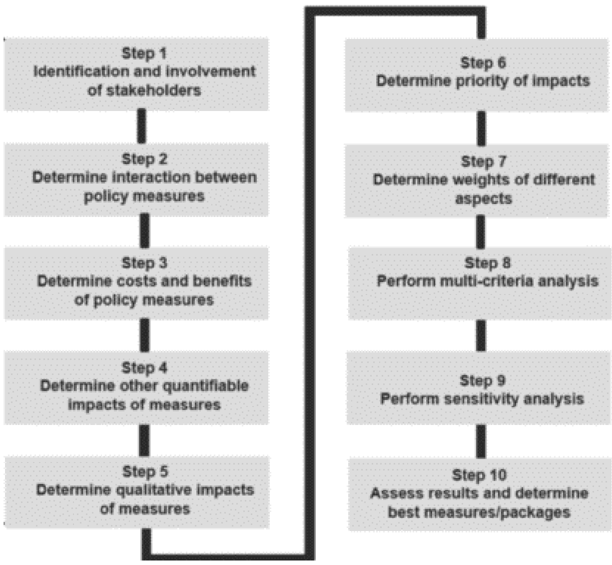

Figure 2.1 An overview of the Assessment Method for Demand and Traffic Management (AMDTM) developed by Kiel, Muizer and Taale (2015)

AMDTM is a convenient starting point for the SPADE method, because it is developed to address the same issues that SPADE seeks to address. However, the original method has some limitations that can be improved upon.

Firstly, the AMDTM lacks scientific underpinning. The method has been developed by planning practitioners who based the method primarily on their experience. A literature review of various collaborative planning methods helps with justifying the choices that were made and lead to a more concrete definition of how each step should be carried out. For example, we believe that the method can benefit from performing an online survey in preparation of the workshop. This is a well-known form of crowd-sourcing information from a potential unlimited number of stakeholders that can be conducted prior to the workshop. Literature on collaborative planning methods contributes to fine-tuning the collaboration methods in AMDTM.

Secondly, the AMDTM does not make a clear distinction between which steps are done by the planner and which are done by the stakeholders. Hence the collaborative component is not clearly distinguishable. For example, the weighing of factors could be given by the planners in advance or could be part of the multi-criteria analysis. In this regard, a distinction needs to be made between the preparation phase of the workshop (i.e. compiling the information to be shown to the stakeholders in the workshop, done by the planner) and performing the workshop (i.e. the MCA that is conducted with the stakeholders). The new method can benefit from having a clearer guidance between the role of the planner and the role of the stakeholders.

In the remainder of this chapter we look at the scientific foundations behind the need for an integrated assessment method. We start with going back to the requirements of such a method by investigating the planning-related issues that the method is addressing. From there, we briefly discuss the assessment methods and collaborative planning methods that help in overcoming these issues.

2.2. The need for an integrated assessment method

For the (re)development of infrastructure knowledge is needed on the effects that a proposed infrastructural change or transport policy measure can cause. However, there is much uncertainty on the potential social and economic effects of a proposed infrastructural intervention. This uncertainty is due to these effects of infrastructure interventions being complex and widespread through various domains of society. If the planner does good research in finding out the costs and benefits associated to a potential scenario, more informed decisions can be made, which lead to better quality projects.

However, the methods with which policy scenarios can be assessed ex-ante are far from straightforward. Even more so, the lack of good assessment methods has been challenging. For example, infrastructure (re)development projects throughout Europe are suffering from quality issues and legitimacy issues, resulting in dissatisfaction among stakeholders about the result (Heeres et al., 2016). According to Heeres and his colleagues (2016) there are two general reasons for this failure, both of them rooted in the planning process. The first reason refers to the functional interrelatedness of planning, referring to the complex array of effects that an infrastructure intervention can cause, which is often not taken into account. The second reason is called institutional fragmentation and is closely related to the first reason. This refers to the fragmentation of stakeholders affected by the planning intervention throughout society.

These two issues should be addressed during the planning process. Better assessment methods and more stakeholder involvement are needed to combat these shortcomings. The involvement of stakeholders has already gained much attention in academic literature already, with its proponents advocating for ‘collaborative planning’ (Healey, 2003; Innes, 2016). Strategies for well-known assessment methods such as CBA and MCA to deal with the complexity of planning exists as well, however, methods on how to integrate these assessment methods with collaborative planning remain scarce.

In this section, first, the two challenges in the infrastructure planning process are explained. Subsequently, four ex-ante policy evaluation methods are discussed; CBA, MCA the digital workshop and e-participation. The argument is made that, in combination, the four methods address the shortcomings observed in contemporary planning practices.

Functional interrelatedness

Functional interrelatedness refers to the wide range of the effects associated with the (re)development of infrastructure. In general, these effects go beyond transport effects and affect a wide range of economic, ecologic, political and social variables across multiple spatial and temporal dimensions. This is caused by the multi-functional nature of space. Space is often used for various functions at the same time. For example, an area can be simultaneously used for transportation, recreation, housing, nature and work. If an infrastructure project is carried out, often conflict arises between the various functions. The construction of a new railway line can disrupt the local ecosystem if the habitat of various animals is cut into half. The same railway line may also have an effect on nearby cities, either positively when connectivity is increased, or negatively when existing connections are replaced.

Planners can choose for a sectoral planning approach in which they address only one function in a planning intervention at a time. However, due to the interrelated of various functions in the same space, planners increasingly opt for more strategic approaches, in which multiple functions of space are addressed simultaneously. This is partly the result of planners wanting to optimally use the scarce resources available to them by combining work in various domains within a single project. But, this is also demanded by the reality of planning, as intervention in one function almost automatically influences another function. The impacts on these other functions need to be managed by planners as well, even if they are often difficult to identify.

Most conflicts between functions arise when negative externalities are involved, such as air pollution, noise, aesthetic pollution or safety concerns. But also the positive externalities, such as positive spill-overs, agglomeration effects or reduced emissions can benefit from integrated planning. Given that these effects are distributed unequally across stakeholders and experienced differently by the stakeholders, keeping track of all these effects is a complicated matter.

The widespread societal impacts are often not taken into consideration in current planning practices. Assessments are usually limited to the direct transport effects, although the positive and negative externalities can be substantial. Part of the reason for this neglect is unawareness by planners. However, another part is due to inadequate use of assessment methods. The CBA for example, the most commonly used tool the assess impacts in the field of transport, is unable to properly include effects which are difficult to monetize, such as socio-cultural effects like health effects or the quality of space.

Institutional fragmentation (i.e. collaborative planning)

The second challenge to overcome in infrastructure planning is called by Heeres et al. (2016) *institutional fragmentation*. This refers to the fragmentation of actors relevant for the planning process throughout society. This issue is closely related to the functional interrelatedness of planning. As the effects of infrastructure projects are widespread across various domains of society, so are the actors that are safeguarding those interests. The fact that stakeholders are often affected differently, have different reference frameworks and hold different interests makes matters even more complicated.

The merits of including stakeholders in the planning process are twofold. Firstly, stakeholders have access to information of which the planner might be unaware of. Information that is worth sharing with the planner could be of an objective nature, such as reports, data or statistics, or subjective, such as viewpoints on the matter that the planner has not considered before. Secondly, including stakeholders into the planning process awards democratic legitimacy to the process. This avoids future critiques from stakeholders of not being heard during the planning process. A democratic planning process is beneficial, as approval and support from stakeholders are critical components for the success of a project (Roukouni, Macharis, Basbas, Stephanis, & Mintsis, 2018).

At the same time there are disadvantages related to stakeholder involvement. Communication with stakeholders is often a time-consuming process (Ansell & Gash, 2007). Moreover, collaboration can lead to 'negotiated nonsense' if the stakeholders are affected by group bias (Van de Riet, 2003). This means that the participants agree on the outcome, but the outcome has little value because it is based on insufficient and incomplete information. Often the stakeholders are not aware of this bias. Stakeholders may also take a strategic stance against the planning process and engage in dishonest and manipulative communication to pursue their objectives (Ansell & Gash, 2007). In this case, involving stakeholders is not productive and a more top-down oriented approach is necessary.

2.3. Ex-ante evaluation methods

In response to the failing planning process, academics and planners have shown interest in developing methods that are better equipped with dealing with the complexity of planning. These methods deal with the issues described in the previous section, (i) being inclusive by handling the variety of impacts associated to a planning scenario and (ii) enabling collaboration through handling the inclusion of multiple stakeholders. In this section we will describe some well-known methods.

The CBA and MCA are among the best known assessment methods to gain insight into the quantitative and qualitative effects of planning interventions. The advantages and the limitations of both methods are discussed in depth in the previous report (deliverable 3.3) called *'Theory and Practice for Transport Appraisal and Planning: A Literature Review with Focus on Potential Improvements in Practices'* (Bogh Holmen et al., 2019). This report focusses on the first issue by looking at how the CBA and MCA valuate various effects. The conclusion points at new research avenues to obtain more precise and more reliable valuation estimates that might be used in CBAs or other types of assessments of spatial planning.

However the limitation shared by both methods are related to the second issue. The CBA and MCA lend themselves poorly for involving stakeholders (Hardeveld, Driessen, Schot, & Wassen, 2018; Turner, 2006). Both methods does not allow for different perspectives of the same criterion nor is stakeholder involvement part of the method. This section therefore focusses on how the CBA and MCA can be used in a collaborative planning process, where the main focus is not the assessment of effects, but the inclusion of stakeholders. Moreover, two well-known collaborative planning methods are discussed, e-participation and the digital workshop.

Each of the four methods have its strengths and weaknesses. They do not necessarily serve the same purpose and hence cannot be considered competitors. We believe that a combination of the strengths of these methods results in a comprehensive method that addresses the need for a more collaborative and inclusive planning method.

CBA and MCA

The CBA is a well-known tool used world-wide to assess the cost and benefits of policy measures. In Europe, the CBA is the most basic tool to assess infrastructural investments (Beria, Maltese, & Mariotti, 2012).

Advantages of CBA are that it can draw on a broad theoretical basis; it represents a universal ‘language’ that many can understand; and it comprises the ability to process large amounts of information while presenting simplified result in financial values that overcomes cognitive and process-related biases.

Disadvantages of CBA are also well known. Often mentioned are the difficulty to include effects that are hard to monetize, for instance agglomeration or social effects, or effects for which conflicting views exists, i.e. equity impacts like the value of nature. In addition, the overall value of CBA for planning processes also needs to be questioned (Flyvbjerg, 2009). “*Cost estimations used in decision making are highly, systematically and significantly misleading*”, leading to large budget overruns, finds a study in which the estimated and actual cost of 258 major infrastructure development projects in 20 countries were compared (Flyvbjerg, Holm, & Buhl, 2003, p. 71).

Another disadvantage is related to how CBA operates in a collaborative planning process. Turner (2006) writes on how the outcome of an CBA is intended as a deciding factor in selecting the right policy option, namely the measure or package with the highest cost-benefit ratio. However, he argues that this does not reflect the real world policy process, as this is based on a consensus building process in an iterative manner. Turner proposes the CBA to have a partial role as a ‘heuristic aid’ instead of a decisive role in order to better cope with the intersubjectivity of planning. After interviewing 86 key actors in CBA practices, Mouter, Annema and Wee (2013) find how planning discussions in which a CBA is involved tend to be dominated by debates about the methodology and usage of CBA instead of debates about the spatial-infrastructure project itself. Annema, Mouter and Razaei (2015) looked at the role of CBA in the final decisions about a transport measure. They report that decision makers use CBA critically but non-decisive and partially and seem to be especially interested in the trade-offs of a policy, not in the final cost-benefit ratio.

The CBA thus seems to be most useful in collecting and organizing information, operating as an information source by showing the size of the effects and how the effects are distributed across various group. Consequently, this information helps understanding the trade-offs and facilitates the discussion. Many authors suggest a similar role for MCA, either as a component of a CBA, or by using the CBA as part of a wider MCA (Hardeveld et al., 2018; Turner, 2006).

An MCA is similar to a CBA but uses an ordinal scale to assess criteria instead of monetizing criteria. Advantages of MCA are the ability to include criteria that are difficult to quantify, the freedom to include almost all effects and the ability to include perspectives from different stakeholders. The main disadvantages are its subjectivity, the lack of foundation on the chosen values and its susceptibility to double-counting effects (Roukouni et al., 2018).

With regards to the process related issues, MCA suffers the same faith as CBA, however with one exception. Due to the qualitative assessments of criteria MCA lends itself to be conducted by the stakeholders themselves. This form of MCA has gained popularity in recent years under the name of Multi-Actor Multi-Criteria Analysis (MAMCA) (Macharis, Turcksin, & Lebeau, 2012; Roukouni et al., 2018). In an MAMCA, stakeholders are grouped in homogenous groups. Each group performs an MCA individually with criteria tailored to that specific group. This approach enables the planners to identify different wishes between the groups and also allows for adding weights to the groups in the final results. An important prerequisite for this method is that a thorough stakeholder analysis is required to identify the correct stakeholder groups.

Within a collaborative planning process, both assessment methods seem to work best as an *aid* to make decisions instead of a tool that *makes* decisions (Hardeveld et al., 2018; Turner, 2006). Not necessarily the composite number of a CBA or MCA is interesting for decision making, but the trade-offs between the various criteria (Annema et al., 2015). Despite the popularity of both, there is still little known on how a CBA and MCA should be integrated in a collaborative planning process.

A positive exception in this regard is the work of Hardeveld (2018). They applied CBA in combination with a deliberative tool in a collaborative planning process for water management in Dutch peatlands. The authors used a CBA to assess multiple water management alternatives in various rounds of discussions with stakeholders. In evaluating their method, the authors found that the usage of CBA was generally regarded by the stakeholders as adding value to the stakeholder discussions. According to the researchers, various conditions contributed to this success.

First, a clear signalling by the planners is required that the CBA is only used as an information source rather than a defining component in the final decision. This avoids lengthy discussions about the design and methodology of the CBA and instead helps to focus the discussion on the policy issue at hand. This is a well-known issue in CBA practices that was also found by Mouter, Annema and Van Wee (2013). Second, the authors recommend to include empirical data provided by the stakeholders in the process. They believe that it helps with gaining support from stakeholders when they see their own data being used. Third, the way the results are presented matter. The authors recommend to present the results as distributed effects and temporal effects, because this provides room for the stakeholders to weigh the criteria by themselves. This allows for a discussion on equitable trade-offs. Fourth, the inclusion of indirect effects were explicitly mentioned by the stakeholders as positive.

The authors also identified some limitations related to using CBA. Economic value of non-financial effects were difficult to understand by stakeholders. The respondents expressed their wish to separate financial indicators from non-financial indicators. This indicates the potential of combining CBA with MCA. At the same time, this points to avoiding monetization of effects that cannot be directly associated to financial values, even though monetization is common practice among CBA practioneers, such as the monetization of emissions. Moreover, the stakeholders report that they found it difficult to interpret uncertainty caused by various assumptions and future developments (Hardeveld et al., 2018).

Digital workshop and e-participation

Other inspiration on how to include MCA and CBA in a collaborative planning process can be found in literature dedicated to collaborative planning methods. In contrast to appraisal methods, there is a much higher diversity in collaborative planning methods, combined with little consensus about the best method, let alone which method is best suited for infrastructure related investments.

Vacik et al. (2014) analysed 43 collaborative planning methods used in natural resources planning and find that most of them have more or less similar features with no single method being universally the ‘best’. Still, the authors have identified key requirements for such collaborative methods. They find that the most suited methods are those that capture the preferences of participating stakeholders, increase the transparency of the planning processes and allow for dealing with qualitative data. Suitable methods include:

- a form of stakeholder interaction (physical such as focus group or online such as e-participation);
- a technological support systems (such as computer-based systems such as GIS-technology or web-applications or physical tools such as maps or models);
- decision support systems (such as soft-systems methodology, SWOT-analysis the Vroom-Yetton method or the Four Rs framework); and/or
- basic statistical analysis methods (such as MCA and its variants or Q methodology) (Vacik et al., 2014)..

With many of these methods existing and no particular method surpassing the rest, how is the best method selected? Since our aim is to deliver a method that should be applicable to many different planning contexts we consider the best approach is to stick with the basic and most-known collaborative planning methods. A well-known method in this regard is the focus group. A focus groups is an often used qualitative research technique in which a group of between five to twenty people are brought together in the same room for a planned discussion about a pre-determined topic.

Such group settings can be facilitated by Planning Support Systems, i.e. technology-based tools that supports specific tasks in the planning process (Brömmelstroet & Bertolini, 2008). The idea behind computer-facilitated technology is that planning deals with a complex interrelationship between a variety of factors. Computer programs can help with handling the large quantities of quantitative and qualitative data involved.

Weitkamp, Berg, Bregt and Lammeren (2012, p. 19) refer to a similar concept called a Group Decision Room. This is an “electronic meeting room that enables fast and efficient stakeholder dialogue with real-time exchange of opinions, feedback of results, brainstorming and discussions”. The main advantages of computer-facilitated meetings is that it allows for face-to-face contact and anonymous communication, more structured and informed discussion and basic statistical analysis (Weitkamp et al., 2012). Pelzer, Geertman, Heijden and Rouwette (2014) use an large table-like interactive digital touch-enabled screen called MapTable in combination with the online ranking tool MeetingSphere in two planning cases and find that the tools facilitate collaboration and communication between the stakeholders. The authors stress that much more research is needed to deeper understand which tool is suited for which planning context.

Another collaborative tool that we want to pay attention to is e-participation. E-participation is a form of public participation that involves the usage of digital technology (Tang & Waters, 2005). Various forms of e-participation exists. The so-called one-way information channels such as the online access to information of planning methods and the two-way information channels where participation is interactive through direct communication and feedback systems. A popular form of e-participation is the usage of web applications to gather opinions of a potential unlimited amount of stakeholders. The reach of such online surveys is large, but the method is limited in gathering in-depth information because no one-on-one communication or face-to-face contact is involved.

3. The SPADE method: an overview

The SPADE method captures *all* impacts associated with planning scenarios allowing while the involvement of different stakeholders. The method integrates four well-known planning assessment methods and tools, namely CBA, MCA, the digital workshop and e-participation. These methods are combined into a single process in such a way that the tools complement each other and address each other's weaknesses. This chapter provides a general overview of the SPADE method, including the expected results, when and where the method should be applied. The method is explained in more detail in the following chapter.

3.1. Overview

The SPADE method consists of two parts; a process and a tool. The SPADE process comprises the necessary steps to include the SPADE tool into the planning process. The SPADE tool involves a one-day workshop in which stakeholders meet, conduct a computer-assisted MCA supported by CBA and discuss the planning issue. An overview of the SPADE method is provided in Figure 3.1.

The SPADE method should be regarded as an inherent part of the planning process. Although a relatively small part, it is efficient and essential in speeding up the planning process. The method starts with the planner finding the right moment to fit the tool into the existing planning process. The planner needs to consider the added value of SPADE in light of the expected outcome. Measures to be evaluated with the SPADE method are defined in advance with the different stakeholders.

The setting of a digital workshop is chosen to effectively assess policy measures via stakeholder consultation. The workshop consists of a computer assisted MCA that is conducted live with the stakeholders. The MCA is an effective tool to assess many quantitative and qualitative impacts of transport measures quickly. The live setting enables discussion during and after the MCA takes place. Moreover, CBA is used to provide an initial assessment of the policy measures. The tool also includes an option to perform an online survey prior to the workshop. This allows for gathering information from many more stakeholders than can be consulted during a workshop. The workshop is evaluated by the planners and stakeholders in light of the planning process. The SPADE process and tool are described in more detail in the next chapter.

3.2. Expected results

The added value of the method is twofold. It helps with collecting information from different stakeholders while at the same time stakeholders are involved in the planning process. The method increases the information available to the planners and helps in narrowing down the potential solutions from many to a few preferred solutions.

The SPADE method can be applied at various stages in the planning process, depending on the needs of the planner Figure 3.2. shows the application of SPADE in the planning process and its expected effects.

Involving the stakeholders in this way serves two purposes. Firstly, stakeholders are a valuable source of information and data for planners. The workshop enables the stakeholders to provide the planner with input about their domains and their views. Secondly, the workshop facilitates the democratic nature of the planning process.

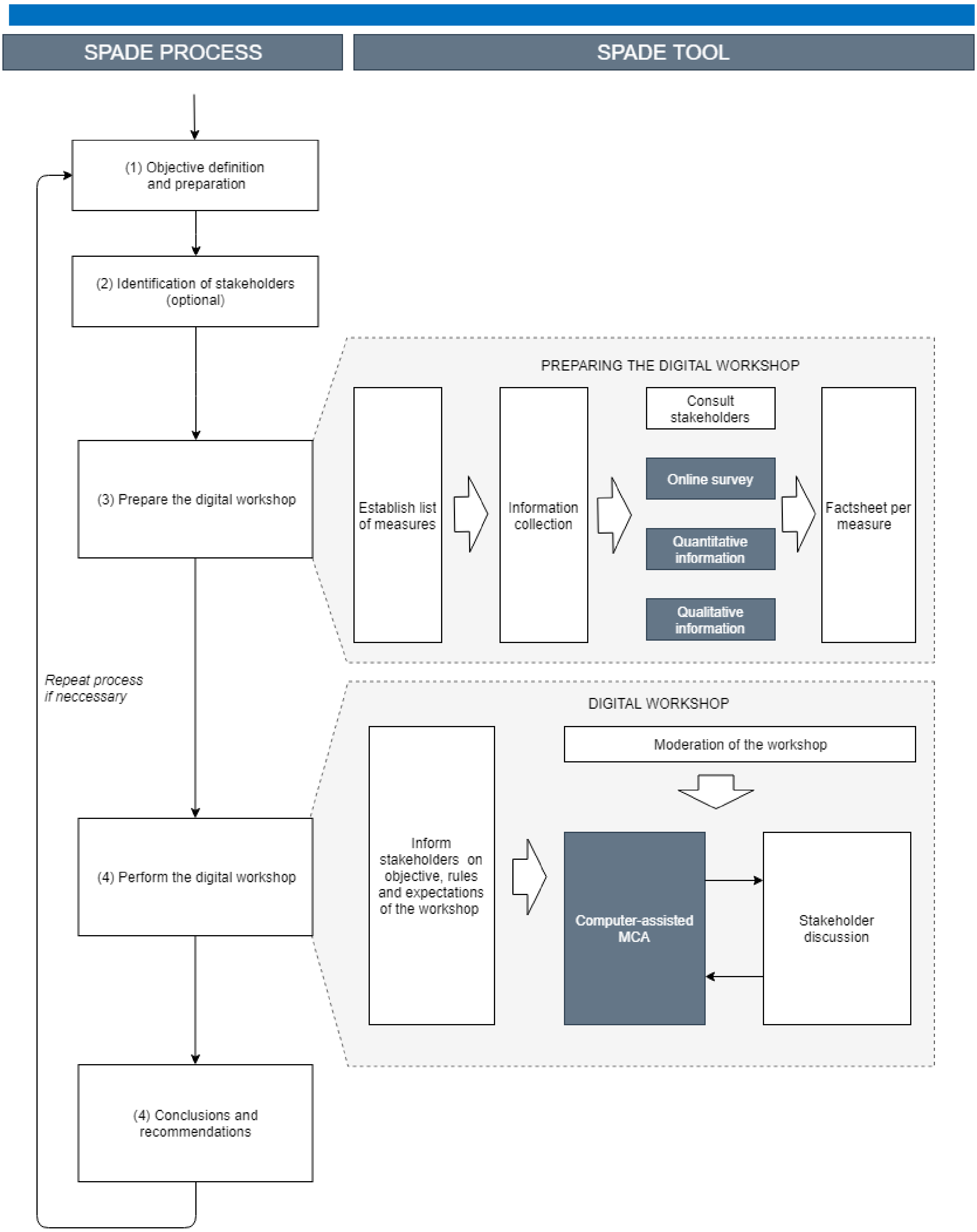

Figure 3.1 Visual depiction of the SPADE method, showing the SPADE process and SPADE tool, including the four methods (CBA, MCA, digital workshop and online survey, indicated in color) used in the workflow

The expected outcomes of the SPADE method are therefore:

- Collection of information and data on policy measures;
- Learning more about the views and opinions of various stakeholders;
- Narrowing down or further concretizing policy measures;
- Gaining stakeholder support.

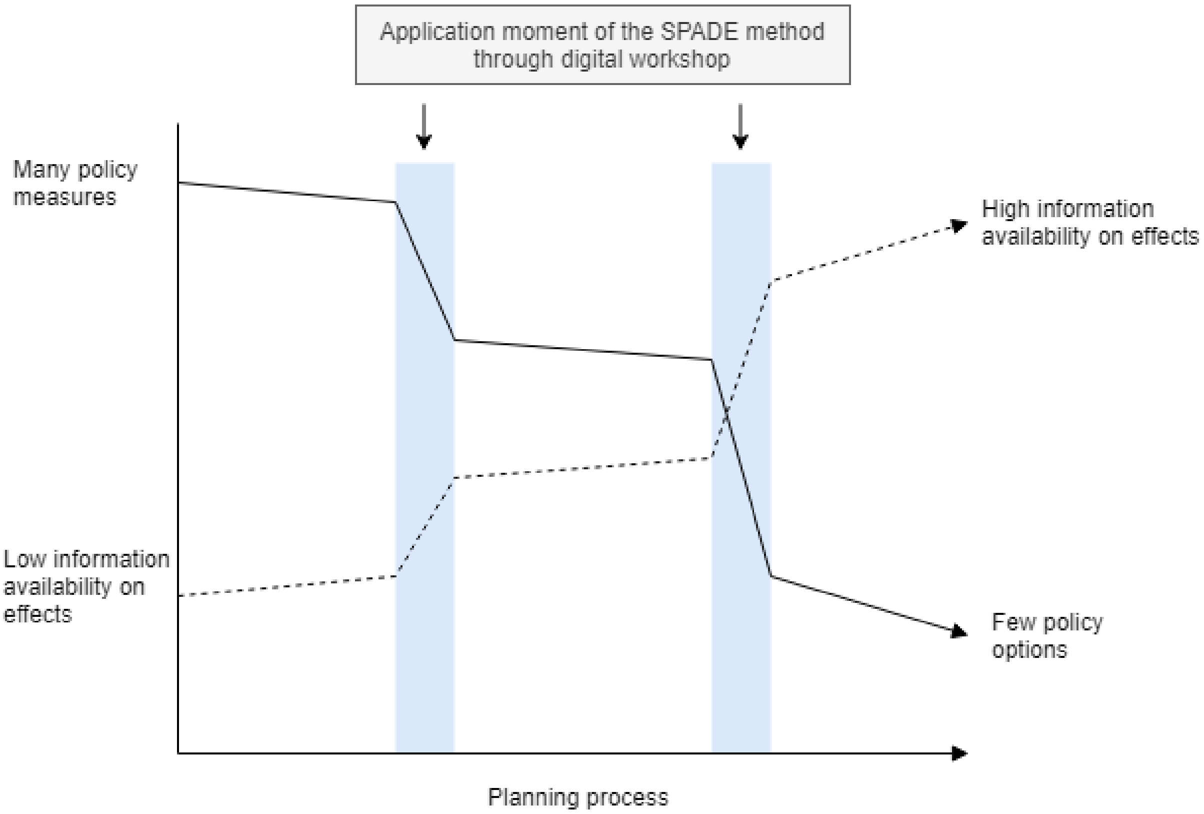

Figure 3.2 Suitable application moments of the SPADE method and its effects on the planning process. The method helps in narrowing down the policy options while increasing stakeholder support and knowledge on the effects of different policy measures.

The predecessor of the SPADE method, AMDTM, has been applied to four test cases (Kiel & Taale, 2019). During these cases, various packages of policy measures were evaluated by a small group of experts. Figure 3.3 shows an example of an automated documentation generated from the computer assissted MCA. Five measures were evaluated according to six criteria: costs, accessibility, environment, safety, quality and interaction. The values are relative and weighted based on the relative importance the participants awarded to each criteria.

The context in which each case was conducted differs slightly from the proposed SPADE approach. No stakeholder analysis was performed prior to the workshop to ensure all stakeholders were included, neither was an online survey conducted to gather input for the workshop. Nevertheless, the results still hints at the potential of the method. The authors find that, first, even though some criteria are multi-interpretable (e.g. safety) the MCA provides structure so that the resulting discussions were focused and to the point and resolved the contrasting views. Second, since everyone contributes through the computer assisted MCA, the discussions are more democratic and not dominated by a few. Third, the results are shown immediately which helps to raise the discussion to a higher and more focused level.

Fourth, the time available to rank a measure is short, requiring focus from the participants. The authors did not report if the ranking exercise had an effect on the planning process.

Measure	Costs	Accessibility	Environment	Safety	Quality	Interaction		Relative score
Subway Hoekse Lijn	1.7	2.4	1.4	1.3	1.3	0.1		8.2
Greenport	1.7	1.7	0.8	1.3	1.3	0.2		7.1
RDH Airport	2.2	0.3	0.7	0.1	1.6	0.3		5.1
A13-A16	0.2	3.0	0.1	0.1	0.2	0.3		3.9
A15	0.7	2.4	0.3	1.3	0.7	0.2		5.6

Figure 3.3 Example of an automated documentation resulting from the computer-assisted MCA (Kiel & Taale, 2019)

3.3. Application in the planning process

One of the challenges set out for SPADE is to provide a method that is applicable in many different situations, including small and large scale projects, rural and urban contexts, in long and short planning processes and for projects concerning freight and passenger transport.

The SPADE method is applicable to many different contexts due to the planners being free to choose any criteria to be assessed with the stakeholders. The main question is when to apply SPADE in the planning process. This depends on the following two needs of the planning process:

- If information is required to make a better judgement about further narrowing down or further concretizing policy scenario's;
- If stakeholder support is required.

With regards to the first need, the added value of the SPADE method can be described according to the following two planning scenario's.

Scenario 1: SPADE in the earlier stages of the planning process

Scenario one takes place in the earlier stages of the planning process. After an initial mapping of potential solutions, a longlist of approximately twenty to thirty solutions remains. At this stage, detailed information to perform a CBA is lacking. The list is too long to make a detailed effect calculation of each solution. The SPADE method can be applied to consult various stakeholders as 'experts' to judge each solution based upon various pre-defined criteria. The combined perspectives of many stakeholders help in separating the wheat from the chaff the longlist is transformed into a shortlist of solutions that are worth considering more in-depth. During the process, the stakeholders are able to provide feedback which may convince the planner to slightly deviate a solution.

Scenario 2: SPADE in the later stages of the planning process

The second scenario takes place in the later stages of the planning process. At this stage, few project alternatives remain, out of which the preferred alternative needs to be chosen. Detailed calculations regarding the cost and benefits associated to each alternative already exists. At this point the planner would like to consult the stakeholders about their preference regarding the best solution. This is also a good opportunity to verify the planner's considerations of each alternative. Stakeholders may hold different views regarding an effect and thus interpret the cost and benefits differently from what the planner had in mind.

To ensure that the view of each stakeholder group is regarded in the final decision, the SPADE method can be applied to collect these opinions. After the SPADE method is applied, the planner is able to make a better judgement about the shape of the final alternative.

Instead of or in addition to collecting information, the SPADE method can also be used as a tool to gain stakeholder support. By involving stakeholders, the transparency of the planning process is increased. Through the SPADE method, the stakeholders are given a sense of being included in the planning process, regardless of the outcome of the SPADE method. This may avoid future critiques of a non-transparency during the planning process, in case stakeholders are dissatisfied and feel not being heard. However, this also assumes a responsibility of the planner, who needs to include all stakeholders in the planning process on an equal basis, while carefully weighing the views of each stakeholders in the final decision.

The SPADE method thus serves different purposes and can be applied at various stages in the planning process, depending on the needs of the planner. SPADE helps in narrowing down different policy options while increasing stakeholder support and knowledge on the effects of different policy measures. The method can be repeated at various stages in the planning process.

4. The SPADE Process and Tool

After having given an overview in the previous chapter, the SPADE method is explained in more detail in this chapter. The sections are organized according to the five stages in the SPADE process as shown in Figure 3.1. The first stage, the objective definition and preparation, is described in section 4.1. The second stage, stakeholder identification, is an optional step that is described in section 4.2. The SPADE tool is divided into a preparatory stage and the workshop, respectively outlined in section 4.3 and 4.4. Section 4.5 covers the final stage called conclusions and recommendations. After each section, the main points are summarized.

4.1. Objective definition and preparation

The SPADE method starts with a preparatory stage. In this stage, a plan is drafted with information on how to merge the method into the planning process. The planner needs to consider the added value of SPADE and how the expected outcome contributes to the planning process. Not only the information the planner gains from SPADE is valuable, also the democratic legitimacy that SPADE brings to the planning process is relevant.

The planner defines the high-level goal that needs to be achieved with SPADE. For instance, this could be improving the accessibility for a given target area or reducing the congestion on a particular road. Depending on how far the planner is in the planning process, this involves narrowing down a longlist of measures into a shortlist with the best solutions.

Tasks for the planner:

- Consider the **added value** of SPADE in the planning process by answering the following questions:
    1. Is input from stakeholders needed, such as expert opinion or other views, to narrow down the list of policy measures?
    2. Are views from various groups of stakeholders insufficiently taken into account and do we need to increase the transparency of the planning process by involving the stakeholders?
- If one of the above questions are answered with yes, it is a good indication that the planning process may benefit from the SPADE method.
- Define the **objective** of the SPADE method. This facilitates concretizing the next steps.
- Formulate the results the planner expects from the SPADE method. This facilitates an ex-post evaluation of the evaluation of the method.
- Create a **timeline** for implementing the SPADE method in the entire planning process.

4.2. Stakeholder identification (optional)

The next stage is to map the relevant stakeholders to be involved in the planning process. In some cases, the stakeholders are already known by the planner. In that case, this stage can be skipped. However, this stages helps in gaining a deeper understanding of all stakeholders and their attitude towards the planning process. This is useful for later on in the SPADE method, for example when weights can be added by the planners to specific stakeholders. The stakeholder analysis provides input in determining the weights.

Mapping stakeholders is not an easy task. It is especially challenging to identify those stakeholders that are less visible than others. If not all stakeholders are included equally, the planners does not maximize the potentially available information and the planning process is not truly collaborative.

A way to select all stakeholders is to perform a Social Network Analysis (SNA) (Dempwolf & Lyles, 2012; Pira et al., 2017; Prell, Hubacek, & Reed, 2009). In a SNA, the stakeholders are mapped in a network consisting of nodes and links. The nodes represent stakeholders (individuals or organisations) and the links illustrate the relationships between them. The SNA helps to organize the (complex) field of stakeholders in a visual manner, similar to a mind map. The social network can be compared to a network of stakeholders that have been involved in the planning process so far. In doing so, the planner can determine if the participants represent the network of actors that is influenced by the project. SNA even allows basic statistical analysis, such as computing the centrality of nodes.

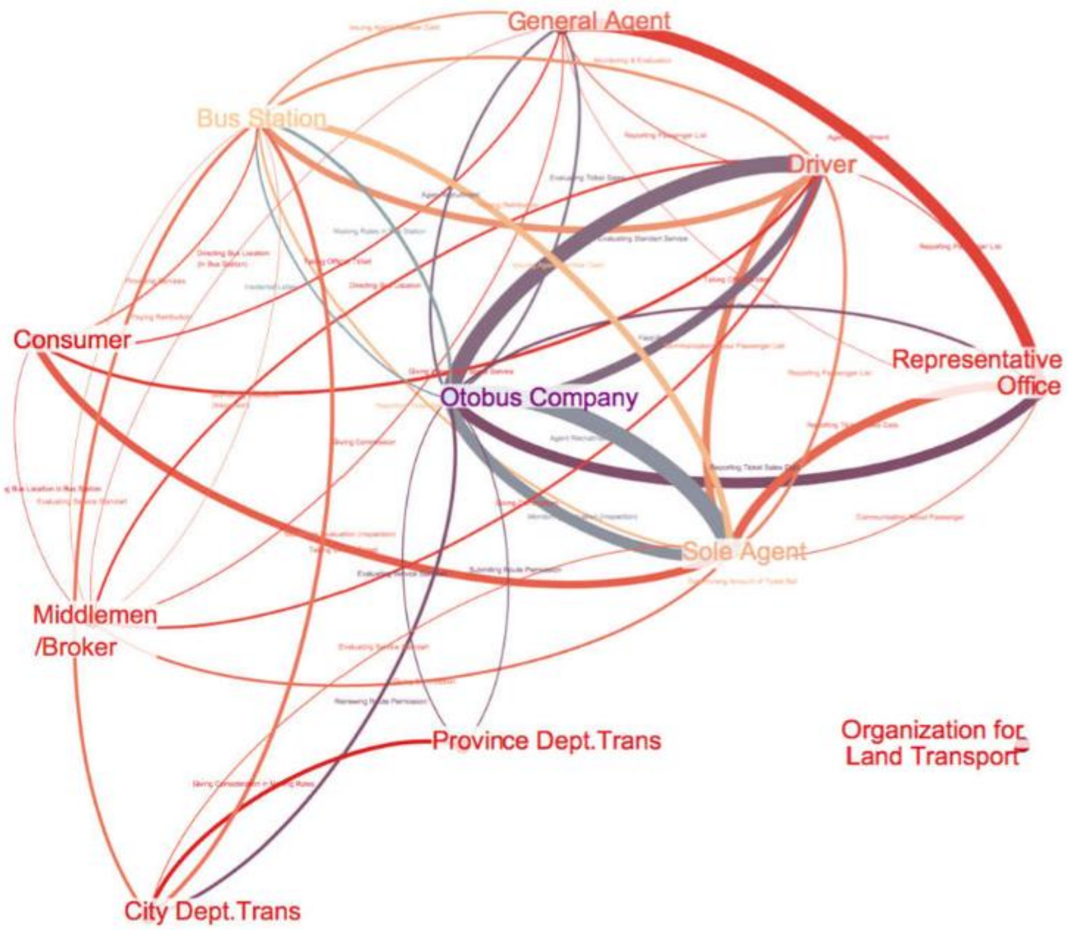

Figure 4.1Social network visualisation of the bus industry (Wilopo, 2016)

In addition to mapping the stakeholders, a network analysis helps to understand the type of relationships between the actors. SNA also allows for determining the relative importance of actors in the network. This helps planners in identifying dominant and less dominant stakeholders or even to reflect on the own position of the planner within the network

(Dempwolf & Lyles, 2012).

It is useful to supplement a mapping of stakeholders with information on each stakeholder, for example regarding their commitment availability of resources to participate or the extent to which they are affected bij the policy measure. Table 4.1 shows an example of a stakeholders analysis conducted in a Norwegian planning case. Using such a structured stakeholder evaluation method enables the planner to identify the important or dominant stakeholders.

Table 4.1 An example of a few stakeholders analysed in Norwegian Coastal Zone planning. The stakeholders are graded on a 1 to 5 scale, where 1 is the highest and 2 the lowest.,Urgency' refers to how active different stakeholders were during the planning phase. ,Legitimacy' refers to the extent to which the stakeholders are heard in the planning proces. ,Power' refers to the influence the different stakeholders have. ,Future' refers to the extent to which the respondent expected each stakeholder group to increase or decrease in importance (Buanes, Jentoft, Karlsen, Maurstad, & Soreng, 2004)

Group	Urgency	Legitimacy	Power	Future
Country Governor	1.93	1.91	2.08	2.52
Directorate of Fisheries	2.00	2.08	2.32	2.88
Fish-farmers	2.41	1.91	2.22	2.28
Fisherman	2.08	2.24	2.54	3.24
County Council	2.11	2.24	2.50	3.24

The necessity of understanding the relations within a network is emphasized by Ansell and Gash (2007), who explain that a history of cooperation or antagonisms facilitates or hinders collaboration. Animosity between stakeholders expresses itself in low levels of trust, low willingness to commit and provokes manipulation and dishonest communication. At the same time, collaborative governance may be the opportunity for stakeholders to solve long vested conflicts. The authors suggest that “if there is a history of antagonism among stakeholders, then collaborative governance is unlikely to succeed unless (a) there is a high degree of interdependence among the stakeholders or (b) positive steps are taken to remediate the low levels of trust and social capital among the stakeholders” (Ansell & Gash, 2007, p. 553). On the other hand, past successful collaboration creates an atmosphere of mutual understanding and trust that facilitates further cooperation. However, the authors warn that strong relationships between a subgroup of stakeholders could reduce the incentive for collaborative strategies among the wider group of actors.

Various techniques exists to construct a social network. The social network can be recreated through surveys or in depth interviews with key stakeholders. Another technique is called snowballing, in which stakeholders are asked to nominate others until the network is built. In constructing the network, stakeholders are put in homogenous groups that share the same interests, objectives and ambitions. Each relevant group needs to be represented in the network.

Tasks for the planner:

- Perform a **Social Network Analysis** to have an overview of the stakeholders and their relationships.
- **Group** the stakeholders in groups representing shared interests, objectives and ambitions.
- Consider the **attitude** of the stakeholder to the planning process. Are they willing to cooperate or is there animosity towards the planning process?
- Consider the **power relations** between the stakeholders. Do some stakeholders are overrepresented or do stakeholders need boosting?
- Consider the **relationships** between the stakeholders. Do some stakeholders have hostile relationships?

4.3. Preparing the workshop

The stakeholder analysis in the previous step forms the basis for conducting the SPADE tool, the digital workshop. Preparations are needed before the workshop can be conducted. Logically, the better the stakeholders are informed about the objective of the workshop and the various planning scenario's, the better the stakeholders can prepare themselves and the more useful the results of the workshop will be.

The stage starts with the planner drafting a list of potential measures or policy packages that are to be evaluated in the workshop. It is advised to consult stakeholders in drafting this list. Sometimes the list of measures is already established. This is usually the case in the later stages of the planning process. Once the list of measures has been established, the process of gathering information on each (package of) measure starts.

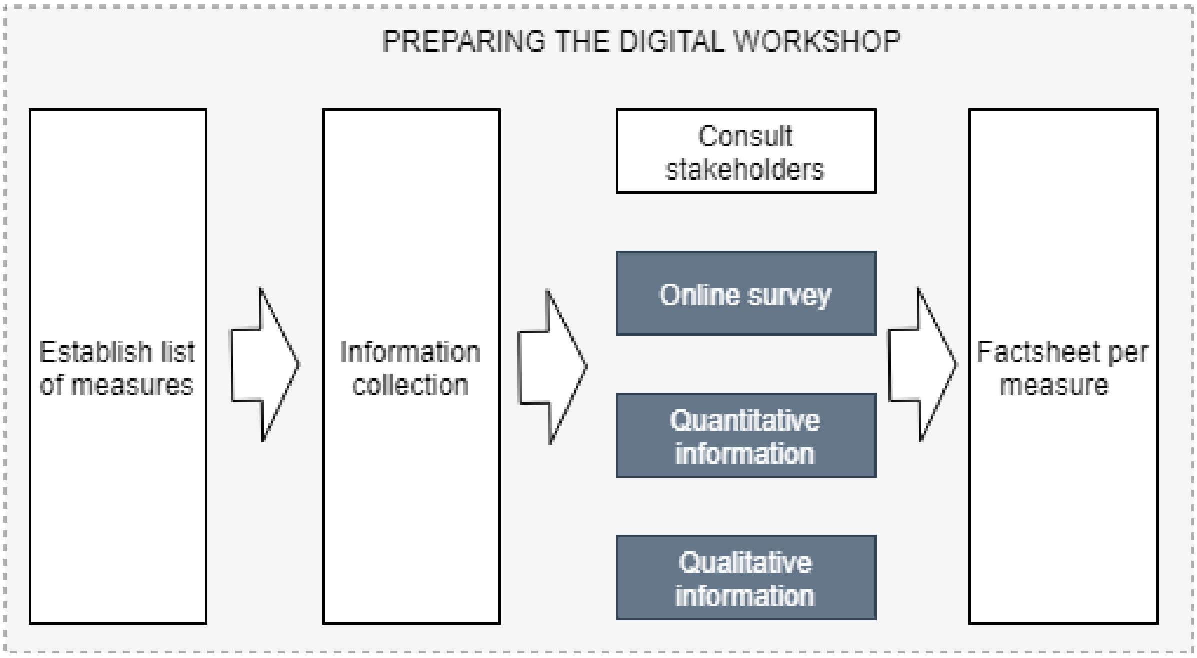

Figure 4.2 Workflow of stage three, the preparations to the digital workshop.

The output of this stage is a package of information with factsheets and/or a presentation that serve as input for the workshop. The factsheets contains information on the costs and benefits of the various measures or alternatives that need to be assessed and discussed with the stakeholders, including the criteria according to which the various measures or alternatives need to be assessed. Central in this stage is to compile the necessary information for the workshop. The following four ways are available to the planner to do this:

- Information request to stakeholders
- Conduct an online survey
- Collect quantities information using CBA (insofar information is available)
- Collect other qualitative information

The first two topics require information from the stakeholders, even before the workshop takes place. The CBA may serve as further input to the SPADE method. The output of the preparation stage is an information package that contains information of the measures that are to be evaluated during the workshop. An overview of this stage is given in Figure 4.2 and described in more detail below.

Information request to the stakeholders

A great source of information are the stakeholders themselves. Stakeholders may have access to information that the planners have no access to or which the planner was not aware of. Information may come in the form of quantitative information, e.g. costs calculations, finance figures or pollution measurements, or qualitative information, e.g. policy documents or previous research. For this reason, stakeholders should be asked to provide information on different policy measures prior to the workshop.

Moreover, requesting and using information from stakeholders does also increase the stakeholder's sense of being included in the planning process. Hardeveld et al. (2018) asked stakeholders input for a stakeholder session and found out that this made stakeholder feel being more considered in the planning process. Asking for information and showing the provided information facilitates collaborative planning, disregarding if the information is useful or not. This is apart from the fact that, logically, it saves the planner time to not have to look for the information themselves.

The way the information is presented is open. However, factsheets (for example on one A4) of the different measures help to get a quick overview of the measure and its potential effects. At the beginning of the planning process most likely no quantitative information is available, while in later stages, information on costs and quantifiable effects may available. This forms important input for the workshop.

Conduct an online survey

Another way to collect information in preparation of the workshop is by means of an online survey set out among the stakeholders. This technique is known as a form of E-participation in which the stakeholders provide feedback through digital technology (Tang & Waters, 2005).

The main benefit of the online survey is that data can be collected from a potential unlimited amount of stakeholders. This is a valuable addition to the workshop because the workshop only allows for including a limited amount of participants. The results can be grouped according to stakeholder groups. Statistical analysis of the results can reveal the preferences of these groups. The online survey may be used as input to the computer assisted MCA. The results are to be discussed in the digital workshop.

Collection of quantitative and qualitative data

In addition to consulting stakeholders, the planners themselves can decide to collect data themselves. The CBA and MCA are two methods of organizing information on the effects of measures or alternatives. How CBA and MCA are used is discussed extensively in the previous deliverable (Bogh Holmen et al., 2019).

Planners need to be aware on how to properly conduct quality ex-ante policy evaluations. This is because ex-ante estimation endeavours of cost and benefits of infrastructure projects are generally severely lacking in quality, causing many budget overruns (Flyvbjerg, 2009). Extensive guides on this are available (e.g. Romijn & Renes, 2013).

Within SPADE, the quantitative and qualitative data is collected and combined in the computer assisted MCA that is conducted during the digital workshop. The quantitative and qualitative dat provides background information to the stakeholders about the measures that are to be evaluated in the digital workshop. It is best to put the quantitative and qualitative information on the factsheets mentioned earlier. This information helps the stakeholders to discuss and evaluate the various measures.

It should be made clear that the CBA is optional as in early stages of the planning process no CBA information is available at all.

Tasks for the planner:

- **Include** data from stakeholders in preparing the various scenarios;
- Conduct an **online survey** among the stakeholders if considered useful;
- Collect **good quality** CBA data, if available);
- The computer assisted MCA should be considered as a **heuristic aid** instead of a decision rule. This needs to be **communicated** to the stakeholders before the workshop in order to prevent lengthy discussions about the method used, which diverts attention away from the planning issue;
- Include **all relevant effects**, including those that are more subjective and difficult to quantify;
- Don't limit the results with a composite number. Stakeholders are particularly interested in the trade-offs, per **criteria**, per **stakeholder group** and how these effects materialize over time;
- Avoid a **monetization** of effects that are normally not monetized, as this is difficult for stakeholders to interpret;
- **Present** the results in an attractive and understandable way, for example by using GIS. Prepare **factsheets** on the measures and distribute it to the stakeholders to inform them before the workshop;
- Prepare a **presentation** as input to the workshop.

4.4. Executing the workshop

The workshop takes place on a single day and lasts for approximately three to four hours. Participants are limited to approximately fifteen persons at maximum to keep the workshop effective. The participants need to be a good representation of the various stakeholders according to the stakeholder analysis conducted earlier. Moreover, each participant invited to the workshop needs to be a good representative of the stakeholders group they are representing. A general overview of this stage is given in Figure 4.3.

Introduction of the workshop

The workshops starts with an introduction or presentation given by the planner. The introduction needs to contain at least the following items:

- Description, approach and objective of the planning process;
- Objective of the workshop;
- Expectations from the planner of the stakeholders;
- Rules of the workshop, to avoid unstructured and ineffective discussions;
- Presentation of the various measures or alternatives, including their effects resulting from the CBA used in the previous stage;
- Emphasize the usage of computer assisted MCA as a heuristic aid;
- Include all relevant quantitative and qualitative effects;
- Show effects per criteria, per stakeholder group and how these effects materialize over time;
- Avoid a monetization of effects that are difficult to understand;
- Present the results in an attractive and understandable way.

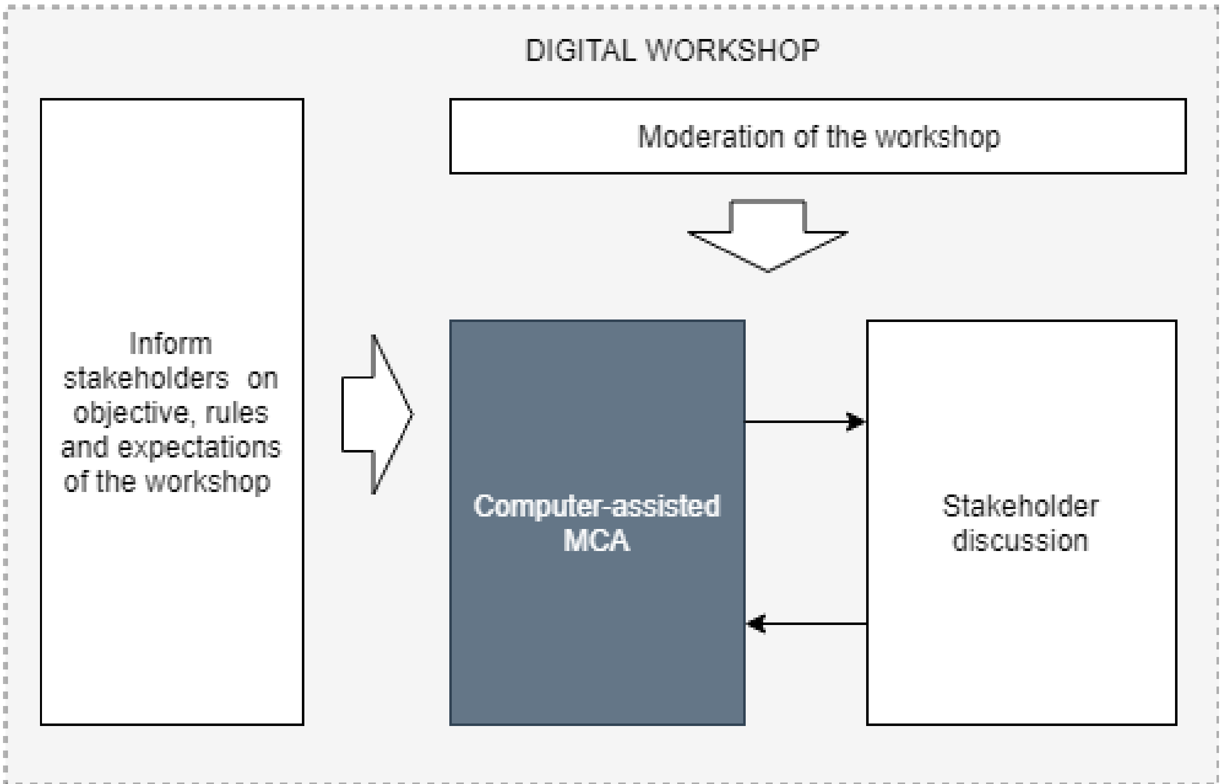

Figure 4.3 Workflow of the fourth stage, the digital workshop

Conducting the computer-aided MCA

The computer-aided MCA conducted with the stakeholders is the main feature of the SPADE tool. In the MCA, multiple scenarios are assessed by stakeholders according to multiple criteria. The amount of measures and criteria varies, depending on the needs of the planning issue. The decision needs to be made between evaluating many measures or alternatives according to a few general criteria, or few measures and alternatives according to multiple criteria. Avoiding double counts is vital when establishing these criteria.

The computer-aided MCA is ideally conducted with a software package that can handle input from stakeholders simultaneously while allowing for basic statistical analysis. Many packages exists that are able to do this. In earlier case studies we use a software package called MeetingSphere[1].

Each attendant uses a device (computer or mobile phone) to provide input to the MCA. If necessary, the input given by the attendants is anonymous. During the MCA, discussions may emerge between the stakeholders. These discussions form an intrinsic part of the tool and are considered more in depth later on in this section.

A major concern in designing the computer-aided MCA is determining the criteria used to conduct the MCA Table 4.2 shows a (non-exhaustive) list of criteria identified in the literature desk research on tools and methods supporting collaborative planning (see Bogh Holmen et al., 2019). Depending on the objective, criteria can be combined into a more general category or divided into more detailed criteria. It is recommended to consult with the stakeholders prior to the workshop which criteria are to be included.

Moreover, it's vital that the definition of each criterion is made clear to the stakeholders. Not all stakeholders may have an understanding of what is meant with 'network effects', or there are different interpretations of what is meant with accessibility.

The list in Table 4.2 can be distinguished into costs and benefits. The costs include all costs related to the implementation of the measure. The benefits relate to the effects on transport, economy, environment and society. This distinction is important as it is the only way to include the CBA results in the MCA properly.

In the early process of the planning stage, when no quantifiable information on costs and benefits is available, the costs and benefits might be judged in a more qualitative way by the stakeholders. This can still be done by using the computer-aided MCA, using ordinal scales for the different effects instead of quantified costs and effects.

Table 4.2 Non-exhaustive list criteria to be assessed with the stakeholders during the computer-assisted MCA.

Aspect		Criteria
Costs		Investment costs, construction costs, maintenance costs
Benefits	*Transport effects*	Journey cost, journey time, journey time reliability, journey experience, network effect, construction hindrance.
	Wider economic effects	Agglomeration effects, labour market effects, tourism.
	Environmental effects	Air pollution, noise, vibration, global warming, water quality, soil quality, recreational value, sustainability, biodiversity, option and non-user value.
	Social effects	Safety, affordability, severance, townscape, landscape, historical/cultural value, physical activity, consumer possibilities, social justice, social cohesion.
	Public account effects	Tax costs, public income.
	Other effects	Sunk costs, innovation value, risks.

[1] Available at https://www.meetingsphere.com/

The MCA consists of various steps, shown in Figure 4.4 and explained in more detail below. The steps may to some extent be performed by the planner in preparation of the workshop. For example, certain costs could already be fixed, or the interaction between the measures could be pre-given to save time during the workshop. However, if this is done, this needs to be justified by the planner. The MCA consists of the following eight steps:

1. Determine the interaction between the policy measures;
2. Determine the financial cost and benefits of policy measures;
3. Determine other quantitative benefits;
4. Determine other qualitative benefits;
5. Determine weights of different aspects;
6. Perform the multi-criteria analysis;
7. Perform sensitivity analysis;
8. Present and discuss results.

Each step is described in more detail below.

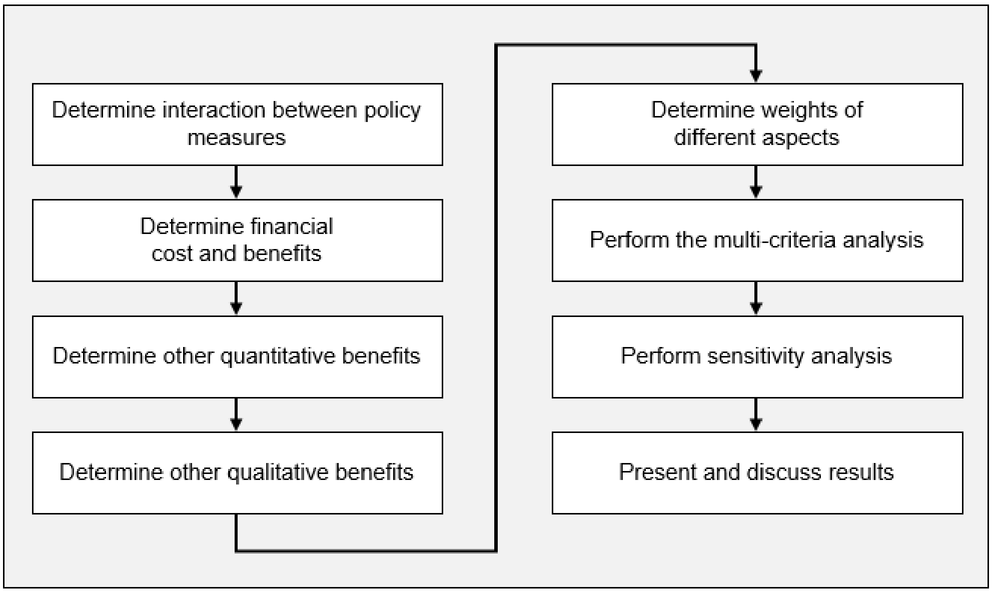

Figure 4.4 Eight steps in the computer-assisted MCA

Determine the interaction between the policy measures

The first step examines the extent to which the measures influence each other. Practice shows that measures could strengthen or weaken each other. Measures which enforce each other are preferred over measures that weaken each other. For example, a measure introducing a green wave on a road works well with a measure expanding the capacity on the same road. Both measures have a positive effect on the travel time. Therefore, interaction of measures needs to be mapped first. The mapping is done for example by awarding scores to combination of measures on a scale of -3 to 3 (see Figure 4.5). Zero indicates no interaction, 1 or -1 a small interaction, 3 or -3 a large interaction.

	Interaction Matrix	PT1	IM1	IM2	RN1
PT1	Upgrade the main railway station in Ljubljana as an intermodal passenger hub (link to bus service-regional and urban, public bicycle system, car sharing, car-pooling, taxi etc.)				
IM1	Construction of substitute cargo by-pass line/ Build a new railway line for goods:	3			
IM2	Introduction of HSR yellow lanes to ensure priority of PT over other types of traffic and 8 intermodal hubs (HSR; 4 existing and 4 to be built) at the highway access points (and 19 more in the Ljubljana urban region), representing feeder points for PT:	1	0		
RN1	A new transport and logistics terminal at : short term at BTC- Intermodal Logistic centre and long term: Zajčja Dobrava)	2	3	-1	

Figure 4.5 Example of an interaction matrix

Determine the financial cost and benefits of policy measures

For each measure (in a package) the costs and benefits need to be determined. For a uniform assessment, the benefits need to be monetised whenever possible. Measures can only be monetised if the effects of the measures can be quantified. This is possible if the impacts can be determined on key indicators such as distance, time and transportation costs and all other indicators that can be derived from the key indicators, such as speed, time losses or emissions. The costs relate to costs such as investment costs and maintenance cost.

Determine other quantifiable benefits of policy measures

If monetisation of the impacts on for example safety and the environment is not desirable or possible, these effects need to be quantified. For safety, the number of accidents, deaths and injuries can be quantified. For the environmental impacts, all types of emissions and noise can be quantified. To compare results, it is desired to put together the effects in absolute numbers using a standardized scale. The measures can be ranked based on the sum of the absolute effects.

Determine other qualitative benefits of policy measures

For many criteria, no quantitative information is available. For example, no clear representative value can be attached to determining recreational value. Instead of amounts in euros or in absolute values, the impacts are described in scores, for example varying from '-5' to +'5', where '0' stands for 'no effect', '+5' for a 'big positive impact' and '-5' for a large negative effect.

This step captures the criteria that are more subjective in nature. This could lead to discussions about whether an effect is large or small, positive or negative. By asking multiple stakeholders to score these aspects, an inter-subjective outcome is created. The estimated effects of all stakeholders are collected and an average effect is determined. It is important that at lease

Determine weights of different aspects

Per stakeholders, differences in goals and interests could lead to weighing one aspect larger or smaller than the others. Therefore weights needs to be applied to the various aspects in order to arrive at a well-balanced representation of the effects. Furthermore, it provides awareness about the extent in which the different aspects contribute to the end result. The weights can be selected on a scale of 1 to 100, but the sum of the weights has to total to 100.

Perform the multi-criteria analysis

Once all previous steps have been completed, the MCA can be performed by the software package that is used. The outcome of this exercise is a ranking of all alternatives or measures based on a weighted average over all aspects.

Perform sensitivity analysis

Within the available budget, several composed packages of measures are possible. A sensitivity analysis could make that clear. Given the available budget and the cost per measure, the sensitivity of multiple different packages of measures can be determined. Normally, the budget is exhausted, but obviously there is a chance that the budget is exceeded or under-utilized. In addition, the possibility exists that the optimal package of measures in terms of benefits requires extra funding requirements in access of the original budget. In that case the discussion will focus on the question where extra financial sources can be found.

Present and discuss results

For each measure or alternative, the mean score on each aspect is shown including the standard deviation. The standard deviation shows the extent to which the stakeholders agree over a certain criteria. A high standard deviation points to a high level of disagreement among the stakeholders over the rating of a criteria. To reach consensus, it is important to clarify these issues.

Discussions during the workshop

An intrinsic part of the workshop is the discussions emerging between the stakeholders. It is highly likely that during the course of the workshop the participants comment or raise questions which are likely to unfold into discussions. These discussions are a valuable source of information to the planner because the stakeholders are able to express their opinions in ways that are not possible through online surveys or through the MCA.

The discussions should not be seen as secondary to the MCA. The conversations occurring alongside the MCA are equally important to gain an understanding of the views of the stakeholders. In speech, stakeholders are better able to express their intentions behind a certain viewpoint. Through follow-up questions, the attitudes of stakeholders can be explored in depth.

Moreover, the stakeholders can learn from each other's viewpoint through these direct conversations. Face-to-face contact is more than a form communication, it combats stereotypes and other barriers to communication and facilitates mutual understanding, trust building and consensus finding (Ansell & Gash, 2007). The aim of the workshop is not only the exchange of information. Building trust between the stakeholders and between the stakeholders and planners is equally important. Understanding each other's viewpoints and trusting each other helps in the consensus finding process (Ansell & Gash, 2007).

Ansell and Gash (2007) point to one critical component in bringing the stakeholders together and finding consensus: the role of a facilitator or mediator that gives guidance to the process. The discussions emerging are not always well-constructed or constructive. The first reason for this is that the participants do not always have a precise idea about 'what to think', even when they are experts. The complex nature of infrastructure and spatial projects and their effects makes it impossible to know all the effects, let alone knowing all subjective experiences of each stakeholders. This is prone to lead to 'negotiated nonsense', meaning that all stakeholders find consensus on a certain topic but this consensus is not well-grounded due to the prevailing group bias (Van de Riet, 2003). Good leadership channels the discussion in the right direction and helps avoiding misconceptions or off-track discussions, being aware of own biases. The computer-aided workshop helps in this respect as the discussions become more focussed on topics.

Next to maintaining productive discussions, another critical task for the mediator is make sure each stakeholder is heard on an equal basis (Ansell & Gash, 2007). The mediator needs to be aware of the ‘weaker’ and less vocal stakeholders and empower them so that their views are heard as well. Equally, the mediator needs to pay attention to the dominant and more powerful stakeholders and ensure that their concerns are heard proportionally to others. Moreover, awareness from the mediator is needed for exaggerated or manipulative comments from stakeholders that are focused on pushing their own ‘wish list’, even if this is done unconsciously, and relativize these attempts. Thus, safeguarding the integrity of a collaborative process is the second critical task for the mediator. The computer-assisted workshop helps, as all participants provide input and are heard.

Tasks for the planner:

- Introduce the **planning issue** and the various scenario’s / measures
- Inform the participants about the **rules** and **objectives** of the workshop
- Perform an **computer-assisted MCA** according to the eight steps
- Discuss the **results** with the stakeholders
- Encourage **discussions** between stakeholders during the workshop
- Support the workshop with a **neutral mediator**
- The mediator should keep the discussions **structured** and **focussed**
- The mediator should **empower** the less vocal stakeholders while not letting the vocal stakeholders dominate

4.5. Conclusion and recommendations

The final stage starts once the workshop is completed. The planner drafts a document in which the main findings from the workshop are summarized. The document includes at least the results of the MCA conducted during the workshop. Moreover, the next steps in the planning process are presented. The document is disseminated to the stakeholders, including to those that did not participate in the workshop.

At this moment, the planner can reflect back on the added value of including stakeholders in the process. Relevant questions for the planner to answer are: Did I gain new information, e.g. new information on an effect that was considered more or less relevant before? Is there more support from the stakeholders for the plan? While doing so, it’s crucial to set own biases aside.

This is also an opportunity for the planner to assess the collaborative nature of the process. Did the stakeholders find the workshop useful? Do the stakeholders have the feeling of being heard? If the stakeholders do not have the feeling of being heard, the planner needs to rethink on how stakeholder involvement should take place. Doing this avoids future critiques of an undemocratic and opaque planning process.

Finally, planners should contemplate on if it is necessary to conduct another SPADE method in the future of the planning process. This is usually the case if the amount of potential policy measures is decreased new information is available and stakeholder support is needed, for example through more detailed CBA, cf. **Error! Reference source not found.**.

Tasks for the planner:

- **Disseminate** results to all the stakeholders and allow them to comment on the conclusions
- **Reflect** back on the added value of including stakeholders in the planning process
- Ask for **feedback** on the collaborative nature of the planning process and consider if more collaboration is needed
- Consider **repeating** the SPADE tool

5. Conclusions

This report describes a planning method that addresses two shortcomings of current infrastructure planning processes, namely that all effects associated to planning measures or alternatives are considered insufficiently into the decision-making process and the lack of stakeholder involvement.

The method introduced in this report is called the SPADE method and seeks to address these shortcomings. An overview of the SPADE method is given in **Error! Reference source not found.**.

The methods combines four existing planning methods and tools, CBA, MCA, online surveys and the digital workshop, into a single process. In particular the combination of these methods and synergies between these methods makes SPADE a powerful and complete integrated assessment method.

The method is divided into two parts, the SPADE process and the SPADE tool. The SPADE process contains the necessary steps to include the main component, the SPADE tool, into the planning process. The SPADE tool involves a one-day workshop in which stakeholders meet in a focus group-like setting and discuss various policy measures or alternatives by means of conducting a computer-facilitated MCA.

Overall, the methods facilitates the planning process by (i) narrowing down the amount of policy options, (ii) gaining a deeper understanding of all effects, including the subjective effects which are only understood to close stakeholder interaction and (iii) obtaining stakeholder support.

The method is multi-purpose. It can be applied in spatial and infrastructure projects from various sizes, multiple contexts, including projects focussed on spatial planning and at multiple stages in the planning process. The method is flexible, giving freedom to the planner to tailor the method to the needs of the planning process.

In the introduction of this report, various challenges for the SPADE method were set out. Below is described how each challenge is addressed by the method.

Challenge	The SPADE-method
Stakeholder identification and involvement;	Stakeholder identification is optionally done according to a Social Network Analysis. This ensures that all stakeholders are involved, including those that are less vocal and have fewer resources available to them. Large groups of stakeholders are involved through an online survey, whereas the digital workshop allows for close interaction with a few representative stakeholders.
Inclusion of both passenger and freight transport;	The method is flexible. The digital workshop is a standard research technique used in many disciplinary fields to gather opinions from stakeholders. This setting allows for any topic to be discussed. Similarly, the MCA can be tailored to the needs of the planning

	process by including the criteria that are relevant.
Applicable on different spatial scales (international, national, regional and local);	The flexibility of the method as described above likewise allows for including projects from various scales. Larger projects are often more complex than local projects, making the SPADE method longer or decreasing the level of detail. The planners needs to be aware of this.
Assessment of indirect benefits on economy, society, environment and public accounts;	The method is particularly suited for assessing the ‘unconventional’ indirect effects because it gathers opinions from stakeholders through an online survey and a digital workshop. The usage of an MCA simplifies these complex and intersubjective effects into a comparable number, making assessing these effects easier. The workshop allows for the stakeholders to provide context to these simplified numbers, avoiding that the complexity of indirect effects are reduced to a number.
Applicable at different time horizons (short, medium and long);	The flexibility of the method as described above likewise allows for including projects with different time horizons. In fact, the method is particularly suited to be used at multiple stages in the same planning process.
Inclusion of different types of data or information;	Thanks to the combination of four methods and tools, CBA, MCA, the online survey and the digital workshop, all kind of data types can be included, from subjective data to financial data. The CBA is best suited for handling financial data, whereas the workshop is best suited for handling subjective data, with the other two methods laying in between.
Different paces of spatial planning at the different stakeholders;	The structure provided in the digital workshop via the moderator and the computer-assisted MCA helps the stakeholders in finding consensus about the best fitting planning pace.
Systematization of stakeholders interests and strategies:	The Stakeholder Analysis performed under the first step of the SPADE process constitutes a systematization of stakeholders and their background.
Classification of impacts with distinction between efficiency and distributional impacts;	This is an important challenge. The method stresses the need to present the effects *according to stakeholder groups*. Decision-makers are most interested in these trade-offs instead of the composite number resulting from CBA and MCA. Moreover, showing the effects per stakeholder group facilitates discussions and consensus finding better than composite numbers.
Inclusion of weights of different aspects.	Standard to an MCA is the inclusion of weights. The computer-assisted MCA conducted during the workshop enables the stakeholders to pick their own weights.

5.1. Next steps: the validation of SPADE

The SPADE method concept will be tested in three different settings, one in the Netherlands, one in Norway and one in Austria. These tests will be evaluated in order to gain a better understanding of how the method performs and under which situations the methods work well.

Part of the evaluation is an interview with the planners to understand how they see the added value of SPADE in the planning process. The first interview takes place right after the workshop, the second interview takes place a few months later when the planning process progressed. Questions to be asked are:

- What has been the added value of SPADE to the planning process?
- Did input from the stakeholders gave a better understanding of the effects associated to the policy measures and in what way?
- Did stakeholder support increase?

Moreover, a survey will be distributed among the participants to evaluate the workshop. Questions asked are:

- Did you gain a better understanding of the planning problem?
- Did your support for the preferred policy measures change after learning about the views of other stakeholders?
- Do you feel that your opinions are sufficiently taken into account by the planners?
- Do you think the computer-assisted MCA is a good tool to select preferable policy options?

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