Effective policy instruments to successfully involve communities in the implementation of green-blue measures in the public space

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Abstract
The effects of climate change are causing problems in urban areas. Flooding, heavy rainfall, heat stress and drought can all cause significant damage to the urban area. Green-blue measures are an effective method to reduce the impact of heat stress and flooding. Yet municipalities face a shortage of resources to implement these measures in the public space. This research assessed if community involvement in implementing these measures can result in more effective implementation because of their contribution. This research investigates five cases, consisting of one street in the Netherlands and four in Belgium, where a community contributed to the implementation of green-blue measures. The effect of policy instruments on community involvement and the effect of the involvement on the implementation within the cases is explained using the contextual interaction theory. The cases confirm that community involvement leads to more effective implementation of green-blue measures. The use of communicative instruments by municipalities to explain the benefits in spatial quality, traffic safety and social cohesion of green-blue measures to the community and a municipal contribution of organisational resources are a first necessary step towards successful community involvement. Increased municipal contribution of resources increases the effectiveness of the implementation. Based on the urgency of the measures, it is recommended to use more municipal resources if heat stress and flooding due to rainfall cause significant problems.

1. Introduction

The effects of climate change are causing more and more problems in urban areas. Flooding, heavy rainfall, heat stress and drought can all cause significant damage to the urban area (Gasper, Blohm, & Ruth, 2011; Hoogvliet, et al., 2012). This has led to the call for a transition to more climate resilient cities, which can cope with these effects (Donghyun & Up, 2016). To stimulate this transition the Dutch Deltaplan (Staf deltacommissaris, 2018) requires every municipality to do a stress test, to identify where heat stress, heavy rainfall, drought and flooding can cause problems. the program also aims to implement climate resilient building into rules and regulations of spatial planning (Staf deltacommissaris, 2018).

Many municipalities within the Netherlands are already striving to solve both heat stress and heavy rainfall problems by implementing green-blue measures at street level (Stadslab 2050, 2018; Brouwer, Stoffels, Pötz, & Uitzetter, 2013; Pötz, 2016). The reason for street level is because it is the unit in which measures by municipalities take place (Kluck, et al., 2017). Implementing green-blue measures means that water and vegetation are accommodated into the urban landscape. Vegetation and open water will allow for storage and infiltration of water during heavy rainfall, and cool the air during warm summer days. Furthermore, vegetation cleans the air, increases biodiversity, provides shade and reduces the paved area, thereby reducing the heat-island effect. Infiltrating and discharging water through the soil instead of sewer systems recharges the groundwater level and reduces the operation cost of the sewer system (Pötz, 2016).

Yet municipalities, which try to implement green-blue measures in the street space face difficulties. The lack of a clearly defined problem owner and financial and human resources hinder the widespread implementation (Maris, 2016), and therefore leads to less effective implementation (Voskamp & Van de Ven, 2015). This has led to a call for community involvement (Castaño, 2016; Deltacommissaris, 2018; Few, Brown, & Tompkins, 2011). Often a community can act more efficiently and more effectively than governments, as such making widespread implementation more efficient and more effective (Veen, 2009; van Houwelingen, Boele, & Dekker, 2014). It can provide manpower, local expertise, organisational and financial resources, exactly the factors that hinder the widespread implementation (Maris, 2016). Others have also stressed the need for the involvement of the community in maintaining green infrastructure (Hardenbol, 2017). Yet the community often perceives the government as the only body with the financial power and knowledge to address the larger effects of climate change (Few, Brown, & Tompkins, 2011; Weytingh, Kisman, & Blaauwijkel, 2016). This makes involving communities in the implementation of green-blue measures difficult. The involvement of multiple interdependent actors also makes defining objectives and solutions more difficult (Castaño, 2016).

To achieve objectives in public policy, in this case the implementation of urban green-blue measures, municipalities can use policy instruments (Hoogerwerf & Herweijer, 2008). A theory which has proved to be useful in comparing the efficacy of policy instruments is the contextual interaction theory (Bressers & Klok, 1988). This research uses an adapted version of the contextual interaction theory to describe community involvement, and the efficacy of the policy instruments.

The aim of this research is to provide recommendations to municipalities which policy instruments to use to successfully involve a community in the implementation of urban green-blue measures in the public space. The assumption is that by successfully involving the community, the implementation will be more effective.

Based on a literature study, assumptions have been made on how policy instruments influence community involvement and how successful community involvement affects the effectiveness of the implementation of green-blue measures. These assumptions are then verified using five case studies, each representing a street, four of which are in Belgium and one in the Netherlands.

The outline of this report is as follows: in the first section, the concept of green-blue measures will be explained, as well as how policy instruments influence community involvement, and how community involvement can influence the implementation of green-blue measures in a successful way. In the second section, the methods of data collection and analysis of the cases are described. The selection criteria of the cases and data sources are explained as well. The third section depicts the results and analysis of the case study, followed by the conclusion and recommendations.

2. Concepts and theories

In this section the concept of green-blue measures is explained, as well as how successful community involvement is defined within this research. The process of implementation of green-blue measures in the public space with communities is explained using the contextual interaction theory. The way in which municipal policy instruments influence this process is also explained using this model. The last section presents the conceptual model, which guides the case study.

2.1 Green-blue measures

Climate adaptive building is the way in which we shape the built environment to better deal with the effects of climate change. The concept of green-blue grids or measures has often been described as an effective method in reducing the heat stress and damage due to flooding due to heavy rainfall (Pötz, 2016; Voskamp & Van de Ven, 2015). Green-blue measures will ease heat stress, reduce flooding due to heavy rainfall, improve biodiversity, life and air quality (Pötz, 2016). Voskamp and Van de Ven (2015) have described them as "a collective term for sustainable green and blue infrastructure that utilises underlying ecosystem functions to deliver multiple benefits: for example, cooling via evapotranspiration, water storage for heavy rainfall events, discharge peak attenuation, seasonal water storage, and groundwater recharge" (p159). A measure can be considered a green-blue measure if it provides one or more of these benefits by utilising the underlying ecosystem. In general it is assumed that the more widespread implementation of these measures, the more effective they are at achieving the benefits (Voskamp & Van de Ven, 2015).

2.2 Community involvement

Community involvement or participation is theoretically a part of "good urban governance for climate change adaptation" (Sarzynski, 2015, p. 53). In principle, "participation will result in more effective adaptation programs" (Sarzynski, 2015, p. 53). But what community involvement exactly encompasses is not clearly defined (Sarzynski, 2015; Few, Brown, & Tompkins, 2007). Yet "For most social analysts, a meaningful interpretation of the term participation must imply a degree of active involvement in taking decisions" (Few, Brown, & Tompkins, 2007, p. 49). Participation, or involvement is valued instrumentally for what resources it brings to the governance of public problems (Sarzynski, 2015), which in this case is the implementation of green-blue measures.

The resources contributed by the community are in this research referred to as "community contribution". It is assumed that this contribution leads to more effective implementation, as there are simply more resources available compared to just municipal efforts (Veen, 2009; Kalk & Dubbelboer, 2016)). Community involvement in the implementation of green-blue measures can therefore be seen as successful if their involvement has a positive effect on the effectiveness implementation.

Some municipalities in the Netherlands have been experimenting with giving more control to communities in spatial planning (Kalk & Dubbelboer, 2016; van Houwelingen, Boele, & Dekker, 2014). They have given communities control over maintenance and budget, as well as the power to propose changes and hand in plans at their municipality (Veen, 2009; Hoogerwerf & Herweijer, 2008). The policy here is to provide financial, organisational and institutional resources to the community. This is known as community driven development, which gives control of decisions and resources to community groups (Dongier, et al., 2003). It was perceived and proven more efficient and effective to give several responsibilities of municipalities to community groups (van Houwelingen, Boele, & Dekker, 2014; Veen, 2009; Kalk & Dubbelboer, 2016; Sarzynski, 2015). The creation of a local way of maintaining spatial and social infrastructure creates self-sufficiency, organisational resources and a sense of community, which is beneficial for community development (Chavis & Wandersman, 1990).

2.3 Implementation

Implementation refers to "the process(es) that concern the application of relevant policy instruments, including the realization of projects to achieve physical changes. The relevant activities and interactions are pursued for one part by the actors – organisations and

people – that are officially commissioned with promoting the envisaged measures, (the implementers), and for another part by actors that are necessary to realize them (often so-called target groups)" (Bressers, 2004, p. 284). The efforts of implementation can thus be seen as the efforts associated with the relevant activities and interactions with promoting and realizing the envisaged measures. Activities and interactions require resources, so the efforts of implementation are perceived as the resources required for promoting and realizing the envisaged measures. These resources can be financial, human, organisational, institutional, spatial, knowledge (technical and local) and public support (Vinke-de Kruijf, 2013; Weytingh, Kisman, & Blaauwijkel, 2016; Boonstra & Boelens, 2011). A detailed description can be found in appendix A.

2.3.1 Policy instruments

To achieve objectives in public policy, in this case the implementation of urban green-blue measures at street level, municipalities can use policy instruments. Policy instruments are interventions made by government/public authorities in local, national or international economies which are intended to achieve outcomes which conform to the objectives of public policy (Hoogerwerf & Herweijer, 2008). Policy instruments can be classified along three main types, legal (sticks), economic (carrots) and communicative (sermons) (Mees, Driessen, Runhaar, & Stamatelos, 2013).

With legal instruments, municipalities can make green-blue measures mandatory in spatial planning. Legal instruments provide a direct way of implementing green-blue measures by forcing them. Part of the delta plan is that climate adaptive building becomes common practice in urban renewal projects by 2020 (Staf deltacommissaris, 2018). The effect of this legal policy instrument remains to be seen, but will only come into action when a change occurs in the built environment.

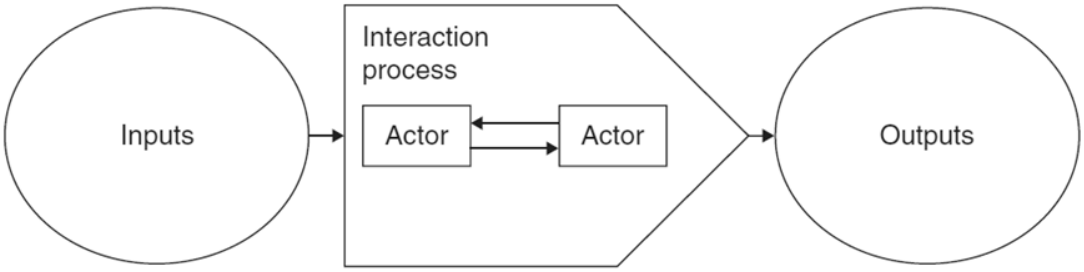
Economic instruments refer to a possible reduction in tax or energy bills implementing green-blue measures (Storm, 2019; Mesters & Bor, 2016), or by providing financial and/or human resources to communities to make the necessary changes (Hop & Hiemstra, 2014; Holdijk, 2017).

Communicative instruments have been used in educating inhabitants about the benefits of green-blue measures, and making communities aware of the risk of heat stress and flooding due to heavy rainfall (Holdijk, 2017). Experiencing the consequences and the awareness of the risk seem two of the most driving factors in climate adaptive building (Holdijk, 2017; Grothmann & Patt, 2005; Tompkins, et al., 2010; Adger, et al., 2009). Communicative instruments can also be used by municipalities to either provide organisational resources and technical knowledge, or teach communities the necessary organisational and technical skills (Weytingh, Kisman, & Blaauwijkel, 2016).

2.3.2 Contextual interaction theory

A theory which has proved to be useful in comparing the efficacy of policy instruments is the *contextual interaction theory* (Bressers & Klok, 1988). The implementation process is described in terms of how the policy instrument is able to affect the motivations, cognitions and resources of the actors involved (de Boer, 2012). If the policy instrument has no effect on these characteristics, then it has not impacted the final outcome of the process. The policy instruments are part of the input into a multi-actor process (de Boer, 2012).

Figure 1 - Contextual interaction theory (de Boer, 2012, p. 20)



The desired output of the interaction process is the implementation of green-blue measures. Policy instruments employed by the municipality are therefore aimed at effectively influencing this output.

2.3.3 Conceptual model

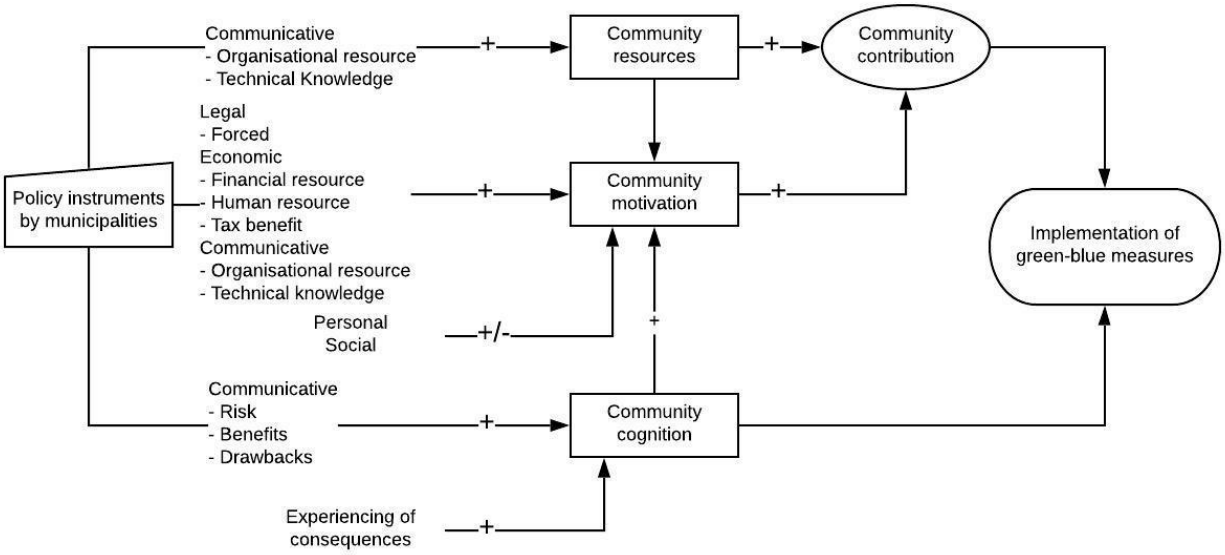
The contextual interaction theory is used as a basic model for how community involvement will affect the implementation of green-blue measures in the public space. The two factors that influence the implementation are the community contribution and the cognition of the community (Bressers, 2009). This contribution is determined by the resources the community possesses, and the motivation to contribute. The assumption is that an increase in resources and motivation leads to an increase in contribution.

The community resources can be referred to as the resources the community possesses (Bressers, 2009). To influence the resources of the community, municipalities can provide communities with organisational resources by teaching them the skills required for organising collective projects (Chavis & Wandersman, 1990). The municipality can also teach communities the required skills (technical knowledge) to implement the desired measures (Holdijk, 2017). Whether these resources contribute to the implementation of green-blue measures depends on the community motivation.

The community motivation depicts the reason for the community to contribute resources (Bressers, 2009). To influence the motivation a variety of instruments can be used. Forcing green-blue measures through legal means is a strong community motivation changer, but can lead to a decrease in public support (Zijlstra, 2016). Economic instruments, such as making financial and/or human resources available for the intended action, can increase the community motivation (Bressers, 2009; Holdijk, 2017). Another economic instrument is a tax benefit, providing financial reward if green-blue measures are implemented, which have had some of the intended effect (Holdijk, 2017; Storm, 2019).

The community cognition affects the motivation and the implementation through perceived problems and effect of solutions (Bressers, 2009). A better understanding of the benefits and drawbacks of the measures can either increase or decrease the motivation respectively, which depends on the previous cognition of the community. However the assumption is that the benefits of green-blue measures are not known to most communities (de Boer, Goosen, & Huitema, 2003). As such it is assumed that a better cognition, leads to a stronger motivation. The effect on the implementation remains to be seen. The cognition of communities is only influenced by means of communicative instruments. They can be used to explain the benefits and drawbacks of measures, and make people aware of the risk of flooding and heat stress. Experiencing the effects of climate change is a strong cognition changer (Holdijk, 2017), yet is out of the control of municipalities.

Figure 2 Conceptual Model – adapted from (Bressers, 2009)



The case studies are used to determine various relations within the conceptual model:

- The effect of used policy instruments on the characteristics
- The influence of characteristics on each other
- The influence of contribution and cognition on the implementation

3. Methods

Case studies on the implementation of urban green-blue measures at street level are used to determine what motivated these communities to cooperate with the municipality. The reason for a case study is that these instances are not a widespread phenomenon, and that it often entails complex situations and problems (Bougie, et al., 2017). The case study research has been shaped based on three steps, adapted from Eisenhardt (1989). First the selection criteria for the cases to be investigated have been determined, followed by a within and cross case analysis.

3.1 Selected cases

Cases have been selected based on the following criteria in order to reduce the number of variables, so that a more relevant analysis can be made (Eisenhardt, 1989):

- Inhabitants play a major role in defining the problem, and the development and implementation of green-blue measures
- Inhabitants were united, and a collective project was taken up.
- The project concerns a street, or set of streets
- The initial goal was to implement green-blue measures.
- Based on the spatial criteria established by Kluck et al. (2017). Street will need to be classified as “Urban city block” or “Pre-war building block”.

Based on the criteria selected above, five cases from two different projects have been selected. The four cases in Belgium allow this research to compare the effect of universal policy instruments in different contexts. Comparing these cases with a Dutch case allows for a comparison between policy instruments. The choice for a similar spatial classification ensures spatial similarities between cases, and possibly similar community characteristics. The choice

for these classifications is that both have a public paved area of almost a hundred percent (Kluck, et al., 2017), assuming a high use of public space. This means that the likelihood of possible conflict between functions is high. If green-blue measures can be implemented here, it can be assumed that they can certainly be implemented where there is less conflict between functions.

3.1.1 Klimaatactieve Seringenstraat Zwolle

This project started as a desire by inhabitants to redevelop old parking facilities into new parking garages. The municipality has aided the community in implementing green-blue measures such as water storage crates and green roofs, along with the new garages. The inhabitants, seeing the benefits of a green environment, have instigated multiple projects to implement further measures in their street (Kennisportaal Ruimtelijke Adaptatie, 2018).

3.1.2 Garden Streets Antwerp

The municipality of Antwerp, Flanders, has recently started the pilotproject “Garden Streets”(tuinstraten). The municipality aims to experiment with both green-blue measures and community involvement at street level, to learn valuable lessons, and promote green-blue measures amongst inhabitants. The green-blue measures are an effort to minimize heat stress and flooding due to heavy rainfall. The municipality works in close cooperation with communities, who are partially responsible for the maintenance of the vegetation in the area. The more inhabitants participating, the greener the street (Stadslab 2050, 2018; Stad Antwerpen, 2018).

Five streets will implement various green-blue measures, with contribution from the communities. Each of these streets is located in a different district, giving slight differences in context. Four districts have been investigated within this research. two of these districts, Berchem and Borgerhout, are in the more dense areas of the city [B.2.I.1;B.1.I.1]. While the districts of Deurne and Wilrijk are in less dense areas [B.3.I.1; B.4.I.1]. The selected streets within the districts are similar, and can be classified as “Urban city block” or “Pre-war building block”.

3.2 Data collection

Data were collected through a desk study of the cases, as well as interviews with the actors involved. The desk study has been conducted using news articles, public project documents and project websites. This pre-study allowed the researcher to get familiar with the project before conducting the interviews. To improve the validity of the interviews and the case study, multiple actors within a case have been interviewed. This concept is a form of triangulation (Yin, 2013), where multiple data sources are used to improve validity.Within the cases chiefs of communications and designers of the municipality as well as an inhabitant have been interviewed (Table 1).

Table 1 - Interviewed actors

District Berchem	**District Borgerhout**	**District Deurne**	**District Wilrijk**	**Seringenstraat**
Chief of communications	Chief of communications	Chief of communications	Chief of communications	Process coordinator
Participation expert		Lead designer	Lead designer	Inhabitant

Interviewees have been asked questions about:

- The reason to start the project
- Used policy instruments,
- Community motivation, cognition and contribution
- The effect of policy instruments on the characteristics
- The effect of the community characteristics on the implementation

During the interviews the spatial plan of the situation before and after implementation has been requested, this allows the researcher to see the effect of the implementation. Combined with the effect of the policy instruments on the community characteristics allowed the researcher to see if those had effect on the implementation of green-blue measures.

3.3 data analysis

Data from the cases will be analysed both within the cases, and cross-case to be able to indicate similarities and drawn conclusions.

3.3.1 Within case

Within the cases the used municipal policy instruments, community characteristics and the effect of the implementation on the layout of the street has been described. Followed by an analysis of the effect of policy instruments on the characteristics, and the effect of the community characteristics on the implementation. This detailed description helps to cope with the amount of data, and allows the researcher to discover unique patterns, before generalising patterns across cases (Eisenhardt, 1989).

3.3.2 Cross case

When the five cases were documented, and the relations between policy instruments, characteristics and implementation were known, a cross case analysis has been performed. The goal here was to compare community characteristics, influence of policy instruments and effect of community involvement on the implementation. Comparing cases might result in in similarities in both the effect of policy instruments on community characteristics the effect of characteristics on the implementation, from which conclusions can be drawn.

4. Results and analysis

In this section the results and analysis of the case studies are presented. As said one case is in the Netherlands, while the other four cases are in the city of Antwerp in Belgium. It has to be noted that the municipality of Antwerp is divided into districts, which have similar responsibilities in spatial planning as municipalities in the Netherlands. Each data source in this section has a code, a full reference can be found in appendix B. As the cases within Antwerp have similar policy instruments, there are described and analysed as one project, differences between streets are indicated.

4.1 Garden streets Antwerp

The inhabitants of district Berchem have a high desire for more public green, which is due to highly paved neighbourhood and a lack of private green [B.1.I.1]. This led the district to

ask the municipality of Antwerp to make resources available for the implementation of green-blue measures, which resulted in a city wide pilotproject [B.1.I.1; B.4.I.1;B.3.I.1].

4.1.1 Policy instruments

Financial, human and organisation resources were made available by the municipality of Antwerp, to cover the cost made by the districts for the implementation of the project [B.1.W.1;B.1.I.1;B.2.I.1;B.3.I.1;B.3.I.2;B.4.I.1;B.4.I.2]. Several information evenings were organised by the district to explain the purpose and benefits of the project to the community, such as reduced heat stress and flooding, increased traffic safety, spatial quality and social cohesion [B.1.W.1;B.1.I.1;B.2.I.1;B.3.I.1;B.3.I.2;B.4.I.1;B.4.I.2]. Temporary measures were installed as an experiment to show the community the benefits of various measures [B.1.W.1;B.1.I.1;B.2.I.1;B.3.I.1;B.3.I.2;B.4.I.1;B.4.I.2]. Manpower for the maintenance of new public green are only partially provided by the district, inhabitants are required to partially provide these resources [B.1.W.1;B.1.I.1;B.2.I.1;B.3.I.1;B.3.I.2;B.4.I.1;B.4.I.2].

4.1.2 Community characteristics

The community was motivated to contribute to the implementation was the increase in spatial quality, social cohesion, in most streets traffic safety (Berchem, Borgerhout, Wilrijk) and in some streets the ability to influence the design and increase house value (Deurne) [B.1.W.1;B.1.I.1;B.2.I.1;B.3.I.1;B.3.I.2;B.4.I.1;B.4.I.2]. The community perceived that the measures would increase spatial quality, social cohesion and in most cases traffic safety (Borgerhout, Berchem and Wilrijk) [B.1.W.1;B.1.I.1;B.2.I.1;B.4.I.1;B.4.I.2].The community contributed public support, local knowledge, manpower for implementation and maintenance of public green and in some cases organisational resources and technical knowledge (Borgerhout) [B.1.W.1;B.1.I.1;B.2.I.1;B.3.I.1;B.3.I.2;B.4.I.1;B.4.I.2].

4.1.3 Implementation

The measures which are installed are mainly an increase in trees, decrease of the paved area, and an increase in vegetation. Details for each of the cases can been seen in Table 2. It should be noted that details on the case of Berchem are lacking due to the complexity of the data (area could not be calculated). It can be said however that Berchem shows similar, if not better results. According to the district, the maximum possible measures, without compromising the function of the street, have been achieved [B.2.I.1]. The large increase in the presence of grass in the district Deurne is due to the fact that inhabitants acquired a large plot from the nearby airport [B.3.I.2], the actual changes in the street itself therefore are lesser than would appear from the data. Besides these physical changes, rainbarrels have been installed and rainwater from rooftops is infiltrated wherever possible.

Table 2 - Effectiveness assessment implementation Garden streets Antwerp

	Borgerhout	**Berchem**	**Deurne**	**Wilrijk**
Small trees	9 to 11	18 to 20	8 to 0	6 to 5
Large trees	13 to 11	-	0 to 7	0 to 2
Paved	93% to 71% (18% is storage)	-	100% to 33%	85% to 35%
Semi-paved	0% to 18%	-	0% to 25%	0% to 55%
Grass	7% to 0%	-	0% to 25%	15% to 0%

Vegetation	0% to 10%	-	0% to 17%	0% to 10%

4.1.4 Analysis

The information evenings held by the districts were able to change the cognition of the community in such a way that the green-blue measures were perceived by the community as a way to increase spatial quality, traffic safety and social cohesion. Although it has to be said that this was hardly necessary in the districts of Berchem and Borgerhout, as these inhabitants were already convinced of the benefits of green-blue measures [B.1.I.1;B.2.I.1].

The motivation to contribute in Deurne was lower compared to the motivation in the other districts. This was due to the fact that inhabitants correctly perceived that the green-blue measures would require maintenance on their part. Which they were less inclined to do, due to large private gardens [B.3.I.1;B.3.I.2]. Also the benefits in traffic safety were less, due to the street already having good traffic safety. In Wilrijk the motivation to contribute was high due to the enthusiasm of several inhabitants, which motivated the other inhabitants [B.4.I.1;B.4.I.2]. In the more paved districts of Berchem and Borgerhout the lack of vegetation was a major influence on the high motivation [B.1.I.1;B.2.I.1]. Despite this high motivation, contribution of municipal resources was still required. Without these resources projects would have never started. The community contribution is mainly aimed at measures which increase the vegetation, for example community gardens, as these bring the benefits the communities desire. The reason for the lack of contribution for measures which reduce flooding appears to be the absence of flooding due to heavy rainfall.

The effect of the contribution on the implementation is that almost all unpaved areas are vegetated, with the exception of Deurne. Although here the contribution of local knowledge ensured the acquisition of a large space suitable for infiltration [B.3.I.2]. More trees than thought possible by the district were added due to community contribution of local knowledge [B.1.W.1;B.1.I.1;B.2.I.1;B.3.I.1;B.3.I.2;B.4.I.1;B.4.I.2]. Therefore it can be concluded that the community involvement is more effective compared to just municipal involvement in all four cases.

4.2 Klimaatactive Seringenstraat Zwolle

The Seringenstraat is located in one of the more dense and paved areas of Zwolle. Due to earlier collaboration between the municipality and the community with the development of a garage complex inhabitants were convinced of the benefits of green-blue measures. The project also showed the community that they had the ability to adapt their street without municipal help. This prompted the inhabitants to implement more green-blue measures such as rain barrels, trees and façade gardens in their street [B.5.I.1;B.5.I.2;B.5.R.1;B.5.W.1].

4.2.1 Policy instruments

The municipality provides organisational resources where required to aid inhabitants with implementing green-blue measures in the public space. The municipality also provide information regarding the benefits and technical knowledge of green-blue measures through a website and information evenings, where examples are shown [B.5.I.1].

4.2.2 Community characteristics

The community was motivated to contribute to the implementation because of the desire to improve the street and increase the spatial quality. The community perceived that green-blue measures would increase the spatial quality, as the street is highly paved, but sees street

parking as a important asset too [B.5.I.1;B.5.I.2]. The community contributed organisational and financial resources, local and technical knowledge and manpower for implementation and maintenance of measures [B.5.I.1;B.5.I.2;B.5.B.1].

4.2.3 Implementation

The paved area is slightly decreased due to façade gardens. The process is seen as more efficient and effective compared to municipal efforts, which were almost non-existent.

4.2.4 Analysis

Due to the earlier experiences with implementing green-blue measures inhabitants were convinced of the benefits it would bring for spatial quality [B.5.I.1;B.5.I.2]. The desired increase in spatial quality through more public green is due to a highly paved area [B.4.I.1;B.4.I.2]. The lack flooding due to heavy rainfall means there is limited motivation towards addressing these issues [B.5.I.2]. The municipality contributes very limited resources, which created a necessity of community contribution [B.5.I.1;B.5.I.2]. Due to the large presence of young industrial households, a high contribution has been given [B.5.I.1;B.5.I.2].

The desire for street parking and limited municipal contribution results in a limited change in paved area and vegetation [B.5.I.2], but in much more efficient implementation for the municipality [B.5.I.1;B.5.I.2].

4.3 Cross-case Analysis

The motivation for most communities to contribute to the implementation of green-blue measures is the perceived improvement in traffic safety, social cohesion and spatial quality. The more paved the area, the higher the desire for spatial quality through public green. The motivation for an increase in traffic safety is only present if the existing situation is poor. The availability of financial and organisational resources by the municipality was necessary in almost every case to let the motivation translate into contribution.

Due to active communication, communities perceive green-blue measures as a way to increase spatial quality, traffic safety and social cohesion. In some cases (Berchem, Borgerhout) the use of communication is less effective as the benefits of green-blue measures were already known.

The community contributes public support, local knowledge and manpower for implementation and maintenance of public green in every case. It has to be noted however that participation within communities varies, which has a direct effect on the implementation. In some cases (Zwolle) communities also contribute financial and organisational resources and technical knowledge (Zwolle, Borgerhout). This seems to depend on the strength of the motivation and/or the absence of municipal resources (Zwolle).

The community contribution means more effective implementation in every case. The community cognition has little (direct) impact on the implementation.

The differences between Belgium and the Netherlands appear to be slight, the motivation to contribute is the same. What is different however is that while Belgium streets were motivated before the start of the municipal project (Berchem and Borgerhout), no community project was set up, while in the Netherlands this was the case.

5 Discussion

In this section the findings and methodology of this research are reflected.

5.1 Reflection on findings

This research shows an direct influence of the community contribution on the increased effectiveness of the implementation. This effectiveness is compared to what would have been implemented had the community not been involved. In every case municipalities were not willing to make resources available for an increase in the maintenance of new public green. This means that any form of community contribution in this regard results in more public vegetation, which is an increase in effectiveness. The exact difference between just municipal resources or with a contribution of the community remains difficult to determine.

The differences between Belgium and the Netherlands appear to be slight, the motivation to contribute is the same. What is different however is that while Belgium streets were motivated before the start of the municipal project (Berchem and Borgerhout), no community project was set up, while in the Netherlands this was the case. This could be the difference in culture in community involvement in spatial planning.

5.2 Reflections on methodology and generalizability

This research takes place across two different countries, each with a different context. Spatial differences are small between the various streets, and the motivation to contribute in the cases are similar. This similarity in motivation, despite differences in context, indicates that it is a motivation which should me targeted by municipalities in other cases too.

The cases are limited in a sense that none of them have experienced significant heat stress or flooding due to heavy rainfall, which can be a strong motivation (Holdijk, 2017; Grothmann & Patt, 2005; Tompkins, et al., 2010; Adger, et al., 2009). It remains therefore hard to predict what the effect of these factors is on the success of community involvement in the implementation of green-blue measures.

6 Conclusion and recommendations

The aim of this research was to discover which policy instruments are recommended to be used by municipalities to successfully involve the community in the implementation of green-blue measures in the public space.

The literature study has shown that community involvement in the implementation of regular spatial planning policies has led to more effective implementation of these policies (Boonstra & Boelens, 2011; van Houwelingen, et al., 2014; Veen, 2009). The cases have shown that the same is true for the implementation of green-blue measures in the public space. The involvement of the community has led them to contribute resources, resulting in more effective implementation. The motivation for communities to contribute is associated with a desired increase in spatial quality, traffic safety and social cohesion. Communities only contribute to the implementation of measures which achieve these benefits, which are mainly green, and some blue, measures (Pötz, 2016).

The problem therefore which hinders the widespread implementation therefore is not only the lack of resources (Maris, 2016), but also the lack of awareness amongst communities of the benefits green-blue measures bring for traffic safety, spatial quality and social cohesion.

Despite the community often perceiving that the government is the only body with the financial power and knowledge to address the larger effects of climate change (Few, Brown,

& Tompkins, 2011; Weytingh, Kisman, & Blaauwijkel, 2016). The cases have shown that communities do perceive it in their power to increase traffic safety, spatial quality and social cohesion in their street, by implementing green-blue measures, thereby reducing the local effects of climate change.

Due to active communication, through the use of examples and information evenings to explain the benefits of green-blue measures by municipalities, the communities investigated in the case study, perceived that green-blue measures can increase traffic safety, spatial quality and social cohesion. Although in some cases communities already perceived that green-blue measures would have the desired benefits, reducing the effect of the instrument. Mainly the extra public green was seen as an effective method in increasing the spatial quality. This motivation for extra public green increases the more paved the area is, lesser paved areas have a lower motivation. However, The strong motivation in paved areas is not enough to initiate the implementation of green-blue measures, some form of municipal contribution of resources was required.

The municipal economic instruments of making financial and organisational resources available to the community are not a reason why the community contributes, but are a motivation to start the community contribution of resources for the implementation of measures, in which municipal organisational resources are a first step. However, the effectiveness of implementation is significantly increased when financial and human resources are contributed by municipalities as well.

The conclusions therefore is that once communities perceive that green-blue measures have relevant benefits for them, their motivation increases, but that in order for communities to contribute, municipalities need to contribute some resources. Increased contribution of municipal resources increases the effectiveness of implementation.

6.1 Recommendations

This study has aimed to identify which policy instruments are recommended to be used by municipalities to successfully involve the community in the implementation of urban green-blue measures in the public space. Which policy instruments are to be used to successfully involve the community in the implementation of urban green-blue measures depends on the severity of heat stress and flooding due to heavy rainfall.

All cases were the contribution of municipal resources was high have said that this large contribution cannot be maintained across every street. The recommendation therefore is to change the policy instruments based on the urgency of the situation.

If the goal is to promote green-blue measures city wide than the use of communicative instruments to explain the benefits, and some availability of organisational resources are recommended. The use of information evenings and examples to make the communities aware of the benefits of green-blue measures for increasing spatial quality, traffic safety and social cohesion provides a strong motivation. The contribution of organisational resources by the municipality is required to help communities get started with the implementation.

If the goal is to seriously reduce heat stress and the chance of flooding, then the recommendation is to also use economic instruments. By significantly increasing the municipal contribution through the contribution of financial, human and additional organisational resources, the effectiveness of the implementation can be increased, while still using the community to further increase the effectiveness of implementation.

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8 Appendices

Appendix A – Explanation of Resources

Resources can be divided into four sections, human, financial, knowledge and institutional resources (Vinke-de Kruijf, 2013). Human resources refer to the manpower available to carry out the project. Connected to this is the technical skill of the actor and the availability of financial resources. Furthermore, an actor can have the human and financial resources to act, but also requires the institutional power to do so. Public spaces are the jurisdiction of the municipality, and actors need to have the institutional power to be allowed to carry out the project. Lastly three types have been added: spatial resources, organisational resources, and public support. Spatial resources refer to the fact that space is limited in urban environments, and not always easily available. While organisational resources represent the ability to mobilise actors into collective action, to acquire more resources (Weytingh, Kisman, & Blaauwijkel, 2016). Public support is a factor which is often important in public projects, it is assumed it means easier implementation (Boonstra & Boelens, 2011).

Appendix B – Data sources case studies

1 – District Berchem

Code	Name	Link
Websites		
B.1.W.1	Official Website	https://www.antwerpen.be/nl/info/59c10b91ca69bc4b16578078/tuinstraten-berchem
Rapporten		
B.1.R.1	First info moment	https://assets.antwerpen.be/srv/assets/api/download/144fffbe-92dc-4f1d-aa18-0598fb157983/B800332_tuinstraten_7x_1000x1400mm_def.pdf
B.1.R.2	Spatial plan	https://assets.antwerpen.be/srv/assets/api/download/22e571d4-13f9-4a70-8d1a-66d96f4590d7/20170919_bevraging_web.pdf
Interviews		
B.1.I.1	Chief of communications – District Berchem Antwerp Participation expert – District Berchem Antwerp	

2 – District Borgerhout

Code	Name	Link
Websites		
B.2.W.1	Report project team	https://stadslab2050.be/klimaatadaptatie/tuinstraten/de-bloemstraat-staat-mooi-de-knop
Rapporten		
B.2.R.1	Spatial plan	
Interviews		
B.2.I.1	Chief of communications – District Borgerhout Antwerp	

3 – District Deurne

Code	Name	Link
Websites		
B.3.W.1	Official Website	https://www.antwerpen.be/nl/info/5a268b83ca69bc7696424079/jan-olieslagersstraat-wordt-tuinstraat
B.3.W.2	News report	https://stadslab2050.be/klimaatadaptatie/tuinstraten/tuinstraat-deurne-palmt-een-groen-stukje-luchthaven
Reports		
B.3.R.1	Report first info moment	https://assets.antwerpen.be/srv/assets/api/download/fa908c5f-47f0-4818-9373-e14ffd58c01c/20171205_Tuinstr_JOlieslagers.pdf
B.3.R.2	Modular street units summary	https://assets.antwerpen.be/srv/assets/api/download/4bb679d8-a822-4a05-b4f8-9d12a6694028/ModulaireStraatunits_Uitleg.pdf

B.3.R.3	Spatial plan	
Interviews		
B.3.I.1	Chief of communications – District Deurne Antwerp	
B.3.I.2	Lead designer – District Deurne Antwerp	

4 – District Wilrijk

Code	Name	Link
Websites		
B.4.W.1	Official Website	https://www.antwerpen.be/nl/overzicht/district-wilrijk-1/openbare-werken/azi-laan-wordt-tuinstraat
Rapporten		
B.4.R.1	Verslag info-moment	https://assets.antwerpen.be/srv/assets/api/download/a9cb07ce-d58e-4035-b33a-04c3e972ae59/20171130_Infomoment_verslag.pdf
B.4.R.2	Droom-moment	https://assets.antwerpen.be/srv/assets/api/download/fddb0163-1f29-4e1b-b992-af2dd537e492/20180130_Bewoners_Droomronde_verslag_onlineversie.compressed.pdf
B.4.R.3	Toelichting concept	https://assets.antwerpen.be/srv/assets/api/download/65d4d881-47ee-47ee-b514-3dab438c1103/20180502_11799_PD_COM_TM_presentatie-sm-pm.pdf
B.4.R.4	Spatial plan	
Interviews		
B.4.I.1	Chief of communications – District Wilrijk Antwerp	
B.4.I.2	Lead designer – District Wilrijk Antwerp	

5 – Seringenstraat

Code	Name	Link
Websites		
B.5.W.1	Official Website	https://klimaatactieveseringenstraat.wordpress.com/leefstraat-2018/
Rapporten		
B.5.R.1	Research climate adaptation Assendorp	https://toekomststerk.files.wordpress.com/2017/06/310316-onderzoeksrapportage-assendorp-toekomstbestendig-versie-3.pdf
B.5.R.2	News report	https://klimaatactieveseringenstraat.files.wordpress.com/2017/12/171109-nieuwsbrief-seringenstraat-totaal.pdf
Interviews		
B.5.I.1	Process coordinator - Municipality of Zwolle	
B.5.I.2	Inhabitant Seringenstraat	