



How do you

value

this  place?

An investigation of (participative) GIS-based place value assessments for infrastructure planning

Master Thesis
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August 2018

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Introduction

Amelisweerd, 23 April 2014. In a forest nearby the ring road of Utrecht in the Netherlands hundreds of people come together. With a large group, they protest against the new highway extension of the A27. The ring road will be extended 15 meters along 570 meters of the existing ring road (Volkskrant, 06-04-2013) It will be a tiny piece of forest which doesn't have the feeling of a very attractive place due to already existing highway nearby. But the protest is huge and the highway project is delayed. This raises the question why this tiny piece of land is so much more valuable for the people than all the other pieces similar to this land. On a normal map, it is just a forest area nearby a highway, but the protest is more intensive than at other similar places. Is it possible to map this "citizen's value" of places?

With a background in Geographical Information Management (GIS), it seems logical that those values can be easily digitally mapped, as long as they have a location. Nevertheless at a meeting of the use of GIS and mappables in spatial planning on the 23th of October 2013, social-based GIS solutions weren't present at all. Especially the solution of the national road and water Agency (Rijkswaterstaat), which was intended to serve the local citizens, lacked information about the opinions of the citizens themselves.

Those two experiences resulted in the topic of this thesis: Could citizen's values of places be mapped with GIS? And if so, how could those values be implemented in infrastructure planning so those place values will be used in practice?

This thesis is the result of a 5-year long search to find answers to those questions. From this place I would like to thank all my supervisors, friends, family and colleagues who have supported me in this process.



PART 1 - RESEARCH

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1 Research Overview

1.1 Reason of Research: Objectives

As explained in the introduction, values could possibly play a role in the emergence of conflict during infrastructure planning. But those values seem hard to grasp and difficult to assess (Stolp, 2006). Several research methods have been developed to assess those values, of which Social Impact Assessment and the Citizens' Values Assessments are examples. However, those values are hardly implemented in infrastructure planning practice, despite their expected importance in the planning process.

Last years a growing amount of participative GIS-tools are developed. However, those tools and research methods lack the research, are not useful in practice, or miss the GIS possibilities that are available (Kahila & Kytä, 2009). They lack a profound base of investigation of the place values, and/or are missing a good connection with the decision makers and change-makers who decide or influence the layout of new infrastructure, or they do not use the possibilities of GIS to analyse and summarize the information for better communication with the decision makers.

The goal of the thesis find out how place values could be implemented in infrastructure planning by using participative GIS tools and if this will improve the citizen participation in the planning process.

The task for this master thesis project is to design a GIS-tool for infrastructure planning in which place values could be mapped. The tool has several goals: Firstly, it should make it possible to predict conflicts in infrastructure planning based on the place values. Secondly, it should offer useful information for participation processes in infrastructure planning projects. Both should contribute to the main goal: finding out how a GIS-tool could contribute to a better infrastructure planning in which the social environment is better taken into account.

1.2 Research Questions

By designing this GIS-tool and interviewing practitioners of research on citizen's values, infrastructure planning in the Netherlands and GIS-tools the main research question will be answered:

Main Question: How could place value-based participative GIS-tools contribute to a better citizen participation in Dutch infrastructure planning practice?

This study will have a holistic view of the use of GIS-tools. Not only the technical abilities of GIS-tools will be discussed, but also a decent theoretical framework will be set up about what will be mapped (place values) as well as profound investigation of how a GIS-tool could be implemented. The reason of this holistic view is derived from the notion that most of current GIS-tools lack a decent research on the role of the content that is visualised and GIS-tools are in most cases more focused on the technical structure of the GIS-tool instead of how it will be used (Brown & Kytä, 2014). Therefore will this thesis all those three topics (content, technical aspects & implementation) be covered.

Derived from those three topics are the three main questions of this thesis (in short): what to map? how to map? And how to implement?.

Subquestion 1: Which value indicators should be mapped in order to improve participation in Infrastructure planning? (What to map?)

For a better implementation of values in the infrastructure planning process, the concept of values should be better developed (Brown & Kyttä, 2014). This question will focus on the several concepts of values and the role of values in place-making. Around values and valuation of places are a wide variety of concepts which are strongly related to each other, which will be tied together towards a conceptual model which will be checked in practice.

The answer starts with a short introduction of participation and why we should incorporate citizen's opinions in spatial planning, based on leading publications by Healey (Healey, 1997) (Healey, 1998) and new insights from studies by Kahila-Tani and Kyttä (Kahila-Tani, et al., 2016) (Kahila & Kyttä, 2009) on incorporating values in planning process.

To develop a conceptual model of place values, theories from different fields of study are combined. The basis will be built on the model of Zube (1987). This model will be extended and adapted based on knowledge on values from a political perspective (Firth, 1998), a psychological perspective (Brown & Weber, 2012), a spatial planning perspective (Dijk, 2011) and finally an ecological perspective (Groot, et al., 2010) (Christie, et al., 2012) (Brown & Raymond, 2007).

This model will serve an analysis on how values are influenced by or enforce change and how infrastructure planning is related to those values. The theoretical part will be finalised with a list of criteria on which good value-based mapping should be made.

In the analytical part those criteria are checked at current participative GIS-tools and in infrastructure planning practice, in order to find out how in the future investigation of place values could be improved to better serve infrastructure planning.

Subquestion 2: How can participative GIS tools improve participation in infrastructure planning? (How to map?)

As stated before, not all the GIS capabilities are used in current social GIS tools. This question will start with an investigation of what is meant with participative GIS tools. The main articles on this topic are from Dunn (2007), Elwood (2006) and Brown & Kyttä (2014). Those authors summarise and/or compare different participative GIS approaches. This will give an overview of the extent of the possibilities of participative GIS tools.

The investigation will continue with an overview of criteria for good participative GIS. This will consist of the processes involved, based on literature from main SoftGIS researchers Brown and Kyttä (2014) and the quality of the GIS data throughout those processes, mainly based on criteria by Veregin, published in the one of the main books of Geographic Information Systems by Goodchild (Veregin, 1999). Finally an overview of good methods of GIS implementation in planning practice will be shown. This last part will be based on research and there resulting studies on Planning Support Systems, developed by Vonk, Geertman and Stillwell (Geertman & Stillwell, 2003) (Vonk, et al., 2005).

Those criteria will be checked in GIS and planning practice in order to define the gap between current practice and preferred situation. With this information it could be determined if current GIS practice is ready for good implementation of participative GIS tools.

Subquestion 3: How could participative GIS tools be implemented in Dutch infrastructure planning in order to improve participation in infrastructure planning? (How to implement?)

The third question is how those tools and values could be better implemented in Dutch infrastructure planning practice.

Firstly, infrastructure planning will be defined, as well as its characteristics. The description of the characteristics will be based on articles by Flyvbjerg, a leading researcher who focused on the reason of the long duration and high costs of infrastructure projects. Also theories on how Dutch planning should look like, stated by commissie Elverding, will be touched upon, in order to make the participative GIS-solutions locally applicable.

Secondly, a framework will be set up of good participation, which will be the goal of the proposed participative GIS-methods. This framework will be based on the participation ladder Arnstein (1969) in combination with some additional frameworks from current planning practice (Péribois, 2005).

In the analytical part data are collected on current infrastructure planning practice, in order to define where value-based participative GIS tools could be useful. Furthermore the current and possible future role of participation in infrastructure planning practice will be investigated, together with the level of participation in current participative GIS-tools. This will lead to an answer on how participative GIS could increase the participation in infrastructure planning processes, or in other words, “how to implement?”

Those three sub-questions together will finally lead to an answer of the main question: “(How) could mapping of place values with participative GIS-tools contribute to a better citizen participation in Dutch infrastructure planning practice?”

1.3 Structure of Research

This research is divided between a theoretical part (part 1) and a practical analytical part (part 2).

In the theoretical part, the main concepts of values, GIS, participation and implementation in infrastructure planning will be discussed and reviewed. This part will mainly focus on the values and their theoretical background, so the first sub-question of ‘what to map?’. But this part will also touch up onto the questions about GIS (How to map?) and implementation (How to implement?) on a theoretical level. At the end of each chapter a theoretical framework as well as list of criteria will be published, with which current assessment-, GIS- and planning practice could be evaluated.

The analytical part consists with a study of current practice. This part will focus on the status quo of GIS, values and participation in Dutch infrastructure planning and GIS practice. In this segment, current knowledge and use of GIS will be researched. This will be based on an investigation of GIS-products available for socio-spatial planners and interviews with GIS-experts and socio-spatial

planners. Furthermore, the participation process in current infrastructure planning and the level of implementation of place values in current Dutch infrastructure will be discussed with information from interviews with socio-spatial planners. Also the wishes of what the role could or should be of participation, values and GIS will be discussed in this part. Therefore this part will answer the questions from the first part about the theories, but this time how those theories will work in practice at the moment. So the focus in this segment is more in 'How to implement' the theoretical questions of values (What?) and GIS (How?).

This will lead to a conclusion on how place value-based participative GIS-tools could contribute to a better infrastructure planning.



PART 2 - THEORY

2 What to map? - Place Values: Origins, Characteristics and Relations

2.1 Introduction: Why is citizen's participation important?

The emergence of citizen's participation: the communicative turn

After the Second World War, urban planning was focused on functionality and objectivity. (Taylor, 1998) Decisions were made by professionals and their objective reasoning on what should be the best for the citizens. And the outcomes were more important than the process itself (Taylor, 1998) During the 1980s, communicative planning emerged, in which there was not only a role for the state, but also for other stakeholders like market and local community (Healey, 1997). This communicative turn was a result of critiques on the objectivity of urban planners, of which the publication of Davidoff (1965) on advocacy planning played a central role.

In an article on this communicative turn (Healey, 1998) Healey states that "the planning authority did not have control over all the investment and regulatory resources needed to implement projects" (Healey, 1998), or as Hartmann later proclaimed (Hartmann, 2012) "the world is too complex to control". Using the knowledge of local communities, also called "local knowledge", could improve the quality of the planning process (Healey, 1998) (Däne & Brink, 2007) and makes it possible to "adapt to continuously changing societal conditions" (Innes & Booher, 1999).

Furthermore, a participatory approach enforces the social capital of "place-focused stakeholders" and enforces their power to 'make a difference' to the qualities of their place (Healey, 1998). This social capital or institutional capacity is enforced by participatory planning on three levels: it enforces (1) the knowledge resources by supporting learning and knowledge-building (Healey, 1998) (Friedman, 1973), it enforces (2) the relational resources by strengthening recognition of the different values of various actors (Healey, 1997) (Healey, 1998) (Kahila & Kytä, 2009) as well as it enforces (3) the capacity for mobilisation (Healey, 1998).

Beside increasing the knowledge used to make the decisions and improving the social capital of society, the views of participants can also potentially smooth the planning and design process and reduce the number of conflicts (Taylor, 1998).

Critiques on the participatory approach

Nonetheless, a participatory approach is not always 'the holy grail' to smooth a spatial planning process and can even do harm when used wrongly.

Firstly, giving local issues too much importance in a regional planning process could obstruct the development or even mal-function of the region or country (Born & Purcell, 2006). If, for example, all options of a new road are blocked by local participants, the region could not develop or even maintain the current level of wealth and welfare. This so-called 'Local Trap' could be seen in environmental (Gibbs & Jonas, 2000) as well as urban planning (Pennell & Marrison, 2008). So the question is to which extent local issues should be incorporated in the planning process. The role of spatial planners is to weigh the 'local' knowledge against the regional needs to make well informed decisions about future developments.

Secondly, community response is low in most participative planning processes (Selman, 2001) (Kahila & Kyttä, 2009) and the people that turn-up are in most cases not a representation of the community. Participants of participatory meetings are usually older, white and high-educated people that are used to go regularly to participatory meetings (Pennan & Marrissing, 2008) (Däne & Brink, 2007). As a result, participation will be with only "professional participants" (Pennan & Marrissing, 2008). Furthermore, people who are negative against the proposed project are overrepresented at those meetings (Däne & Brink, 2007). As a result, the 'knowledge' gathered at those meetings is likely to be an incorrect representation of the opinions within the community.

In this context, it should be noted though, that this response from a specific group is also a result of inconvenient participation methods (Kahila-Tani, et al., 2016). Public hearings and written statements are still often used as participation process (Innes & Booher, 1999) and more creative solutions like workshops, charettes and open houses do not attract the preferred wide-range of participants (Laurian, 2004). According to Kahila-Tani et al. (2016) this is a result of a focus on face-to-face solutions which result in an overrepresentation of certain social groups, mainly high-educated and above 60 years old (Pennan & Marrissing, 2008). Digital and online solutions can be a solution to this misrepresentation by public participation participants (Kahila-Tani, et al., 2016).

Thirdly, participation processes are not always leading to increased social capital and improved relational resources. Negative reactions occur, due to participants different expectations of the influence of their input (Pennan & Marrissing, 2008) and to the knowledge gap between the professionals and participants (Selman, 2001) (Pennan & Marrissing, 2008), which will lead to a decrease instead of an increase of social capital and relational resources.

Conclusion

To conclude, public participation can be of use for planning processes, by using the local knowledge to get grip on the complex situations in practice, enforcing social capital by improving knowledge resources, relational resources and capacity for mobilisation in the future and finally smoothing the planning process and reducing conflict, but only when it is used wisely.

Spatial planners should therefore take care of a public participation process. In such a process, participants should have a certain influence which should also be clearly communicated, participants should be representative for the community in which alternatives to face-to-face meetings could help and the input of the participants should be clearly weighed against other stakes and stakeholders of other citizen's and organisations.

This conclusion leads to the analysis that planners have to acquire new skills and professional roles (Kahila-Tani, et al., 2016), and, as Kahilla and Kyttä (2009) state, also have to develop more usable and effective participation methods in which a deeper understanding is obtained of the experiences of citizens of the region. In the next paragraphs, those more usable and effective participation methods will be discovered by digging further into the concept of experiences and values citizens have with/on places in their own environment: the concept of citizen's place values and how this could be used in planning practice.

2.2 Place Values: the important link between space & place in conflicts

2.2.1 Defining Place Values

Over the past decades, a wide variety of studies have been published on the valuation of locations, all with different names and specialisations. There are for example citizen's values (Stolp, 2006), social impacts of projects (Vanclay, 2003), social costs and benefits related to locations (Geurs, et al., 2009), biodiversity related values (Groot, et al., 2010), economical values, landscape values (Zube, 1987) and

unpriced values (Sinden & Worrel, 1979). Different fields of study which are only sometimes, and if so only partly, brought together. However, those different fields of study overlap, are interconnected and more importantly, can learn from each other. Because of their huge overlap and interconnectivity the more generic term “place values” will be used in this thesis to define all values that are related to a location. *Place values are what the third rule by Gieryn (2000) describes; the value that co-constitutes ‘place’ out of ‘space’, or in other words, the values that people assign to the human and social aspect of a certain location.* By using this broadened definition, all knowledge available on the relation between different human values within space, regardless the name-tag that it is given, could be combined to further enforce the research on the essence of place-making and investigate in further detail the reason why conflicts occur in spatial planning.

In the following paragraphs, this concept of place values will be further developed. The main questions that will be researched in the following paragraphs are: What defines a (place) value? What characterises do place values have? How is a place value influenced and how does place values influence other processes? And what are the place values that are specific for infrastructure planning?

2.2.2 What is a Value?

The use of the word “value” is in academic literature ambiguous and used in different contexts. In economics, the word value is used in economics as an amount of money of a certain location. “Adding value” is increasing the monetary or market value of an object or location (Nabatchi, 2012). In another field of study, ecology, the word value refers to the value that contributes to biodiversity and health of the ecosystem. And finally there is the one that is used in social sciences, which is also the focus of this thesis, and this one is used as an opinion on what is valuable for life. Those latter values are also described as social values (Groot, et al., 2010) or “unpriced values” (Sinden & Worrel, 1979). In this social value the things that are valued more make a difference in one’s life and this value increases by an growth of the desire or need for a thing that is valued (Zube, 1987). Such a value is also described as a range of attachment feelings about an object or idea, in which the attachments could be related to usability (functional), expensiveness (economical) and/or emotional attachment (Firth, 1998). Landscape values are an interesting type of social & ecological values that are related to a certain physical location and are mainly associated with the characteristics of unpriced and social values (e.g. in (Brown & Raymond, 2007) and (Zube, 1987)).

So in short, there are three main value domains: economic, ecological and social (MA, 2005) (TEEB, 2010) (Groot, et al., 2010) (Christie, et al., 2012). In this thesis the focus will be mainly on the latter, the social values.

From an economic perspective values can be divided into use and non-use values. Use values are values that could be directly consumed, whereas non-use values are not consumed but it is important that it exists ('existence value') (Groot, et al., 2010). For example, a boy who likes to fish appreciate the local fish pond by its use (use value), while his grandfather doesn't use the fish pond at all, but he appreciates that his grandson can use it (non-use value). In the case of economics and biodiversity, the combination of use values and non-use values is called Total Economic Value (TEV). In the paragraph on methods of assessment (Chapter 2.5.2) the different aspects of TEV, and use and non-use values will be discovered in more detail.

Furthermore, values are personal (Zube, 1987). The desires and needs differ per person. Take for example a forest nearby a city, like Amelisweerd. Most people appreciate the view, but for a commuter on the highway, it is the nice pleasant view from the car while going to work. For a schoolboy it could be his nice shortcut from home to school. On the other hand for a retired women who goes for a walk in the forest every day, the forest is a part of her daily life and moment of

relaxation, while a who come their every month for their moment of fishing with his two sons, the creek is a place they do not visit that often and the needs are different than others, but for them it is of even value as the person who visits it every day. The influence of desire and needs on the valuation of places could be enlarged by the experience a person has with the area.

As earlier mentioned, values have a hierarchy (Zube, 1987), or in other words, a level of importance (Groot, et al., 2010), which differs per “thing” and per person who values it. In paragraph 2.3.2 this will be covered in more detail. Because of this differentiation, things, and in the case of place values, places could be ranked. This is the basis of assessing places and how they value those places. But what is a place?

2.2.3 What is a Place? And its relation to Space and Spatial Planning

Space is a residential road, a piece of asphalt placed in between a row of houses, hedges of 70 cm. In height separating the gardens, orderly managed and at the end of the road is a play garden, which is surrounded by benches. Space is a tree in the middle of a field, or a set of trees strictly ordered in rows, or randomly placed like in a forest with a small path in between those trees which connect place A with place B. Space is a highway between two cities, with every 100 meters a lamppost. Space is a geometry (size, shape, distance, volume) (Tuan, 1979; Gieryn, 2000)

Place is what people make from this space. As Tuan (1977) describes a discussion between two physicists Niels Bohr and Werner Heisenberg when visiting Kroneburg Castle in Denmark. As scientists, they look at a castle as a thing that consists of stones, wood and patina. But by knowing it was probably the castle where Hamlet has lived, it became a totally different castle. “None of this should be changed by the fact that Hamlet lived here, and yet it is changed completely. (...) The courtyard becomes an entire world, a dark corner reminds us of the darkness in the human soul, we hear Hamlet’s ‘To be or not to be.’” (Tuan, 1977, p. 4). The experience (although in this case an experience of which was written about) resulted in a transformation of a space into an area filled with stories, feelings and attachment: a place.

The perception of places is not universal within a given population or area and differs per person and per culture (Brown & Weber, 2012). Those perceptions could change over time and/or be contested, which can lead to a spatial plan or a spatial action resulting in a change of the space.

This whole process of spaces that are viewed as places which are contested and will lead to a plan-making in which spaces are adapted, could be visualised in a small scheme. This scheme will be used as a main conceptual model of the theory which will be extended and in the rest of the thesis.

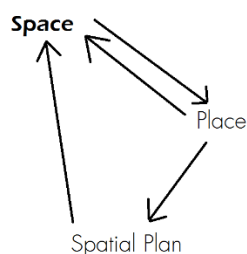


Figure 1- Roles of Space, Place and Spatial Plans

2.2.4 Place values: why they do matter!

An essential part of the process from space to place is the valuation of those spaces. A space becomes a place when we get to know it better and attach meaning and values to a space (Brown & Weber,

2012). As a result places become, as Tuan (1977) describes in his article, a “centre of felt values”, or a sum of different place values (Brown & Weber, 2012).

Those values that make places from spaces are an important part of the process. Values related to places, or place values as we’ve called them, are central to the individual, but as well collective decisions (Brown & Weber, 2012). Also Zube (1987), underlines the importance of those values, stating that if a spatial plan is fitting into a person’s value orientation, it is likely that they are supportive towards a future land use change. And if the plans do not correspond with their value orientations it is likely that they will not support a future land use change.

Because place values are not universal in a certain population and differ between people and cultures (Brown & Weber, 2012), they could be contested. Those differing place values may lead, as Brown and Weber (2012) state, to a conflict or a change of the land use over time. Moreover, if those values are not taken into account, history learns that it could easily result in a failure of a project or program, with all the financial and political consequences (Firth, 1998).

And this is one of the main aspects of place values, which make them interesting. What Brown & Weber say, as well as Zube and Firth is that place values are actually at the basis of spatial conflicts and also the main drive in spatial plan making and place values should be taken into account in order to prevent financial and political losses. The better news is that those place values could be easily measured and spatially quantified according to Brown and Weber (2012). So a better understanding of place values and their role in spatial planning processes is to measure could improve the planning process as a whole.

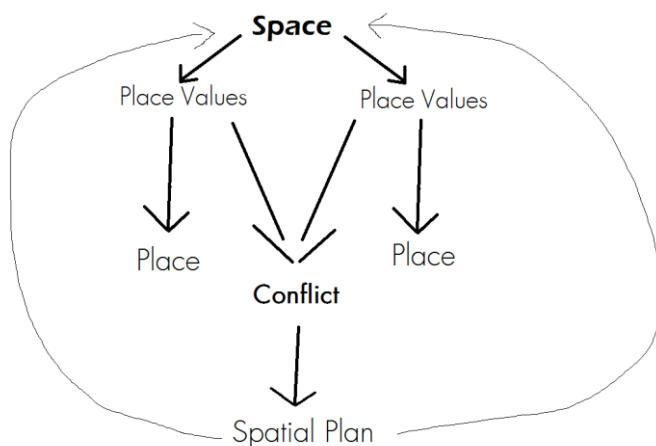


Figure 2 – Influence of Space and Place on values

In the following sections we will further elaborate on place values, their characteristics and how they can be assessed.

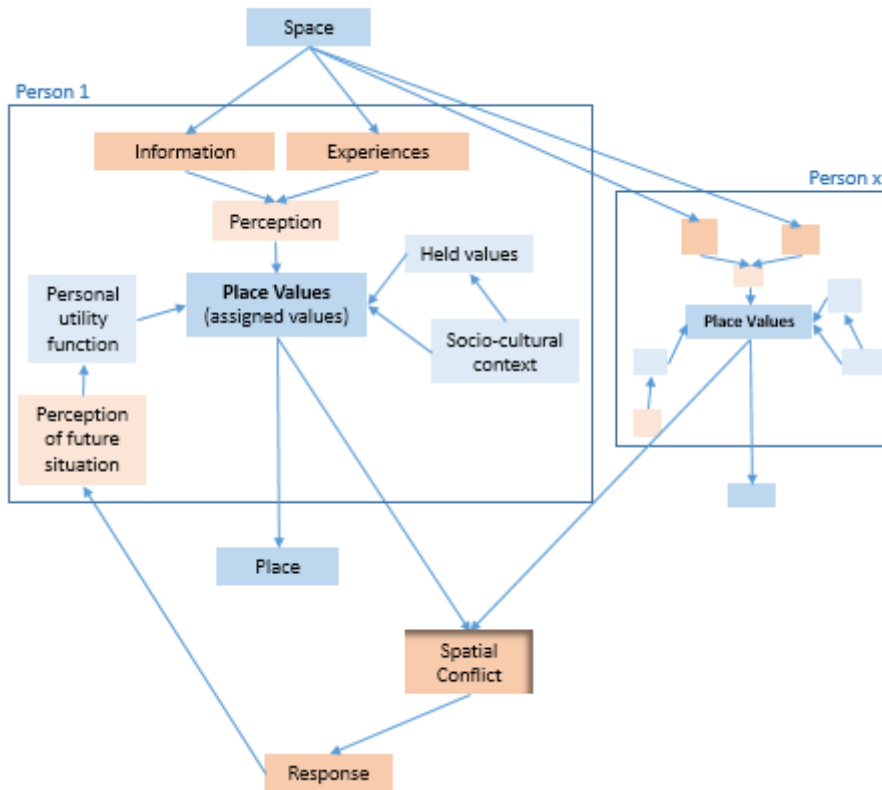


Figure -

2.3 Place Values: characteristics

2.3.1 Held versus assigned values

Values are not only the values of a certain place. They are also influenced by the valuation of a general idea, like valuation of nature, accessibility or economic progression. In literature this is explained by two concepts: the concept of held values and the concept of assigned values. Held values are general ideas or principles that are important to people (Lockwood, 1999) (McIntyre, et al., 2008). They are complex, but relatively stable and more importantly guide individual behaviour (Nabatchi, 2012). Assigned values are more specific values that express the importance of an object in relation to other objects (Brown, 1984) (McIntyre, et al., 2008). They can more easily change over time. For example, the retired woman of the story in the previous section values nature areas more than built human environments (held value), but appreciates the Amelisweerd forest specifically more than other forests, because of its quietness and beautiful scenery (assigned values). Although they are different, held values are of huge importance for assigned values. As Brown mentions “held values are believed to influence assigned values through the subjective evaluation of objects (Brown, 1984)” (Brown & Weber, 2012, p. 316). So a person who appreciates natural areas in general more than human built areas (held values), is likely to value the adjacent forest more than the city itself (assigned values). But not only assigned values differ geographically, also held values are different on different locations. The main influencer of those held values is, according to the theories of Zube (1987), the socio-cultural context in a certain area. Also Schwartz found a similar result when researching values like protecting the environment and unity with nature. Schwartz proved that where people live, influences the importance that people assign to certain held values (Schwartz, 1992). Because of this difference in held values per location, it is important to assess them, so it can be taken into account in the participation as well as the design process.

2.3.2 Hierarchy of values

As mentioned earlier, “value” is a relative term and should therefore be used as part of a hierarchy of scale. As already mentioned by Zube, the value of “a thing” increases by the growth of the desire or the need for a thing (Zube, 1987). Maslow’s hierarchy of needs (Maslow, 1943) (Morgan, 1986), although it was set up for human developmental psychology, gives an insightful framework that could be used for the hierarchy of those needs. In his theory Maslow divide the human needs and values in five types (Maslow, 1943). The most fundamental needs are psychological needs, like breathing, food, water, sleep and homeostasis (constant health state), followed by safety, love, self-esteem and finally self-actualization. The highest need in the hierarchy (self-actualization) is only obtained by a small portion (Maslow, 1970), mainly of higher economic status (Firth, 1998) of the population, the lowest need by a large part of the population. In spatial planning in western countries resistance is expected if higher valued needs are affected. Following the argumentation of the hierarchy of Maslow (1970) and Firth (1998), more resistance is expected if lower needs are affected or if infrastructure projects cross more prosperous areas (where higher values are more important).

2.3.3 The option value: unlinks value from activity

Several value assessment tools, like the Hotspotmonitor (Vries, et al., 2013), imply that valuation of places is linked to the type of activity and frequency of activity of the people in a certain area. By using it daily for a walk with the dog, or cycling weekly would be the measurement of the valuation of a certain place. To begin with, frequency of visiting isn’t always an indicator of appreciation. Visiting a certain place, like a beach, a monastery or a certain camp site yearly could be of much more importance to a person than the supermarket or daily cycle route to work.

But appreciation of places could even be the case if the person isn’t visiting the place at all. Places could be appreciated by being an option to go to, regardless people really visit this place itself. This explanation is partly covered by Geurs in his article about the so-called option value (Geurs, et al., 2006). “The option value is the willingness to pay for the continued availability of a transport facility, to preserve the option of using this facility in the future” (Geurs, et al., 2009, p. 76). A forest or a specific place could be seen as a facility. How this ‘facility’ is appreciated is not based on the frequency of using this ‘facility’, but only having the option to use this ‘facility’ in the future.

This aspect makes the assessment of values even more complicated. What is the importance of those option values? Which reaction is most appropriate to a region with a high option value, but low usage value? This will lead unavertable to a discussion like the local bookshop around the corner. People like having it in the street, but no-one ever buys a book in this bookshop. Replace book with a nature area or park and buying a book with using this space and we come back to the discussion of valuation of natural places. From an economic point of view the bookshop or park should be closed immediately. But from a sociological perspective it should be maintained, while from an economic perspective it should be closed. What should we do? In order to give the decision makers the option of making an informed decision, this aspect should be taken into consideration in every assessment of place values. Therefore not only direct users, but **also possible ('option value') users and non-users should be asked about their valuation of specific places** and not only activities undertaken in a specific area should be assessed but also the general appreciation of an area, without taking the activities into account.

Christie et al. (Christie, et al., 2012) extends this option value to even a next level, by including this option value in their framework of use and non-use benefits for biodiversity and ecological services. Christie et al. subdivide use values in direct and indirect use benefits and option values. *Direct use benefits* are related to direct consumption of a place or a thing. You value, for example a fish pond, because you use it to fish. *Indirect use benefits* are about benefits you have because something else influence something you value. For example the existence of a fish pond influence the air quality around your house, while you are not using the fish pond itself. And the third use benefit is that of the

option value, which you don't use at the moment, but the appreciation is focused on possible use in the future. You don't want to use it at the moment, but appreciate to use it in the future. Beside the use values there are also the non-use values. Those are *altruistic values* (satisfaction of knowing that other people have access to for example the fish pond), *bequest values* (satisfaction that people of future generations can use that place) and *existence values* (satisfaction of knowing that people or a place exists). All those six use and non-use values should be taken into account when assessing values for infrastructure planning.

2.3.4 Place Values & Change

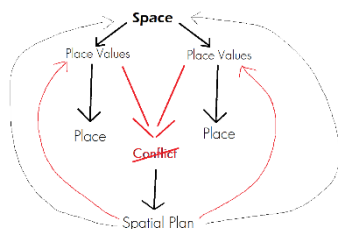
Another important aspect of place values is that they could change over time. Infrastructure projects and participation projects are known for their long time span (Flyvbjerg, 2005), therefore it is important to further investigate the role of change on place values. The question is why, how and when those place values change. Those questions will be answered by four themes: interactivity, life span, personal circumstances and physical environment.

In the discussion of changing values it should be mentioned that the earlier mentioned assigned values are the values that change more quickly than held values (Brown & Weber, 2012). In other words, values on a certain area (like Amelisweerd) change more rapidly than general values and beliefs. In the following sections it will be mainly the assigned values which will change, instead of the held values.

Planning Process

As van Dijk (Dijk, 2011) states (place) values can change in conversations and discussions about those places. Or in his words “the values held by the regional population are also fluid and partly influenced by communicative planning processes” (Dijk, 2011, p. 126).

Furthermore, Making plans and telling stories with the designs plan making and design making or other future visualisations are not only focused on changing the perception of the future, but also the perception of the current state of the landscape and therefore are changing how people value certain areas (Dijk, 2011).



Also the opinion about the project itself could change over time. When details are more known, this could change the valuation of the project. And also when something is finally there, it could differ from earlier expectations (Sweeney & Soutar, 2001). The presence of for example a new road, could be found more useful than expected beforehand. This could lead to a change of the valuation of a new plan for a road.

But this change could also come from the person itself. To understand this process of change one should dig further into the formation of place values.

Life Span / Time

As Zube pointed out the situation of the person itself is important, as well as its experiences in the past (Zube, 1987). Furthermore the history of a space can contribute to the valuation of this place

(Tuan, 1977). Moreover the future plays a role in the formation of place values. Not only future plans (Dijk, 2011), but also possible changes in the landscape (Brown & Weber, 2012) can influence the valuation of a location.

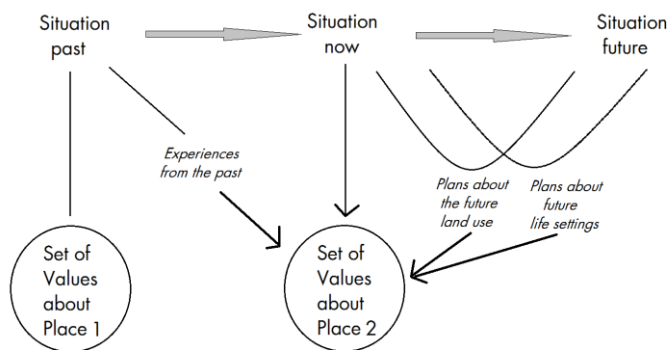


Figure 3- Influence of time on values

Physical Environment

The physical environment of a place could change, for example by building a new road or other piece of infrastructure. This could have benefits as well as drawbacks. But in both cases it will change the value of a place.

Values & Conflict

As stated before, diverging values can lead to conflicts. But how do values influence and conflicts? Psychological literature gives the answer.

Two types of conflicts emerge in psychological literature: social values conflicts and interpersonal conflicts (Brown & Raymond, 2013).

But what will people do in case of a conflict resulting from conflicting values? Rossi (1955) explains that there are four options when people are dissatisfied with their current household. (1) People remain living in the same house, do nothing and just accept the situation, (2) they change their location preferences and thereby diminish the feeling of dissatisfaction, (3) they decide to protest and try to change the location (plans) itself (4) or they move to a new location which better fits their location preferences.

So a conflict would not always lead to protests, but it could lead to a lower appreciation of the environment (in other words places become less valued), and even moving of people to other places. In planning the focus is mainly on the third group, the group of people that protest, but the 'silent minority' of unsatisfied people or people who mitigate their preference or location is often ignored (Firth, 1998).

2.4 Place Values in context: Values in Infrastructure planning and the area-oriented approach

This thesis focuses on place values that occur in infrastructure planning. Infrastructure planning is an important source of value conflicts, both interpersonal and social value based. Therefore infrastructure planners should have a good notion of the underlying place values. Important in this

context is the role of infrastructure itself on place values, so that those infrastructure planning specific place values could be added to the GIS-based questionnaire.

The basis of the value conflicts related to infrastructure planning is a spatial problem inherent to infrastructure. Infrastructure itself is a linear structure, while the effects could be felt in the area surrounding the infrastructure. Those different spatial entities have their own values, goals and characteristics. Infrastructure is focused on improving the accessibility, while planning in the area surrounding the infrastructure is focused on improving liveability, economic growth or environmental sustainability. How this has an effect on the planning process will be discussed in the 4th chapter of this thesis. But how place values play a role in infrastructure planning and which place values are involved, will be discussed in this section.

The Theory of Residential Satisfaction and Highways

The area surrounding the infrastructure is mainly affected on a local level. Tillema et al. (2012) researched residential satisfaction and how it is influenced by a nearby highway. Residential satisfaction is how people appreciate/value their living space and could therefore be seen as a type of a place value.

To research residential satisfaction, property prices are used as a proxy, which is grounded by the study of Baterman et al. (2001). Tillema et al. (2012) developed a theory of road proximity and residential satisfaction and how living nearby highways could increase the regional accessibility but also has to cope with the negative externalities of the highway. The negative externalities (which will be discussed in more detail later on) have an effect only on the first 600m. (Eliasson, 2005), while the positive influence of improved accessibility reaches a wider area. The positive influence of improved accessibility is also higher present at the surroundings of an access lane compared to the surroundings that are not nearby an access lane. So the theory is that people living nearby a highway, but far away from a access lane, have to cope with the negative externalities of the highway and don't have the benefits of the improved regional accessibility. Therefore this group are expected to have the highest decrease of residential satisfaction when the highway is built. The second group, the people who live nearby the access line, have both to cope with the costs of the externalities as well as the benefits of the accessibility. The third group is located quite close to the access lane and far from the highway. This group has, according to the theory, only the positive effects and little disadvantage from the nuisances caused by the highway. The fourth group is living far from the highway as well as the access lane and therefore have no costs or benefits from the highway. So, according to this theory, where people live influences how a highway affects the residential satisfaction, an aspect of place values.

Reflection on the Theory of Residential Satisfaction

The basis of this theory couldn't be criticised, but two side notes should be taken into account, regarding this theory.

Firstly, the negative effects of more traffic should also be taken into consideration.

This better connection will also result in more traffic in general and will be mainly affect the traffic intensity on supporting roads. Therefore local negative externalities will also occur in the region. Beside those negative externalities, like noise, air, water and soil pollution, more traffic will also result in more parked vehicles in the area (Geurs, et al., 2009). Parked vehicles have a negative effect on perceived attractiveness of areas and on safety, which will result in a lower valuation of certain places.

Secondly the role of personal sensitivity. Location is not the only basis of valuation of a new highway.

Based on the previous paragraphs about place values and a study by Geurs et al. (2009), valuation of places is also heavily influenced by the personal sensitivity to the effects of a highway.

Sensitivity could be influenced by subjective personal preferences, which are a product of the personal set of held and assigned values. The retired woman from an earlier example would probably value a quiet place more than a place that has a better car connection to the city, creating more people disrupting her quiet places where she lives. But a business man could, on the other hand, appreciate such a connection more than this older retired woman.

Sensitivity could also be influenced by objective measurable personal circumstances, like state of health (Geurs, et al., 2009). Some people are for example more sensitive to air pollution, because they suffer from respiratory diseases.

Sensitivity to externalities is mentioned in the article of Tillema et al., but it is not used in the rest of the theory because there is, according to them, no evidence that this sensitivity results in a bias in the effect on housing prices, their main indicator for residential satisfaction. So, from an economic perspective, personal sensitivity doesn't have a proven effect. But, on the other hand, also the human and social aspects should be a part of an investigation of the effects of infrastructure, unless how it is measured.

So, therefore, in studies about the effects of infrastructure, this personal sensitivity aspect should be taken into account. **Assessing values on a personal level** is therefore an important and useful addition to the more generic location analyses in order to find the local differences of sensitivity of the negative externalities of infrastructure.

Negative Externalities of Infrastructure

Geurs, Boon and van Wee (2009) focus in their article on the impact of transport on social aspects of the environment (opposing themselves to the common way of assessing impacts of infrastructure). They have a useful list of how infrastructure affects its environment and what the negative externalities are of infrastructure.

They put forward that the presence of infrastructure influences the *visual quality* of a certain place. A certain view could be obstructed by the presence of this infrastructure. In a study by Groot et al (Groot, et al., 2010), this aesthetic quality is seen as one of the more important value indicators. This should therefore be taken into consideration when new infrastructure is being planned.

Furthermore, *noise* could influence the appreciation of a place as well.

Infrastructure also functions as a divider (Geurs, et al., 2009) (Tillema, et al., 2012). Infrastructure could divide communities as well as natural habitats. Both could affect the quality of life in a certain area and therefore the valuation of a certain area. Communities are very location-specific and couldn't be known from hard data only. Soft data about the social aspects should be included in research about the situation surrounding planned infrastructure. Therefore **research about the communities should become a part of a questionnaire about place values** in planned infrastructure areas.

2.5 “Measuring” Place Values

2.5.1 Introduction

After having set out what place values are and how there are interrelated with spatial planning, the question remains how to measure those values. Although there is not a pre-defined method to assess

values related to locations, several theories and assessment methods of adherent concepts exist. Two of the most useful concepts will be used to set up a basis for assessing Place values: Social Impact Assessment and Citizen values assessment. Those methods will also give input to an extension of the list of indicators to be researched in order to find out the status of certain place values in a region. In the last sub-paragraphs those indicators will be listed, so they can be used as an input for the model that will be developed in the following chapters.

2.5.2 Social Impact Assessment

The Concept

Social Impact Assessment is described in the international principles for Social Impact Assessment by Frank VanClay (Vanclay, 2003) as "the processes of analyzing, monitoring and managing the intended and unintended social consequences, both positive and negative, of planned interventions (policies, programs, plans, projects) and any social change processes invoked by those interventions."

This field of research and practice has been set up to empower local people and increase the position of minority groups, women and other marginalized members of society in order to create more equality within a society. Impacts of projects on their environment are covered in Environmental Impact Assessments (EIA), but the impact on the human environment was not sufficient according to the researchers. To lay the focus more on the social consequences the concept of Social Impact Assessment (SIA) has been set up.

The social impacts that SIA is intended for are about people's way of life, their culture, their community, their political systems, their environment, their health and wellbeing, their personal and property rights and their (future) fears and aspirations (VanClay, et al., 2015).

The Process

The social impact assessment process consist of four phases, according to the publication of VanClay et al. (2015). This publication is a result of a thorough consultation of the Social Impact Assessment community.

In *phase 1* the researcher understands the issues. Besides understanding the project of concern and the task for the SIA-team, an analysis of the communities that are likely to be affected by the project or 'community profiling' is one of the important elements of this phase. This community profiling consists of (a) a stakeholder analysis (b) a discussion of the socio-political setting (c) an assessment of the "needs, values, interests and aspirations" of the affected communities (d) their impact history, (e) a discussion on the trends happening in those communities (future plans & life paths) (f) a SWOT of the community itself and (g) optionally the results of an opinion survey.

The SIA-process continues with *phase 2*, the prediction, analyses and assessment of likely impact pathways. How will the communities be impacted by the project and how will they react and how will those reactions influences their future life style.

In *phase 3* strategies are developed and implemented to cope with or, where possible, reduce the impacts. An important step in this phase is to facilitate an agreement-making process with a Impacts & Benefits Agreement (IBA) and a Social Impact Management Plan (SIMP) as a result.

In *phase 4* it is monitored if and how the IBA and SIMP are put into practice.

Lessons learned from Social Impact Assessment

This is, in short, the process of Social Impact Assessment. The main question is, for now, what can place values assessments learn from or contribute to the field of research and practice of SIA?

To start with the contribution of GIS-based place values assessments to SIA. GIS-based place values assessments can become part of the SIA process. Especially in part c of phase 1 it is of use, where the analysis on the needs, values, interests and aspirations could be partly covered by place value assessments.

On the other hand, place value assessments in infrastructure planning could also use some elements of the SIA-process. For example when analyzing the values, an analysis of the conflicts between the values and a future project is a good addition. Furthermore, working towards an agreement in which the values are stated

Despite its similarities though, place values assessment also distinguishes itself from Social Impact Assessment.

Social impact assessment (SIA) is a useful methodology for incorporating citizens' perspectives in spatial planning, because it is "a methodology used to measure the social effects from proposed projects or policy actions" (Becker, et al., 2004). SIA is a well-developed concept and is used in many situations, but the concept as it is defined and used contains some contradictions and missing elements.

Firstly the social impact assessments are about the assessment of impacts on people, but the research is in a lot of cases done by experts and researchers without an intervention of the people involved. Although in the academic world a change could be seen from technocratic towards participative methods (sources) and participative methods are proven to lead to better results, still a large group of researchers focuses on technocratic SIA methods.

But also participative SIA methods have their limits. Research proved that most of the citizens don't participate in participative projects and the participants are in most cases not a representative selection of the population (Firth, 1998). It is a fact that could hardly be changed, but every attempt to include those "silent majority" should be encouraged to ensure a better assessment of the possible impacts of a project.

Furthermore the concept of SIA is fragile due to the intrinsic focus on negative impacts which harms the reliability of the scientific-based method of SIA. Although the International Association of Impact Assessment states that SIA includes "the processes of analysing, monitoring and managing the intended and unintended social consequences, both positive and negative" (Vanclay, 2003), the focus in many articles and practices is predominantly on the negative consequences and groups that are negatively affected by a certain intervention. This negative focus is explicable, because oppressed groups and negative impacts are mainly not well recognised in projects. SIA is a good method to highlight this "forgotten" side of a project. Furthermore, in the case of participative SIA, involved citizens are mainly negative. Studies also proved that the people who participate, participate mainly because they oppose the proposed project (Firth, 1998). As a result the negative impacts are more highlighted than the positive effects. Although this negative-focused approach enforces weaker and "forgotten" groups, this special favouring shouldn't be part of a scientific, objective research method. Also in this case an attempt to include more citizens from "the silent majority" could increase the quality of the impact assessment.

Lastly, place value assessment has a special focus on locations and how participative GIS-methods can be used to map those place values.

So, on the contrary, place value assessment focuses more on the participative acquisition of the data and place value assessments will also include the positive effects of infrastructure, besides the negative externalities of it and place value assessment is about places and uses therefore more GIS in its analysis.

To conclude, Social Impact Assessment has several useful elements that also can be used in place value assessments (like the conflict-analysis and values agreement), but distinguishes itself with a

focus on the participation process, the GIS possibilities and has a focus on both the negative as well as positive social effects of plans and projects.

2.5.3 Citizen Values Assessment

The Concept

Citizen values assessment is an investigation of “the potential impacts of planned interventions in the environment from the perspective of those citizens who are potentially influenced by them” (Stolp, 2006:Summary), because “the values individual citizens attach to particular environmental characteristics often differ (partly) from expert judgements” (Stolp, 2006:Summary). So Citizen values assessment (CVA) could be seen as a subjective analysis of the environmental impacts which could be added to “objective” analysis by experts, which is mainly current practice of Environmental Impact Assessments.

The concept of Citizen values assessment has been developed between 1994 and 2002, mainly by Annelies Stolp, a PhD-researcher at the Civil Engineering Division (Bouwdienst) of Rijkswaterstaat in the Netherlands (Stolp, 2006), due to the lack of practical techniques in Social Impact Assessment and the necessity to make a stronger differentiation between citizens’ values and expert judgements in perceived impacts on the environment.

A Citizen Values Assessment consists of several citizen values: “a synthesis of well-specified, concrete positive and negative values, which are grouped into more abstract higher-level categories”. (Stolp, 2006: 2.4) Those citizen values could be divided in values of the natural (biophysical) environment and values of the constructed living environment as well as values that are related to the use and values that are related to the existence of a certain element of the environment.

The Process

CVA consists of four phases.

In the first phase the basic groundwork is set up. In this preparatory phase the impact area is defined, as well as relevant interest groups and the land-use patterns are identified.

In the second phase the key values are identified by means of face-to-face interviews with citizens. In those interviews participants are questioned about their perception of current environmental qualities, recently perceived changes in environmental qualities, checking if reason of project is clear, opinion towards the project and their perceptions of possible impacts and finally about the issues relevant for design around the project. The outcomes of those interviews are analysed and a list is created with all elements and their related meanings according to the participants. Those lists can be double-checked by the participants if they agree with the analysis and how they’ve spoken about the environmental qualities. After this double-check a preliminary profile is made, which already can be used in the preparations for the Environmental Impact Assessment (EIA).

In the third phase the key values are checked with a quantitative survey. In this quantitative survey citizens are asked to give a weight by ranking, scoring or rating the key values and explain which mitigation measures they prefer. The weighing of the key values will lead to the the Citizens Value Profile (CVP).

In the fourth phase the CVA researcher translates the key values into recommendations for the EIA and the project. Firstly the key values (for example, having a nice view) are translated to criteria for the project (e.g. no obstruction by sound wall). Secondly evaluation criteria are set up. Thirdly, the impacts of the highway on each criteria will be defined and finally some recommendation for mitigation and compensation procedures. The impact list and the mitigation recommendations will form the final CVA report, which can be used in the EIA process.

This process of Citizen values assessment can be embedded in the Social Impact Assessment Process, as is shown in figure 4, as well as it is embedded in the process of Environmental Impact Assessment.

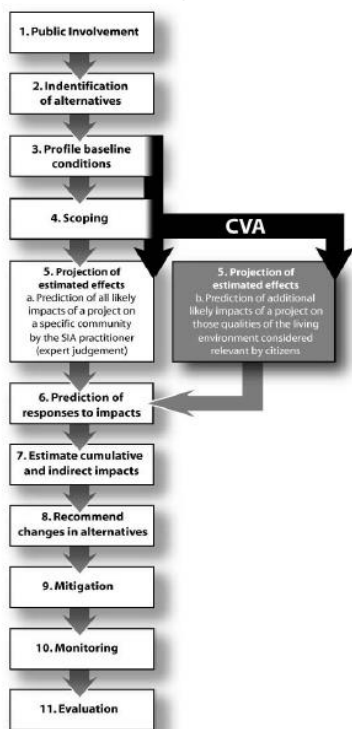


Figure 4- CVA process (Stolp, 2006)

Lessons learned from Citizen Values Assessment

Also in the concept of Citizen Values Assessment, Place Value Assessment could be integrated. In this case Place Value Assessment can play a role in the second phase, where participative GIS methods can be used to gather the data on place values, something CVA is missing at the moment.

What can be learned from Citizen Values Assessment is the combination qualitative data collection to harvest the different values and the quantitative data collection to verify and give the weight to each of the key values. This combination will create a better insight in the values and is therefore a valuable addition to the process of Place Value Assessment.

2.5.4 Indicators & categorization of Place Values

Several studies summarize different types of values, of which the study by Brown & Weber on landscape values (Brown & Weber, 2012) and the study by Groot et al. on ecological values (Groot, et al., 2010). Furthermore there are the studies on social impacts, which also cover several values. Those studies are summarized by vanClay et al. (VanClay, et al., 2015) (VanClay, 2002)

From those lists only the indicators that are related to a location are extracted and combined into a list of possible indicators of place values that are not mentioned in previous chapters.

Nature values

Valuable wild areas (Brown & Weber, 2012)

Valuable wildlife areas (Brown & Weber, 2012), described as “ I value these places because they provide for a variety of wildlife, marine life and plants.”

Cultural values

Places with inspiration for culture, art and design (Groot, et al., 2010)

Places with cultural heritage and identity, for sense of place and belonging (Groot, et al., 2010) (Brown & Weber, 2012)

places with spiritual & religious value (Groot, et al., 2010) (VanClay, 2002)

Recreational values

Location, Type, Frequency and appreciation of recreational activities (Groot, et al., 2010) (Brown & Weber, 2012)

Other values

Economic values (Brown & Weber, 2012) (Firth, 1998)

Valuable places for future generations (Brown & Raymond, 2013)

Valuable places for learning (Brown & Raymond, 2013) (Groot, et al., 2010)

Therapeutic values (Brown & Raymond, 2013)

Life sustaining values (Brown & Raymond, 2013)

2.6 Summary: A questionnaire about place values

This analysis of place values leads to a list of criteria for good place value research (table 1). This list of criteria will be tested in practice in chapter 6.

		Questionnaires about citizen's opinions have questions about...
General values	2a	... their appreciation of specific areas in general
Personal Information	2b	... current age, and the family situation now and in the future
Personal Information	2c	... for how long they already know those places (experiences)
General values	2d	... assigned & held values
General values	2e	... all 6 use and non-use values (direct use benefits, indirect use benefits, option values, altruistic values, bequest values and existence values)
Future place values	2f	... how well-informed they are about future plans
Future place values	2g	... how their values will change with the new plans
Future place values	2h	... what they will do if the plans will be (accept, dissatisfaction, protest, move), if the plan will negatively affect the valuation of the area.
Infrastructure place values	2i	... current accessibility (of social contacts, work-related locations and facilities) and how it is affected by future plans
Infrastructure place values	2j	... appreciation of current and future accessibility (e.g. better access is useful?)
Infrastructure place values	2k	... aesthetics: visual quality / appreciated views and how it is affected by future plans
Infrastructure place values	2l	... silent and noisy areas and how it is affected by future plans
Infrastructure place values	2m	... positive and negative smells and how it is affected by future plans
Infrastructure place values	2n	... geographical layout of communities
Nature values	2o	... valuable wild areas
Nature values	2p	... valuable wildlife areas
Cultural Values	2q	... places for cultural inspiration
Cultural Values	2r	... places with cultural heritage and identity value

Cultural Values	2s	... places with spiritual & religious value
Recreational values	2t	... places with recreational value
Recreational values	2u	... which recreational activities are performed where
Recreational values	2v	... how often those recreational activities are performed
Recreational values	2w	... appreciation of those recreational activities
Other values	2x	... economic values
Other values	2y	... valuable places for future generations
Other values	2z	... valuable places for learning
Other values	2aa	... therapeutic values
Other values	2ab	... life sustaining values
Relative values	2ac	The hierarchy of their place values compared to the other place values (Zube)
Relative values	2ad	The hierarchy of their place values compared to their other needs & desires (Maslow)
Rest	2ae	Description in own words
Value Assessment Process	2af	The assessment is done in different rounds of data collection: a qualitative round and a quantitative round to check the qualitative data

Table 1 – Summary of Chapter 2 – Value Criteria

3. How to map? - Adding GIS to a questionnaire about place values / The possibilities of GIS

3.1 Introduction

In order to profoundly examine the possibilities of GIS, the first step is to identify what GIS exactly is. In this section a definition of GIS will be given in order to frame how the tool will look like and which functionalities it could have.

3.2 A framework of what GIS is

Geographical information is all the information of which the geographical location is known.

Geographical Information Systems (GIS) are the systems that are “capable of creating, storing, manipulating, visualizing and analysing geographic information” (Goodchild, 2000, p. 6) . The term GIS is nowadays mainly used for digital geographical representations, but could also be used in the context of paper maps or even photos of a set of maps drawn in the sand (a method of participatory GIS that is used in developing countries). Though, digital versions of GIS are used more and more. The advantage of digital maps is that it could be overlaid easily with each other which could result in new discoveries of relations between certain phenomena. The power of the information from those different layers could be strengthened by combining those layers. A frequently heard remark in the field of GIS specialists is that the combination of different layers and performing analysis with this information, revealed information that was unexpected and not know before.

The process of GIS analysis could be divided in several steps. Schuurman (Schuurman, 2004) divides the GIS process in six stages: data collection, data storage, data input, data analysis, mapping and data output. Each stage has an effect on the results of the research.

Despite the benefits, GIS has also its limitations which should be taken into account when doing GIS research. One of the main critiques of GIS focuses on the determinism of GIS. If a certain issue is mapped and visualised, it is mainly seen as the truth, although the information behind the map is uncertain or not yet fully investigated (Llobera, 1996). For example the sphere of influence is defined as exactly 5 km., which means that a location that is 5.1 km. from a certain point is not influenced by this point any more, according to the map. In most cases this 5 km. boundary is a vague boundary, because of most things the exact sphere influence depends on to much issues to know the exact sphere of influence.

Furthermore Geographical Information Systems and GIS-analysis have, due to the complexity and/or unfamiliarity with computer logics, the risk of becoming a “black box” (Schuurman, 2004) (Latour, 1987), a situation in which the process of analysis is unknown, while the output is undisputed as the truth.

Moreover GIS is a simplified version of reality. To obtain an overview of a situation, information is generalised and analysis also focuses mainly on certain issues, while other issues are left out of the research. As a result, as Mark Poster (Poster, 1996) already warned for in 1996, governments tend to

view their citizens as numbers, statistics or entities located at a certain place (the 'digital citizen') which doesn't correspond with the actual citizen of "fresh and blood" (Schuurman, 2004).

Taking those limitations into account, GIS is still a useful technique for investigating a large group of people about certain issues e.g. place values. It is a proxy of how the real world works. And the more the GIS is related to personal opinions (instead of collective opinions), the more accurate it is to describe this real world. To investigate the opinions of people with GIS more and more participative GIS methods are developed.

3.3 Participative GIS methods

3.3.1 Towards new definitions of GIS: participative GIS

In the mid '90s, several critiques emerged on the positivist epistemology of current Geographic Information Systems (Craig, et al., 2002) (Elwood, 2006). An epistemology that could be seen at every new technological innovation till at least the '90s (Lévy, 1990)

In several researches was pointed out that there was a difficulty for communities to get access to the right data and gain sufficient knowledge to use the GIS possibilities, resulting in a geographic information systems that were totally developed by governments and large organisations and institutions (Yapa, 1991) (Rundstrom, 1995) (Harris, et al., 1995). This resulted in a lack of local knowledge in GIS practice of that time (Rundstrom, 1995, among others). Furthermore, traditional GIS focus mainly on the physical environment and lacks the focus on the social environment and human scale. But "location has an important influence on human behaviour (Rantanen & Kahila, 2009) and the examination of social spatial patterns is crucial (Vaattovaara, 2001). Those critiques resulted in several researches how GIS technologies are socially constructed and related to knowledge and power (Elwood, 2006). Those researches resulted in the construction of a new form of GIS, beside the normal use of GIS (Goodchild, 2000), where GIS is combined with public participation (Lévy, 2002) (Elwood, 2006).

3.3.2 Terminology: The different Participative GIS approaches

Nowadays a wide range of terms exist in which participation is combined with GIS. There are PPGIS, PGIS, VGI, SoftGIS, Community-integrated GIS, Collaborative GIS etcetera. Several studies in this field acknowledge that there is an abundance of lacks a proper consensus (Brown & Kyttä, 2014) (Aysegul & Roche, 2008). According to some researchers there's no difference between all those terms (Dunn, 2007) (Tulloch, 2008) and "guiding definitions are not to be found and utilizing [*sic*] the term 'PPGIS' is inconsistent across applications and uses" (Schlossberg & Shuford, 2005, p. 15), but according to others those terms are no synonyms, but different concepts, and there are enough points of distinction to address the differences between the different concepts (Brown & Kyttä, 2014). In the attached figure an overview could be found of the different participative GIS and their characteristics according to several sources. For this thesis the term participative GIS will be used, which will cover all earlier mentioned variations of GIS in which citizens are involved.

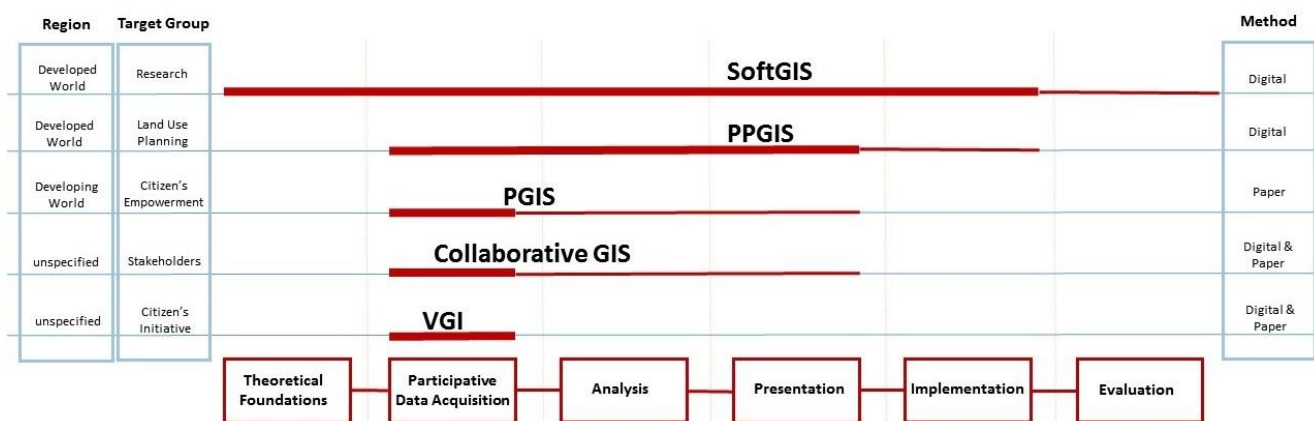


Figure 5 - Overview of Participative GIS approaches, based on (Aysegul & Roche, 2008) (Balram & Dragicevic, 2006) (Brown & Kyttä, 2014) (Dunn, 2007) (Goodchild, 2000) (Goodchild & Li, 2012) (Kahila & Kyttä, 2009) (Rambaldi & Callosa-Tarr, 2000) (Rambaldi & Callosa-Tarr, 2001) (Rantanen & Kahila, 2009) (Sieber, 2006)

3.3.3 Challenges of Participative GIS approaches & Future research agenda's

According to several scholars in 2006-2014, participative GIS methods still needs to be improved. Gregory Brown and Marketta Kyttä wrote in 2014 a critical analysis about the future of PPGIS and what should be changed in the future in order to stay an important tool for land use planning and management.

One of the main research priorities (according to Brown and Kyttä (2014)) is the role of public participation in PPGIS. Nowadays PPGIS-projects are mainly focused on the GIS parts of PPGIS, while the main goal of PPGIS-tools should be public participation. Respond rates of Internet-based PPGIS are relatively low (around 13% according to Brown & Kyttä, 2014) and sometimes the influence of the participants is too limited to call it even participation, according to some scholars (Elwood, 2006). Therefore it should be one of the research priorities how those participation rates could be raised.

Another research priority should be the threads of data quality, which is lower at PPGIS due to the decreased accuracy of the data and how this could be solved.

A third research priority is the evaluation of the effectiveness of PPGIS. Nowadays evaluation of used tools and methods is scarce, due to the lack of willingness of governments to fund those evaluations (Sewell & Phillips, 1979) and the absence of useful evaluation methods (Rowe & Frewer, 2000). Moreover, when evaluations are executed, those evaluations are more focused on the tool instead of the effects on the planning process (Brown & Kyttä, 2014). So, therefore, also extra attention is needed for this part of the process.

To conclude, GIS started as a mathematical, deterministic way to look at space, and is now developing towards a more social, fluent way of looking at space and place. But new, more participative types of GIS, were in 2014 still lacking sufficient tooling to analyse and map the social and 'soft' side of space and implement it in the planning process. The question is if this situation still is the case nowadays.

3.4 Challenges on Data Quality

3.4.1 Introduction

As mentioned in the research of Vonk et al., the quality of the input data is one of the main bottlenecks for the use of a GIS-tool. Data quality is a separate field of study with a lot of subtopics where could be elaborated on. For the purpose of this thesis only some main topics will be highlighted that are useful for the evaluation of the different participative GIS tools.

GIS Data quality is often categorized in four components: Accuracy, Precision, Consistency and Completeness (Brown, et al., 2015) (Veregin, 1999).

Accuracy is the difference between the digital GIS situation and the real situation. It can be a line that is off-set and lays 2 meters away from where for example a hedge is, but also a wrong representation of what a person meant to say, creating the 'digital citizen' mentioned in chapter 3.2.

Precision is related to the level of detail and if this is reflecting the level of detail that is needed for decision making. Data of greenery appreciation is for example for a local park maintenance project less useful on province level than data with a precision of some meters.

Consistency is how the data stay intact throughout the process. Or, in other words, that the data entered by the citizens reflect the same information as is presented to the infrastructure planners. This could be in location, but also thematic (a question of "do you appreciate this bench" could be wrongly translated in "appreciation of the whole park") and temporal (citizens appreciated only the situation at that moment, not after the changes that were made in the area)

Completeness is if the data contain all the information. So in this case from (a representation of) all the citizens in all concerned areas. This topic won't be covered in this chapter, but will be further explained in the chapter on Public Participation (Chapter 4.3).

Those four components should be explained in the metadata. Metadata in this case is not only an attachment to the data itself, hidden for only GIS experts, but also something that should be communicated to the persons that use the data, in this case the infrastructure planners.

With this information on data quality they know what they know, but also know what they don't know and therefore can make better informed discussions. Or in other words, they make better decisions because they know better what the difference is between the 'real citizen' and the 'digital citizen', know what the level of determinism is of the data and they know better what is inside that 'black box', the three disadvantages of GIS stated in chapter 3.2

In the following paragraphs the components of precision, accuracy, consistency and metadata will be explained with some applications in Participative GIS.

3.4.2 The right location

Precision: Level of detail

Data that is received from participative GIS projects could be difficult to analyse, because it is unknown with which level of detail the data are entered. If data are entered on a scale of a region a point or area could mean a large part of the city, while entered on a scale of a neighbourhood it could mean only some streets or just a home. In both cases it could be drawn the same. So, therefore the scale of the map when entered should always be added to the presentation of the data.

Accuracy: Point, Lines, Polygons... Viewpoints?

Data gathered by participative GIS should be representative for the area that the participants meant to mark. In most cases a point will not be sufficient, as persons normally don't like that exact point,

but the area surrounding that point. Also lines are a possibility if routes for e.g. cycling or recreative walking are meant. However, in a lot of cases the view from a certain place is more important than the exact location. The result will be an area with the elements that can be seen from a certain point. By mapping with lines, polygons and viewpoints, the geographical representation of the citizen's opinion will be more accurate

3.4.3 Consistency: Generalising the right way

From points to density of points (Heatmaps)

Points can be easily converted into so-called heatmaps or density maps. Those maps show the places where a high density occurs. But it differs per analysis which density is related to which colour. As a result maps could look similar on density, but this is in most cases different due to the different colouring rules.

Another method to generalize points is to count the points within an area. In this case the amount of values in the scope of a route alternative could be calculated for example. This result will give a more accurate image of the original data and keeps the data more consistent throughout the process.

From areas to clusters of areas (Hotspots)

Areas can be transferred to hotspots, a visualisation in which regions more areas are drawn than other areas. This is standard tool in most advanced GIS software.

From opinions to groups of people (Bag of Words)

Opinions, especially when there are plenty, can be difficult to grasp in a moment. GIS could analyse and generalize complex situations easily, but in the cases of text analysis, artificial analyse can be of use. In artificial intelligence the method of Bag of Words can cluster texts based on their topics. Although the details are quite complex, this method can be of use to cluster the data. If those clustered opinions are also clustered on maps, a quick overview could be shown of the different opinions. The result will be for example a map with the clustering of places where people answered with a nature-related topic compared to where people answered with a traffic-relate topic. The method of Bag of Words has also the possibility to find out the difference between negative and positive comments, so combination of topic and opinion could be shown on a map. By using this method no loss of data will occur and the data will stay consistent.

3.4.4 Metadata, information on how it is collected & analysed

All the above mentioned information should be collected in the metadata. With this metadata everyone can see what has happened with the data and can therefore judge the usefulness of the results for their own planning practice. Whilst official metadata are difficult to grasp for infrastructure planners with limited GIS knowledge, the process of analysis should be explained to the infrastructure planners, including its limitations.

3.5 Challenges of Implementing GIS-tools: The theory of Planning Support Systems

As Brown & Kyttä already mentioned (Brown & Kyttä, 2014), in the practice of geographical information systems the focus is too much on the technological element of GIS. But GIS should not only focus on the participative part as Brown & Kyttä mention, but also on the implementation in planning practice.

Geertman and Stillwell state in several publications (Geertman, 2002) (Geertman & Stillwell, 2003) that GIS and spatial planning, as well as information and communication technology (ICT) drifted apart

from each other and planning support systems (PSS) could bridge this gap. Planning Support Systems are geo-technologies that are designed to support planning practices, irrespective they are public or private, “at any defined spatial scale and within any specific planning context” (Geertman & Stillwell, 2003). Whereas geographical information systems provide generic information, planning support systems are specific and focuses on the tasks of the application. Or, as Geertman explains, “each different planning situation will have its own planning procedures, underpinning theory, data, information, knowledge, tools, methods, presentation requirements et cetera and will therefore require a customized PSS.” (Geertman, 2002).

But still, if those applications are designed for planning practice, it is hard to implement the application in the planning practice. Still some bottlenecks pop-up with the translation from GIS to planning practice. In 2004 to 2005 Vonk, Geertman and Schot (2005) investigated those bottlenecks through surveys and in-depth interviews with people working in spatial planning (The exact division of the respondents is shown in figure 6) As a result he has found three types of bottlenecks at the development of PSS (instrument approach), at the transfer from PSS to user (transfer approach) and at the use of PSS (user approach). Those bottlenecks (figure 7) include too complex tools for the use of it, top-down use of the tools (instead of bottom-up initiatives by the people who should use the tools) and too less experience from the planners with PSS and GIS. Those bottlenecks, which have to be checked in current planning practice, have to be taken into consideration when working with GIS tools in spatial planning.

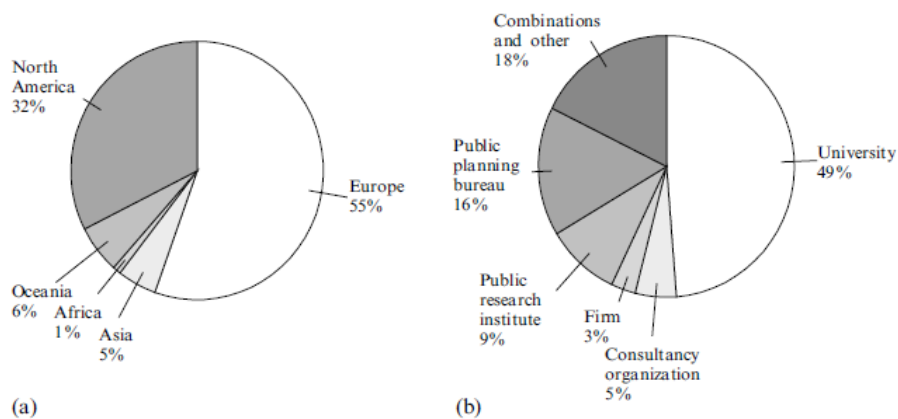


Figure 6 - Respondents of a study by Vonk et al.(2005)

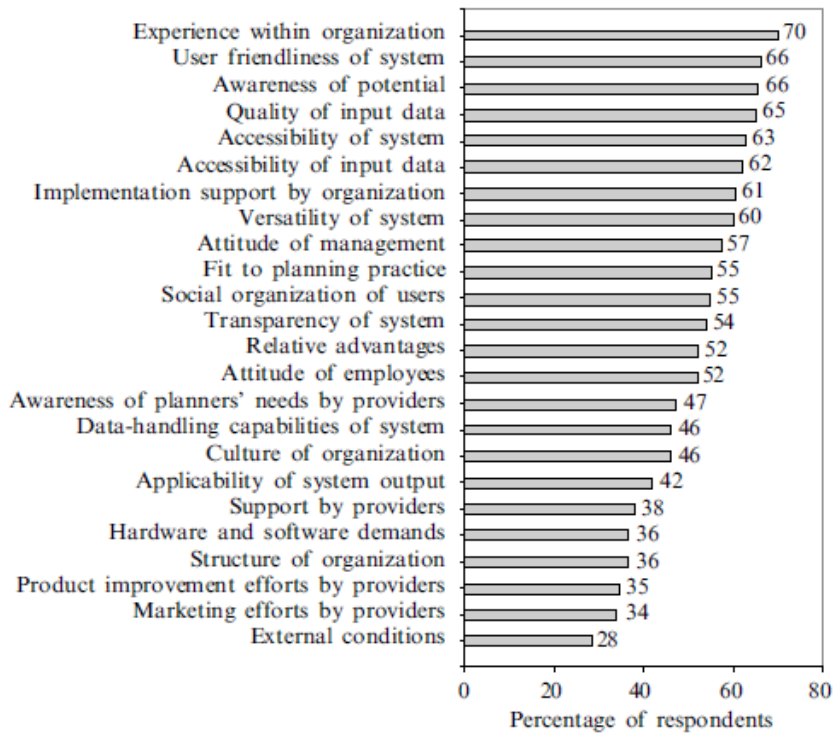


Figure 5. Bottleneck indicators with their importance.

Figure 7 - Bottlenecks according to Vonk, Geertman & Schot (2005)

3.6 Summary: Adding GIS to a questionnaire about place values

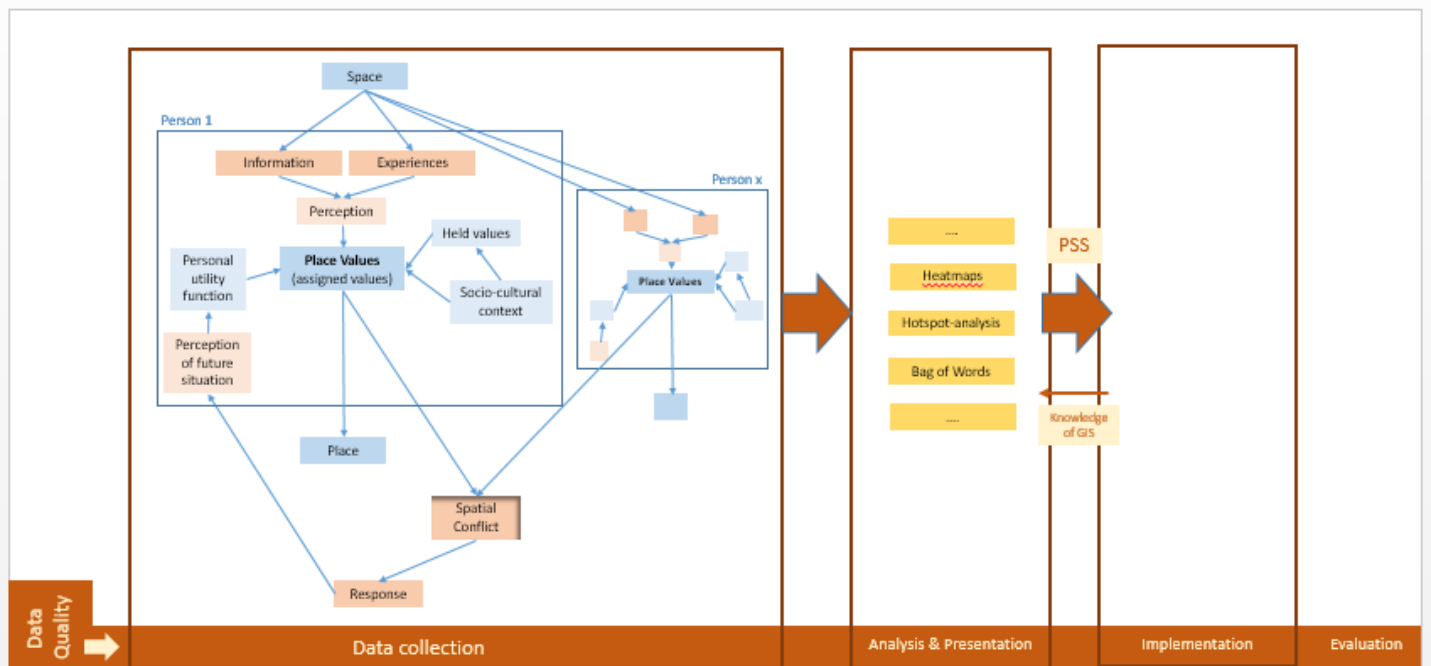


Figure 8 – Conceptual model of GIS in a value-based assessment process

Using GIS as a tool to investigate place values has its advantages as well as its disadvantages.

The most important advantage of participative GIS methods is that they make it more easy to analyse the information that is gathered from the respondents. Furthermore, by adding the location to this information, the geographical difference of the population could be shown, as well as an overview of which parts of the area are more appreciated than others. Those three reasons makes GIS a useful tool for investigation place values.

On the other hand one should take into account the different challenges that come with the use of GIS as an assessment method. Of those are several that should be part of the tool and the process around the GIS tool.

Firstly, the participative GIS tool should not only focus on the data collection tool itself, but also the data processes around it. In the scope of this thesis it is important that beside data collection, also data analysis, data mapping and data output is part of the project.

Secondly, the processes around the GIS and data process should be part of the project, in order to make the tool useful for planning practice. As Kahila & Kitta (2009) state, the project should also have good theoretical foundations, should also cover the implementation of the tool itself and should include a thorough evaluation. In this thesis the criteria for good theoretical foundations will be the criteria from chapter 2, the criteria for good implementation will

Thirdly, for a good implementation of the GIS-tool in the project several aspects play a role. For the evaluation of the different tools later on in this thesis, it is important that they will be checked on user-friendliness, quality of the input data and accessibility of source and meta-data. For investigation of the possibilities of implementation of participative GIS-tools in infrastructure planning, it is important to check the following :

- knowledge of infrastructure planners on GIS,
- their awareness of the potential,
- if GIS is already part of their organization,
- if they know people who use it (social organization of users),
- what the attitude is of the management
- if current & future participative GIS-tools fit to their planning practice.

Fourthly, as mentioned in the previous point, data quality is essential in the process. The data in the tools should be evaluated on their precision, accuracy, consistency, and if this information is known by the users.

Those four topics will lead to the following criteria for a good environment for implementation of participative GIS tools for place value based research for Infrastructure Planning. Those criteria will be used in chapter 6 to analyse current (participative) GIS practice.

Participative GIS projects ...		
GIS process	3a	... have theoretical background on which the tool is developed
GIS process	3b	... use analysis to translate the raw data into useful visualisations
GIS process	3c	... take care of implementation
GIS process	3d	... take care of evaluation
GIS data quality	3e	... have tools that are user-friendly
GIS data quality	3f	... have data that are precise
GIS data quality	3g	... have data that are accurate
GIS data quality	3h	... have data that are consistent
GIS data quality	3i	... has information on data quality and the data process available for all users (no 'black box')
Infrastructure Planners ...		

Planners & GIS - knowhow	3j	... have basic knowledge about GIS, in order to use the data in the right way
Planners & GIS - knowhow	3k	... are aware of the potential of GIS
Planners & GIS - organization	3l	... have GIS as part of their organization
Planners & GIS	3m	... know people who use GIS
Planners & GIS - organization	3n	... have a management who encourages the use of GIS
Planners & GIS - potential	3o	... see a potential for the use of participative GIS-tools in their own planning practice.

Table 2 – Summary of Chapter 3 – GIS Criteria

4 How to implement? – Place Values in Infrastructure Planning & The role of public participation in spatial planning

4.1 Introduction

This thesis will research if and how it is possible to implement the earlier mentioned concept of place values could be implemented with PPGIS/SoftGIS in infrastructure planning. Infrastructure planning combines local values with regional and (inter)national values and infrastructure planning has difficulties to implement those local values in their planning process, so therefore infrastructure planning is an interesting case to explore the possibilities of implementing place values.

It should be noted that in this thesis the focus will be on the planning of transportation infrastructure. Transportation infrastructure are all the physical elements on, in or under water or land that support the movement of goods and or people.

The question how to implement values in infrastructure is more complex. Geurs et al. already stated that incorporating social impacts of infrastructure planning is difficult and should be further researched (Geurs, et al., 2009). And also how the public should be included in the planning process stays an ongoing discussion. Therefore this chapter of the thesis public opinions and place values could be implemented in the planning process.

As a start of this chapter a framework will be set up to determine the preferred level of participation, which will be combined with an overview of current situation of public participation to identify the gaps between the preferred and current level of participation. Filling those gaps is one of the goals of the GIS tools that will be developed in this research.

The chapter will continue with the implementation of public values in infrastructure planning in the past. Lessons learned from those past experiences could improve current participation processes. Furthermore, this history influences the current thinking of incorporating public values in infrastructure planning and therefore should be considered when implementing a new approach to including public (place) values in infrastructure planning.

A third aspect that will be touched upon are the characteristics of infrastructure planning, where the place values needs to be implemented. Shaping the image of infrastructure planning shown in academic literature in this part, and checking this image later on in the field, in part 3 of this thesis, could support the incorporation of the idea of place values in infrastructure planning nowadays. Those aspects could be taken into account when designing a good GIS-methodology for place value assessment.

In the last part of this chapter a summary will be given based on the lessons learned from academic literature on participation and on infrastructure planning.

4.2 Infrastructure Planning

4.2.1 What is Infrastructure Planning?

4.1.2 Characteristics of Infrastructure Planning

Infrastructure planning is long-lasting.

Flyvbjerg (Flyvbjerg, et al., 2003) (Flyvbjerg, 2005) states that large infrastructure projects or so-called megaprojects, are inherently risky due to the long planning horizons and the complexity. Those projects have to cope with complex decision making with a wide variety of actors and conflicting interests, while the scope of those projects will change significantly over time. Those unplanned changes result generally in high cost and time overruns and creates an environment where misinformation about costs, duration and risks are ubiquitous.

Infrastructure connects and divides.

One of the main characteristics of infrastructure planning is combining the line-element (the road, railway, canal for example) connected to national or regional economic vitality that crosses through an area where local liveability is the main stake in the planning process (Heeres, et al., 2012) when paraphrasing (Graham & Healey, 1999)). This physical difference result in conflicting interests which needs to be integrated when planning new infrastructure. Those are the conflicting interests (and values), which are also mentioned in the previous chapter, where Flyvbjerg writes about.

As a result, different types of governance should be applied. Heeres et al. (2012) describes those governances as a hierarchical engineering-based approach versus a participative social-focused approach. Those different governances should be combined within one project. Therefore infrastructure should be more multi-sectoral than single sectoral as well as more multi-actor, according to Heeres et al.. A trend that is not only seen in the Netherlands in the last decades (Heeres, et al., 2012), but also in the rest of Europe.

4.2.3 Infrastructure Planning in the Netherlands:

4.2.3.1 *The Dutch Infrastructure Planning Process Cycle by Elverding*

To cope with the negative characteristics of infrastructure planning in the Netherlands, a research committee led by Elverding was set up in 2007 to investigate the causes and solutions for those problems. Which led to a report 'Faster and Better' ("Sneller en Beter" in Dutch) which was published in 2008 (Elverding, et al., 2008).

This "Commissie Elverding" emphasises the conclusion of a report by the "Tijdelijke commissie Infrastructuurprojecten" (Duivesteyn, et al., 2004) that the causes of omnipresent time- and cost overruns in infrastructure planning are mainly national, due to national laws and planning cultures.

Elverding addressed that participation should be improved, an area-oriented approach is needed as well as limitations to the time per stage in the process. Elverding also proposed a new process lay-out in which the different stages are more clearly divided. The planning of infrastructure starts with a start decision (startbesluit) in which the whole process is described. In the first stage, the exploration stage (verkenningfase) different alternatives are being researched, preferably together with the different stakeholders and a preferred alternative is chosen. This will be finalised with an Draft Trajectory Decision (Ontwerp-Tracébesluit). In the next stage, the Plan Development Stage, the plan is further developed and more detailed research about the effects is performed. After this stage a Final Trajectory Decision is made and the Realisation Stage can start. The whole process with good evaluation.

This process with those stages as described by Elverding is still used nowadays in national infrastructure planning, as well as in most cases of regional and local infrastructure planning in the Netherlands.

So when designing a tool to improve the planning process of infrastructure planning in the Netherlands it should be taken into consideration where in the infrastructure planning cycle of Elverding it will be implemented.

4.2.3.3 Towards area-oriented approach

In the Netherlands Infrastructure planning moved towards a more area-oriented approach (Lenferink, et al., 2008). In this approach not only the line itself, but the area surrounding the infrastructure became important. By combining infrastructure planning with the spatial potentials of the area, synergy could be achieved according to Lenferink et al.

4.2.3.4 Dutch Environmental Impact Assessment (EIA): Maatschappelijke Kosten-Baten Analyse (MKBA)

As a result the environment should be investigated. In order to find out what the effects of infrastructure will be on its surroundings, an Environmental Impact Assessment (EIA, mer) is nowadays compulsory for every infrastructure project.

4.3 Implementation of Public Participation in Infrastructure Planning

4.3.1 Introduction

This thesis started with the notion that it is important to have a certain degree of public participation in the planning process. Public participation will make it possible to use local knowledge, will smooth the planning process and it improves social capital which could be of use in other projects. Though, participation should be handled in the right manner. As explained in the previous chapters an addition of value assessment and participative GIS methods, the earlier mentioned goals could be reached, but also the participation process itself needs to meet certain criteria.

In this chapter those criteria will be presented, so the case studies and current planning practice could be checked according to those criteria.

4.3.2 Level of Influence

An important issue in public participation is the influence participants have on the planning process. Often participation is only used to create legitimacy or to generate ideas for the process and make use of local knowledge (Däne & Brink, 2007) (Brown & Kytä, 2014). A well-used tool to measure the influence of citizens on the planning process is the ladder of citizen participation by Sherry R. Arnstein (1969). Arnstein divides his ladder participation in three parts: degrees of nonparticipation, degrees of tokenism and degrees of citizen power. In addition to this ladder, a less acknowledged and widely known, but interesting perspective is the view of the French Carine Péribois on the level of participation (Péribois, 2005). This perspective places the ladder of Arnstein in a wider environment, where participation is not only led by the government, but also can be led by citizen's themselves or by elections for new governments. A side-note on this list is that the militant participation, in which citizen's take over the power of the decision process by force, is more common in France than in other countries (Centre d'analyse stratégique (CAS), 2008), although the situation in Amelisweerd can be one of the rare examples in The Netherlands. Therefore militant participation is less a case as an option of participation in the context of this thesis (participation by value assessment in Dutch infrastructure planning). On the other hand, the ladder of participation by Sherry R. Arnstein combined with the perspective by Carine Péribois of citizen initiated participation could be a useful measure of the level of citizen's participation and its effectiveness in spatial planning and will be therefore used in this thesis as a criterion for good participative assessment methods.

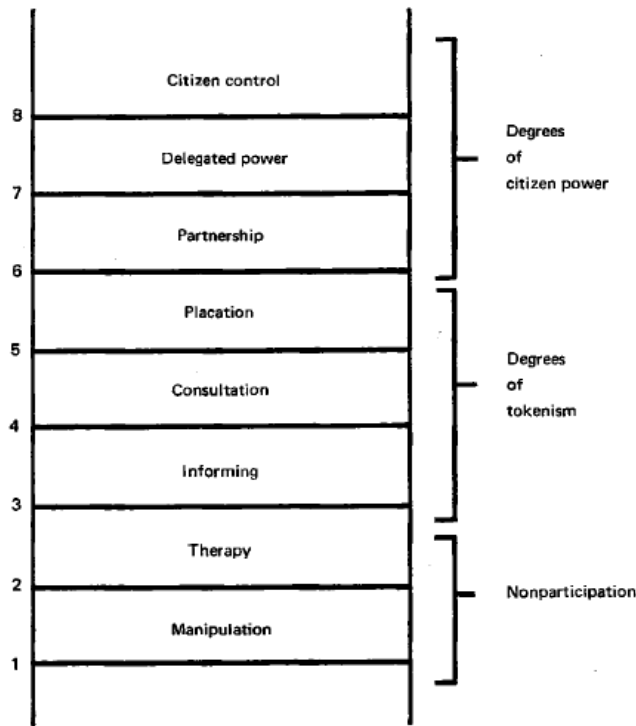


Figure 9 - Ladder of Participation (Arnstein, 1969)

Type of Participation	<i>Elective participation</i>	<i>Institutionalised participation</i>	<i>Spontaneous participation</i>
Level of Participation	Voting	Hierarchical model*	Militant participation
		Information	Autonomous action
		Consultation "Concertation"	
		Model of Negotiation**	
		Coproduction	
Delegation			
Managed by	government	government	citizens

* Traditional hierarchical model: the government proposes the participation strategy
 ** Negotiated model: There's no programme a priori

Public Participation (highlighted in orange box, encompassing the 'Autonomous action' cell and its associated 'Model of Negotiation' and 'Coproduction' levels)

Figure 10 - Model of public participation by Péribois (translated from (Péribois, 2008))

4.3.3 Representativeness

Representativeness is another important criterion for good public participation. It often happens that public meeting are mainly attended by “professional participants”, participants that are used to attending the meeting and know local politics quite well (Pennan & Marrissing, 2008). As a result the voice of those attendees could easily be not the voice of the citizens of the community.

How should the group of participants be to become representative for the community?

Firstly, the group should consist of people with a wide *variety of ages*. Especially younger people are difficult to involve in the planning process (Pennan & Marrissing, 2008). One of the goals of participative GIS is to increase the involvement of those age-groups.

Secondly, the participant group should be *geographically even spread* over the area of influence of the project.

Thirdly, This group should consist of users and *not so frequently or even non-users* (Christie, et al., 2012)

Fourthly, public meetings are often visited by the citizens or organisations that are against the new developments (Firth, 1998) (Brown & Kytä, 2014). For good representativeness, *groups that positive and groups that are negative* towards the project or ideas should be involved in the project.

4.3.4 Clarity & Transparency

For participants it is often unclear what exactly their influence is on the final design and how their information will be used in the planning process (Pennan & Marrissing, 2008). This can cause frictions between planners and participants and can even lead to negative outcomes of the participation process (Selman, 2001). So therefore, the nature and the scope of the participation task should be clear in advance; the *clarity* principle (Rowe & Frewer, 2000)

Furthermore, it should also be clear for the people who participate and didn't participate what for information has been collected. By this process, individual input can be known by a wider public, as far as it is legally and ethically possible. This *transparency* will support the representativeness of the process and support by the community (Rowe & Frewer, 2000).

All those elements should be taken account in a participative planning process to make it more effective and useful. Henceforth all those participation criteria will be used to evaluate the participative GIS cases and current infrastructure planning practice.

4.4 Summary: What should be taken into account when implementing a GIS-based questionnaire on public values in infrastructure planning?

This literature will lead to the following list of criteria (table 3) and conceptual model (figure, which

Infrastructure Planning & the cases		
Infrastructure Planning	4a	Participative GIS-tools could be used in this type of infrastructure...
Infrastructure Planning	4b	The stage in the planning process where participation is used is...
Infrastructure Planning	4c	The process is evaluated
Infrastructure Planning	4d	The level of participation in the process is...
Infrastructure Planning	4e	The stakeholders targeted in the process are...
Criteria for Participation		
Representativeness	4f	The assessment reached groups that are positive and groups that are negative towards the project or ideas
Representativeness	4g	The assessment reached 'the silent minority' by involving younger people
Representativeness	4h	The assessment reached also not so frequently users, or non-users
Representativeness	4i	The assessment reached participants from different areas
Influence	4j	The participants have influence (based on level by Péribois/Arnstein)
Influence	4k	The participants know their task & influence
Influence	4l	The participants' input is clearly communicated afterwards

will be tested in practice in chapter 8.

Table 3– Summary of Chapter 4 – Implementation Criteria

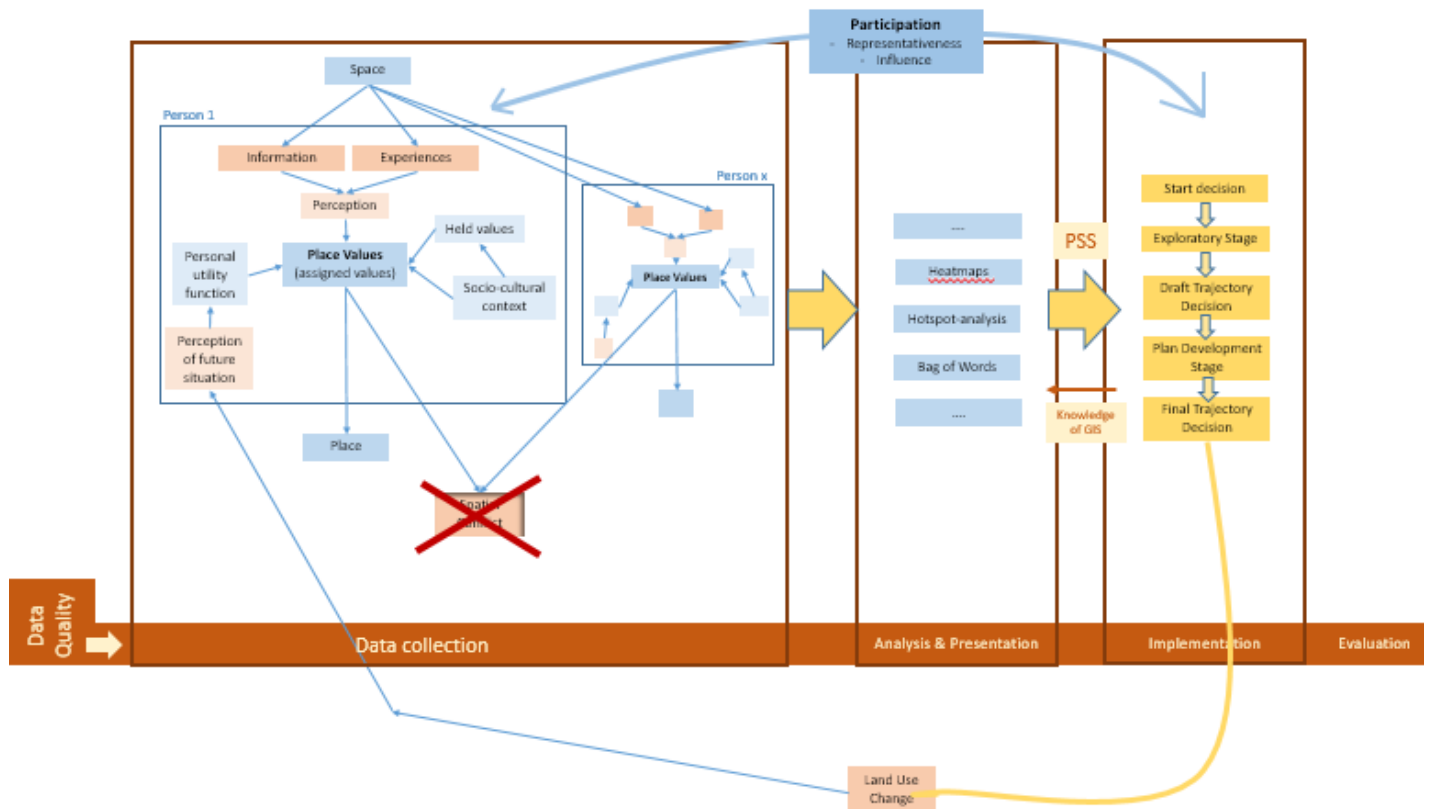


Figure 11- Conceptual model of the relation between participative GIS, value-based assessments and infrastructure planning.



PART 3 – ANALYSIS

5 Introduction to the Analysis

5.1 Methodology of Data collection

In order to analyse how the criteria on good place value research, GIS and infrastructure planning are met in practice, several methods of data collection were used.

Firstly several conferences on participative community planning (omgevingsmanagement) were visited, to get an overview of current participative infrastructure planning practice. In addition to those conferences, round tables on participative GIS-tools were visited.

At those meetings and conferences an overview could be sketched of current GIS and participative infrastructure planning practice. To find more details how the criteria work in practice, more detailed qualitative information was needed. Therefore, several interviews have been held with GIS-professionals and Public Participation professionals. Those insight gave a good overview of how the different processes work and why certain decisions were made.

The last step was to find out how the data quality, values and participation was used in current participative GIS-tools. Therefore different tools were examined. Six cases were chosen and those were in detail inspected by visiting the tool itself and investigate the different possibilities. Furthermore, interviews and presentation at conferences were used to find information on the implementation in planning practice and which analysis has been performed. Those three methods were combined to obtain a description of the tools, which could be found in the appendix. With those descriptions the different tools are checked on the earlier mentioned criteria from the theoretical part.

5.2 Interviews

To find out what the experiences are with current participative GIS-tools and how participation is used nowadays several interviews were held. The interviewees were chosen based on their variety of infrastructure they were involved in, as well as the role they had in this planning process. The interviews were semi-structured, with the main themes from the theory as guide for the questions. However, beside those restricted questions, also open questions were asked on current participative planning practice, in order to obtain a broad qualitative overview of current planning practice.

The first interview with the tram manager of a municipality of a large Dutch city on participation possibilities in the planning of Tramways. The main conclusion of this interview, that in Tramway planning participation wasn't useful because in all cases citizens protested against the removal, creation or any other change in the tramway system, lead to a re-focus on road infrastructure.

The second interview at an engineering company focused on the GIS-tool they've used at their project of a provincial road near Eindhoven and how they think they will use GIS in the future.

The third and fourth interview at Rijkswaterstaat (The National Road & Waterway Agency of The Netherlands) focused on current participation approaches in national highway planning.

The transcriptions of those interviews can be found in the appendix.

5.3 Participative research

During the writing of this thesis, I've worked at several places and visited a lot of conferences on GIS, participation and omgevingsmanagement (community management for spatial planning projects), of which are some that were especially visited for this thesis. Those experiences give a good insight in current GIS practice and use of participation in infrastructure planning. Therefore, this third part of the thesis is also expanded with insights from different conferences, conversations with planning and GIS practitioners and discussions around different topics at workshops and presentations. This will give a better overview of the current state of GIS and participation in The Netherlands.

The following working environments, conferences and seminars were researched and have obtained valuable results for this thesis:

GIS working environments

2013-2015 University Geo Helpdesk, the GIS research department of an university.

2014-2015 Municipality of semi-large town, at the department of Green Infrastructure researching effectiveness of social media tools for green infrastructure planning.

2015-2018 GIS consultancy firm, a GIS consultancy company for municipalities, provinces and national public agencies in The Netherlands

September 2016 - September 2017

& January – July 2018 Province in The Northern Netherlands, at the (Geo)-data team supporting the maintenance department as well as the mobility development department of the Province.

GIS Conferences

Symposium "Geo-informatie op tafel", 23th of September 2013, Nijmegen – A small symposium on the added value of map tables with general presentations by phd-researchers on this topic and a small information market with maptables and how they are used by several GIS practitioners. The symposium was organised by phd researcher Peter Pelzer in order to collect data for his phd as well as to create a Dutch learning community around map tables.

Meeting Faculty of Spatial Sciences, University of Groningen & Planbureau van de Leefomgeving, 23th of June 2014, Groningen – A meeting to sign a collaboration contract between the university and the national research agency for the living environment. At this meeting the results and experiences of the Hotspotmonitor project, in which both agencies worked together, has been presented and discussed.

Rooilijn Kenniskring #3 "ICT-tools en participatie in gebiedsontwikkeling", 10th of September 2014, Amsterdam – Seminar organised by spatial planning journal Rooilijn and debating centre Pakhuis de Zwijger, on how ICT-tools could be used in public participation in urban and regional development.

AGIT/GI-Forum Conference, Salzburg – European Conference on GIS from a more university perspective, combined with a German Conference with the latest developments of GIS in the German speaking world.

Geobuzz, 22th of November 2016, Den Bosch – National GIS-Conference of the The Netherlands Geo-information Association (GIN) and Geo-business Netherlands, on the latest and future developments in GIS practice. This conference focuses not only on the tooling possibilities but also on the developments surrounding GIS and geo-information.

ESRI Dev Summit, May 2018, Rotterdam – Conference of the main GIS software developer on the newest developments in GIS

FOSS4G-NL Conference, June 2018, Almere – Conference on open-source GIS software and the new developments in this field

Ruimteschepper Kenniskring “Publieksparticipatie – GEO-tooling maakt het verschil”, 5th of July 2018, Almere - Seminar organised by GIS consultancy firm & knowledge institute Ruimteschepper, on how Geo-tooling could be used in public participation.

Participation Conferences

Omgevingsmanagementdag 2014, 19th of June 2014, Den Bosch – Conference for community managers for spatial planning (omgevingsmanagers) with presentation of and discussions on current practice, as well as an information market with the latest digital tools for omgevingsmanagement.

Omgevingsmanagementdag 2015, 18th of June 2015, Den Bosch - Conference for community managers for spatial planning (omgevingsmanagers) with presentation of and discussions on current practice, as well as an information market with the latest digital tools for omgevingsmanagement.

5.4 6 case studies

In order to check the quality of current PPGIS-tools, a wide variety of PPGIS-tools has been chosen to be evaluated based on the earlier collected criteria. The case studies have been chosen on the availability of information and on the variety of cases.

The chosen PPGIS-tools vary from academic research focused value tools (Hotspotmonitor), PPGIS-tools focused on regional development (Hoensbroek region) and local development (Meridiaanpark for nature areas and Gorinchem for urban areas) and finally also some digital and non-digital tools for infrastructure planning (Noordoostcorridor for provincial roads and Blankenburg verbinding for national roads).

Also the tools are spread over a longer period, so it will be possible to find a trend in the development of PPGIS-tools. The first cases of this thesis are from 2011 (Blankenburgverbinding) and 2012 (Noordoostcorridor), it continues with 2012-2015 (Hotspotmonitor) and 2014 (Hoensbroek). The latest case studies are from March 2016 (Meridiaanpark) and October 2016 – June 2017 (Gorinchem). Unfortunately no case studies could be found from after June 2017, because most cases are presented and evaluated after completion of the whole planning process. On the other hand, as a result, of all the cases information on the implementation could be given.

In the following texts, the cases will be shortly explained. More detailed information can be found in the appendixes.

Hotspotmonitor

Hotspotmonitor is a tool which has been developed in the period 2010-2015 by the University of Groningen in collaboration with the Netherlands Environmental Assessment Agency (Planbureau voor de Leefomgeving – PBL). On the website of Hotspotmonitor hotspots of valuable places in nature areas can be mapped. The user marks the nature places that they find attractive and answer several questions about those places (how they use those places etc.). The results have been used for research purposes and those results have also been used in reports for national policies.

Noordoostcorridor, Eindhoven (NL) with SoftGIS-tools of an engineering & consultancy company

The Noordoostcorridor is a provincial road that had been planned to connect two highways in the region of Eindhoven, to complete the ring road of Eindhoven. Participants from different villages were asked in 2012 to draw their preferred routes on paper maps and maptables. The results have been combined by an engineering & consultancy company and those results have been added to the final environmental impact assessment, completed in 2014. Unfortunately, due to changing local councils, the plans haven't been used. At the moment, in 2018, a similar solution is proposed at the local councils in order to complete the ring road.

Blankenburg Verbinding, Rotterdam (NL) without SoftGIS-tools

The Blankenburgverbinding is a newly planned national highway, connecting two main highways in the western part of Rotterdam. This road has to cross the port districts as well as a large water area. Participants, business and citizens from different areas were invited in 2011 to 'meedenktafels' (round tables) to map their values, wishes and recommendations on paper, in 4 rounds. Their input has been used in the final design of the Blankenburgverbinding.

Hoensbroek, Limburg (NL) with SpatialQuestionnaire

For the municipalities near Hoensbroek, a shrinkage area in Southern Netherlands, an investigation was needed of the most preferred elements of the landscape. This information could be used to decide on the focus in the future in this area, where budgets are tight. Respondents were asked with a PPGIS-application about a preset list of values where those values existed according to them. The data were collected with tablets and a special Phoenix-based application. Participants were collected in libraries and other public places in the region. How the results were implemented in planning practice is unknown.

City Centre, Gorinchem (NL) with Maptionnaire

The municipality of Gorinchem wanted to change the centre of the medieval town (called "Het Eind") for future use. In an earlier stage a negative atmosphere was developed around to plans to make the area car-free, so the municipality changed their strategy and started a participative process. For this redesign of this area they collected opinions and ideas from local residents and users with a first questionnaire with maptionnaire-application. This information has been used to draft the first design of this area. A second questionnaire with maptionnaire was distributed to collect opinions on the proposed plans and to clarify some parts of the first questionnaire. The final results were reported back to the participants and used in the design of the new city centre.

Meridiaanpark, Almere (NL) with WebGIS publisher

For a renovation and restructuring of the local park, the Meridiaanpark in Almere (NL), local planners invited local residents to a meeting on the 21th of March 2016. At this meeting residents were informed on the plans on three topics (green, water and roads) at three different stands and after that they were sent to a mactable where they could add their opinions, ideas and questions. After the meeting the tool became also available on the internet for residents who couldn't attend the meeting. The results were used for small renovations in the park. The effect on the re-design of the park are unknown.

6 What to map? – Role of place values in Dutch Infrastructure Planning

6.1 LESSONS LEARNED from place values in practice

Place values are not used very explicitly in planning practice nowadays, while they are more actively used in the academic world. For this reason the lessons learned from planning practice on place values is relatively short. In the interviews three issues on values were mentioned.

Firstly the engineering company emphasised, as well as the literature does, that values can change rapidly. In planning practice they've experienced several times that pressing groups could influence the opinions of citizens quickly. Ironically, this situation also happened after the interview with their Noordoostcorridor project. Because those opinions change, the underlying values could also be affected.

Secondly, the Rijkswaterstaat employees mentioned that the level of aggregation, and therefore the level of detail of the opinions and/or values that is needed, differs per step in the planning process. In the beginning of the process it is useful to get a quick and clear overview of the values in the area. Later on in the process more detail is needed as well as reactions on current plans. The values collected in different steps of the process are therefore also different.

6.2 EVALUATION of 6 case studies on the use of Place Values

Based on the criteria of chapter 2, the six case studies are evaluated. In the first table (table 4) the raw data could be found. If it was a question in the survey it is marked with a x, which is equal to 1 point. If it was not questioned, but came back in the comments by the participants, it has been marked with a /, equal to 0.5 point.

Those totals are transferred to a 5-point scale, to give an indication for a Likert-scale. For this calculation half of the total amount of criteria is set as the maximum of 5, as tools with half of the values stated in literature have already of good quality of values assessment. The formula that is used is therefore $(\text{total points} / (\text{total points possible}/2)) * 5$. Those results could be found in table 5.

			1. Hotspotmonitor	2. Noordoostcorridor	3. Blankenburg	4. Hoensbroek	5. Gorinchem	6. Meridiaanpark	Total
General values	2a	General	x			x	x	x	4.0
Personal Information	2b1	age	x			x			2.0
Personal Information	2b2	House Location	x		/	x	x		3.5
Personal Information	2b3	Living Situation now				x			1.0
Personal Information	2b4	Living Situation future				/			0.5
Personal Information	2c	House Location past				x			1.0
General values	2d	Held Values							0.0
General values	2e1	Direct use benefits	x	x			x	/	3.5
General values	2e2	Indirect use benefits					/		0.5
General values	2e3	Option values							0.0
General values	2e4	Altruistic values							0.0
General values	2e5	Bequest values							0.0
General values	2e6	Existence values							0.0
Future place values	2f	Information plans		/	x			/	2.0
Future place values	2g	General change plans		x			x	x	3.0
Future place values	2h	Reaction new situation							0.0
Infrastructure place values	2i1	Current accessibility		x	x		x		3.0
Infrastructure place values	2i2	Future accessibility		x	x		x		3.0
Infrastructure place values	2j	Appreciation accessibility		x	x		x		3.0
Infrastructure place values	2k	Aesthetics			/		/	x	2.0
Infrastructure place values	2l	Silence & Noise	x		/				1.5
Infrastructure place values	2m	Smell							0.0
Infrastructure place values	2n	Communities			/	/			1.0
Nature values	2o	Wild areas	x		/	x			2.5
Nature values	2p	Biodiversity	x		/	x			2.5
Cultural Values	2q	Cultural inspiration	x						1.0
Cultural Values	2r	Cultural Heritage	x		/				1.5
Cultural Values	2s	Spiritual & Religious							0.0
Recreational values	2t	Recreational	x		/	x	x		2.5
Recreational values	2u	Activities	x		/		x		2.5
Recreational values	2v	Frequency	x		/		x		2.5
Recreational values	2w	Value Activities	x						1.0
Other values	2x	Economic		/	/	/			1.0
Other values	2y	Future Generations							0.0
Other values	2z	Learning							0.0
Other values	2aa	Therapeutic							0.0
Other values	2ab	Life sustaining							0.0
Relative values	2ac	Hierarchy internal	x						1.0
Relative values	2ad	Hierarchy external							0.0
Rest	2ae	Description possible	x	x	x	x	x	x	6.0
Value Assessment Process	2af	Several Rounds			x		x		2.0
Total			15.0	7.0	11.5	10.5	13.0	5.0	
Score on 5-scale			3.7	1.7	2.8	2.6	3.2	1.2	

Table 4- Scores of Case Studies on Value Criteria - per Criterion

	1. Hotspotmonitor	2. Noordooscorridor	3. Blankenburg	4. Hoensbroek	5. Gorinchem	6. Meridiaanpark	Average
General values	2.0	0.0	0.5	4.5	1.0	0.0	2.7
Personal Information	0.7	0.7	0.0	0.0	1.1	0.4	1.0
Future place values	0.0	2.5	1.7	0.0	1.7	2.5	2.8
Infrastructure place values	0.7	2.1	3.2	0.4	2.5	0.7	3.2
Nature values	5.0	0.0	2.5	5.0	0.0	0.0	4.2
Cultural Values	1.0	1.0	0.0	0.0	1.5	0.5	1.3
Recreational values	5.0	0.0	1.9	0.0	3.8	0.0	3.5
Other values	0.0	0.5	0.5	0.0	0.0	0.0	0.3
Relative values	2.5	0.0	0.0	0.0	0.0	0.0	0.8
Assessment Process	0.0	0.0	5.0	0.0	5.0	0.0	3.3
Score on 5-scale	3.7	1.7	2.8	2.2	3.2	1.2	

Table 5 – Scores of Case studies on Value Criteria - per Category

Place values are in most cases not well covered, especially on the aspects of non-use values, held values and the landscape values used by Brown & Weber (Brown & Weber, 2012). Furthermore, values are in most cases not ranked or put in a broader perspective relatively to other needs. On the other hand, recreational and natural values are covered in most cases and the values in future situations occur in larger amount of participative GIS-tools.

To start with the general values. In almost all cases, only direct use benefits were asked for or answered. Only in the case of Gorinchem some respondents stated that they don't use the place often, but that they are happy to have the possibility to visit the place. The question is if those opinions should be taken into account in spatial planning, or that spatial planning should only focus on people who use the place. Although, on the other hand, if it adds to the wellbeing of a large group that doesn't visit the place regularly it could be an option to preserve this place.

Values about the future situation of the living environment occur in most cases. This reason of this can be because this is also part of the more original method to assess the reaction on the plan, instead of looking to the original values. What could be added, though, is what the participants will do if for example the road will be at that place. Will they move but have a lower liveability? Or will they even move? Or will it not have any or only a small effect? On this element current participative GIS projects could be improved.

Interestingly enough, on the values of infrastructure effects, even the infrastructure projects do not cover all values related to infrastructure. Participants were not questioned about smell effects for example. On the other hand, accessibility was in most cases part of the value criteria that were used or put forward by the participants itself, even when infrastructure was not the main topic.

Most natural, cultural and recreational values are covered in one or more participative GIS projects. Improvements on those topics could be made on the valuation of the cultural and recreational activities. Most questions are about what people do at a certain place, but not how important this

activity is for them. By incorporating this aspect, a better description could be given on the real value of this place.

Lastly it is good to see that more participative GIS tools have extra (quantitative) rounds to check the outcomes of the qualitative research. This element is also part of the practice at Dienst Participatie of Rijkswaterstaat, which has a certain influence on other participative projects in The Netherlands due to their connection with the omgevingsmanagementdag, so there is a high chance that this method will be seen in more cases in the future.

6.3 Conclusion: What is mapped?

To conclude, at the moment values are only partly used in participative GIS-tools. Despite its possibilities it is not used in practice a lot at the moment and in conversations with participation practitioners place values is not yet an important topic. Therefore, more research is needed in order to find out how values can be of better use in planning practice.

7 How to map? – GIS & its bottlenecks in Dutch Infrastructure Planning

7.1 LESSONS LEARNED from GIS in practice & interviews

7.1.1 Introduction: Status Quo of GIS use in infrastructure planning

In current infrastructure planning practice GIS is used more and more, but there is still improvement possible on the participative part of GIS.

In the interviews, as well as at the Province of Groningen, people acknowledge that GIS becomes more well-known nowadays. According to some spatial planners at the Province of Groningen, this was due to the increasing amount of available data as well as the easy to use that it becomes useful for planning projects to use spatial data and GIS.

Another reason for the increase of GIS use are the so-called maptables: 'large iPads' in the form of a table on which maps could be projected and even edited. According to discussions at the symposium "Geo-informatie op tafel", the fact that people have to stand when joining a map table discussion and the fact that the instant, adjustable information triggers people to discuss, map table discussions will often lead to more active discussions. Planners are quite interested to create those discussions and therefore maptables, with geographical information on it will be shown to several other planners. As a result geographical information becomes more well-known and therefore more used.

Also at the conference of participation & infrastructure planners (the omgevingsmanagement days), the amount of GIS information stands increases each year. However, most of those GIS stands offer only hard GIS information. In 2014 the GIS at the stands was on showing information of each physical element in the project area or showing the 3d-representation of the buildings in the area or the traffic flows according to several analyses. That year no participative GIS products were shown. In 2015 a new company entered the conference, Over Morgen, which focused on statistics on the citizens to get an overview of the stakeholders, but also in this case there was no real case of participative GIS. In the years after that a company, Ruimteschepper, started with the tool Maptionnaire, in which appreciation of location could be mapped and easily analysed. This company has spread slowly across the Netherlands and the tool is nowadays used at several projects a month. Nonetheless, the head of Ruimteschepper confirmed that at the last edition of the Omgevingsmanagement days they were the only organisation with participative GIS possibilities. So, although in other fields of planning participative GIS is used, the use in infrastructure planning is still limited.

In the future this could change. At a GIS conference for mainly governmental organizations several presentations focused on participative GIS tools as part of the new land use law, the omgevingswet. In this new law, participation of citizens becomes more important. Consequently the role of GIS for spatial planning will also focus more on participative methods and several speakers named participative GIS as one of the main developments for the following years.

Another trend that could be seen at GIS conferences, and which observation is supported by colleagues at The GIS consultancy firm, is the growing ease-of-use of GIS-tools, which make it possible for a growing group of people to set up an easy GIS-tool, edit data or even make impressive visualisations with simple drag&drop functions.

7.1.2 Bottlenecks in the use of GIS in Dutch infrastructure planning

But why is GIS not yet widely used nowadays by all infrastructure planners?

According to a spatial planner at the Province of Groningen, the possibilities of advanced analysis are quite unknown for many people. Most people know GIS as a map-making tool, but the possibilities to let their data being analysed by a GIS-expert is lesser known. According to this spatial planner, GIS practitioners should sell and show more of those data analysing possibilities of GIS, to make it more useful for planning purposes.

A good example is the comment by An participation officer about input from participants that they wanted to add the beautiful views and scenery to the map as well as their important cycling routes. According to An participation officer “those elements are of course not possible to add to a GIS-system”. This triggered me to find out if it is possible to map views and routes with their scenery. At the AGIT/GI-forum conference I had a discussion with the people of Hrava, another participative GIS application. And according to them it is possible to map views and routes. By making it possible for the participants to draw lines, routes could be set. And together with a 3d-analysis, also presented at that conference, it will be possible to show the areas that can be seen from that cycling route. For the views from a certain point, participants can easily draw the boundaries of their view in two simple lines from which with some clever analysis the view can be calculated. In other words, it is possible to add views, scenery and cycling routes to a GIS-system, which shows that with a bit more analyses, GIS could be made more useful for planning purposes.

7.1.3 The future of GIS & new possibilities

GIS in the future will be with more 3D-analysis, as well as the use of virtual reality, based on several GIS-conferences and colleagues.

With more and more 3d-data becoming available (especially in the Netherlands), 3d analysis will become easier nowadays. At the open source-conference Foss4G-NL in spring 2018, the most used topic for the presentations was 3D analysis.

At the omgevingsmanagement day also virtual reality was available at different stands, as I way to visualise your new plans. The link with participative GIS was not yet made, but with Google Glass and other easy-to-use virtual reality application, pinpointing your ideas and comments on a digital virtual reality glass, couldn't be too far away is the expectation.

7.2 EVALUATION of 6 case studies on the use of GIS techniques

Based on the criteria of chapter 3, the six case studies are evaluated. Each criterion is rated on a scale of 1 to 5, which corresponds with a Likert-scale. 1 stands for “isn't applied at all”. 2 for “is scarcely applied. 3 for “is partly applied” 4 for “is nearly perfectly applied” and 5 for “is perfectly applied”.

			1. Hotspotmonitor	2. Noordooscorridor	3. Blankenburg	4. Hoensbroek	5. Gorinchem	6. Meridiaanpark	Average
		Participative GIS projects ...							

GIS process	3a	... have theoretical background on which the tool is developed	5	1	1	3	1	1	2.0
GIS process	3b	... use analysis to translate the raw data into useful visualisations	3	3	3	5	3	1	2.8
GIS process	3c	... take care of implementation	3	2	5	1	5	5	3.5
GIS process	3d	... take care of evaluation	3	1	5	1	2	2	2.3
GIS data quality	3e	... have tools that are user-friendly	5	3	5	5	5	3	4.3
GIS data quality	3f	... have data that are precise	3	3	3	3	5	5	3.7
GIS data quality	3g	... have data that are accurate	3	4	3	4	3	3	3.3
GIS data quality	3h	... have data that are consistent	5	3	3	5	5	5	4.3
GIS data quality	3i	... has information on data quality and the data process available for all users (no 'black box')	3	2	4	4	4	4	3.5
Average			3.7	2.4	3.6	3.4	3.7	3.1	

Participative GIS-tools nowadays have a data quality that is sufficient, also regarding the trend that participative GIS-tools are more easier to use and set up, whereas the knowledge-intensive part could be improved.

Most GIS-tools are user-friendly and could be easily used by the participants, or if they need help it is given (as was the case in the Hoensbroek project). This finding is also consistent with the trend that is presented at GIS conferences nowadays.

Furthermore, it is interesting to note that paper GIS has only be used in the older projects in 2011 and 2012. Nowadays most projects are based on digital GIS. In 2014 GIS-professionals and planners at The engineering & consultancy firm (Appendix 2b) were sceptical about the use of GIS, because of the time it takes to develop an application and the limited time reduction in the analysis of the data. But as colleagues at The GIS consultancy firm mentioned, as well as could be seen at GIS conferences, the ease-of-use , also for the GIS-professionals. Especially applications like Maptionnaire are nowadays as easy-to-use as a googleform. As a result all researched partivipative GIS projects of the last years are based on digital GIS.

On the other hand, the GIS data quality did not increase in the transformation from paper to digital, and in some cases even decreased. Still in most cases data are entered like points, while the comments are on views, routes, connections and or areas. The extra possibilities digital GIS gives to enter views or routes for example is not used in practice. This is an important aspect that can easily be changed.

Also the analysis part is limited in the GIS-projects. Only a study by the GIS-researcher that studied Hoensbroek, resulted in advanced analysis of the data, while other project only work with the standard heatmap of the dots. Furthermore, there are different possibilities with bag of words and

clustering that could integrate the comments with the outcomes on the maps, but those possibilities are not further developed yet and therefore also not used in practice. A further development of GIS analysis possibilities for participative GIS is therefore recommended.

Lastly, it should be mentioned that most researched projects are still not or limited evaluated, a trend that also has been found at the participative GIS-conference by Ruimteschepper that were attended. When the audience was asked how many people performed a participative GIS-project, around 20 people put up their finger. When they were asked how many of them evaluated the process, only 3 or 4 people answered yes. So it can be concluded that the research priority of Brown & Kytä to evaluate more is still relevant ((Brown & Kytä, 2014) in chapter 3.3.3).

7.3 Conclusion: How is mapped?

GIS is used more and more and there is potential for even more use of GIS, caused by the trend of more easy-to-use tools. On the other the quality of the data as well as the possibilities of GIS-analysis need extra attention in participative GIS projects. According to several spatial planners., improving the GIS-analysis of participative GIS projects could boost the use of participative GIS in spatial planning.

8 How to implement? – Experiences with Participation and Implementation of Assessment methods in Dutch Infrastructure Planning

8.1 LESSONS LEARNED from Participation in practice

8.1.1 Introduction - Participation in practice: Omgevingsmanagement

Participation in Dutch infrastructure planning is nowadays mainly a role performed by the so-called 'omgevingsmanager'. This can be translated as environmental manager or in some cases as community engagement manager, when the focus is more on managing the social than the physical environment.

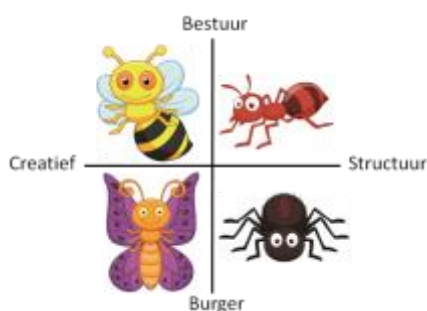
Every year the platform Omgevingsmanagement, organises the National Omgevingsmanagement Day. At this conference the status quo of omgevingsmanagement and participation in spatial planning projects is shown and evaluated with the attendees. Furthermore different tools for omgevingsmanagement and useful practices of participation are presented and shown to each other at this conference.

Therefore, this National Omgevingsmanagement Day as well as the environmental managers attending those days are a useful resource to evaluate the current status of participation in infrastructure planning in The Netherlands.

8.1.2 The 'omgevingsmanager' – translator of citizen's place values to planning practice?

The quadrant of omgevingsmanagement

According to the key note of the Omgevingsmanagement day of 2014, there are 4 types of omgevingsmanagers: the bee, ant, butterfly and spider, each with their own characteristics.



According to the researchers (*Ingrid Iding - Bart Klaver - Jan Henk Tigelaar - Marco Maréchal*) omgevingsmanagers have all their own qualities, of which most of them are partly focused on of those types. In omgevingsmanagement there is a focus on the citizen (Burger) or the board/government (Bestuur). On the other hand there are the omgevingsmanager that work creatively and others will use more structure to connect the citizen with the government. Combining those focuses will lead to the four animals.

The butterfly is focused on the citizen and work in all ways to find a solution together with this citizen. Rules and institutions are not part of the scope of this omgevingsmanager, who will find a way to move around it.

The spider is slowly building its structure and feels the needs of the citizens and will contact them with a preconceived plan. The spider uses a lot of tools and methods to analyse his “web” of stakeholders. The bee knows how to live in an official environment, working together with all the partners. This bee is focused on getting things done in this environment, with or without the rules. The ant is the real manager of the environment. By following all the official rules, the ant is structuring the environment around the project. Official participation moments, checking with the official laws and procedures and efficient meetings are the main part of the approach of this omgevingsmanager.

This division of people could also be seen in practice at the conference itself. A huge part of the conference contributions were focused on the ant-perspective. How to get the project done, without too much problems with the environment. Some presentations were stories on how all official stakeholders were combined to come together to the final plan. Other presentations were on the mind of the citizens. At those presentations the importance of drinking a cup of tea with the citizens to get a good relation came as an important element of omgevingsmanagement practice. The last type of presentations were focused on methods and tools to analyse all the stakeholders. At one presentation by Adviestalent on tools for an overview of all the stakeholders, including the organization of stakeholder reports, an interesting discussion started. Some omgevingsmanagers told they never make stakeholder reports, because she prefers to spend as much time as possible with the stakeholders themselves. This was a typical discussion between the spider and the butterfly typologies. One of the omgevingsmanagers of that last group had a business card with a tea bag as present.

What does this variety mean for value-based participative GIS-tools? It means that those tools are not suitable for every omgevingsmanager and therefore not for every project. Such a tool will be the most useful in an organisation with a lot of spiders, where the focus is on citizens and structure. Creative omgevingsmanagers are less likely to use such a detailed method for their omgevingsmanagement. And, although, as also An participation officer (appendix 2d) emphasized, most omgevingsmanagers have a combination of those animals, the trend will be that omgevingsmanagement will move, according to the researchers, more towards the spider-type of omgevingsmanagement. Omgevingsmanagement will professionalize with more tools and will slowly move more to the citizen’s perspective. This will be an interesting movement for future implementation of value-based participative GIS-tools.

Tools of omgevingsmanagement & infrastructure planning

In the interviews also the process of omgevingsmanagement has been explained. On national projects, the goal of the omgevingsmanager is to prepare for the so-called klanteneisenspecificatie (KES), in which the boundaries for the engineering company are stated for further development of the plan. In this plan also the demand and claims by citizens are stated.

In order to get an overview of the demands and possible mitigations for citizens, an environmental impact study (EIA) is performed. A part of this EIA is the Maatschappelijke Kosten-Baten Analyse (MKBA), which is the Dutch version of the SIA, and focuses on the effects for society. Value-based participative GIS-tools could be part of the preparation of this MKBA, which will lead to the KES.

Is the omgevingsmanager, the translator of citizen’s values?

To conclude, the practice of omgevingsmanagers is moving more towards tools-oriented approaches and for a part of those tools information on citizen’s values is needed.

8.1.3 Role of citizens in Dutch Infrastructure Planning

As mentioned earlier, at the omgevingsmanagement days, a majority of the presentations was on the government’s perspective and less on the citizen’s perspective. Participation was in several cases explained as participation of other businesses and governmental organizations, instead of citizens. On

the other hand there could be a trend visible at the omgevingsmanagement towards a more citizen's focused approach, as was forecasted at the presentation of the omgevingsmanagement day in 2014.

Another observation was that the level of participation was different per type of infrastructure, an characteristic that also could be seen in the interviews.

Different type of infrastructure, different level of participation?

There is a difference of participation at different types of infrastructure. This mainly related to the amount of choice there is for changes from a technical perspective.

To start with tramways In an interview with the spatial planner of the municipality of The Hague, she mentioned that participation is limited in tram projects in densely urban settings. This is due to the fact there are technically not that many options on which route the tram should take. Sometimes there are changes in the location of the stops. However, in those cases citizens will get angry if the tram stop is removed from nearby their home as well as other citizens get angry when a tram stop is built in front of their home. As a consequence, the municipal spatial planner, thought that a tool for participation in tramway projects wouldn't be useful.

The other option are highways. But also highways have a limited flexibility. Nowadays most national highway projects are focused on enlarging the current highways. New routes for highways are quite rare at the moment. The project of the Blankenburgverbinding was a rare example. Only in those cases a detailed value-based participative GIS-project could be useful.

Nevertheless, there are some possibilities. In discussions at the omgevingsmanagement day, with spatial planners and GIS analysts of the provinces, they mentioned that provincial roads are highly likely to have this choice of route and encourage the use of local participation. An example is the provincial road near the town of Lemmer, where there was a choice of a route north of the town and a route south of the town. Both cases were technically possible and the role of the citizens became quite important. Also omgevingsmanagers of the Wunderline, the train connection between Groningen and Bremen in Germany became interested, as they were looking for tools to collect information from the citizens. Furthermore, in conversations with GIS experts at the Province of Groningen, they mentioned a case of a new high-voltage cable in the eastern part of the province. In this case they were asked to find reasons with GIS why one the routes was better than the other one. Also in this case value-based participative GIS-tools could be of use.

To conclude, in urban environments, as well as on national level, value-based participative GIS-tools will not have an important added value, while on regional level there are several possibilities to support infrastructure planning decisions with value-based participative GIS-tools.

8.2 EVALUATION of 6 case studies on Participation & Implementation

8.2.1 The results

Based on the criteria of chapter 4, the different case studies are evaluated. The same Lickert-scale as in the previous chapters (section 6.3 and 7.3) has been used to rate the level implementation in the planning process. The result can be found in the following table:

		1. Hotspotmonitor	2. Noordooscorridor	3. Blankenburg	4. Hoensbroek	5. Gorinchem	6. Meridiaanpark
	Description of Process						
4a	type of infrastructure	none	provincial road	national highway	none	none	none
4b	phase planning process	Exploration phase	exploration phase	exploration phase & plan development phase	early exploration	exploration phase & plan development phase	plan development phase
4c	type of citizen's input	values	values & route proposals	values & route proposals & reaction on plans	values	values & design proposals & reaction on plans	reaction on plans
4d	level of participation	unknown	Consultation	Consultation	unknown	Consultation	unknown
4e	targeted stakeholders	citizens	business organisations & residents' organisations	businesses & residents	elderly citizens	Residents at meeting & online	professional participants at meeting

			1. Hotspotmonitor	2. Noordooscorridor	3. Blankenburg	4. Hoensbroek	5. Gorinchem	6. Meridiaanpark	
Representativeness	4f	Positive and Negative	5	3	5	5	4	3	4.2
Representativeness	4g	Silent Minority / young people reached	5	1	3	1	5	1	2.7
Representativeness	4h	(nearly) non-users reached	3	1	5	1	3	1	2.3
Representativeness	4i	geographical diversity	5	3	5	3	5	3	4.0
Influence	4j	influence (ladder)	0	2	4	0	4	1	2.2
Influence	4k	informed on influence	0	1	5	0	3	1	2.5
Influence	4l	results participation available	5	1	5	5	5	3	4.0
			3.3	1.7	4.6	2.1	4.1	1.9	

8.2.2 Analysis of results

The input of citizens on their values is mainly used in the exploration phase of planning practice. For the other phases, only route proposals or reactions on the plans are collected. This part is also performed with GIS and or maps, but there is less a role for values in this part of the process.

Citizens that participate in the process are randomly selected participants (Blankenburgverbinding), members of certain resident organisations (Noordoostcorridor), participants of already existing information meetings (Gorinchem & Mediaanpark) or specific locations (Hoensbroek) or are open to everyone (Hotspotmonitor, Gorinchem). It is interesting that the infrastructure planning related GIS-projects invited specific groups, while the other projects were more open to more participants.

The representativeness is variable. Some projects (Hotspotmonitor, Blankenburgverbinding, Gorinchem) have really focused on having a good representation and were able to reach a diverse group of people. On the other hand some other projects had mainly professional participants that attended their meetings or targeted only a limited group (elderly people). Therefore, it could be concluded that there is still improvement possible in representativeness in participative GIS projects, although there are some good examples.

Also the influence could be improved. In most projects it was (partially) unclear what has been done with the results (marked with 0 or 1), or the tool missed a specific goal to support spatial planning. So also on the level of influence, improvements are possible in participative GIS projects for spatial planning.

8.3 Conclusion: Can value-based participative GIS tools be implemented in infrastructure planning?

Value-based participative GIS tools can be implemented in infrastructure planning, with some considerations.

At the moment participative infrastructure planning (omgevingsmanagement) is moving towards a more citizen and tools-focused practice and those tools need information on the citizen's values, so therefore value-based participative tools could be of use in planning practice. Especially in the planning phase in regional infrastructure planning is a high chance that it will be applied, although this should be further researched in detail.

Improvements in planning practice are needed on the level of participation, especially around representativeness of the participants. Value-based participative tools could support this improvement.



PART 4 – CONCLUSION & DISCUSSION

Conclusion

The main question of this thesis has been if place value-based participative GIS-tools could contribute to a better citizen participation in Dutch infrastructure planning. The conclusion is that participative GIS-tools can contribute to a better participation process in Infrastructure Planning, but that place-value-based participative GIS-tool contribute could not be confirmed.

Place values have an important impact on spatial conflicts, as academic studies and articles by Brown & Weber (2012), Zube (1987) and Firth (1998) confirm. However, in practice place values are only partially used in participative tools. Values on nature, recreation and culture, now and in the future are well used in participative GIS-tools. On the other hand, though, non-use values, an important aspect of values according to Christie et al. (2012) and Geurs (2006), are not used a lot in participative GIS practice. Furthermore, the concept of held values is not used in any of the analysed participative GIS-tools, despite the importance of those values in long-term infrastructure planning, where slow-changing values like held values (Brown & Weber, 2012) (McIntyre, et al., 2008) could be of use.

The reason why place values are only partly used in practice is unknown. Further research is therefore needed, in order to answer the question which values should be mapped in order to improve participation in infrastructure planning. Furthermore current theories on values lack still a good overview and are mainly focused on usage in research. The theories should be adopted for planning practice, in order to be of sufficient use in this case.

GIS, contrarily, can play an important role in making place values more useful by diminishing the complexity with powerful analysis. For example an analysis of the viewpoints, which is named in a study by Geurs et al. (2009) as an important part of infrastructure-related place values, and also seen as important by some employees at Rijkswaterstaat for value-research in infrastructure planning, can be investigated with the use of participative GIS-tools, according to presentations at the AGIT/GI-forum. Despite its possibilities, though, analysis with soft data from participative GIS tools is still limited at the moment. An investigation of different participative GIS-tools has shown that most tools do not use a lot of the possible geographical analysis on their obtained data. Therefore it can be concluded that the gap between place values and infrastructure planning, as shown in the conceptual model, could be bridged by the use of participative GIS-tools, although it hasn't been used a lot nowadays.

Furthermore, this study emphasises that the quality of the data in participative GIS projects, as is listed by Veregrin (1999) is sufficient. Finally, the knowledge of GIS at infrastructure planners, an important element of good Public Support Systems according to Vonk et al. (2005), has grown, partly due to the increased ease-of-use and map tables, which makes it easier to implement GIS in planning practice.

In infrastructure planning are possibilities to implement place value-based participative GIS-tools. In the future, there will be a growing need for participative tools to support infrastructure planning decisions. As has been seen at the conferences of the Omgevingsmanagement-dag, participative practice is moving to more structured involvement of citizens in the planning process. As a result more advanced investigation tools are needed to find out the needs of those citizens.

The role of place value-based participative GIS will not be in urban infrastructure or national infrastructure planning, but on the regional scale it can be useful, as the different interviews have shown.

Participation of citizens is most useful in the exploration phase (as described by Elverding et al (2008). All investigated GIS-tools have their participation process in this phase and also participation officers at Rijkswaterstaat emphasize that this will be the best phase to incorporate citizens. The influence of the citizens on the planning process could be improved, though. Based on the models of Arnstein and Péribois, citizen's had in half of the cases influence on the level of consultation, whereas at the other half of the cases, the influence of the citizens was not mentioned. The gap of clarity mentioned by Pennen & Marrison, Selman and Rowe & Frewer could be found in current practice. This should be improved in order to make GIS-based place value research in infrastructure planning effective.

To come back to the original question: How could place value-based participative GIS-tools contribute to a better citizen participation in Dutch infrastructure planning practice?

Place values as described in the conceptual model should be investigated. In practice an extra focus is needed to incorporate non-use and held values. Participative GIS can be a useful tool to investigate those place values, although the possibilities of analysis should be better made. And finally the results should be implemented in the exploratory phase of the infrastructure planning process and with a focus on regional infrastructure projects

Reflection

This thesis covers a broad range of subjects. As a result several fields of study that are normally not combined are combined in this study, which will lead to interesting results. On the other hand, it makes the thesis complex. What I would have done differently in hindsight is limit more the range of subjects and different theories used, in order to make clearer conclusions in the end.

The thesis also creates an overview of all studies on place values and its influences. This model can be used for future research on the influence of values on different planning practices.

In future research, though an extra round of interviews is recommended, in order to find out the reasons of the gaps between literature and participative GIS-tools.

In GIS practice the recommendation from this thesis is to improve the use of analysis in participative GIS-tools.

Over-all it has been an interesting journey and there are several possibilities for further detailed research.

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Appendixes

Appendix 1 – Case Studies Descriptions

1a – Hotspotmonitor (2010-2015) & Greenmapper (2015-..)

This chapter is based on a presentation by Frans Sijtsma about the Hotspotmonitor on the 23th of June 2014. This presentation was part of a meeting to sign co-working contracts between the Netherlands Environmental Assessment Agency (Planbureau voor de Leefomgeving - PBL) and the University of Groningen. In addition, his chapter is enriched by information from several academic articles focusing on the academic background of this Hotspotmonitor, as well as own participation in an analysis of the data when working at the Geodienst of the university of Groningen from 2014 to 2015.

Hotspotmonitor is a tool which has been developed in the period 2010-2015 in which hotspots of valuable places in nature areas could be mapped. The user can mark the nature places that they find attractive and answer several questions about those places (how they use those places etc.).

Hotspotmonitor was developed because of a lack of systematic information about experience of nature. It wasn't the culture to take experience into account in planning and there were no possibilities to have sufficient information about those experiences which were well connected with the process of Social Cost-Benefit Analysis (SCBA or "Maatschappelijke Kosten Baten Analyse" (MKBA)). Furthermore assessments focused on nature experience became more important. Due to an increase of multi-scale spatial problems, spatial decision became more complex. This increased complexity resulted in an increased demand for accountability of decisions. Impact assessments and experience analysis became as a result more interesting to incorporate in the planning process. Moreover, welfare increased in combination with urbanisation. Those changes resulted in more concerns about nature and how nature is valued by people. Although people in e.g. the United Kingdom spend only 3,5% of their time in nature and rural areas, it is an essential part of wellbeing of persons and liveability of an area. Due to those changes in society Frans Sijtsma (at that time working at the PBL research institute) started to develop a tool for assessing the value of natural places in the Netherlands.

In June 2014 the tool had already been used by 3000 citizens in the Netherlands and the tool was expanding its research area to Denmark and Germany.

Data Collection

The tool is developed by the University of Groningen, PBL and the Ontwikkelfabriek, which resulted in the following steps which the participants take in this tool.

Step 1 – Mapping your own location: Asking for a postal code and checking it with a map

Step 2a – Mapping most attractive place in neighbourhood

This attractive place should be a place with green, nature and/or water.

Step 2b – Describing most attractive place in neighbourhood

- Give a mark for the attractiveness
- Describing attractiveness in own words

- Selecting reasons of attractiveness (Green, Variation in landscape, Nature can be free, special animals/plants, historical elements, Not that many people, the silence, recreation possibilities, less buildings visible, open space, good combination of everything, Used by farmers, the water)
- Describe use frequency (Daily, weekly, monthly, several times per year, yearly, seldom, never, something else...)
- Describe activities (Cycling (race cycling, mountainbiking, normal cycling, cycling with car), Walking (walking with dog, walking, jogging/running), Touring (with motorbike, with car), Watching nature (birds, plants, animals, all nature), Watersports (swimming, sailing, rowing, kayaking, sailing with motor boat, (kite)surfing), Other sport (fishing, skeelering, horse riding), Sitting in the sunshine & playing (Sitting in the sunshine, Sitting in a café on a terrace, picnicking and barbecuing, playing), Something else...)
- Describe Reason of recreation (Being together with friends & family; Relaxing; Discovering, exploring and leaning about nature or culture; Walking in nature, discovering trees, flowers and birds; Sport and challenge; Something else...)

Step 3 – Mapping & describing the most attractive place in the region (max. 20 km. from home)

Following the same steps as step 2a en 2b.

Step 4 – Mapping & describing the most attractive place in the country (entire Netherlands)

Following the same steps as step 2a en 2b.

Step 5 – Mapping & describing the most attractive place in the world (entire Netherlands)

Following the same steps as step 2a en 2b.

Analysis & Presentation

The results of this assessment were shown in a map of the Netherlands where the most valuable local, regional and national natural places are shown. To attract more participants, participants who finished the questionnaire have access to those maps.

Furthermore, an analysis has been performed on the most valuable areas according to the participants. This study, performed with a count of points-in-polygon analysis, found that especially dune areas as well as forest areas were more appreciated than other nature areas.

Another analysis has been performed upon request of the researchers by the Geodienst on the most valuable nature reserves according to the survey. This study reveals that in The Netherlands the Nature reserves of the Wadden Sea and the Veluwe National Park received the most national markers and that the Nature reserves of the Dunes of Vlieland, the Dunes of Schiermonnikoog and the Dunes of Kapittel and Solleveld (near Hoek van Holland) received the most national markers/km².

Implementation

The collected data have been used for several follow-up researches, of which are a research on the relation between property prices and valuation of nature (Daams, et al., 2016), the appreciation of nature by urban citizens (Bijker, et al., 2014). Furthermore the results have

been used for policy documents of the national board of the living environment and infrastructure (RLI) on financing of nature by private organizations and the national government (Sijtsma, et al., 2013)

Participation

In total 7656 people have filled in the questionnaire in 2013. Of which 1316 in The Netherlands, 1056 in Denmark and 5275 in Germany. In 2018 more than 1500 people filled in the survey of Hotspotmonitor or its follow-up Greenmapper.

In Denmark were merely younger respondents than in Germany and The Netherlands (50% younger than 40 years old, most respondents between 20 and 50 years). In Germany most respondents were older (75% older than 40 years old, most respondents between 40 and 70 years). In The Netherlands the respondents were quite evenly spread (in each 5-year age group between 20 and 65 years between 8 and 12 % of the total respondents).

Evaluation

The participants were overall positive on the survey, based on the comments they gave in the comment section. However, some people remarked that they had found it difficult to mark only one place at each scale that is valuable for them. They suggested to have the possibility to select more areas.

The team of analysts at the Geodienst mentioned that it was unclear which areas were meant by the participants. A point in the Veluwe park could mean exactly that place with that specific view, or the whole area of the Veluwe park. They recommended to use areas or other geographical specifications to specify the area that is meant.

1b – Noordoostcorridor, Eindhoven (NL) with paper maps and participative GIS-tools of The engineering & consultancy firm

This chapter is based on a presentation by GIS Specialist & Infrastructure Planner at the ESRI GIS conference 2012, on 27th of September 2012 in Rotterdam and the interview some years later, on 8th of June 2014, with GIS Specialist & Infrastructure Planner in Heerenveen, to discuss some details. The transcript of this interview can be found in appendix 2.

The Noordoostcorridor project started in 2007 to find a solution for the prospected congestion problems on the ring road of Eindhoven, which is incomplete, due to a missing eastern part. To give local traffic the opportunity to drive easily from Helmond to the Randstad, without using the congested western ring road, the idea of a provincial road connecting Helmond with the northern and western highways was born. The Province of Noord-Brabant asked engineering & consultancy firm The engineering & consultancy firm to find, together with stakeholders, alternatives within the designated search area. The engineering & consultancy firm organised 12 evenings with more than 100 local organisations attending and set up a digital tool for collecting the data at those meetings.

Data Collection

At those meetings participants could choose between a method with paper and a method with a maptable. The questions and tasks were in both cases the same.

The evening was divided in 2 sessions.

In the first session participants were asked about their values in three questions:

1a	Does the new road have to be built at all?
1b	Why does it have to or does it not have to?
1c	And looking to the map, what do you think is important?

In the second session participants were asked about the route. This session had two questions:

2a	If the road will be constructed, which route should it take?
2b	And why should it be laid there?

Analysis & Presentation

For the analysis, the different routes were digitalised, filtered (within the search area and were physically possible) and clustered into some search areas for further research. The GIS officer, Maurits Schilt, mentioned that this process was quite complicated and took a while. This was due to the wide variety of input (several opinions and variations), finding the right GIS tool (finally the clustering was done by hand) and because the original maps had to be redrawn.

The results were presented in an overview map with the main alternatives and the advised areas for further research. The different values and specific comments have been separately presented as a list with numbers connecting to the map.

Implementation

Unfortunately the results haven't led to a final design. The outcomes of the questionnaire have been used for the Environmental Impact Assessment (Arcadis, 2014), but the search areas were already contested by several environmental organisations. So as a result, the Noordoostcorridor became a central issue in the elections of 2014. This resulted in an important change in the political situation (Eindhovens Dagblad, 2018), which had the end of the prepared Noordoostcorridor plans as an effect (Omroep Brabant, 2015). In 2018 new attempts are undertaken, although the possible routes and search area are now more situated nearby Eindhoven, instead of around Helmond (Eindhovens Dagblad, 2018).

Participation

In the meetings 100 different local organisations participated. Those organisations were invited by the Province of Noord-Brabant and were both business representatives (e.g. associations of entrepreneurs) as residents' representatives (e.g. village committees and residents' associations).

The age of the participants was mainly between 40 and 60 years old.

Because participants had the choice which method they used (paper or digital), there were no limitations for participation. The people at the map table had first, according to Mauritsch Schilt, some difficulties to add their input, but they finally managed.

Evaluation

Both the province as well as The engineering & consultancy firm were enthusiastic about the possibilities to map the local knowledge. Infrastructure Planner and GIS Specialist think that it could be a really useful tool to make more well-informed choices for routes of infrastructure in the future as well as it could decrease the amount of appeals and/or objections in the future. It should be mentioned, though, that this was the expectation at the presentation in 2012. In the years after this, the project received quite a lot complaints and objection, as mentioned before.

Beside the positive outcomes, dhr. Schilt and Kraan had also their doubts about the project. They were especially about the use of digital data collection tools less enthusiastic. The choice to use digital tools for collecting data, was made by the Province of Noord-Brabant.

Although the map table caused more interaction than the paper map, Infrastructure Planner and GIS Specialist won't use a digital tool again in the future, they said in 2014, or only if the client asks for it. The reason for not recommending digital tools is the time it costs to design the tool and prepare the map table for the meeting. The lesser time that it takes to analyse the digital data compared to the data collected by paper, is minimal. In both cases the lines had to be adjusted and transformed to make them suitable for analysis.

So overall, it had been an interesting project, but it needed some improvements to become really successful.

1c – Blankenburg Verbinding, Rotterdam (NL) with paper maps and without SoftGIS-tools

This chapter is based on an interview with An participation officer (of which the transcription can be found in appendix 2) in 2014 and the final document on the participation process in the Blankenburgverbinding project (Ministerie van Infrastructuur en Milieu, 2012).

Data Collection

Data were collected in 5 phases, of which 4 consisted of participative 'round tables' (meedenktafels).

In phase 1 the area and detail of the participative project was set.

In phase 2 maps of the area characteristics were made. After an historical and a transportation introduction participants were asked to mark the most important characteristics of the area on paper maps. Data that was collected in this phase consisted of locations characteristic places ("Garden of Rijnmond", "monumental farm"), suggestions for improvement ("potential for recreation area", "view on this area can be improved") or elements to keep ("keep this boat route", "this park is essential"). Topics that were covered were, natural beauty, recreation, accessibility, landscape elements, heritage, quietness, noise from highways and (feeling of) safety.

In phase 3 the different possible routes were drawn. With the information of the second phase and the help of experts on traffic and landscape, participants worked on the different possible routes. Those routes were afterwards checked and filtered from 64 options to two options, based on technical possibility, realistic land usage and traffic feasibility.

In phase 4 adjustments were made to the selected possible routes. The adjustments were made based on recommendations of the 4th meedenktafel in which participants were asked to name positive and negative impacts of the route. Also 3d-visualisations were shown to examine the visual impacts of the different solutions.

In the last phase the results were shown to the wider public.

Analysis & Presentation

The created routes were filtered with a GIS analysis to find neighbours. All the other processes were manually made from paper maps to digital versions which were shown at the meetings. The values were shown as dots on a map. What type of values were meant was not specified.

Implementation

The results, a co-creation between professionals, stakeholders and citizens, were a direct input for the next step in process: the Plan Development Stage, in which the different proposals were further developed based on Environmental Impact Assessments and more detailed technical cost estimations and designs.

Participation

For the meedenktafels 5 groups were formed: a group of civil servants and politicians, a group of associations and business and 3 groups of citizens. The citizens were randomly selected, nearly evenly divided over the two possible areas.

The participants were informed about the goal of the meedenktafels and about the choice possibilities that are available throughout the whole planning phase.

Evaluation

Rijkswaterstaat and the organisers of the meedenktafels were positive about the outcomes. The results of the meedenktafels was useful local knowledge and it gave them a better insight in the type of issues involved in the areas surrounding highways.

1d – Hoensbroek, Heerlen (NL) with SpatialQuestionnaire

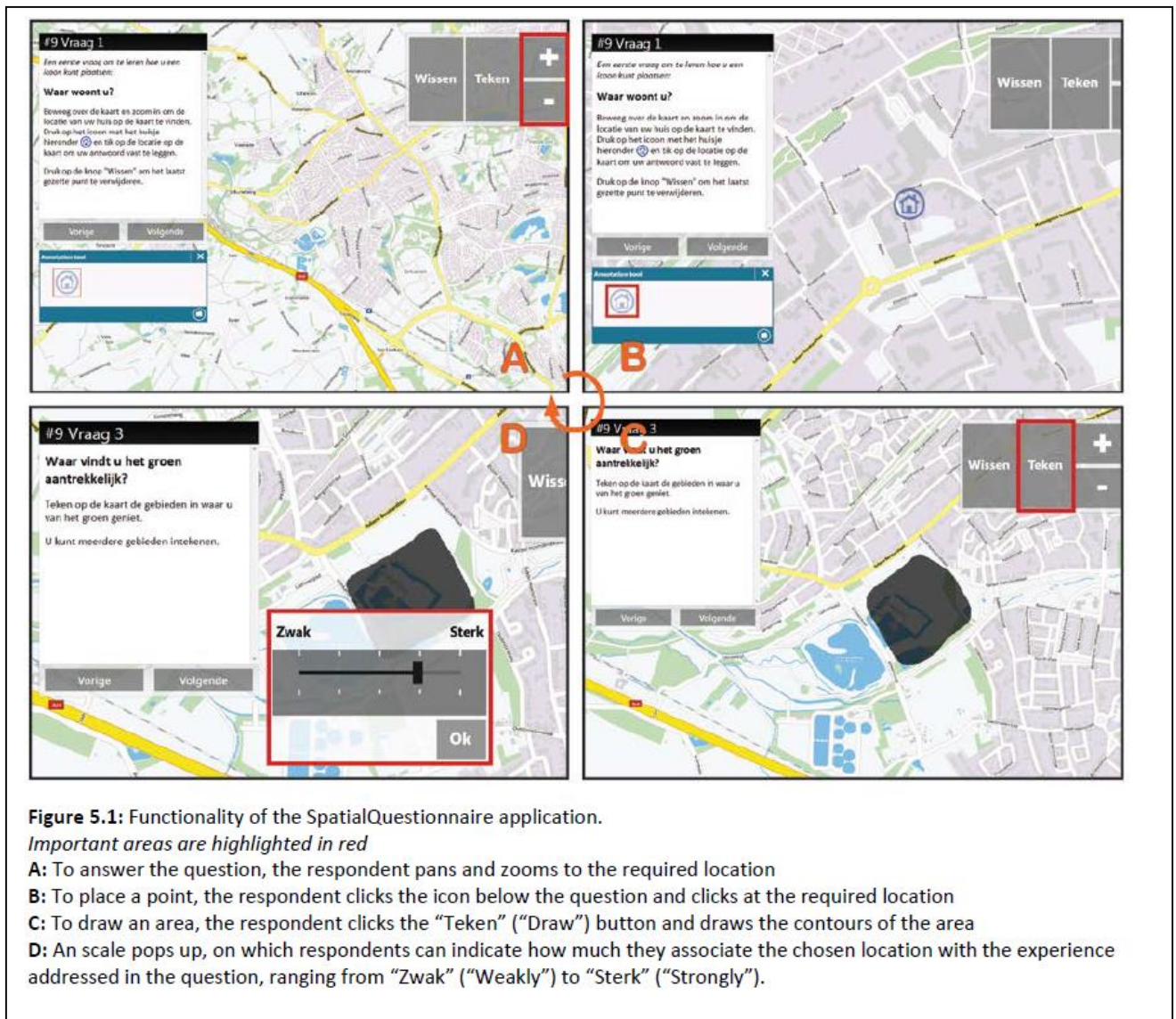
This chapter is based on a presentation by Michiel Prak given on the 10th of September 2014 at Pakhuis de Zwijger in Amsterdam ('Rooilijn Kenniskring #3: ICT-tools en participatie in gebiedsontwikkeling') and the discussion with the audience afterwards. Some complementary information and pictures are obtained from the thesis by Michiel Prak (Prak & Geertman, 2014)

Data collection

The SpatialQuestionnaire was a Phoenix-application built by Simeon Nedkov, junior researcher at the Vrije Universiteit Amsterdam, together with Michiel Prak in the year of 2014. With this application respondent were able answer several questions about their opinions on the environment by selecting several areas that corresponded with the description in the question. Respondents were for example asked "Where in Hoensbroek do you find the greenery attractive?". This application differs from other PPGIS and SoftGIS applications by (1) asking question about a specific list of values (attractive greenery, attractive neighbourhoods) and the location of where those values correspond with (instead of questions about places and which values they have to those areas) and (2) by asking to draw areas instead of points, which makes the answers more general and therefore more easily to communicate the results to the public. The questions about their environment were combined with questions about characteristics of the person (gender, age, income, how long they've lived in the area etc.).

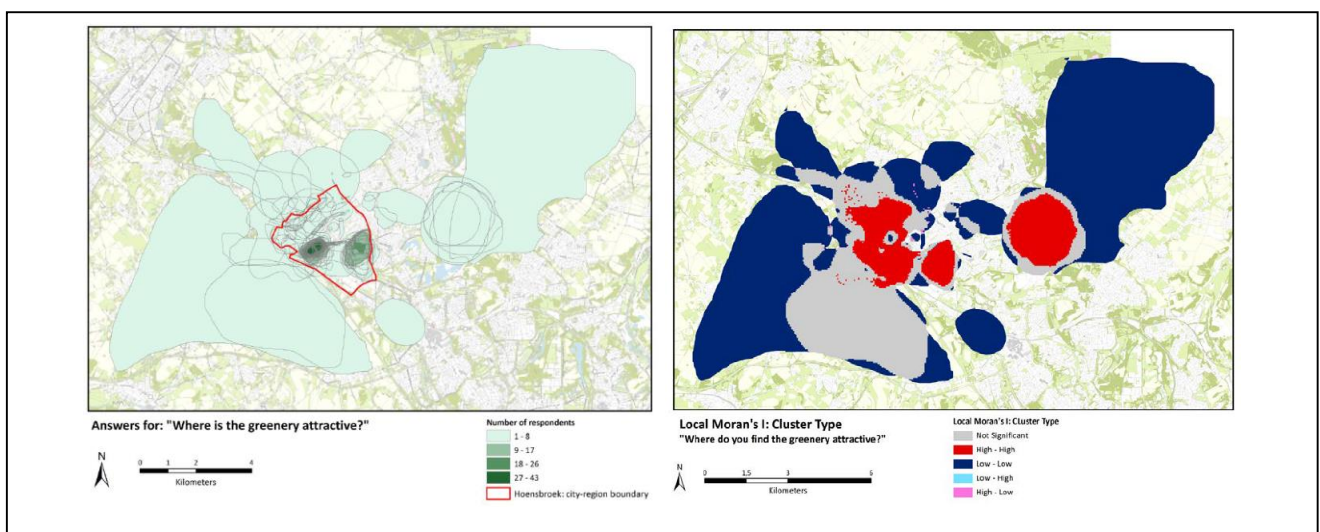
Number	Question
1	Waar woont u?
2	Welk gebied beschouwt u als uw woonomgeving?
3	Waar vindt u het groen aantrekkelijk?
4	Waar vindt u de bebouwing aantrekkelijk?
5	Waar vindt u de bebouwing onaantrekkelijk?
6	Welke plaatsen worden goed onderhouden?
7	Welke plaatsen worden slecht onderhouden?
8	Waar in Hoensbroek neemt u leegstand waar?
9	Op welke plaatsen ervaart u overlast door leegstand?
10	Waar zijn goede winkelveorzieningen?
11	Waar zijn de winkelveorzieningen gebrekkig?
12	Waar zijn goede openbaar vervoer voorzieningen?
13	Waar is de openbaar vervoer voorziening gebrekkig?
14	Waar zijn goede horeca voorzieningen?
15	Waar zijn de horeca voorzieningen gebrekkig?
16	Waar zijn goede sportvoorzieningen?
17	Waar zijn de sportvoorzieningen gebrekkig?
18	Waar voelt u zich soms onveilig?
19	Waar doen zich onveilige verkeerssituaties voor?
20	Waar vindt u de omgeving het meest aantrekkelijk?
21	Waar vindt u de omgeving het meest onaantrekkelijk?
22	Waar in Hoensbroek zou u het liefst willen wonen?

Figure 12 – Survey questions of SpatialQuestionnaire Hoensbroek



Analysis & Presentation

The results were analysed by clustering the different areas with Local Moran’s I indices and Getis-Ord-G indices in order to create heatmaps of the different answers on each question.



Implementation

The area where the survey was performed (Hoensbroek) is part of the population shrinkage area in the southern part of The Netherlands. Because of this shrinkage, municipalities have to prioritize their expenses. The aim of this tool was to support municipalities with this prioritization as well as to improve their relation with the local residents and to decrease the negative ambiance when new plans are presented. The tool also aimed for a better evaluation of the current situation, instead of immediately having discussions about the future plans and collecting opinions about those plans.

Despite their initial purposes, how and if the results were used in planning practice was at the moment of the presentation in 2014 unknown.

Participation

The research was performed with people visiting the local library, where people had time to fill in the questionnaire. Another reason was that support could be more easily given than when it was online. One of the most interesting results of this pilot was that in most cases, especially with elderly people, support was needed with using the tool. Although the tool was set-up as easy-to-use, most people did not have sufficient digital literacy to use the tool independently.

Evaluation

The most important positive outcomes of this pilot were (1) the high amount of respondents (90 in 3 days), of which most of them would normally not attend public participation meetings of the municipality and (2) the readability and usability of the attractiveness maps with the focused information (according to the spatial planners of the municipality)

The researchers themselves emphasized on the other hand that (1) the list was quite long, (2) the questionnaire lacked detailed questions about the opinions, therefore respondents were giving more detailed answers to the researchers, which couldn't be collected in the application and (3) it has been unclear what has been finally done with the results of the research and how it influenced the planning process.

The audience also questioned whether the existence of attractive areas is important to know, or that the reachability of those areas are a more important issue to research. Another point was made that people probably didn't know all the places that were attractive, although those areas could exist in their environment. And the last point made at this evening was the question whether a person who marked an area that is quite large has the same value/km² than a person that marked a very small and specific area and if you could show this in the final maps. The conclusion was that it was not easily possible to analyse this with the results from the current tool, but that it could be in the narrative attached to the maps of this research. So therefore this tool and the maps couldn't answer all the questions, but still needs the narrative and stories around it to give a good analysis of the situation in the region.

1e – City Centre, Gorinchem (NL) with Maptionaire

This chapter is based on a presentation by Douwe Blankensma, initiator of geo-consulting company Ruimteschepper, given on the 5th of July 2018 at a conference on Public Participation and Geo-tooling (Ruimteschepper Kenniskring "Publieksparticipatie – GEO-tooling maakt het verschil) at the Applied University HAS in 's Hertogenbosch. Additional information has been obtained from <http://www.ruimteschepper.nl/producten/>, <http://www.eindgoedalgoedgorinchem.nl/Home/>, <https://www.ad.nl/rivierenland/discussie-over-het-eind-begint-met-schone-lei~a7a1caf3/> and the final report of the participation project (Gemeente Gorinchem, 2017)

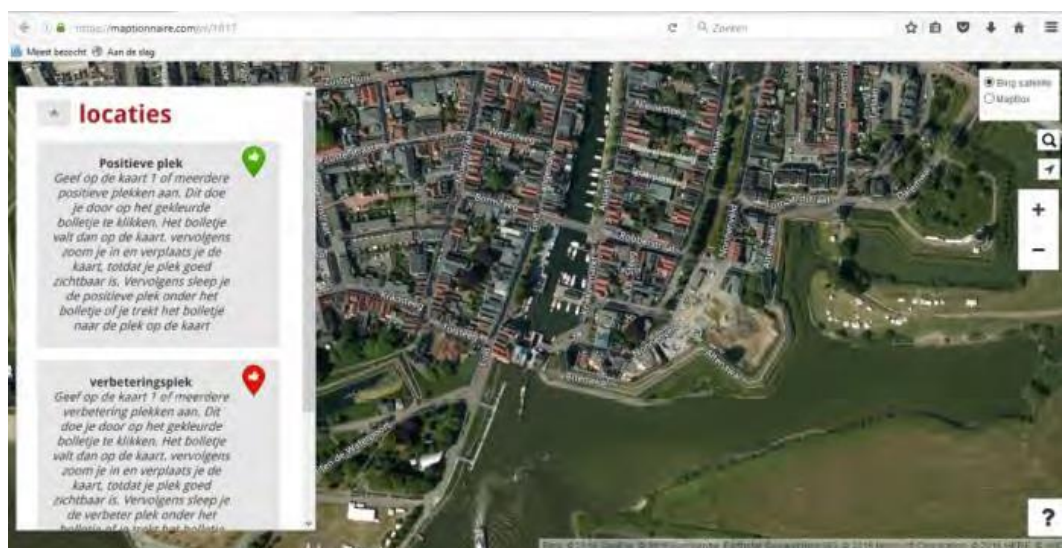
The municipality of Gorinchem decided to change the centre of the medieval town (called “Het Eind”) for future use. In an earlier stage a negative atmosphere was developed around to plans to make the area car-free, so the municipality changed their strategy and started a participative process. For this redesign of this area they collected opinions and ideas from local residents and users with a first questionnaire with maptionnaire-application. This information has been used to draft the first design of this area. A second questionnaire with maptionnaire was distributed to collect opinions on the proposed plans and to clarify some parts of the first questionnaire.

Data Collection

The application they’ve used was Maptionnaire by Ruimteschepper.

For the first questionnaire participants were first asked some general questions about their relation to the location. This was followed by some questions about current uses and possible future solutions. The last part were the questions to pinpoint with maptionnaire the places that they want to keep and places they want to change

<i>Table... Questions of first questionnaire on “Het Eind” in Gorinchem</i>	
General	1. If you live in Gorinchem, select your postal code
General	2. What is your relation with Het Eind?
Current Use	3. How often do you visit Het Eind?
Current Use	4. How do you use the outdoor space of Het Eind? / Which activities?
Current Use	5. How do you grade the current situation?
Future Use	6. On Het Eind should be less space for... ?
Future Use	7. On Het Eind should be more space for... ?
Future Use	8. Het Eind should be accessible for...?
Future Use	9. Safety should be improved in the field of...?
Map	10a. Map one or more positive places
Map	10b. Why do you appreciate this place?
Map	11a. Map one or more places that should be improved
Map	11b. Why should those places be improved?



For the second questionnaire participants were asked about specific situations (like together with a request for more explanation. This questionnaire ended with the questions to pinpoint on the map the good ideas of the new proposal as well as the bad ideas, together with an explanation.

Analysis & Presentation

All the results were published on the website, so the respondents what came out of the survey.

From the questionnaire they've made an overview with graphs. From the point maps they've made heatmaps, a standard functionality in Maptionnaire. From the comments of the 1st questionnaire they've made a wordcloud in which the most use words were highlighted. From the comment of the 2nd questionnaire they've published a list of the all the comments. In both cases the link with the locations was not present.



Figure XX – Heatmap & Wordcloud of the positive comments on the plan (part of the 2nd questionnaire)
Figure XX – Wordcloud of the comments on what should be improved (part of 1st questionnaire)

The main findings from the first questionnaire were that participants preferred less space for cars and that traffic was the most negative aspect of the area. More space for green and benches were wishes of the participants and they appreciated the views and the port the most. In the results it was not specified which views were meant.

The main findings of the second questionnaire were that most people liked the proposed plans, especially the idea of shared space. On the other hand the opinions were divided on making the roads one-way.

Implementation

The results of both questionnaires were used to make the proposed design and the final design as well. The ideas and comments of the participants were combined with the elements of the design team to form the final design.

Participation

406 participants answered the questions of the first questionnaire. A part of this group attended the presentation before hand in which the process, questionnaire en tools were explained.

Of those 406 participants, around 300 people live in Gorinchem. 20% of the respondents lived in the area of 'the eind' itself, 10% worked in the area, and 31% comes to the area for leisure, the other 50% is just a passer-by. Most people used it daily or weekly, but also some respondents (10%) who only uses it yearly or monthly, and even some respondents used the area less than yearly.

Evaluation

The municipality as well as the Geo-experts who guided the project, are positive about the use of the questionnaire together with the map.

The Geo-experts of maptionnaire mentioned that at meeting where people attend physically there is normally more positive interactions between the citizens and participants than happened in the case of online questionnaires. Although later on in the process via social media people started to publish and contact each other on the topics of the questionnaire, although this happened later in the process than in an offline situation.

Based on the reactions they received, participants were positive on how their input was used in the planning process.

So overall, they recommend a similar method for future planning processes.

1f – Meridiaanpark, Almere (NL) with WebGIS publisher

This chapter is based on a presentation by Emil Otte, consultant Geo-data at the municipality of Almere, given on the 5th of July 2018 at a conference on Public Participation and Geo-tooling (Ruimteschepper Kenniskring “Publieksparticipatie – GEO-tooling maakt het verschil) at the HAS in ‘s Hertogenbosch.

For a renovation and restructuring of the local park, the Meridiaanpark in Almere (NL), local planners invited local residents to a meeting on the 21st of March 2016. At this meeting residents were informed on the plans on three topics (green, water and roads) at three different stands and after that they were sent to a mactable where they could add their opinions, ideas and questions.

After the meeting the tool became also available on the internet for residents who couldn't attend the meeting.

Data collection

The application they've used was WebGIS Publisher by Nieuwland. They were thinking of using Maptionnaire, which has more possibilities than WebGIS Publisher, but because they were already used to WebGIS Publisher they used this application.

Participants were asked to pinpoint the location of their commentary. Then they selected their main topic (“green”, “grey”, “water”) and a category (“I do like”, “I don't like”, “I have an idea”). And the last question was to give their reaction or idea in a text pane. In the end their e-mail address was asked, so they could be informed about what has been done with their ideas.

Analysis & Presentation

The results were shown a map at the meeting itself. On this map all the points were shown and people could read some comments.

The final results were also put in an excel, which has been used internally to solve the issues.

Implementation

It was unclear what had been done with the results in the case of the restructuring of the park. No important changes have been made after those meetings with the local citizen's.

For the problems they took up the task to solve those as quick as possible. A part of the answers were specifically on renovations and repairs that could be easily fixed (like small flooding in cases of heavy rain). Those problems were sent to the different officials at the

municipality so they could solve those problems. In the excel they could also give updates on the status which were semi-automatically emailed to the people who reported the problem.

Participation

For this meeting 2000-2500 people were invited. Based on a GIS-analysis a selection was made on the distance they lived from the park. On the day itself 100-110 people turned up at the meeting, based on the ideas/reactions given with the application. The participant age was ranging roughly from 40 to 70 years old, both men and women. On internet was only a small amount of responses.

From the audience came the question whether all participants could use the digitals. Emil Otte didn't see any problems. Even a man of 70/80 years old could use the application easily. Furthermore people were supported with filling in the form by a pro-active citizen from the neighbourhood.

Evaluation

Overall the officials from the municipality were enthusiastic about the use of this GIS-tool in the planning process.

Data could be managed easily in some days instead of several weeks. Furthermore the interaction between the participants as a result of the geo-tool was a great asset for those meetings. At the map table people started discussions on their preferences. In one case, a man noted that he didn't appreciate the trees along the road, because they were blocking their sun, when a women explained that she actually really liked the view on those green trees. After the discussion they were both more content with the plans and proposals than they were before. Such situations happened several times at those meetings.

On the other hand there were some difficulties with the official terms "green" "grey" and "blue", referring to forest and nature issues, road and infrastructure issues and water issues. In a next solution they would change those descriptions in more commonly used words.

Beside this last comment, they were quite content and they would use it more. And, as Emil Otte explained, such a tool could also be used quite easily earlier in the process, in the plan making phase. An idea that was also seen by the different spatial planners present at the meeting in Almere.

Appendix 2 – Interview Transcriptions

2a – Interview Municipal/Regional Tram Network – Municipal Spatial & Tram Planner (Program Manager Public Transport, Municipality of The Hague) – 26/06/2014

This interview was held in 2014 at the municipality of The Hague. Because participation occurred to be limited in tramway planning, this interview hasn't be transcribed. The most valuable outcome of this interview has been used in chapter 8.1.3:

“In an interview with a municipal Spatial & Tram Planner of the municipality of The Hague, she mentioned that participation is limited in tram projects in densely urban settings. This is due to the fact there are technically not that many options on which route the tram should take. Sometimes there are changes in the location of the stops. However, in those cases citizens will get angry if the tram stop is removed from nearby their home as well as other citizens get angry when a tram stop is built in front of their home. As a consequence, the municipal Spatial & Tram Planner, thought that a tool for participation in tramway projects wouldn't be useful.”

2b – Interview Provincial Road, Engineering Company - Infrastructure Planner & GIS Specialist (The engineering & consultancy firm) – 08/10/2014

This interview has been held at the office of The engineering & consultancy firm and was a combination of an interview for the thesis and an acquaintance to get to know each other professionally. The abstract below are the answers on the thesis questions only and is based on the notes made at this meeting.

Firstly we introduce ourselves to each other

The Infrastructure Planner is working at the department of Spatial Development of the engineering company The engineering & consultancy firm. His job focused on so-called “inpassingsplannen “ in which a new development was linked to the environment, based on environmental issues. Since 2012 he is the head of the department of Spatial Development and he just started as a location manager at the office of The engineering & consultancy firm in Heerenveen.

The GIS Specialist is working at the department of PMC; Process, Info management and Asset Management. As a part of Infomanagement he is consultant Geo-Information and works together with 7/8 GIS-colleagues. Furthermore he is working on “Informatiehuis Water” with which the data of water safety are structured and organized.

How is GIS used at projects of The engineering & consultancy firm?

E: GIS is mainly used by checking information via the Geoportal of The engineering & consultancy firm. At this Geoportal employees could check several geographical information concerning their project. The added value of GIS was in this case the possibility to visualize several layers and combine this information.

In the past you worked on the project of the Noordoostcorridor, on which you gave a presentation in 2012 at the ESRI GIS conference. What was the reason to use interactive GIS in this project?

M: It was mainly because the client asked for it. As a company we do a bid on a certain project. Due to the fact that there are also other competitors, we have to keep the costs as low as possible. So as a result, if a client or contractor doesn't ask for interactive GIS, we wouldn't include it in our bid.

How was interactive GIS used in this project?

This project was focused on the decision-making process of a new provincial road, which was highly disputed. Interactive GIS was used on participative evenings with several stakeholders. Those stakeholders were representing a certain group of the population and users of the area. Each group of stakeholder was set around a mactable or around a normal paper map with markers. Each group had the task, after a short introduction to the design of road tracks, to map the preferred track within preset boundaries and add to the map the argumentation related to this preference. The resulting maps, which were quite diverse, were digitalized if needed and combined in a general map, which was given to the client.

What were the experiences with the use of GIS in this project? And will you use this interactive mapping in the future?

The interactive mapping process resulted in intriguing discussions during the sessions and the use of mactables worked as a catalyst in this process. But on the other hand, the use of the mactable was not cheaper than the paper version which needed to be manually digitalized. Preparing the mactables for this specific task and transporting them didn't make it less expensive than a normal mapping session with paper maps.

What is the future of GIS for a company like The engineering & consultancy firm?

At The engineering & consultancy firm we expect in the future that apps on mobile phones and tablets will become more and more important. Those will not be only apps that are used to view information, but also to collect information in the field. In both cases we expect that websites will become less and less important to spread and collect information.

What could be the future of participative GIS methods?

Mapping opinions at a certain moment could be useful, but it should be mentioned that opinions could change quickly. Citizens living around the project could be affected by pressing groups which could result in a radical change of their opinion. But on the other hand a map of a **verbeterpuntenkaart** could be useful for Social Cost-Benefit Analysis.

Thank you for your insights and time. Hopefully we see each other again.

[2c – Interview National Infrastructure Agency 1 – Omgevingsmanager I \(Rijkswaterstaat\) – 14/10/2014](#)

Wat houdt dat precies in: omgevingsmanagement?

Omgevingsmanagement is samenwerken met de omgeving. Vaak wordt het ook door de aannemer gedaan (Rijkswaterstaat besteedt het ook vaak uit), daarom is het ook belangrijk om contact met hen te houden. Dit zijn vooral ingenieursbureaus en het is dus goed om hen er ook bij te betrekken en met hen te overleggen hoe zij met omgevingsmanagement omgaan.

Wat is dan de rol van Rijkswaterstaat?

Rijkswaterstaat heeft zelf rond de 70 omgevingsmanagers, maar daar is deel inhuur van. Ter vergelijking: Prorail heeft er bijvoorbeeld 19, maar die hebben ook veel projectleiders die omgevingsmanagement in hun pakket hebben.

Het ligt er ook aan hoe je het noemt. Gemeenten hebben bijvoorbeeld geen omgevingsmanagers. Daar heet het dan weer communicatieadviseur en dergelijke.

Ligt dit ook aan de naam die mogelijk burgers tegen het verkeerde been kan stoten?

Zelf noemen we ons, ook aan de keukentafel, omgevingsmanager. Dit zou het gevoel kunnen geven dat wij 'even de omgeving komen managen', maar wij communiceren juist heel goed met de mensen dat we dit samen met hen gaan doen. We staan er meer met een toon van wij willen het er met jullie over hebben hoe dit het beste ingepast zou kunnen worden. Bijvoorbeeld bij de Zuidasdok, het project waar de zuidelijke ringweg van Amsterdam die wordt ondertunneld midden tussen allemaal bedrijven van de Zuidas, wordt nu in de planfase al heel erg gekeken waar de omgeving blij van wordt.

Je kan natuurlijk niet iedereen 100% tevreden stellen. Maar als je er van het begin duidelijk over bent, wordt dat al erg gewaardeerd. En soms komen er ook ideeën van weggebruikers en omwonenden waar je best rekening mee kan houden. In dit geval kan je ook dingen samen oppakken met bijvoorbeeld gemeenten, provincies of bedrijven. Dat bij elkaar is omgevingsmanagement.

Wat is precies het doel van omgevingsmanagement, waarom is het in het leven geroepen?

Rijkswaterstaat doet veel infrastructuurprojecten. Op een gegeven moment zijn hiervoor zogenaamde IPM-teams in het leven geroepen: Integraal Projectmanagement-teams. Deze teams bestaan uit een contractmanager, een omgevingsmanager, een technisch manager, een projectmanager en nog een.

Het is zo: je begint bij een planfase en uiteindelijk naar de uitvoeringsfase. Maar het blijkt dat als mensen echte actie ondernemen en naar de Raad van State gaan, en ze krijgen gelijk, dan wordt jouw besluit opgeschort.

Als je omgevingsmanagement vanaf het begin goed regelt, gaat de besluitvorming sneller en hoop je dat er minder mensen naar de Raad van State gaan.

Dus het omgevingsmanagement heeft twee doelen: een betere omgeving creëren, dus zo min mogelijk weerstand, maar ook het beter laten verlopen van het proces.

Dus de focus is ook op de juridische kant en daarom dus ook op de mensen die het meeste klagen?

Het is inderdaad dat op een gegeven moment je wel door hebt wie er naar de Raad van State gaan en dat neem je mee. Maar aan de andere kant heb je bijvoorbeeld ook kleinere projecten waar bijvoorbeeld een boer naar je toekomt met het idee om de afgesloten tunnel weer te openen omdat hij het niet erg vindt dat de schoolkinderen dan tijdens het project via de tunnel maar ook via zijn erf naar school fietsen. Als die man niet vroeg bij het plan was betrokken, was hij ook niet met dit idee gekomen. Het is dus ook belangrijk om deze mensen erbij te betrekken, zodat er zoveel mogelijk goede ideeën erbij komen.

Verder zijn het niet alleen de mensen in de buurt waar we op ons richten, maar ook de weggebruikers. Met hen is communicatie ook heel belangrijk. Als je van tevoren meedeelt: dan en dan is die weg afgesloten, dit gaan we doen, dan kunnen ze ook alternatieve routes kiezen. En als ze het weten is het begrip beter, dan krijg je ze ook mee.

En je hebt natuurlijk altijd te maken met hinder. En de een wil graag een extra weg en de andere niet. Je hebt natuurlijk ook milieuverenigingen, die zijn er niet altijd mee eens. Bijvoorbeeld bij de afsluitdijk. Maar in dit geval hebben we dan met hen gesproken over bijvoorbeeld het aanleggen van vispassages. Dus we zijn niet zo van: we zijn rigoureuus en we gaan gewoon door, maar het is ook een kwestie van overleggen.

Dus, om terug te komen op je vraag, het is dus niet dat je niet alleen degene met de meeste invloed wil bereiken, het is dus wel breder.

Dus kort gezegd: 'De omgeving' van omgevingsmanagement is niet alleen die paar honderd meter rondom het project, maar ook de gebruikers en de overheden die ermee te maken hebben.

Inderdaad, en heel belangrijk ook de marktpartijen.

Het is trouwens grappig dat je het zo zegt. Wij noemen de omgeving, de gebruikers. Dus de weggebruikers, vaarweggebruikers. En we hebben ook de stakeholders, en dat zijn de markt, de medeoverheden. En daar zitten dan ook de belangenverenigingen bij.

Ook goed om te noemen is dat die weggebruikers van bijvoorbeeld een weg in Amsterdam ook uit Friesland of Limburg komen. Dus de omgeving is zeker meer dan een paar honderd meter rondom de weg.

Over die weggebruikers van ver. Hoe betrek je die bij het project?

Dat verschilt per project. Dat is veel tegenwoordig per internet, door middel van bijvoorbeeld een website. Daarnaast zijn er ook informatieavonden die ook weer worden medegegeeld via de website. En huis-aan-huisbladen schijnt ook nog steeds goed te werken, maar dan vooral voor de directe omgeving. En daarnaast wordt er ook gebruik gemaakt van de informatieborden langs de weg en daarmee kan je ook weer verwijzen de website. En er zijn ook de keukentafelgesprekken. Er worden namelijk ook wel eens mensen uitgekocht. En zoals bij die tunnel van de A2 in Maastricht, daar speelt ook het buitenland erg mee en worden er ook mensen van over de grens bij betrokken. Het hangt dus van de locatie van de belanghebbende op welke manier we ze betrekken.

Wat ook wordt gedaan, bij de A2 in Maastricht, daar werken de verschillende gemeenten uit de regio ook heel nauw samen en vormen ze samen een projectteam met Rijkswaterstaat. Hier zitten ze zelfs gezamenlijk op één gang, om de samenwerking te bevorderen. En de aannemer wordt daar ook erg betrokken bij het omgevingsmanagement. Veel reacties komen namelijk ook tijdens de bouw, door het vele lawaai of het extra vrachtverkeer en daarom is ook goed om de aannemer bij het omgevingsmanagement te betrekken. Zelf vind ik dit dus een goed voorbeeld van goed omgevingsmanagement.

Verder een goed punt van dat project vind ik dat ze daar een flat hebben opgekocht waar onder andere ook de aannemer in zit. Deze woont dus zelf ook in de wijk en weet daardoor dus ook beter wat de overlast zou kunnen zijn.

En, ja, ik zeg het nu wel positief, maar soms worden inderdaad ook gewoon mensen een hotelovernachting gegeven, of een bloemetje, omdat er toch altijd wel overlast is zo dicht bij de snelweg. En soms moet ook mensen gewoon worden uitgekocht, en ja, dat is niet altijd leuk..

En hoe ga je dan met zo'n situatie om?

Nou, dan ga je daar echt wel langs gaat en vertelt wat de situatie is en met elkaar gaat kijken hoe je het kan oplossen. Wat wil diegene? Heb je het hele stuk grond nodig? Ja, en dan moet je alternatieven aanbieden. Bijvoorbeeld financieel en dergelijke.

Maar dan ga je dus echt bij de mensen op gesprekken, en daar zitten wel gevallen bij, nah, ja...

Dus ja, zo is omgevingsmanagement ontstaan: projectgebonden en gericht op de uitvoering. Maar ze gaan nu ook binnen Rijkswaterstaat kijken naar het hele proces. En daar zitten wij nu een beetje tussen. Dus met de afdeling communicatie & strategie, om te zorgen dat de hele Rijkswaterstaat ook

beter gaat communiceren. Want het is goed als er goed wordt gecommuniceerd binnen een project, maar het zou ook goed zijn als men van elkaar weet hoe het zit. Dat doen we nu per regio en daarin maken we bijvoorbeeld een top-10 stakeholderanalyse en kijken we wie daar onze belangrijkste stakeholders zijn. Dit zijn bijvoorbeeld de grote gemeentes, Havenbedrijf Rotterdam... Maar wat je soms ook wel merkt is dat bij dezelfde gemeente opeens weer iemand anders van Rijkswaterstaat langskomt. En dat proberen ze nu een beetje te stroomlijnen.

2d – Interview National Infrastructure Agency 2 – A participation officer (Rijkswaterstaat) – 24/10/2014

Dank dat dit gesprek mogelijk is. Dit gesprek is in het kader van het master thesis. Deze thesis gaat over de verschillende mogelijkheden om met GIS de planningspraktijk te ondersteunen. Vaak wordt dit gedaan vanuit het perspectief van de GIS, maar ik wil graag horen wat de ervaringen zijn vanuit de praktijk. “Hoe steekt de planningspraktijk, en dan met name het omgevingsmanagement in elkaar?” en “hoe wordt GIS hierbij gebruikt?” zijn vragen waar ik graag meer over zou willen weten. Maar om te beginnen welke rol vervul jij op dit moment binnen Rijkswaterstaat?

Ik ben als omgevingsmanager betrokken bij de Blankenburgverbinding, onder andere op inhoudelijk vlak. (...) GIS wordt hier vooral inhoudelijk gebruikt. Zo wordt in kaart gebracht waar de kabels & leidingen liggen, en waar wordt verwacht dat er archeologische waarden onder de grond liggen. Hiervoor gebruiken we onder andere veel maptables, waarvan er één achter je staat.

En hoe is de ervaring binnen de organisatie met de maptables? Vaak zie je namelijk dat een paar mensen binnen de organisatie weten hoe zo’n mappable werkt en dat de rest hiervan afhankelijk is. Is dat hier ook het geval?

Dat klopt. Zelf weet ik alleen nog hoe je zo’n mappable moet opstarten en het programma moet openen. En dat is soms wel lastig, om niet meer kennis te hebben. Laatst waren er namelijk op een avond problemen met de mappable en toen konden we het niet oplossen, waardoor we hem niet hebben kunnen gebruiken. Gelukkig hebben we altijd genoeg ander materiaal mee, maar het was toch vervelend.

De maptables gebruiken jullie dus veel op informatieavonden?

Op informatieavonden gebruiken we ze inderdaad en dan laten we vooral de situatie zien zoals het is. We zitten nu in de planuitwerkingsfase, waarin over de verschillende details wordt gediscussieerd. De zaken die al besloten zijn brengen we hierbij onder andere in kaart.

Maar daarnaast gebruiken we het ook intern, voor o.a. wegbeheer, netwerkbeheer etcetera. En de verschillende werkvelden. Deze hebben ook allemaal hun eigen visie op het plan en ook hun eigen belangen.

En door deze belangen samen te voegen komen jullie tot het uiteindelijke plan. Maar hoe brengen jullie deze verschillende belangen dan in kaart?

Er wordt onder andere een klanteneisenspecificatie (het KES) opgesteld. Hierin staan de verschillende eisen en wensen. The engineering & consultancy firm is hiermee bezig en kijkt wat er van de wensen en eisen mogelijk is. Zij zijn ook bezig met het ontwerp-tracé-besluit. Rijkswaterstaat is vooral bezig met de regio en afstemming.

In hoeverre is er tijdens het proces overigens speling en variatie mogelijk in het tracé?

Dat verschilt per plek in het proces. Hiervoor zijn we bijvoorbeeld met de verkenningsfase bezig geweest. Hierbij waren er twee mogelijkheden voor de oranjeverbinding en drie mogelijkheden voor de blankenburgverbinding. Hier is vervolgens een keuze in gemaakt. Na de keuze van het tracé is er binnen het tracé nog een speling van +/- 25 meter. Inmiddels is hierover ook een besluit genomen en zijn nu ook de exacte coördinaten vastgesteld.

Het is misschien lastig om het snel en kort te beantwoorden. Maar wat zijn de belangrijkste argumenten geweest om tot deze keuze te komen?

Allereerst de verkeersafwikkeling. De blankenburgverbinding kon bijvoorbeeld twee keer zoveel meer verkeer afwikkelen als de oranjeverbinding.

Daarnaast de kosten. De blankenburgverbinding bleek twee keer zo goedkoop te zijn als de oranjeverbinding.

Al laatste werden de effecten voor natuur en landschap meegenomen. Deze effecten waren eigenlijk kleiner voor de oranjeverbinding dan voor de blankenburgverbinding. Maar gezien de voordelen voor het verkeer en het financiële plaatje is er uiteindelijk toch voor de blankenburgverbinding gegaan.

Deze keuze is gemaakt door de verschillende overheden in de regio. Zij hebben dan ook gezamenlijk een brief naar de minister gestuurd. De minister heeft uiteindelijk officieel besloten, maar dus wel op advies van de regio.

Hoe was eigenlijk de reactie van de omwonenden en burgers op deze beslissing?

Dat verschilde heel erg per locatie. In Rosenberg, in het zuiden, waren ze bijvoorbeeld erg positief. Ze wachten namelijk al lang op de komst van de verbinding. Hier hoor je bijvoorbeeld verhalen van mensen die in de jaren '70 een huis in Rosenberg hebben gekocht met idee dat er snel een goede verbinding naar Rotterdam zou komen. Dit is er dus nog steeds niet, waardoor ze nu via de A15 moeten reizen om naar de overkant te komen.

In Vlaardingen zijn de gevoelens gemixt, zowel positief als negatief. Aan de ene kant zien ze er een verlies van onder andere natuurgebieden, terwijl ze aan de andere kant graag de nieuwe verbinding zien om handiger van A naar B te komen.

Wel is het goed om te vertellen dat de nut en noodzaak door iedereen gezien wordt. Iedereen wil graag sneller van A naar B, maar deze verbinding hebben ze dan liever niet in hun achtertuin. Het bekende NIMBY-effect.

Hoe ga je als omgevingsmanager om met de mensen die negatief tegenover het project staan?

We hebben hiervoor verschillende meedenktafels georganiseerd. Hierbij werden een viertal sessies georganiseerd met 3 groepen van ongeveer 50 personen. Hierbij konden ze hun mening geven over de route en deze zijn gebruikt bij het bepalen van het tracé.

Ook nu worden de meedenktafels nog steeds gebruikt onder andere voor het de verdere detaillering van het plan. De blankenburgverbinding bestaat namelijk uit een gedeelte onder de rivier en een landtunnel. Deze landtunnel zou in eerste instantie een open tunnel zijn, waarbij de weg onder het maaiveld zou blijven. Uiteindelijk is er besloten om deze tunnel dicht te maken waardoor er een soort van dijk zou ontstaan die vervolgens de twee natuurlijke gebieden verbindt. Ik zal je ook even een boekje meegeven met meer informatie over deze meedenktafels (pakt het boekje "als je doet wat je deed, krijg je wat je had", publieksparticipatie in de praktijk")

Over de verschillende varianten is ook een online consultatie geweest. Hier zijn echter weinig reacties op gekomen.

Bij de participatie is dus een kleine groep actief geweest. Wat was de reactie van de rest van de omgeving?

Ondanks dat een kleine groep actief met de plannen bezig zijn geweest, zijn de reacties van anderen over de resultaten positief. De punten die aangedragen zijn worden, zover we daar zicht op hebben, ook ondersteunt door de anderen.

Daarnaast stond de minister open voor alternatieve plannen, zolang het maar geen extra geld zou kosten en het project geen tijdvertraging zou oplopen.

Verder komen we ook bij verschillende mensen thuis voor de zogenaamde keukentafelgesprekken.

En welke personen komen vooral op deze informatieavonden avonden en wie worden er precies betrokken bij het proces? Ligt de focus vooral op de mensen die negatief zijn over het project of zijn het ook mensen die positief staan tegenover het project? Want het lukt natuurlijk niet om met al die duizend mensen om tafel te gaan.

De mensen waar we thuis komen zijn vooral de grondeigenaren, eigenaren van grond die we mogelijk nodig hebben voor de nieuwe verbinding. Daarnaast gaan we ook in gesprek met mensen die zich zorgen maken. Daar gaan we bij op bezoek of die nodigen we hier uit.

Bij de meedenktafels zijn er zowel personen die positief zijn als mensen die negatief zijn.

Daarnaast hebben we ook klankbordgroepen. In deze klankbordgroepen zitten verschillende verenigingen van de scoutingvereniging tot en met de fietsersbond en bewonersverenigingen en ondernemersgroepen. Van deze verenigingen verwachten we ook dat ze een achterban hebben, deze vertegenwoordigen en hiermee communiceren.

In het boekje zie ik trouwens dat er veel met analoge kaarten wordt gewerkt in plaats van de maptables die hier achter staan. Wat is precies de reden hiervoor?

Het belangrijkste is dat er met kaarten en stiften lekker gekrast en gestreept wordt. Hierdoor kan er vrijer getekend worden en ontstaat er meer creativiteit.

Het voordeel van de maptables is echter denk ik wel dat je de verschillende onderlagen kan toevoegen. Dan kan je sneller even de archeologie eronder te leggen of te laten zien waar bijvoorbeeld de natura2000 gebieden liggen. Zodat men weet in welke gebieden men echt niks mag veranderen.

Ok. Misschien is dit ook een goed moment om uit te leggen wat ik ongeveer van plan ben en om te kijken of dit goed in de praktijk van omgevingsmanagement zou werken.

Het idee is om een waarderingskaart te maken. Waarbij mensen kunnen aangeven hoe ze de ruimte gebruiken en welke plekken ze belangrijk vinden.

Dit is zeker handig! We hebben het ook gebruikt bij de eerste sessie van de meedenktafel. De mensen konden aangeven wat hun voorkeuren waren en welke plekken werden gewaardeerd. Deze informatie is later samengevoegd in een boekje over de waarderings, welke is gebruikt bij volgende sessies. De keuze van het voorkeurstracé is hierdoor dus ook beïnvloed.

En wat hebben jullie aan deze mensen gevraagd?

We vroegen ze wat de belangrijke plekken zijn in het gebied en deze aan te geven. Daarnaast vroegen we hen ook "wat vindt U belangrijk?". Want naast de algemene voorkeuren hebben de mensen ook

hun eigen specifieke voorkeuren. Hieruit kwamen onder andere belangrijke weidsgezichten en belangrijke fietsroutes. Deze zijn echter ook weer lastig in een GIS-systeem te zetten.

Interessant. En wat waren de reacties van mensen die niet bij deze tekensessies waren?

We hebben hier geen reacties meer op gehad en we hebben hier ook geen discussie over gehad. Dus wat de reactie was van de rest weten we helaas niet. Maar voor de mensen die er wel waren, waren de reacties positief. Ook omdat ze zagen dat er wat met hun ideeën werd gedaan en dat dit werd meegenomen later in het proces.

Ik zal trouwens ook even een document pakken waarin het hele proces wordt beschreven. Een momentje. (komt even later terug met Rijksstructuurvisie, deelrapport C (Ministerie van Infrastructuur en Milieu, 2012))

Dankjewel. Ik vroeg me trouwens nog af hoe jullie intern omgaan met de verschillende gesprekken. Want uit hoeveel mensen bestaat jullie team?

Allereerst is er Hans van Zijst, die verantwoordelijk is voor de bestuurlijke kant. Daarnaast is er een communicatieadviseur, een omgevingsmanager die zich bezig houdt met de conditionering (kabels en leidingen en dergelijke) en iemand die zich bezig houdt met de vastgoed kant.

Een redelijk compact team dus met korte lijntjes...

Ja we zijn met zo 9 a 10 man

En hoe communiceren jullie met elkaar? Ik bedoel, hoe houden jullie alle gesprekken bij?

We hebben hiervoor stakeholderdossiers. In deze dossiers staan kort de gesprekken weergegeven die we hebben gevoerd.

Ok. Al is hier ook een variatie in. Er zijn namelijk omgevingsmanagers die alles tot in detail bijhouden en meer aan het registreren zijn dan aan het praten, terwijl anderen juist veel praten en nauwelijks iets registreren. Hoe zit dat bij jullie?

Onze focus ligt inderdaad op de gesprekken, dat vinden we het belangrijkste. Soms kunnen we de verslaglegging niet gelijk doen en dan proberen we het later te doen. Maar het belangrijkste zijn de gesprekken. Toch is het goed om het te registreren. Want dit project in deze fase loopt al zo'n vier jaar. In die tijd zijn er veel nieuwe mensen binnen de organisatie bijgekomen en mensen weg gegaan. Omdat de nieuwe mensen niet weten wat er jaren daarvoor is gebeurd en omdat ze graag willen weten waarom bepaalde keuzes zijn gemaakt is het handig dat we deze registratie doen.

Daarnaast is er natuurlijk ook het KES (Klanteneisenspecificatie). Hierin wordt bijgehouden welke eisen er zijn.

En nog even voor de duidelijkheid: Deze KES wordt intern gemaakt, of door de actoren?

Deze eisen worden door de verschillende actoren en intern samengesteld en na elk proces geüpdate. Witteveen en Bos controleert vervolgens welke conflicterende eisen er zijn. Deze eisen veranderen namelijk continu. In het begin was er de schetsontwerpfase, hierna volgde de voorontwerpfase en vervolgens kwam hierna nog een voorontwerpfase+. Hieruit is vervolgens het ontwerptracébesluit gerold, welke door The engineering & consultancy firm weer werd teruggekoppeld aan het eerste KES.

Hoe ziet trouwens de toekomst van Omgevingsmanagement eruit? Nu wordt het steeds meer gebruikt, ook binnen Rijkswaterstaat, maar zal dit in de toekomst ook zo zijn?

Ik denk het wel. Al verschilt dit ook per project. De intensiviteit van het omgevingsmanagement wordt per project bepaald en de personen zijn hier heel erg belangrijk en de stijl van de betrokken omgevingsmanager(s).

Want hoe wordt precies de omgevingsmanager gekozen voor een project? Wordt dit gedaan door de projectleider of wordt gewoon iedereen verdeelt?

In mijn geval was het inderdaad door middel van een gesprek met de projectleider. Hij moet het namelijk wel eens zijn met mijn ideeën en visie. Daarnaast is de reputatie van de omgevingsmanager erg belangrijk en speelt natuurlijk de fase van het project een belangrijke rol. Iedere fase in het project vergt namelijk een andere aanpak en dus ook een andere omgevingsmanager.

Maar dan is er ook nog de discussie over wat voor type omgevingsmanagers er zijn. Er worden namelijk veel structuren voor bedacht. Zo was er op de Landelijke Omgevingsmanagement dag een typering in vier groepen gepresenteerd...

Die met die beestjes in verschillende hokjes?

Inderdaad! Hoe denk jij over dit schema? En..

Ik vind het eerlijk gezegd niks, dat in hokjes plaatsen van omgevingsmanagers. Bij dat schema op die dag kon ik me namelijk niet vinden in één specifieke type. Ik had namelijk van alles wat en ik denk dat een omgevingsmanager dat ook moet zijn. Dus in hokjes plaatsen van type omgevingsmanagers, nee. Ik denk dat competenties veel belangrijker zijn en daar kan je ook aan werken. Bij Rijkswaterstaat wordt alles ook al in structuren en protocollen gezet, maar de praktijk is toch veel anders. Dat is niet in structuren te zetten. Daarnaast zijn er wel verschillende stromingen, zoals het Strategisch Omgevingsmanagement (SOM) en mutual gains etcetera. Zelf pak ik uit die verschillende stromingen de ingrediënten die handig voor mij zijn en goed bij mij passen en daar ga ik mee aan de slag. Maar hoe al die structuren heten en hoe ze allemaal precies werken, nee daar doe ik niet aan.

Dus omgevingsmanagement gaat vooral over werken op intuïtie en logisch nadenken?

Dat ook weer niet. Je moet natuurlijk wel een plan maken over hoe je het aanpakt. Geheel op intuïtie kan je uiteraard niet werken.

Had je trouwens verder nog vragen?

Even kijken.... Als laatste vroeg ik me af, om nog even terug te komen op de waarderingskaarten, hoe specifiek je moet zijn met de informatie. Is een kaart met plussen en minnen voor waardering voldoende, of is het juist handig om alle specifieke meningen van iedereen te weten of is een tussenvorm waarbij je vraagt naar verschillende activiteiten en hoe ze die waarden op bepaalde plekken handiger of is dit geen van allen bruikbaar?

Sommige dingen moet je inderdaad erg gedetailleerd weten. Zoals bijvoorbeeld bij een monument bij de Oranjesluisverbinding. Maar afzonderlijke meningen worden vaak “op een grote hoop gegooid”, dan krijg je alleen de belangrijkste fietsroutes en ontwikkelingen. Daarnaast zijn de rode/groene gebieden ook erg handig op andere momenten in het proces. De hogere abstractie maakt het juist weer overzichtelijker en mogelijk om op een ander niveau snellere keuzes te maken. In het begin van het proces zijn bijvoorbeeld die afzonderlijke meningen niet echt handig. Maar het belangrijkste van alles is om de informatie inzichtelijk te maken.

Op wat voor een manier doen jullie dit bijvoorbeeld?

Dit doen we door te werken met plussen en minnen om aan te geven wat de voordelen en nadelen van een bepaald alternatief zijn. Soms doen we dit ook in woord, maar ook soms met kleurtjes.

Om af te ronden, nog één allerlaatste vraag. Ik was namelijk benieuwd wat volgens jou beter is. De meningen verzamelen van 3x50 personen, zoals bij de meedenktafels, of 2000 tot 3000 mensen raadplegen voor een keuze over het tracé.

Hierbij is het wederom belangrijk in welk deel men van het proces zit. Bijvoorbeeld bij het tekenen van varianten lijkt me het niet handig om al die duizenden mensen uit te nodigen. Wel kan je met een klein groepje deze varianten ontwikkelen en de uitwerkingen hiervan vervolgens voorleggen aan de

rest met een simpele ja/nee vraag plus een korte uitleg over het waarom. Op deze manier werkt het denk ik het beste.

Ok. Dan heb ik nu alle vragen beantwoord die ik had.

Bedankt voor het gesprek, met deze informatie kan ik weer flinke stappen maken met mijn onderzoek.

Bedankt!