

Co-production in mitigating the urban peak discharge

How citizens can be effectively engaged in pluvial flood risk management in urban areas



Master's Thesis

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Summary

Due to climate change, heavy rainfall is calculated to occur more often. In urban areas, less evaporation and infiltration are possible due to the interception of precipitation by houses and roads. This results in a shorter lag time and an increased discharge of rainwater, resulting in the urban peak discharge. This water discharge can cause pluvial floods at its peak level. Alongside top-down pluvial flood risk management, the possible value of citizen engagement in the form of co-production is underestimated. The municipality of Kampen mainly incentivises co-production to increase the effectiveness of pluvial flood risk management through financial support. Bottom-up initiatives of citizens do exist but do not dominate. The citizens of Kampen are moderately aware of the pluvial flood risk and of the mitigation measures that can be taken. The citizens generally think that both the municipal organisation and the citizens are responsible for pluvial flood risk mitigation action, but mainly expect the municipality to be the initiator in this. Most of the citizens have the capability to engage, but sometimes they run into practical barriers. The citizens who are not engaged mostly do not possess the required knowledge and/or resources. The municipality can enhance co-production by raising the pluvial flood risk awareness among citizens. An approach more customised to timing, area and citizens can enhance co-production to increase effectiveness in pluvial flood risk management in urban areas.

Keywords: urban peak discharge, pluvial flood risk management, citizen engagement, co-production

1. Introduction

1.1 Problem statement

Human activity influences the peak discharge during rainfall. In urban areas, houses and roads intercept precipitation, thus reducing evaporation and infiltration, causing an increased water discharge. Due to climate change, heavy rainfalls are calculated to occur more often, thus increasing the problem of peak discharges in urban areas (Planbureau voor de Leefomgeving [PBL], 2015; Witmer et al., 2023). Considering pluvial flood risk management in urban areas, local governments cannot always arrange the collection and discharge of water effectively themselves. A more co-produced model could enhance pluvial flood risk management in urban areas where citizens are more engaged in taking measures. However, the practice of co-produced models in planning processes is often neglected and/or ineffective (Fung, 2015; Hatley, 2013). Narratives on co-production often have an emphasis on its potential but lack examples of structural and long-lasting success in practice. The main critique on co-production is that practice is different, and the alignment of stakeholders is more difficult than presented in theory. Additionally, research on flood risk management mostly considers river and coastal floods, whereas floods caused by rainfall are often underestimated. The problem of urban peak discharges has mainly been approached by predictions and measurements of peak discharges (Gericke & Smithers, 2014). Flood risk management and flood risk perception are studied across different times and places (Lo & Chan, 2017; Seifert, Botzen, Kreibich & Aerts, 2013), but the possible value and necessity of a co-produced model of pluvial flood risk management is underestimated and under-researched. Forrest, Trell and Woltjer (2021) do study and recognise the value of citizen contributions but are highly influenced by the sense of urgency of the local citizens since this research is conducted directly after pluvial flood events. National policy mainly focuses on top-down strategies and big infrastructure projects (Planbureau voor de Leefomgeving [PBL], 2009; Witmer et al., 2023). Also on the municipal level, generally there is relatively not much time and money invested in enhancing the co-production in pluvial flood risk management. Despite the promotion and encouragement to some extent, communities' and users' involvement remain often merely superficial (Wiewiora, Keast and Brown, 2016).

To study this problem, the following research focuses on the municipality of Kampen, located in the Dutch province of Overijssel. The pluvial flood risk management of the municipality is mainly characterised by a proactive policy.

1.2 Research aim and research questions

This research aims to analyse how a co-produced model of pluvial flood risk management can lead to more effective pluvial flood risk management by local governments. This results in the following main research question:

How can local governments enhance co-production to increase effectiveness in pluvial flood risk management in urban areas?

The following sub-questions are formulated to support the main question:

1. What types of co-production are evident in pluvial flood risk management in the municipality of Kampen and what is the level of citizen engagement?
2. What drives citizens to engage in pluvial flood risk management?
3. To what extent are citizens capable of taking mitigation measures in pluvial flood risk management?
4. What are the limitations and barriers of co-production in pluvial flood risk management?

1.3 Societal relevance

The Dutch national government aims to make water and soil guiding in spatial planning (Ministerie van Infrastructuur en Waterstaat, 2022). According to the letter to parliament (Ministerie van Infrastructuur en Waterstaat, 2022), issues related to water and soil may not be shifted to future generations, to other areas and from private to public. This calls for action, also on private terrain. A focus on co-production will show the value of citizen action in mitigating urban peak discharges, aiming for a safer and more resilient living space (Attems, Thaler, Genovese & Fuchs, 2020; Lo & Chan, 2017). Also, it will give input for the enhancement of pluvial flood risk management, because it will show possible links between the pluvial flood risk and the willingness to engage in co-production (Lechowska, 2022; Seifert et al., 2013). A broader insight into infrastructure initiatives that can be implemented also enhances the understanding of co-produced models in pluvial flood risk management (Forrest et al., 2021). A better understanding of possibilities and citizen experiences of co-production can thus be useful for municipal policy.

1.4 Scientific relevance

Much research has been aimed at predicting peak discharges and adapting top-down management (Gericke & Smithers, 2014) as well as the flood risk perception of citizens (Birkholz, Muro, Jeffrey & Smith, 2014; Lechowska, 2018). However, little research has been contributed to the possible value of citizen engagement in co-production to mitigate urban peak discharges. Studies from Van de Meene, Brown and Farrelly (2011) as well as Dąbrowska et al. (2023) lack the focus on citizen engagement to fully comprehend the opportunities for co-production in water management. Lamond & Proverbs (2009) emphasise that cooperation and commitment from private property owners are required for resilience programmes to be successful. Further research is required into the degree of success of different models of co-production in the context of pluvial flood risk management (Ananda & Proctor, 2013; Mees, Alexander, Gralépois, Matczak & Mees, 2018). Most importantly, linking co-production with pluvial flood risk management is mainly neglected in the literature. The opinions and experiences of citizens need to be studied, including the possible barriers there are for effective citizen engagement. Studying how citizen engagement in a co-produced model of pluvial flood risk management can increase effectiveness, can contribute to the theory of pluvial flood risk management as well as different forms of co-production processes in spatial planning.

2. Literature Review

2.1 Pluvial flood risk management

Cities are complex systems, dealing with a lot of issues, some becoming increasingly severe and urgent. The management of these issues is of vital importance for the liveability in these urban areas. The ability of cities to retain the same basic structure and ways of functioning despite disturbances or crises is known as urban resilience. Citizens themselves have become key stakeholders in urban resilience via co-production and are more and more involved in planning processes (Haustein & Lorson, 2023). The commitment of citizens is needed for effective flood resilience features (Lamond & Proverbs, 2009). The following section is about pluvial floods to first explain the issue.

2.1.1 Pluvial floods

One of the issues cities need to deal with is the management of water. Extreme precipitation will occur more frequently, will be more severe and will take longer in the near future, caused by climate change (Witmer et al., 2023). In all the climate scenarios developed by the KNMI (2023), the precipitation in winter will increase, with 4% in the lowest scenario and 24% in the highest scenario. More importantly, extreme hourly precipitation that is exceeded once a year will increase by 2% to 46% in 2100 (KNMI, 2023). This makes the management of rainwater increasingly important, especially in urban areas due to the large percentage of impervious surface. Cities need to become resilient to deal with heavier rainfall. This research focuses on flood risk management, which is part of urban resilience.

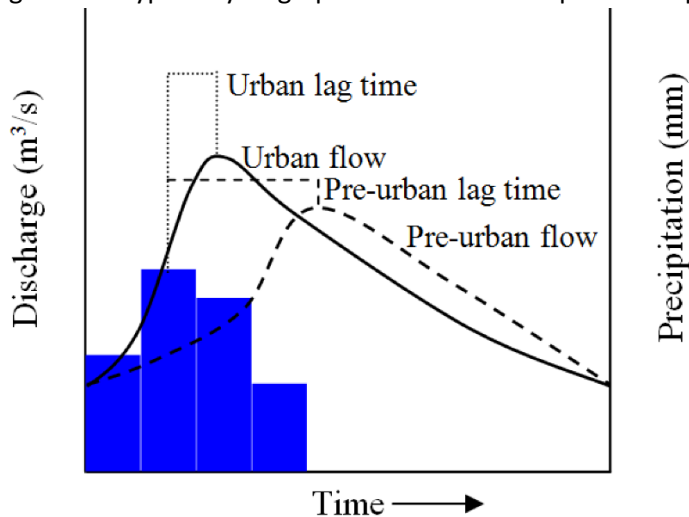
Flood risk management is often seen as the management of floods from the sea or river, since floods are mostly explained as coastal or river floods, causing damage to the built environment and casualties. However, floods that are caused by heavy rainfall are often underestimated, along with their management. To understand the management of flood risk, first, the demarcation of the type of flood is of importance. The term flood can be divided into three types (Dąbrowski et al., 2023):

- Fluvial floods: rivers overflowing through an excess of water
- Pluvial floods: heavy rainfall exceeding the capacity of urban drainage systems
- Coastal floods: seawater floods caused by tidal waves or rising sea level

Both fluvial and coastal floods refer to direct danger from excess water. This is associated with casualties and severe disruption. In contrast, a pluvial flood refers to water nuisance, which is an excess of rainwater affecting life on the surface. There is often no direct danger to life or severe disruption (Forrest et al., 2021). In this research, pluvial floods will be the focus, since they are becoming more relevant, especially in urban areas. According to Dąbrowski et al. (2023), pluvial floods are currently the most challenging, because they are difficult to monitor.

Cities largely consist of impervious areas which prevent effective infiltration of rainwater. The impervious areas in cities prevent natural and effective infiltration and evaporation. This is, together with climate change, the reason why pluvial floods happen more often (Lamond, Rose & Booth, 2015). Compared to natural, pre-urban conditions, urban areas have a higher total discharge as well as a higher peak flow. Also, the urban lag time, the time difference between the highest rainfall and the peak flow, is much shorter (Ouma & Tateishi, 2014). This is because rainwater in urban areas is mostly discharged by stormwater systems or mixed sewage systems, resulting in higher peak discharges. Heavier rainfall can increase these peak flows. These so-called urban peak discharges are characterised by a high probability and a low impact (Witmer et al., 2023).

Figure 2.1: Typical hydrograph of the urban and pre-urban peak discharge



Source: Ouma & Tateishi, 2014

These urban peak discharges can cause surface water floods, called pluvial floods (Lamond et al., 2015; Waterschap Drents Overijsselse Delta, 2021). This is why the management of water, consisting of the retention, storage and discharge, is of great importance in urban areas (see 2.1.3).

Due to ongoing urban densification, an increased number of technical devices (e.g. water tanks) and branches (e.g. water pipes) make water management increasingly complex (Faldi, Ranzato & Moretto, 2022). The increasing demand for space in urban areas also complicates the water management. For example, obtaining land area for water retention is often difficult. Therefore, water retention and storage also need to take place on private terrain. This shows the importance of adequate governance of urban water management.

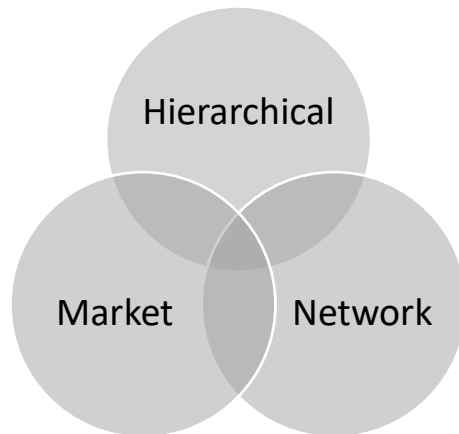
2.1.2 Governance of urban water management

The more frequently occurring urban peak discharges in the future call for adequate urban water management, especially on the local level. As Lamond and Proverbs (2009) mention, the combination of social and physical structures is necessary to make changes in the built environment to increase urban resilience. This means that the governance of urban water management as well as the mitigation strategies need to be discussed, starting with the governance.

Van de Meene et al. (2011) come up with a typology ranging from the hierarchical, market and network approach. Hierarchical governance involves a centralised approach in which representatives are accountable for the water management and little stakeholder involvement takes place. This top-down approach was criticised because it is inefficient and not conducive to learning and adaptation (Van de Meene et al., 2011). The market approach aims for an efficient resource allocation in which citizens are more involved, but it mainly empowers private actors through fixed arrangements. For example, this leads to the privatisation of water supply, creating monopolies and restrictive contracts. In network governance, public, private and civil actors are involved in policy development and implementation. Through social learning and capacity building in this approach, experiences are shared so that a broader knowledge and evidence base is created to support and encourage coordinated action (Van de Meene et al., 2011; Wehn, Collins, Anema, Basco-Carrera & Lerebours, 2020). It is believed that the network approach results in sustainable urban water management, in which the provision of water is sustained for both ecological and human use by integrated infrastructure and a long-term perspective. In practice, there is often a combination between the approaches, resulting in hybrid arrangements in which the

network and hierarchical approaches are combined with market governance instruments (Van de Meene et al., 2011). Therefore, in sustainable urban water management, certainty and leadership are provided by public authorities, flexibility and innovation are provided by network collaboration and incentives and efficient resource use are provided by market mechanisms. In practice, this can be seen when a public authority initiates action in water management, seeking cooperation with other stakeholders using financial incentives.

Figure 2.2: Types of governance approaches in water management combined in practice



Source: Van de Meene et al., 2011

Wiewiora et al. (2016) make a clear distinction between an asset-dominant and a service-centric approach to public service delivery. Assets refer to large-scale public infrastructure like a sewage system. The asset-centric perspective has increased the risk of excluding users and overlooking the real needs of users. However, assets should be considered as means that deliver services to meet the users' needs (Wiewiora et al., 2016). When the users are involved in the service delivery process, optimal usage is achieved. Also, Edelenbos, Van Buuren, Roth and Winnubust (2016) state that mere top-down water management, thus a solely hierarchical governance approach, is often hesitant and inconsistent. Therefore, a transition in water management can be detected, from top-down decision-making towards a more participatory, stakeholder approach. This is mainly caused by the professionalisation of interest groups and the activation of citizens (Edelenbos et al., 2016). Specific research from the Dutch municipality of Arnhem shows that after it experienced pluvial floods in 2011, 2014 and 2016, its citizens were getting more engaged in pluvial flood risk management (Forrest et al., 2021). For example, communities provided money for rain barrels after the floods (Forrest et al., 2021). According to Mens, van Bueren, Vrijhoef and Heurkens (2023), these kinds of initiatives have a broader impact than generally assumed. Though purely local individual initiatives exist, forms of co-production between local stakeholders and government actors have the most positive impact according to Edelenbos et al. (2016). Citizen involvement has the capacity to make improvements in neighbourhoods, also in ways the government is sometimes not capable of (Edelenbos et al., 2016; Hatley, 2013; Mees, Crabbé & Driessen, 2017). In the Netherlands, households themselves are even officially responsible for pluvial floods on their property, except for extreme flood events (Forrest et al., 2021). This shows the importance of pluvial flood risk mitigation measures and citizen engagement, which will be further discussed in paragraphs 2.1.3 and 2.2.3 respectively.

2.1.3 Pluvial flood risk mitigation measures

In water management, flood resilience is a frequently used term, referring to flood risk mitigation and flood consequence reduction, also called adaptation (Forrest et al., 2021). Mitigation is about reducing the risk itself, which means taking action to approach the causes of a problem, thus lowering the risk

of it happening. Adaptation is about reducing the effects, which thus means accepting the risk of it happening but applying changes to reduce the severity of the effects.

In the context of flood risk, Mees et al. (2017) speak of property-level protection (PLP) measures. These measures are specifically taken on private property, hence its name. In this case, property owners invest in these measures out of private interest, but the benefits are public. Public spending can be reduced like this, while public goals can still be achieved. Without specifying the type of flood, Mees et al. (2017) identify four different types of strategies for flood risk governance: risk prevention, protection, preparation and recovery. Here, strategies of risk prevention mainly consist of spatial planning interventions to keep people away from water. Protection means keeping water away from the people, mainly through infrastructural measures. Preparation and recovery involve emergency management and insurance mechanisms respectively (Mees et al., 2018). However, as already mentioned, the distinction between pluvial and fluvial flood risk is of importance here. The strategies of preparedness and recovery are only relevant during and after floods and are therefore to a lesser extent relevant in pluvial flood risk mitigation (see table 2.1).

Table 2.1: Classification of flood risk governance strategies

Flood adaptation	Flood mitigation
Preparation	Risk prevention
Recovery	Protection

Source: Mees et al., 2017

Flood risk prevention and protection thus include spatial planning measures and infrastructural measures. With interventions in the built environment, the causes of pluvial floods, and thus the chance of floods, can be reduced. In flood risk management, adapting to floods includes e.g. the installation of flood pumps, while mitigating the flood risk includes e.g. measures to increase infiltration. Infrastructural measures to keep water away from the people, like measures to increase infiltration, are used in the three-stage strategy of water management, consisting of retention, storage and discharge (see figure 2.3).

Figure 2.3: Three-stage strategy of water retention, storage and discharge in order



Source: Noordhoff, 2023.

When it rains, water retention and infiltration on site are the most important measures to prevent peak discharges from causing pluvial floods. Infiltration measures like a green roof and a rain barrel can contribute to this. If this is not possible, water can be stored in specially designated areas. The water that is stored can also be used in dry periods (Dąbrowski et al., 2023). A rain barrel is an example of water storage as well, though on a smaller scale. Natural water retention measures are considered to be the best because these also contribute to biodiversity protection and climate change adaptation (Zełeńáková, Diaconu & Haarstad, 2017). Lamond et al. (2015) come up with a list of different sustainable drainage systems (Suds), which serve as an umbrella term for all the measures that are designed to reduce the risk of pluvial floods by decreasing runoff volumes. These are comparable with the urban water retention measures provided by Zełeńáková et al. (2017) and include:

- Infiltration devices e.g. permeable surfaces
- Green roofs and walls
- Rainwater harvesting e.g. rain barrel
- Detention and retention basins

These measures foster the collection of water, make infiltration possible and slow down and reduce the discharge. These measures can partly be taken on private terrain by citizens. According to Lamond et al. (2015), these property-level measures are more effective when they are organised in a 'train', meaning the taken measures are interconnected, fitting within the entire urban water system. Owusu, Wright and Arthur (2015) identify property-level flood protection measures that involve a broader collection of resilience measures, including insurances and resistance measures (e.g. a flood proof door). These measures especially reduce damages caused by floods instead of the pluvial flood risk itself.

If water retention and storage are not possible, water will be discharged by water flows, the third step in figure 2.3. A delayed discharge is preferred over a peak discharge. However, often not included is the very first step that can be taken, namely the direct use of rainwater. Both the direct use and water retention stage can be enhanced by informing and activating citizens.

2.2 Co-production

Co-production is an approach in which the state and non-state actors work together and contribute to the delivery of urban and environmental services or infrastructure (Broto et al., 2022; Wiewiora et al., 2016). In this research, co-production is about citizen involvement in service delivery, rather than in decision-making (Mees et al., 2017). Co-production extends beyond consultation or participation because the users are active agents of services rather than passive beneficiaries (Wiewiora et al., 2016). However, a precise analytical definition does not do justice to the wide array of co-production processes that occur in practice (Broto et al., 2022; Galuszka, 2019; Palmer, Polk, Simon & Hansson, 2020). The creation of city and community learning platforms by third parties is an example of co-production, as well as self-organised community groups that support their members through livelihood support (Broto et al., 2022). In general, co-production is understood as the provision of goods or services through relationships between service providers and service users, mainly public authorities and civil society, to which multiple parties contribute. With co-production, communities in sub-serviced areas can deliver services or goods which are beneficial to themselves, thus striving for more equal outcomes.

The following section is about the democratic values of co-production. After that, the types of co-production, citizen engagement and its drivers will be examined, followed by the process and the effectiveness.

2.2.1 Democratic values of co-production

Co-production is substantiated by democratic values because it is said to increase legitimacy, effective governance and social justice (Fung, 2015; Hatley, 2013). When people are more involved in the planning process, the legitimacy and public support are increased, as well as trust in the government. Based on the analysis of a wide array of papers by Mees et al. (2017), citizen co-production impacts legitimacy in many ways, and often positively. In other words, policy is more accepted when citizens and other actors are more involved. Involvement of actors in the funding as well as the practice of pluvial flood risk management changes the relationship between the public authorities and the private actors in such a way that accountability is shared. Clear communication on the distribution of responsibilities results in transparent implementation of pluvial flood risk mitigation measures which increases legitimacy as well. By engaging citizens, effectiveness is increased as well, because citizens can contribute with additional resources and are more aware of the local reality, which is why they can judge ethical and material trade-offs better (Forrest et al., 2021; Fung, 2015; Mees et al., 2017).

Co-production can increase fairness, but whether this happens is highly dependent on the way the planning process plays out. For example, increasing participation can shift the balance away from dominant groups in society (Fung, 2015). However, this often does not seem to be the goal of citizen engagement in planning processes. The objectives of innovative participatory approaches are enhancement of legitimacy and/or effectiveness. This sometimes advances social justice as well, but this is not the main objective (Fung, 2015). However, definitions of fairness and justice are based on normative assumptions. Mees et al. (2017) identify three approaches to assessing fairness. In table 2.2, these approaches are interpreted within the scope of pluvial flood risk management.

Table 2.2: Approaches of assessing fairness in relation to pluvial flood risk management

Approach	Meaning	Pluvial flood risk management
Utilitarian	Total benefits are the highest	Pluvial flood risk mitigation investments with the greatest return
Egalitarian	Equal opportunities in the distribution of resources	Minimum level of available resources to mitigate pluvial flood risk for everyone
Rawlsian	Greatest benefits are for the least advantaged	More attention to groups who are more vulnerable to pluvial flood risk

Source: Adapted from Mees et al., 2017

The benefits can either be individually enjoyed or collectively enjoyed, just like co-production can be either individually or collectively initiated (Mees et al., 2018). Measures on private property are most often individually initiated, but the benefits are enjoyed collectively: the overall water discharge is reduced. Whether this fits within the utilitarian, egalitarian and/or Rawlsian approaches to assessing fairness depends on the context. In general, collective enjoyment conflicts to a certain extent with the Rawlsian approach: collectively enjoyed does not necessarily mean the most vulnerable groups are given more attention. However, it also does not mean they are excluded. In fact, collectively enjoyed means it is enjoyed by everyone to a certain degree, hence the term ‘philanthropic’ used by Mees et al. (2018).

According to Mees et al. (2017), procedural fairness is also a key democratic value of co-production, meaning that every stakeholder has an equal opportunity to get involved. When capacities and vulnerabilities of communities are mapped and targeted during the process of co-production, procedural fairness, and thus an increase in legitimacy, is increased. In this regard, co-production challenges questions of access and distribution and therefore questions of recognition (Broto et al., 2022). According to Wiewiora et al. (2016), co-production increases users’ satisfaction and more

importantly, inclusion. Contrary to this, as a citizen, you could also be excluded from a co-production process (Faldi et al., 2022). Young people, local communities and homeless people are often not acknowledged as stakeholder groups. They have limited experience and knowledge and are often the most vulnerable, making it difficult for them to get involved in co-production (Wehn et al., 2020). Also, some may not have the required technical capabilities. This is necessary since technology is the mediator connecting the social (actor-related skills) and physical (technical devices) components of a planning process (Faldi et al., 2022; Wiewiora et al., 2016). The egalitarian approach can be either inclusionary or exclusionary because equal opportunities do not guarantee equal outcomes. Some people might be able to benefit more than others. According to the utilitarian approach, the overall benefits are the highest. This means that also here, people can be excluded from these benefits. A wider group of people might enjoy benefits, but it is not guaranteed for everyone. So, collective enjoyment of outcomes of co-production does not necessarily mean an increase in fairness.

The research of Broto et al. (2022) discusses co-production in countering urban inequality. In pluvial flood risk management, due to interconnected water systems in cities, there are not certain places or residents that could be held responsible. The different pluvial flood risks within a municipality make a few places and residents more vulnerable, but the co-production strategies fitting for pluvial flood risk management can be implemented by everyone, due to the interconnection of the water discharge system. The researched case studies, consisting of six cities in the Global South, by Broto et al. (2022) result in various co-production strategies countering these kinds of forms of urban equality. One of the case studies is the city of Kampala includes the problem of floods in sub-serviced neighbourhoods. The regular floods impact everyday life here which forces residents to initiate flood prevention actions via co-production. This is an example of an inequality driver that has been targeted by co-production. Overall, the projects in the researched cities successfully challenged issues of the distribution and recognition of knowledge. It bridged the gap between expert knowledge and the knowledge of citizens, therefore achieving shared goals by bringing together diverse knowledge and interests. This managed to overcome the fragmentation in social mobilization. So, forms of co-production could be based on democratic values and increase fairness, but they can also directly come from disadvantaged, marginalized communities out of necessity.

2.2.2 Types of co-production

The different forms in which co-production can take place, make it hard to predict and plan (Broto et al., 2022). Hence, the typology of co-production differs across literature. Faldi et al. (2022) come up with the term urban service co-production, which is understood as the relationship between urbanisation, society and the environment. In urban service co-production, the role of infrastructure is prevalent, together with the governance structures shaping it. This form of co-production does not only include the main networked services, like water systems, but also the less conventional ones, one of them being disaster risk management (Faldi et al., 2022).

To understand the process of co-production, the distinction between top-down and bottom-up is of importance. A top-down approach is initiated by a public authority, which is often the case in new settlements, relatively large city plans or regional planning (Pissourios, 2014). In some cases, a top-down approach is necessary to achieve long-term public value (Wiewiora et al., 2016). This shows that citizen engagement in co-production is not always necessary or desirable. For example, social housing is something that should be managed by a central public authority, which can monitor future trends and implement laws. The bottom-up approach on the other hand is initiated by lower levels of an organisation or the society, usually a community who have certain needs or problems (Pissourios, 2014). These communities are willing to initiate action and be part of planning procedures to achieve their

goals. The scope of purely bottom-up approaches is limited to local planning problems, often relatively small in scale. In large communities, bottom-up processes will either be slow and inefficient, or other forms will be used, like representative participation, which thus moves away from bottom-up planning (Pissouris, 2014). However, forms of co-production are very much dependent on the context and time in which it takes place, which makes the distinction between top-down and bottom-up difficult. It is never fully one or the other, but rather a combination of the two approaches.

However, there is a clear distinction between top-down and bottom-up considering the initiator of a co-production process. Mees et al. (2018) identify three types of the way in which co-production is realised. First, the top-down approach is split into two types: hierarchical and incentivised co-production. Hierarchical co-production includes types which are legally enforced by the government. Incentivised co-production is about encouragement by incentives. These incentives could consist of financial incentives, like subsidies, but could also occur in the form of awareness raising actions. The third identified type is deliberative co-production, which arises from the contradiction between top-down and bottom-up. Deliberative co-production involves a form of co-production which is based on a multi-directional dialogue between the state and the civil society. This form is to a lesser extent bounded by rules. Forms in practice can range from being strongly state-led to self-governance by citizens.

Figure 2.4: Range of deliberative co-production



Source: Mees et al., 2018

However, there are a few marginal notes to be made here. First, self-governance by citizens is often not understood as a form of co-production in the global North. Often, the public authorities retain a privileged position in these emancipatory forms as well (Galuszka, 2019). The other extreme, deliberative co-production that is completely initiated by the state, can be also categorised as hierarchical or incentivised co-production, depending on the strategy used: legal enforcement or encouragement by incentives. These three types of co-production can be aligned with the three governance approaches identified by Van de Meene et al. (2011): hierarchical, market and network, where the hierarchical governance approach corresponds with hierarchical co-production, the market governance approach with deliberative co-production and the network governance approach with incentivised co-production, although the market approach also has similarities with incentivised co-production. In practice, it is conceivable that the three types of co-production are combined and complement each other.

Forrest et al. (2021) come up with a similar typology: traditional authority-led interactions, creative and dialogical approaches and citizen-initiated contributions. The traditional authority-led interactions are comparable to the hierarchical form of co-production but also have similarities with the incentivised type since incentives are implemented by the state (Mees et al., 2018). Both dialogical approaches and citizen-initiated contributions have the strongest similarities with deliberative co-production, the first being more state-led, while the latter strongly leans towards self-governance. However, creative and dialogical approaches can also be categorised as incentivised co-production, in which citizens are for example encouraged to get involved in pluvial flood risk mitigation action by campaigns.

These many different typologies show that co-production models are context-based and flexible, which has a positive effect on the effectiveness. The objective of co-production is therefore not to create a

new institutional framework, but to change existing institutions when they fail to provide sufficient answers to problems in civil society (Broto et al., 2022). Therefore, different target groups and areas require different types of co-produced models (Mees et al., 2018).

2.2.3 Citizen engagement in co-production

Forms of co-production can take place between any actors, meaning citizens are not necessarily involved. When citizens are part of co-production, it does not mean that every citizen living in that area is involved. Citizens can also contribute in many ways without the involvement of any public authority. Citizens can arrange resources themselves through their network organizations in which public authorities are not included (Hatley, 2013). This often happens when public authorities lack adequate provision of answers to planning issues through a lack of capacity and/or passivity (Broto et al., 2022). For example, public authorities cannot (always) operate on private terrain. However, Mees et al. (2018) state that “before citizen input can be regarded as a form of co-production, there needs to be a form of interaction between authorities and citizens” (p.331). These interactions can lead to changes in the division of tasks and responsibilities between the authorities and the citizens. Examples of these interactions could range from regulations by authorities to mere deliberation between the state and society, comparable to the types of co-production ranging from state-led to self-governance by citizens (figure 2.4). This relationship between the civil society and the state can include individuals, households and organised groups (Mees et al., 2018).

In practice, citizens are often part of co-production, though in different forms and with different relationships. First, there is a distinction between service co-production and knowledge co-production, in which the first refers to the redefinition of public service delivery and the latter to knowledge gained from a multidirectional dialogue between actors with different expertise (Broto et al., 2022). However, this distinction is not always useful since both are needed in co-production: for the delivery of services, knowledge is needed and for the gathering of knowledge, appropriate services are needed (Broto et al., 2022). Mees et al. (2018) come up with a slightly more specific distinction of types of citizen input in co-production. The service co-production is split in this typology into co-funding and co-delivery. When citizen input is done by co-funding, the citizen financially contributes to a service or delivery. Co-delivery is about the direct delivery of services or goods. Apart from these theories, Forrest et al. (2021) show the practice of these forms. In the case study of Arnhem, citizens take physical measures and provide resources for consequence reduction and pluvial flood risk mitigation (Forrest et al., 2021).

According to Mees et al. (2018), the co-production of knowledge includes the gathering and sharing of knowledge by citizens. The availability of a certain set of knowledge of pluvial flood risk mitigation action is a key condition in taking pluvial flood risk mitigation measures. Even if citizens understand the problem and have the perceived responsibility, action may be deterred by the lack of information on pluvial flood risk mitigation measures and their implementation (Lamond & Proverbs, 2009). Both Broto et al. (2022) and Wehn et al. (2020) emphasise therefore the importance of experiential knowledge and the possibility of mutual learning. The accumulation of experiences through the collective process of learning generates a broader knowledge and evidence base which promotes collective action (Wehn et al., 2020). Mutual learning however is not necessarily achieved when a group of citizens or other stakeholders are involved in a form of governance. Only when stakeholder involvement is designed as social learning and the enabling conditions are facilitated, it creates opportunities for the development of well-informed contributions to water management and implementation (Wehn et al., 2020). Van de Meene et al. (2011) state that learning and capacity building take place in a network-based type of co-production, in which multiple types of stakeholders are involved, while according to Broto et al. (2022), this is also possible under the prevalence of

traditional planning and siloed thinking. In the more practice-oriented study of Forrest et al. (2021), the co-production of knowledge is split into two categories: knowledge and advocacy activities. Citizens can contribute via the gathering, updating and sharing of knowledge, on which a planning process is often based. Additionally, advocacy activities by citizens include campaigning to authorities for change and raising awareness. This is necessary because the awareness of the pluvial flood risk is generally low (Lamond & Proverbs, 2009). The category of advocacy activities is about persuading and changing perspectives of others, rather than sharing knowledge. Public education and promotion are effective in raising awareness for property-level flood protection measures (Owusu, Wright & Arthur, 2015).

Table 2.3: Categorisation of exemplified citizen contributions to co-production in different theorisations

Broto et al. (2022)	Mees et al. (2018)	Forrest et al. (2021)
Service co-production <i>e.g. self-organised livelihood support within communities</i>	Co-funding <i>e.g. collective tax revenue fund</i> Co-delivery <i>e.g. technical devices</i>	Physical action and resources <i>e.g. communities providing money for rain barrels</i>
Knowledge co-production <i>e.g. community learning platforms</i>	Co-production of knowledge <i>e.g. monitoring watercourses</i>	Knowledge <i>e.g. sharing solutions in post-flood walks</i> Advocacy activities <i>e.g. publishing measures in the local newspaper</i>

Source: Broto et al., 2022; Forrest et al., 2021 and Mees et al., 2018

In short, both service co-production and knowledge co-production can be split up. Service co-production can take shape in the form of co-delivery and co-funding, and advocacy co-production can be split off from knowledge co-production. All these types of citizen input in co-production can contribute to pluvial flood risk mitigation, though physical action, co-delivery respectively, is the most immediately visible in the built environment (Forrest et al., 2021; Mees et al., 2018).

The input of co-production is either individually or collectively provided, meaning by a group of people (e.g. a community) or in a cooperative form between two or more actors (Mees et al., 2018). The individual or community-based provision of input emphasises the emancipatory character that co-production has (Broto et al., 2022). For each of these types of contributions, there is a difference between a complementary and a substantive contribution, meaning either the citizen adds its input to an already existing process or fully initiates and manages the process by himself. The relational character in co-production establishes a certain interdependence which makes complementarity occur more often (Mees et al., 2018). In the case study of Arnhem, citizens gathered ideas and opinions of other citizens via surveys, which has been complementary to the reports and already existing pluvial flood models of the government (Forrest et al., 2021). However, a neighbourhood platform also provided money for rain barrels, which was purely self-initiated and thus substantive. Sometimes, it is hard to distinguish complementary co-production from substantive co-production. If measures fail to fully solve a problem, newly introduced measures could be considered as complementary to the existing basis, or substantive to the measures that failed (Mees et al., 2018). Overall, whether measures are complementary or substitutive to governmental action is clearer when the measures are taken by the government. Action initiated by citizens or other actors is often more flexible and less procedural. This can still even be the case when public authorities initiate action. This emphasises the dynamic and undefined nature of co-production once more.

2.2.4 Drivers of citizen engagement in co-production

The two key drivers of citizen engagement in co-production are the citizen's willingness and ability, which can be influenced by the policy of public authority (Forrest et al., 2021; Lamond & Proverbs, 2009). According to Forrest et al. (2021), the engagement of citizens is driven by pluvial flood risk and pluvial flood experiences, active citizenry and national policy agendas. These can be divided into personal factors (e.g. psychological factors) and situational factors (e.g. financial incentives) (Attems et al., 2020).

First, the pluvial flood risk itself is an indicator of pluvial flood risk mitigation action by citizens. According to Seifert et al. (2013), the higher the flood probability and disruption, the higher the willingness to pay. Even though the scope of the research of Seifert et al. (2013) is limited to fluvial flood risk, it does indicate that some citizens are able and willing to allocate resources to decrease disruption caused by floods. The actual pluvial flood experiences and the ways pluvial flood risk is perceived are more important drivers of pluvial flood risk mitigation action (Forrest et al., 2021; Lamond & Proverbs, 2009). However, as time passes after a pluvial flood event, people gradually recover and forget about the pluvial flood risk, decreasing the pluvial flood risk perception (Lamond & Proverbs, 2009). The willingness and available resources need to coincide to make flood mitigation action possible. The pluvial flood experiences, pluvial flood risk perception and 'active citizenry' are examples of personal (psychological) factors (Attems et al., 2020). In the Netherlands, pluvial floods are generally not perceived as dangerous, despite the damage and disruption it has caused (Forrest et al., 2021). However, due to climate change, heavy rainfall will occur more frequently in the future, raising more attention to pluvial floods as well as active citizenry in policy agendas (Forrest et al., 2021). The way pluvial flood risk is perceived can be enhanced by public authorities via knowledge co-production. This enhancement depends on the policy agenda of the national and/or local government and is therefore an example of a situational factor (Attems et al., 2020).

According to Hatley (2013), the preservation of the place is the main concern of citizen engagement in community-based planning. This drives citizens to initiate action themselves. Preserving the place refers to the conservation of the environment as the citizens know it and ascribe value to it. These citizens aim for land use decisions that are consistent with the existing area and the character of the community (Hatley, 2013). This aligns with the findings of Mens et al. (2023) who state that placemaking activities by citizens, often in collaboration with other actors like local authorities, add value and lead to the appreciation of the environment. Even though these findings of Hatley (2013) and Mens et al. (2023) are not necessarily related to land use decisions based on pluvial flood risk, the damage and disruption pluvial floods cause can stir up the sense of the place and its value, and thus call for action for preservation.

Forrest et al. (2021) recommend public authorities to first explore the experiences of citizens and then try to identify the support for forms of co-production and encourage them to take on responsibilities. The redistribution of responsibilities and tasks to lower structures can enhance effectiveness and trust but should be backed by the capacity of these structures (Ananda & Proctor, 2013). At the same time though, the barrier here to overcome is moving away from assigning tasks only to structures with proven capacity (Ananda & Proctor, 2013). Here, sharing knowledge and advocacy activities can enhance the distribution of responsibilities in co-production.

Additionally, other drivers of co-production are the investments of time and resources to provide the required economic capacity and knowledge (Mees et al., 2017). These investments of time and resources can be done by active citizenry as well as a public authority via policy agenda (Forrest et al., 2021). However, in financial terms, implementing pluvial flood risk mitigation measures is often not

cost-effective (Lamond & Proverbs, 2009). According to Mees et al. (2017), investments by public authorities to build a resilient community usually take three or four years. Users should be aware of the problem of limited resources of public authority as well (Wiewiora et al., 2016). With a service-centric approach, unwanted or unused services can be prevented from developing, reducing costs and increasing effectiveness (Wiewiora et al., 2016).

Alongside time and resources, social capital is a driver of co-production, which refers to the capability to form a successful network. As already noted, before a form of co-production can take place where public authorities and citizens are included, first a relationship or a form of interaction between the two is needed (Mees et al., 2018). However, according to Ananda and Proctor (2013), there is more needed than interaction only. Certain organisational capacity must also already exist in a community for successful collaboration to take place. Both public authorities and citizens need to have adequate organisational capital to be part of a collaborative approach (Ananda & Proctor, 2013). Building this capacity can form a barrier because tasks are usually assigned to actors who have proven to possess this capacity. However, public authorities can initiate a collaborative approach and provide guidance in building capacity that is missing. So, when public authorities have the perception that the citizens are (partly) responsible, it is likely that some sort of collaborative approach including capacity building is initiated. For example, in the case of Arnhem, this was done by post-flood walks in which insight into the experiences of citizens was gained (Forrest et al., 2021). Also, more innovative dialogic approaches were used to encourage citizens to get involved and share their ideas. For example, comedians visited the citizens to form a dialogue in an innovative manner. The success of such a collaborative approach partly depends on the citizen's perceived responsibility, which will further be discussed in the analytical framework (see chapter 3).

2.2.5 Process of co-production

To get more insight into how the types of co-production as well as citizen engagement play out, the process in urban space needs to be studied. Co-production is sometimes not institutionalised, especially the process of citizen engagement in co-production. A contradiction identified by Galuszka (2019) is the one of institutionalisation and flexibility, in which on the one hand, citizens' positions are strengthened in formal governance structures, but on the other hand, operating outside of existing norms is the strength of co-production (Galuszka, 2019). Flexibility and the capacity to operate in the informal sphere are key components of co-production (Galuszka, 2019). This could also be the case because establishing citizens' positions in institutionalised structures is difficult and poses new issues, for example when asymmetrical power relations arise in which the positions of citizens are relatively weak. The current practice of co-production is therefore usually characterised by political freedom through contestation between several actors on the construction of public space (Broto et al., 2022). This practice results in a categorisation of six strategies of emancipatory outcomes of co-production:

- Appropriating: repurposing urban resources
- Reclaiming: adapting underutilised resources
- Pluralising: adapting planning practices for underrepresented communities
- Transgressing: crossing institutional boundaries
- Uncovering: making assets of communities visible
- Contesting: disputing assets or dominant framings

Co-production strategies are continuously changing through time and are often long and complex processes (Broto et al., 2022). This is why examples of co-production processes may be categorised differently through time. It is also why a co-production process may cover multiple categorisations and

why the six categorisations can look similar. For example, surveying the assets of an underrepresented community that has a relatively higher pluvial flood risk can be both seen as uncovering and pluralising.

It should be noted that these six strategies derive from the research of Broto et al. (2022) in the global South, in which the opportunities for strategies of emancipatory outcomes can be highly different from the global North. In the context of the global South, emancipatory approaches are radical, and often done out of necessity. Most of the time, groups of urban poor operate in so-called conflict spaces, in which they are more productive than in planning arenas with regulatory decision-making mechanisms (Galuszka, 2019). In these conflict spaces, the urban poor operate in radical forms to push their agenda forward. Here, citizen action resembles conflict rather than cooperation. These activities are usually not driven by mechanisms initiated by public authorities, even when these mechanisms do exist to support the urban poor. In these informal conflict spaces, the urban poor have the capability to initiate action themselves via self-governance, the one extreme of the deliberative co-produced model (figure 2.4). This is mainly present in contesting and transgressing, in which dominant planning visions are actively disputed in ways which transgress the usual institutional boundaries. For example, this can be seen when informal settlements provide services like sanitation by themselves (Broto et al., 2022).

In the global North, strategies of co-production are generally more formal and institutionalised (Galuszka, 2019). Based on their research in Australia, Ananda and Proctor (2013) see that institutions and administrative inflexibility make collaborative approaches difficult. For example, the Controller of Water Resources has a large share in responsibilities in licencing, regulating and monitoring, and collaboration in this with lower structures is absent (Ananda and Proctor, 2013). Galuszka (2019) does value flexibility but states that some degree of institutionalisation needs to be present to construct a sustainable platform of collaboration. Citizen control in the co-production process must be balanced with the outcomes of the co-production process, which is secured by the provision of resources, often by public authorities (Galuszka, 2019). Here, relations of trust need to be built to create transformation by bringing diverse stakeholders together (Palmer et al., 2020). Active citizenry in these relations, citizens striving for more control, are needed to realise the provision of resources, often by public authorities. This happened for example when citizens of Arnhem initiated the transformation of greened parking areas which was funded by public authority (Forrest et al., 2021). Depending on the origin of these resources, this is an example of the strategies of appropriating or reclaiming (Broto et al., 2022).

2.2.6 Effectiveness of co-production

As mentioned under the democratic values, according to Fung (2015), the engagement of citizens raises effectiveness. Citizens are more aware of their local reality and can therefore better assess the effects of proposed solutions. The question here is how to measure the success of co-production. As Mees et al. (2018) state: "the incentives or obligations introduced by authorities must be successful, i.e. citizens must react with flood risk actions. If not, only an attempt to co-production is made" (p.8). This shows that when studying the process of co-production, the effectiveness of co-production is measured implicitly. This means that the success of co-production is not quantified but is indicated by the implementation of pluvial flood risk mitigation actions and the overall trends of cooperation between the citizens and public authority. The outcomes need to be perceived as effective according to the people who are affected by it (Mees et al., 2018). According to Palmer et al. (2020), appropriateness to the objectives of a project is ensured by evaluation. Evaluation is done by measuring the different effects. These effects differ in formats, timeframe and degree of distance to the project. This differentiation is brought back to three types of effects:

- First order effects: internal, immediate outputs of a project or activity
- Second order effects: impacts and changes within the participating organisations
- Third order effects: impacts on the wider community or society

Especially the second and third order effects are difficult, but important to measure. Evaluation of co-production needs to be formative in order to respond continuously to changes and to capture the experiences of project participants. This contributes to sustainable societal change because it helps building trust and improving the outcomes of co-production (Palmer et al., 2020). This trust building is important, especially when project participants do not possess certain knowledge to be able to assess the pluvial flood risk as well as the effectiveness of co-production themselves (Lechowska, 2022).

To raise the effectiveness of co-production, a long-term perspective of managing public infrastructures is needed, involving citizens in the delivery process to guarantee appropriate outcomes and optimal utilisation (Broto et al., 2022; Lamond & Proverbs, 2009; Wiewiora et al., 2016). Appropriate outcomes here refer to the prevention of pluvial floods in the long term. For example, to raise effectiveness, individualised engagement could be further implemented by engaging younger generations in solving public problems and making data more accessible, e.g. through social media. Overall, communicating, sharing knowledge and building relationships are key to effective co-production (Wiewiora et al., 2016).

Regarding the question of who needs to initiate action for the most effective form of co-production, the range from completely state-led to citizen self-governance should be kept in mind. Sometimes, citizen engagement is of vital importance for the success of co-production. However, the objective of citizens having greater control over the co-production process needs to be balanced with securing access to resources, which are often provided by public authorities. So, maintaining a degree of dependence on institutional settings and legal frameworks is seen as advantageous in collective actions (Galuszka, 2019). As Pissouris (2014) states that "the existence of some sort of legislation is crucial, as it provides formalized rules and procedures that can maintain the agreement reached through the participative processes" (p.93).

3. Analytical framework

To bridge the gap between the literature review and the data collection and result section of the research, an analytical framework needs to be formed. This will make the theoretical concepts measurable in order to gather data following the sub-questions.

3.1 The type of co-production and the level of citizen engagement

To analyse the type of co-production in practice, the distinction of hierarchical, incentivised and deliberative co-production is used (Mees et al., 2018). Hierarchical can be referred to as law and regulation. Therefore, what rules generally apply to citizens regarding pluvial flood risk management is important to research. The rules applying to private terrain regarding water retention are an example. Incentivised co-production can be referred to as positive stimulation, for example with subsidies. The level of citizen engagement can be divided between obligatory citizen engagement by rules and stimulated citizen engagement by incentives. The third type, deliberative co-production, can be characterised by the lack of structure and fixed instruments. This can be different per case, so customisation is an indicator here. In practice, these are often bottom-up initiatives.

The initiator is also of importance in determining what types of co-production are evident. In deliberative co-production, the citizen can be the initiator, namely in self-governance (Mees et al., 2018). In hierarchical and incentivised co-production, the public authority is the initiator.

Apart from the way a co-production process is initiated, the level of citizen engagement and thus the form of co-production depends on the distribution of responsibilities. Therefore, it is necessary to get to know what actors are involved and the distribution of responsibilities among those actors. A clear distribution of responsibilities is a key condition for effective co-production.

Furthermore, getting insight into the communication between the citizens and the municipality indicates the type of co-production. This is about how citizens are getting involved and how they are reached by the government, which is especially relevant in incentivised co-production.

3.2 Motivation of citizens to engage in co-production in pluvial flood risk management

For citizens to engage in co-production, they must both have the motivation and capability. The motivation and capability of citizens together with incentivisation by local governments form the three components of effective co-produced pluvial flood risk management (see figure 3.1). As Forrest et al. (2021) mention that "the growing expectation of greater citizen contributions to pluvial FRM needs to be coupled with an understanding that there will be variations in their willingness and ability to do so" (p.17). In the egalitarian approach, for example, all the actors have equal opportunities through equal distribution of resources, but differences in citizens' motivation and capability result in different thus unequal outcomes.

The motivation for citizen contributions is influenced by various factors, both intrinsically and extrinsically. The first indicator for the motivation of citizens to engage in pluvial flood risk management is the pluvial flood risk awareness of citizens (Lamond & Proverbs, 2009). The pluvial flood risk and pluvial flood experiences come forward as indicators of this awareness: when citizens live in a pluvial flood-prone area or have experienced pluvial floods themselves, they are more likely to engage in pluvial flood risk management (Forrest et al., 2021). Therefore, citizens' awareness is important to research, as well as its indicators of pluvial flood risk and pluvial flood experiences. The national policy agenda, campaigning and media can influence the pluvial flood risk awareness of citizens as well (Forrest et al., 2021; Lechowska, 2022).

Apart from the awareness of the pluvial flood risk, the way the risk is perceived is an important factor in the motivation of citizens to be engaged in the management of pluvial floods. Lamond & Proverbs (2009) state that “awareness itself does not produce action if perception of the probability of the event or the perception of the consequences of the event is lower than reality” (p.64). For the citizen to be motivated to initiate action, the risk should be assessed to a certain degree, so that action is warranted (Lamond & Proverbs, 2009). The pluvial flood risk and pluvial flood experiences influence the pluvial flood risk perception to a certain degree. Improving the communication further contributes to the pluvial flood risk perception, fostering pluvial flood risk mitigation actions by residents of pluvial flood-prone areas (Lechowska, 2018; Wieowiora et al., 2016).

Apart from having risk awareness and perception, perceived responsibility is also a key condition for citizens to engage in any form of co-production (Mees et al., 2017). Citizens must own the problem, meaning they must understand that it is (partly) their responsibility to initiate action, rather than the responsibility of other stakeholders only, like public authorities (Lamond & Proverbs, 2009). The perceived responsibility is especially a necessary condition for resource allocation by citizens. Perceived responsibility is influenced by knowledge about the pluvial flood risk as well as the distribution of responsibilities that exist in a certain area. Interactions between citizens and authorities can lead to changes in the distribution of tasks and responsibilities (Forrest et al., 2021). These interactions often result in more responsibilities for the citizens.

3.3 Capability of citizens to engage in co-production in pluvial flood risk management

Apart from willing to engage in pluvial flood risk management, citizens should also be able to. One of the factors influencing the capability of citizens to engage in co-production is knowledge (Lamond & Proverbs, 2009). Citizens should have the required knowledge for the actions they want to undertake (Ananda & Proctor, 2013). This can for example be the know-how to implement pluvial flood risk mitigation measures in the garden. Knowledge can be addressed as a possible barrier, but also as an opportunity by studying to what extent citizens are open to learning more.

Another factor influencing the capability of actors is the resources, financial or otherwise (Lamond & Proverbs, 2009). According to Ananda and Proctor (2013), the implementation of a collaborative approach relies on local groups as well as public authorities having enough available financial resources. The engagement of citizens can thus be financially incentivised by public authorities (Mees et al., 2018). Although public authorities can generally assign more resources, their resources are also limited. Citizens need to be responsible and aware of the problem of limited resources and competing needs (Wiewiora et al., 2016). The willingness to pay, and thus the amount of resources available, is partly based on the motivation of citizens to initiate action (Seifert et al., 2013).

The third and final factor influencing citizen’s capability to engage in co-production is self-efficacy (Mees et al., 2017). Lamond and Proverbs (2009) use the term ‘belief’ for this, which is mentioned as a necessary condition for citizens to engage in pluvial flood risk management. Citizens need to believe that engaging in a co-production process will enhance effectiveness. When citizens do not trust that their actions will be useful and effective, this will likely refrain them from engaging. Confidence in the effectiveness of measures is also influenced by pluvial flood risk perception, partly based on previous pluvial flood experiences (Lechowska, 2022).

3.4 Barriers of co-production in pluvial flood risk management

Clearly, the effectiveness of co-production depends on numerous factors, its key conditions. However, meeting these conditions can pose barriers to effective co-production of urban services. Simultaneously, these barriers can also be seen as opportunities for public authorities to incentivise

the capability and motivation of citizens, and thus co-production (see figure 3.1). For example, public authorities can incentivise a lack of resources by implementing subsidies.

For the municipal organisation, a significant challenge for effective co-production is the cooperation between the stakeholders. Wiewiora et al. (2016) state that the key stakeholders may have competing interests and lack a genuine dialogue with each other. This slows down the process and is at the expense of the effectiveness of service delivery. In addition, unequal power relations create situations in which some actors have more power to influence decisions and initiate action than others. This also touches upon the different target groups the municipality must deal with regarding citizen engagement.

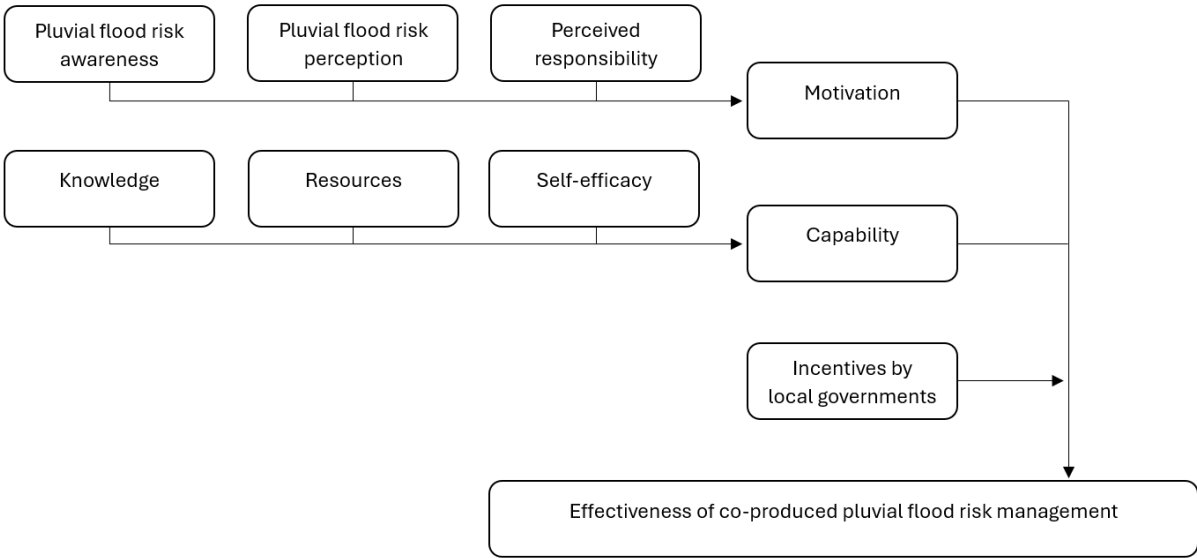
For citizens themselves, there are a few challenges to engagement in co-produced pluvial flood risk management. First, practical barriers hold back citizen engagement. The investment of time is necessary and can be a reason for citizens not to engage in pluvial flood risk management (Mees et al., 2017). Additionally, having a garden with enough space for greenery is essential in individually taking pluvial flood risk mitigation measures.

Furthermore, there are emotional constraints involving the negligence citizens have regarding the pluvial flood risk and possible mitigation action (Lamond & Proverbs, 2009). The uncomfortableness and maybe even fear of taking pluvial flood risk mitigation action is also included here. This has also to do with the generally low perceived responsibility. Often, citizens expect the government to maintain the built environment concerning pluvial flood risk, if they do not want to take action themselves (Forrest et al., 2021).

Laws and regulations can pose challenges for citizens to implement pluvial flood risk mitigation measures as well (Lamond & Proverbs, 2009). However, these can also restrict public authorities. Just like the fact that tenants are not always allowed to make changes on private property, this also applies to public authorities.

The key conditions of citizen engagement and incentives by local governments are examined in the data collection phase according to the analytical framework (see figure 3.1).

Figure 3.1: Analytical framework



4. Methods

4.1 General research strategy

To answer the main research question “How can local governments enhance co-production to increase effectiveness in pluvial flood risk management in urban areas?”, there is chosen for a mixed method research design. Using quantitative as well as qualitative methods, a better understanding is provided (Shackleton, Bezerra, Cockburn, Reed & Abu, 2021).

This research mainly explores the possibilities and drivers of co-production, making it exploratory research (Shackleton et al., 2021). It is an interpretative research approach because it explores the way a local government can enhance co-production (Biggs et al., 2022).

To address the analytical framework, the data collection has been carried out by interviewing ten experts via semi-structured interviews, each lasting between half an hour and an hour. The semi-structured interview contains guiding questions to find ways of allowing people to speak for themselves and discuss their own experiences and opinions (Ward, 2020; Shackleton et al., 2021). The expert interviews have been used to research citizen engagement in the types of co-production in Kampen and the incentives by the municipality of Kampen. The municipality of Kampen is chosen as a case, because of its location, policy and mix of older and newer areas. The municipality is chosen as a whole because the water discharge systems are connected throughout the entire municipality. Additionally, co-production can play out in different forms and places, so focusing on the entire municipality gives complete results. This will be further explained in paragraph 4.2.

Alongside the expert interviews, a citizen survey has been carried out with inhabitants from the municipality of Kampen. Using the survey, citizens’ motivation and capability have been researched to find answers to possible drivers and barriers of citizen engagement in pluvial flood risk management. These surveys have mainly resulted in quantitative data but also contained a few open-ended questions which allowed the respondents to elaborate on their answers (Shackleton et al., 2021).

Analysis of policy documents of the municipality of Kampen has complemented the data on co-production models, pluvial flood risk mitigation measures and government policy instruments. This has not predominated the data collection but merely added context to the data gathered in the surveys and interviews.

Table 4.1: Layout of the data collection methods

<i>How can local governments enhance co-production to increase effectiveness in pluvial flood risk management in urban areas?</i>	Citizen survey	Expert semi-structured interview	Policy Document analysis
SQ1: What types of co-production are evident in pluvial flood risk management in the municipality of Kampen and what is the level of citizen engagement?	x	x	x
SQ2: What drives citizens to engage in pluvial flood risk management?	x	x	
SQ3: To what extent are citizens capable of taking mitigation measures in pluvial flood risk management?	x	x	x
SQ4: What are the limitations and barriers of co-production in pluvial flood risk management?	x	x	

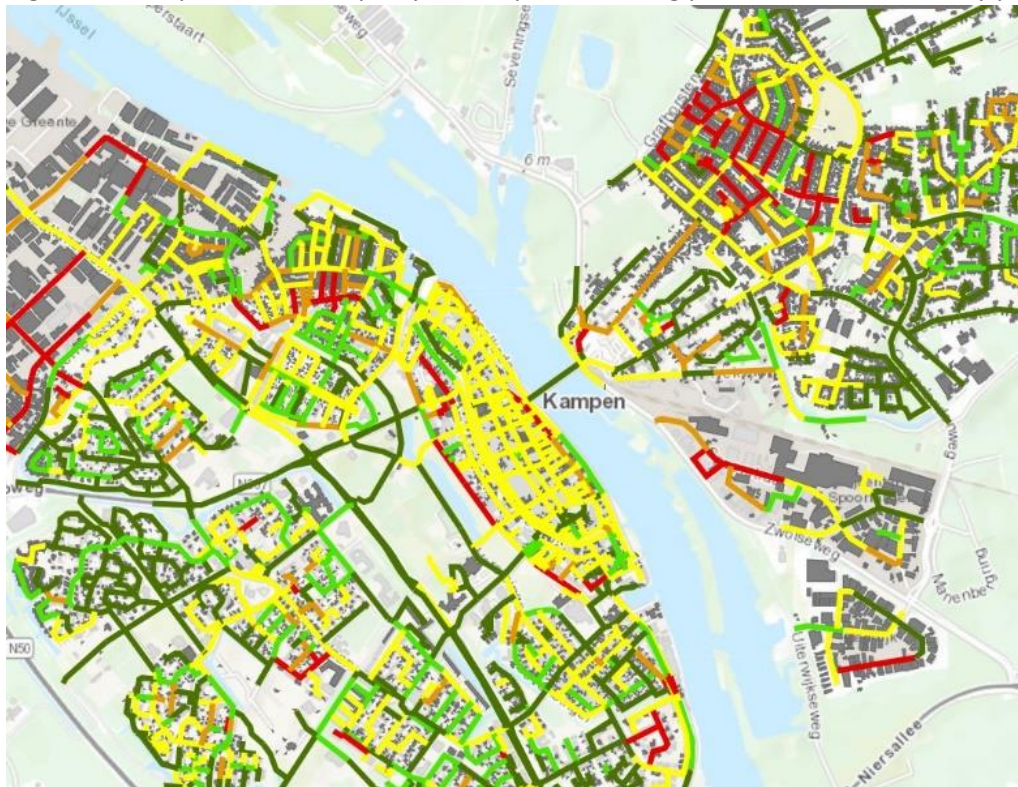
4.2 Case study

Kampen is a municipality with a population of more than 55.000 (KadastraleKaart, 2022). It is located in the west of the province of Overijssel, where the river IJssel flows in the IJsselmeer. The municipality of Kampen is characterised by a large peat meadow area and a lot of surface water. This is why its water management is interesting and relevant to research. The high percentage of surface water as well as certain bottlenecks make its pluvial flood risk management also interesting.

In the figure below, the vulnerability of pluvial floods during heavy rainfall is indicated per street. In the municipality, so-called stress tests are carried out. These are tests in which different types of rain showers are tested (Municipality of Kampen, 2023a). The results of these tests are based on water damage to buildings and traffic disruption. According to the definition used by the municipality, there is a pluvial flood when bike paths and/or property access roads are disrupted for more than two hours or puddles are present on public roads for more than four hours.

The results of the test with a rain shower of 70 millimetres in one hour are shown on the map below, ranging from dark green representing no pluvial floods to red representing serious water damage to buildings and/or traffic disruption (Municipality of Kampen & Sweco, n.d.).

Figure 4.1: Map of the municipality of Kampen indicating pluvial flood vulnerability per street



Source: Municipality of Kampen & Sweco (n.d.)

Mainly in the northeast of the municipality, in the town of IJsselmuiden, some neighbourhoods are relatively more vulnerable to pluvial floods. This mainly has to do with the fact that this is a relatively low-lying area as well as the absence of possible water storage at the surface. Figure 4.2 below shows the pluvial floods caused by a rain shower of 70 millimetres in one hour in IJsselmuiden. Pluvial floods that cause disruption are shown in blue. This ranges from white representing no pluvial floods to dark blue representing 30 cm of water on the streets. The buildings are assigned colours ranging from green representing no disruption, orange representing a pluvial flood with less than 10 cm of water depth

and red representing a pluvial flood with more than 10 cm of water depth. However, many of the red-coloured buildings have pluvial floods with 10 cm or higher water depth because of a cellar or a lower-lying garage.

Figure 4.2: Map of projected pluvial floods and damage to buildings in IJsselmuiden during a 70mm rain shower



Source: Municipality of Kampen & Sweco (n.d.)

To research the drivers for co-production in water management and the citizen's perception towards instruments implemented by governments, a clear overview of the instruments utilised by the municipality of Kampen needs to be formed. For example, in the programme for climate adaptation, sewage system and water (Municipality of Kampen, 2023a), the municipality names instruments like subsidies. In the municipality of Kampen, a climate subsidy is assigned for the following nine measures that can be taken by citizens (Municipality of Kampen n.d.):

- Detaching rain pipe
- Installing a green roof
- Creating a wadi (reduction of land surface for water retention)
- Remove pavement (destoning)
- Planting trees
- Creating a façade garden
- Installing reservoirs
- Collecting rainwater in a rain barrel
- Creating underground infiltration facilities (e.g. stormwater soakaway crates)

The climate subsidy is only available for citizens who live within the built-up areas (Municipality of Kampen, n.d.). In this research, these climate subsidies exemplify incentives by public authority (see paragraph 5.3). All these measures are technical property-level protection measures to mitigate the urban peak discharge, which thus fits within the framework of this research.

4.3 Operationalisation concepts

The concepts presented in the literature review and the analytical framework are operationalised to be able to measure them in the expert interview as well as the survey. First, the interview guide is separated into two sections: one regarding the pluvial flood risk management in Kampen, and one regarding citizen engagement within the pluvial flood risk management (see appendix 1.1). The first main questions are about the pluvial flood risk in the municipality of Kampen and the way in which this is dealt with. This situates the different roles and distribution of responsibilities there are within the pluvial flood risk management of Kampen. Regarding citizen engagement, the roles and responsibilities of citizens have been researched in the interviews. Also, there is referred to types of co-production using examples like regulation, subsidies and bottom-up initiatives. The communication between the government and the citizens is included too, as well as the limits to this. At the end, the interviewee is asked if anything important is missing in the interview. In this way, the interviewee is given the chance to add something important and/or draw a conclusion.

In the citizen survey (see appendix 2.3), the first part is about the pluvial flood risk awareness and perception of the citizens, in which first, the pluvial flood experience is asked on a frequency scale, and then the potential severity of pluvial floods and the pluvial flood risk perception are measured on a scale from 1 to 10. The next questions are about the perceived responsibility and the actions of the respondent. This is mostly done descriptively, so the respondents can explain their actions and reasoning. When they have not initiated pluvial flood risk mitigation action themselves, they are asked to pick their most important reason for this from seven choices. These choices are the six key conditions for motivation and capability (see figure 3.1) and the extra option 'other' which they can fill in if their main reason is not included. The option 'other' is used more often, to make sure people can express their own ideas and are not necessarily restricted by the given options. The next part is about their awareness and use of the climate subsidies of the municipality of Kampen. After that, there are statements regarding the greening of their garden with a 5-point Likert scale from strongly agree to strongly disagree. The statements include the most common barriers for greening the garden based on the literature review and findings from interviews. Furthermore, there are two questions regarding the respondent's openness to learn and their opinion on the effectiveness of individual action to mitigate pluvial flood risk on a scale from 1 to 10. There is chosen for a scale from 1 to 10 because generally, people are familiar with grading. At the end of the survey, the background features of the respondents are researched including their type of house and garden. To ensure that the respondent lives within the municipality of Kampen, the exact town in which they live is asked as well, including the option 'other' just in case of a misunderstanding. Also, age is included in categories, as this can be an indicator of engagement in co-production (Wehn et al., 2020).

4.4 Study Population

Ten experts have been interviewed, consisting of counsellors and policy officers of the municipality of Kampen, comparable municipalities, the water board and consultancy firms. The other municipalities that are included in this research are the municipalities of Deventer, Raalte and Zwolle. These municipalities are not part of the research area but are used to situate the debate of co-production in pluvial flood risk management in the region as well as verifying the quality and representativeness of the findings in the municipality of Kampen. A counsellor from the water board named Waterschap Drents Overijsselse Delta (WDOD) is included in the research because this is the local water board the municipality of Kampen deals with. Two consultancy firm representatives are interviewed as well because these two consultancy firms are or have been involved in one or more projects in Kampen. By

carrying out these ten interviews, information on pluvial flood risk management, models of co-production and incentives of the municipality have been gathered.

Table 4.2: Overview of interviewees and references

Interviewee reference	Role, organisation
Municipal official 1	Neighbourhood director, municipality of Kampen
Municipal official 2	Policy officer participation, municipality of Kampen
Municipal official 3	Management consultant and strategist water and climate adaptation, municipality of Kampen
Municipal official 4	Policy officer sustainability, municipality of Kampen
External municipal official 1	Counsellor water and climate, sewer manager, municipality of Deventer
External municipal official 2 & 3	<ul style="list-style-type: none"> - Counsellor urban water management and climate adaptation, municipality of Zwolle - Driver of citizen initiatives climate adaptation, municipality of Zwolle
External municipal official 4	Developer climate adaptation, municipality of Raalte
Water board counsellor	Counsellor water, Waterschap Drents Overijsselse Delta (WDOD)
Consultancy firm representative 1	Counsellor and co-owner consultancy firm
Consultancy firm representative 2	Garden and landscape designer, owner consultancy firm

The study population for the citizen survey consists of every household living within the boundaries of the municipality of Kampen. The respondents do not have to have a garden or be able to alter the design of their garden to participate in the survey, because this can be one of the barriers identified for sub-question 4. For example, residents in the rental sector are not allowed to make severe changes in their gardens, but still, these residents are part of the study population. Additionally, people for whom the climate subsidy does not apply are still part of the study population, because these can still be useful results in identifying the barriers as well. Furthermore, the climate subsidies in the municipality of Kampen are just an example of an incentive by public authority, and co-production can play out in more different ways.

4.5 Methods for data collection and data processing

For the semi-structured interviews with counsellors and policymakers, a snowball method is used, where policymakers will link the researcher with other policymakers and counsellors with the right expertise on the topic within their organization (De Vocht, 2021). This way, the researcher has found the right person on the topics of citizen engagement and co-production processes in the municipality of Kampen and three comparable municipalities as well as on the topic of pluvial flood risk mitigation measures that can be taken on private property.

The survey for citizens has been made as short and simple as possible, to stimulate proper response. To reach as many households as possible, the survey has been conducted in different ways. First, it has been published in the local newspaper of the municipality of Kampen using an invitation (see appendix 2.1). Additionally, the link to the survey was shared on social media via an employee of the municipality of Kampen. However, most importantly, the researcher has physically invited citizens to complete the survey at the town hall of the municipality of Kampen and on an event day on a construction site. Physically inviting people generated approximately 80% of the total response. The survey has been completed by 114 households from the municipality of Kampen.

The interview data has been analysed by transcribing and coding (Bryman, 2016). The transcribing is done in colloquialism, to present the literal expressions of the experts. The data analysis of the survey is done using SPSS to explore patterns and relations between the different indicators (De Vocht, 2021). The results of the few open questions from the survey have been analysed in the same way as the expert interview answers.

4.6 Reliability and validity

The interview guide has been set up according to the theory on water management and citizen engagement in co-production (see appendix 1.1). The experts were directly asked about concepts and examples of theory in the interviews. The theory has also served as input for the survey. This should have ensured that both the interview data and the survey data correspond with the theory, and therefore directly contributed to answering the main research question. This ensures the internal validity of this research.

The snowball method has made sure the right interviewees with the right information have been approached. The experts have different backgrounds and roles within different organisations, which has increased the reliability of the data. Regarding the citizen survey, the invitation in the local newspaper ensures a high validity since every household within the research area has an equal chance to be included. This also applies to the physical invitations, because in the town hall, the department of civil affairs concerns every inhabitant of the municipality and the event day on the construction site was publicly accessible. This applies to a lesser extent to the invitation via social media. The total combination of inviting citizens via the local newspaper, social media and physically as well as the number of responses of 114 itself ensure a high reliability and internal validity, which means that the results are generalisable to the entire municipality of Kampen.

By interviewing a wide range of counsellors from different organisations, the external validity is increased. Findings regarding citizen engagement and incentives in the municipality of Kampen can be compared to the findings of the other municipalities, the water board and the consultancy firms. The results are also useful for other municipalities who want to implement co-production or who face a high pluvial flood risk. Regarding the representativeness of the citizen survey, the results can be compared to the engagement profiles. However, the results of the survey can be biased when only certain people have participated, for example, people who are particularly interested in the topic. Still, a mixed group of people have participated, thanks to the different approaches to carrying out the survey, which has increased the external validity.

4.7 Ethical considerations

The interviewees as well as the survey respondents were both informed about the use of the data and their anonymity. The interviewees were specifically informed about the fact that the recording of the conversation was only used for the research and deleted afterwards. They were also specifically asked for their consent. If they had questions regarding the use of the data and their anonymity, there were plenty of possibilities to ask these, both at the beginning and at the end of the interview. Finally, the interviewees are asked if they want to receive the report of the results once it is finished.

The introduction of the survey provides a proper explanation of the contents of the survey and the use of the data. Since the survey has been placed in the local newspaper, it is stated that the research is done on behalf of the municipality (see appendix 2.3). It is emphasised that participation is voluntary and anonymous. At the end of the survey, the participants were given the opportunity to leave any questions or comments. Finally, by filling in their email address, they could receive the results of this research if they wanted to.

5. Results

5.1 Pluvial flood risk management in the municipality of Kampen

To find out what types of co-production are present in the municipality of Kampen, first, the basic organisation regarding the pluvial flood risk and its management will be outlined and examined.

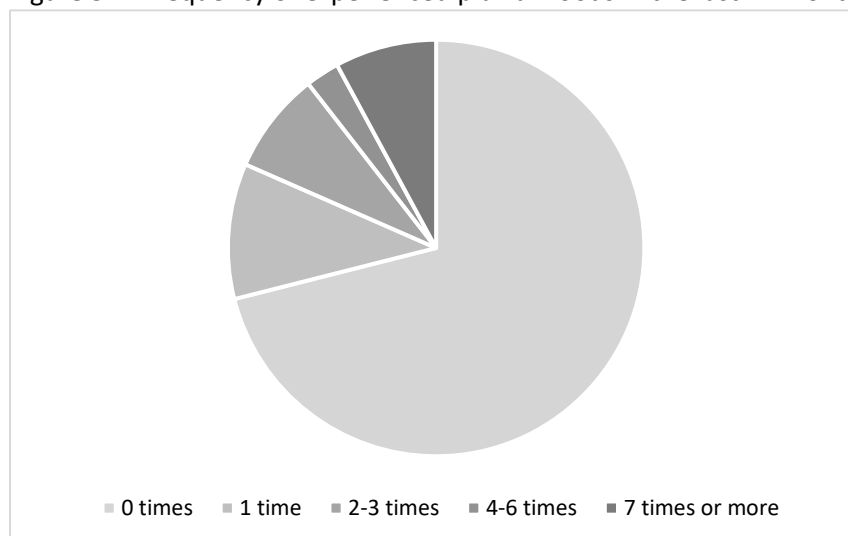
The pluvial flood risk in the municipality of Kampen

Pluvial floods and disruption can be caused by peak rainfall or long-lasting wet periods. The peak rain showers cause the most disruption in urban areas in the municipality. The rural area in the municipality is more vulnerable to long-lasting wet periods. This is partly because the peat and clay soil do not allow optimal infiltration and retention, but this is more about groundwater management. Regarding pluvial flood risk management, the urban peak discharge is the biggest problem, for the living environment as well as for the purification process from the water board. Some urban areas of the municipality are more vulnerable to pluvial floods than others because of differences in elevation. The peat and clay soil can also make infiltration measures difficult in some places in the urban areas.

In the municipality of Kampen, a pluvial flood is defined as rainwater flowing into a building via the street, water that blocks an access road and/or a bike path for more than two hours, water that disrupts traffic for more than four hours or wastewater coming from sewage systems onto the street (Municipality of Kampen, 2023a). Minor disruptions caused by rainfall, like flooded gardens, need to be accepted by the citizens unless it lasts for a long time (Municipality of Kampen, 2023a). The municipality of Kampen uses model calculations with rain showers that are expected to occur once every hundred years. This amounted to 70 millimetres in one hour in the last calculations, but this standard has been increased to 80 millimetres in one hour. This number of millimetres of a rain shower that occurs once every hundred years can increase over time due to climate change.

Whether the citizens of the municipality of Kampen have experienced a pluvial flood is measured on a frequency scale. The results of the citizen survey show that 71.1% have not experienced a pluvial flood in the last 12 months.

Figure 5.1: Frequency of experienced pluvial floods in the last 12 months



Roles and responsibilities in the municipality of Kampen

The municipality of Kampen is responsible for the public space, including its water management. However, the municipality can only operate in the public space, which raises difficulties.

“The division in Kampen is approximately 40/60, 40% of the municipality is public space and 60% is private terrain.” [De verdeling in Kampen is ongeveer 40/60, 40% van de gemeente is openbare ruimte en 60% is particulier terrein.] (Municipal official 3)

Taking climate adaptive measures is therefore promoted by the municipality, but this is not specifically aimed at pluvial flood risk mitigation. For example, in the communication, the municipality does promote the greening of people’s gardens but does not explicitly explain the reasons for doing this regarding pluvial flood risk mitigation. The municipality does monitor the public space by carrying out stress tests every six years, to see where bottlenecks exist in terms of pluvial flood risk. These bottlenecks are approached within the next six years in consultation with the local citizens via risk dialogues. However, in solving these bottlenecks, the municipality is not able to take pluvial flood risk mitigation measures on private terrain.

“We can solve a big part of our bottlenecks in the public space, but not everything.” [En een groot deel van onze knelpunten kunnen we ook oplossen in de openbare ruimte, maar niet alles.] (Municipal official 3)

Therefore, the citizens in the urban areas are stimulated to take pluvial flood risk mitigation measures. Since some urban areas are more vulnerable to pluvial floods than others, some measures on private property are more effective than others. However, the incentives used by the municipal organisation apply to all the urban areas in the municipality.

Newly built houses in Kampen are not connected to mixed sewage systems. Here, property owners are expected to process the rainwater falling on their property themselves, which means they are not allowed to pass it on to other properties, the sewage system or the public space, except ditches and surface water bodies. In newly built neighbourhoods, there are facilities present for rainwater storage and infiltration. This rainwater regulation is not actively enforced by the municipality nor are there any regulations on the design of people’s gardens, because this generally generates resistance among the inhabitants and the enforcement of the regulation is merely feasible. Enforcement of this type of regulation does happen elsewhere in the Netherlands, although this is not always active.

The water board is responsible for the purification of wastewater and the quality of the surface water in the municipality of Kampen. For the water board, the storage and delayed discharge of rainwater is important to prevent peak rainfall causing overload problems in the wastewater treatment plants. The water board emphasises the importance of pluvial flood risk mitigation measures on private properties:

“You would prefer that everyone stores a little or is discharging slowly.” [Het liefst heb je dat iedereen een beetje vasthoudt of vertraagd aan het afvoeren is.] (Water board counsellor)

The water board does not advise the citizens directly, but it does raise awareness by actively informing and educating citizens.

5.2 Citizen engagement in co-production in the municipality of Kampen

Regarding the roles and responsibilities of the citizens and the municipality of Kampen, citizen engagement in co-production is desirable if not necessary in the pluvial flood risk management. Before looking into the types of co-production that are evident in the municipality and the citizens’ perspectives, first, the citizen profiles and the municipal vision on citizen engagement need to be studied.

Citizen engagement profiles

The level of citizen engagement is studied by Citisens, in which citizens are divided into eight different

profiles. This categorisation is based on their general engagement and trust in the government. This identification is made for every zip code area in the Netherlands.

Figure 5.2: Citizen engagement profiles based on engagement (vertical axis) and trust (horizontal axis)



Source: Necker, 2023

According to the generated engagement profiles in the municipality of Kampen, 47% of the population in the municipality of Kampen are in 'Alerte Families' (alert families) and 'Gehaaste Gezinnen' (hurried families), which generally have less trust in the government and are not proactive in cooperating with the government. This categorisation is based on personal characteristics, like income, media preference and social media use. These two dominant profiles in Kampen indicate that the majority of citizens desire only to be contacted online. Encouraging engagement among these citizens is a challenge for the municipality.

"I don't think young people feel the urgency to think about the future. That they just don't care about that. And families are just too busy." [Ik denk dat jongeren niet de urgentie nu voelen om na te denken over de toekomst. Dat ze daar gewoon niet mee bezig zijn. En gezinnen zijn gewoon te druk.] (Municipal official 1)

The approach of any spatial development from the municipality can be adapted to the citizen profiles so that the developer can better estimate the expectations. These citizen profiles thus call for a customised approach depending on the profile. However, these profiles cannot be looked at on an individual level. Developments in the public space mostly cover a larger area in which decisions must be made, dealing with multiple citizens and social groups with different profiles.

“They are tools to make a choice and we are always in favour of customisation. But I do think, per street or per area, that we opt for one major, often one approach.” [Het zijn hulpmiddelen om een, om een keuze te maken en we zijn altijd voor maatwerk. Maar ik denk wel, per straat of per gebied, dat we wel voor één grote, vaak voor één aanpak kiezen.] (Municipal official 2)

Municipal vision on citizen engagement

It was found that the municipality of Kampen is obliged to include citizens in planning processes, but in what way or to what exact extent is not predetermined. The municipal organisation as well as the comparable municipalities, the water board and the consultancy firms all emphasise the value of citizen engagement in projects. For example, for a development project of a street in the city of Kampen, municipal officials had organised an information evening outside, on that location, to make it as easy as possible for citizens to become engaged.

“And then we just literally talked to people there on the street.” [En dan hebben we gewoon echt letterlijk daar op straat, hebben we mensen gewoon gesproken.] (Municipal official 4).

Adapting to the specific case is perceived by the municipality to be of key importance in co-production, since every case is context-based, thus asking for a special approach. Customisation in Kampen is therefore of crucial importance for the effectiveness of a co-produced approach. There is a general municipal vision on community-oriented working and participation, but there is no standard checklist of citizen engagement that needs to be completed in a project at a municipal level. This results in different approaches in the municipality, as enthusiasm for citizen engagement varies among individuals within the municipal organisation. Therefore, the way the municipality approaches the citizens to raise awareness or start cooperating can differ. On the one hand, the municipality wants to leave room for a flexible approach:

“It is not my goal that in two years' time all participation will be done in a certain way.” [Het is niet mijn doel dat over twee jaar alle participatie op een bepaalde manier gedaan wordt.] (Municipal official 2)

On the other hand, however, the municipality wants a more unambiguous vision on which the departments of the municipal organisation are more aligned. A clear framework and more alignment in the organisation regarding citizen engagement will enable co-production to become more effective in the municipality of Kampen. Within the framework, municipal officials should have the space to still customise their approach to a certain case. However, sometimes, an intervention in the public space does not ask for citizen input at all.

“Whether it is actually necessary to enter into dialogue in advance in all cases? I don't know about that. Sometimes it just is what it is, right? Then something just must happen.” [Of het daadwerkelijk nodig is om in alle gevallen echt van tevoren de dialoog aan te gaan? Dat weet ik niet. Soms is het ook gewoon wat het is, hè? Dan moet er gewoon iets gebeuren.] (Municipal official 2)

In these cases, the municipality is merely informing the citizens, rather than engaging. Informing people well and clearly is important here, but it is the lowest step of citizen engagement. Still, information evenings are often organised, which give citizens the chance to react and ask questions. However, merely informing citizens is less common in Kampen and not preferred by the municipality.

The types of co-production

The co-production types existing in the municipality of Kampen arise from the policy of the municipal organisation as well as the level of citizen engagement perceived as necessary. The municipality of

Kampen does not impose regulation on the design of people's gardens, thus shifting away from what is referred to in the literature as hierarchical co-production. However, the types of incentivised and deliberative co-production are present.

Co-production in the pluvial flood risk management of Kampen mainly arises in an incentivised form by the municipality, so engagement is mainly voluntary. This has been an explicit administrative choice by the municipal organisation. Compared to regulation, positive incentivisation is believed to be less effective, but in the end, it is believed that the inhabitants are more willing to cooperate:

“Residents are more likely to do something for positive reasons than because they are required to do so by the government, which often causes resistance.” [Bewoners zullen eerder iets uit positieve overwegingen doen dan dat het moet van de overheid, dat wekt toch vaak weerstand op.] (Municipal official 3).

By keeping in close contact with the municipality, the citizens are encouraged to improve their own living environment. For example, in Kampen, there are information evenings organised once a while, in which information can be shared and citizens can engage by giving input. The attendance on these evenings varies, which is why these are sometimes arranged in creative ways, for example outside, so that it is visible and easily accessible for residents. It is important to create support among the citizens, but only feasible to a certain extent:

“You will never keep everyone 100% satisfied. But I think if you have 80%, then you have come a long way.” [Je zal nooit 100% iedereen tevreden houden. Maar volgens mij als je 80% hebt, dan ben je al een heel eind.] (Municipal official 4)

The choice for positive incentivisation in Kampen is not without critique. In a newly built neighbourhood, a resident had made a wadi, while all the neighbours had their gardens mainly paved. This resulted in all the rainwater flowing towards the garden in which a wadi was placed. Newly built dwellings do need to meet stricter conditions, but as said, regarding the design of people's gardens, there are not any enforced rules. The more requirements there are for new construction, the more this will cost for the developer. These costs will drive up the housing prices: something that the municipality wants to prevent.

Deliberative co-production is also present in the municipality of Kampen in the form of bottom-up initiatives, but this does not predominate. When a citizen comes up with an initiative, their point of contact with the municipality is their so-called neighbourhood director. Since 2016, there have been four neighbourhood directors, who are the link between the citizens and the municipality. Citizens contact the neighbourhood director for a lot of things, for example, complaints and new initiatives. Bottom-up initiatives are either spatial initiatives, which means they must comply with rules and thus follow a fixed route, or the initiatives are not included in this regulation, asking for a customised approach. The initiator is in both cases encouraged to get as many neighbours on their side as possible by themselves (Municipality of Kampen, 2023b).

“We then really take them by the hand. And yes, but they have to want it themselves, so we are not going to take the work off their hands, but we do provide advice...” [We nemen ze dan echt bij de hand. En ja, maar ze moeten het wel zelf willen, dus we gaan niet hun werk uit handen nemen, maar we geven wel advies...] (Municipal official 1)

The neighbourhood directors are in good contact with other organisations and can lobby within the municipal organisation for the citizen's needs, for example for financial support. The citizens can achieve more by contacting the neighbourhood directors. Therefore, involving the neighbourhood

directors in a planning process remains important, because they are familiar with their neighbourhood and its residents. These forms of co-production show that the municipality of Kampen finds it important to take bottom-up initiatives seriously and work together on private terrain as well as in the public space.

“You really just can't avoid doing that at all, because it's their street after all...” [Je kan het echt gewoon niet maken om dat niet te doen überhaupt, omdat, het is hun straat uiteindelijk...] (External municipal official 4)

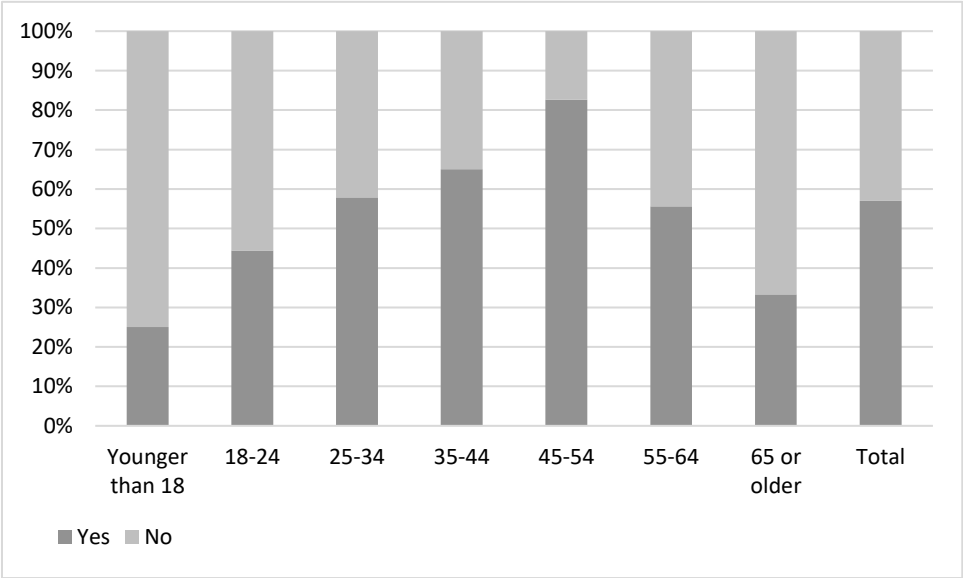
This type of co-production is an example of a deliberative form of co-production, in which citizens discuss and cooperate with a policy practitioner from the municipality about a specific initiative.

Another type of deliberative co-production in Kampen moves more towards self-organisation, in which citizens are encouraged to implement urban greenery by the ‘Groene Loper Kampen’ (the green runner Kampen). This organisation was established by the municipality, but now stands completely apart from the municipality and is run by volunteers. It adopts community-based initiatives, for example, the greening of the neighbourhood, the creation of a façade garden or the transforming of grass areas into flower areas. This organisation is again a form of deliberative co-production, in which the municipality does not play a big role and leaves it up to the citizens.

Citizens' perspectives on engagement in the municipality of Kampen

An additional perspective on the nature and extent of engagement comes from citizens. The results from the survey indicate that 57% of the respondents actively do something to mitigate the pluvial flood risk. Especially the age group of 45-54 indicates to actively take measures, amounting to 82.6% of the citizens within this age group. The younger and the older from there, the less engaged they are in pluvial flood risk management.

Figure 5.3: Citizen engagement in pluvial flood risk management by age



Most citizens indicate that they are engaged in pluvial flood risk management by having a lot of greenery in their gardens so that rainwater can infiltrate. Also, a significant number of citizens have a rain barrel in their garden.

For the citizens who are not engaged, the most important reason is that they do not possess the knowledge to take measures themselves (32.7%). The second most common reason is that people do

not experience problems with rainwater themselves (22.4%). Both 'I don't think it is necessary' (14.3%) and 'I don't have the resources to do something' (12.2%) are also common explanations. An important note to make here is that people who indicate not to actively take measures against pluvial flood risk still might have a predominantly green garden design. They just might not see this as pluvial flood risk mitigation action, or they might not be aware of the issue of pluvial flood risk at all.

5.3 Incentives to enhance co-production in pluvial flood risk management

In the municipality of Kampen, the type of co-production is thus mainly incentivised. The municipality stimulates citizen engagement in co-produced forms using instruments like subsidies, the provision of information and practical support (Municipality of Kampen, 2023a). The following section now examines the climate subsidies and then the practical support by the municipal organisation.

The climate subsidies

A prime example of an incentive in the municipality is the climate subsidies. In 2022, the municipality of Kampen started with a rain barrel subsidy, so the citizens could save up water during the year to utilise in their garden during dry periods. Due to the success of this subsidy and the persistent necessity of climate adaptation, this subsidy was expanded in June 2023 to incentivise further climate adaptation on private properties. The citizens of Kampen can now get a subsidy for nine different measures on private terrain that contribute to the mitigation of pluvial flood risk, heat stress and drought. For example, for the installation of a green roof, people can get a subsidy of 20 euros per square metre. Obviously, there are some conditions which need to be met. For example, the climate subsidies only apply to households and non-commercial social institutions located within the city limits (Municipality of Kampen, n.d.). This is because peak rain showers cause the most disruption in urban areas. The climate subsidy is an example of incentivised co-production in Kampen: the citizens are positively stimulated to engage in pluvial flood risk management. The subsidy also has a communicative function, because it can raise awareness of the issue of pluvial flood risk and other issues as well as showing the importance of citizen engagement.

The objective of the climate subsidy is to stimulate people to take measures, rather than making sure citizens can take measures for free. It thus does not cover all the costs of a climate adaptive measure but should be seen as a contribution. This does pose some issues regarding equality:

"But you will of course always have a group that are excluded from it. People who cannot pay part of it themselves or who are not intrinsically motivated or do not have the capacity to do it." [Maar je zal altijd een groep hebben die het natuurlijk buitensluit. Mensen die niet een deel zelf kunnen betalen of die niet intrinsiek gemotiveerd zijn of niet de capaciteit hebben om het te doen.] (Municipal official 4).

The climate subsidy resembles the egalitarian approach, in which everyone within the city limits has equal opportunities in the distribution of resources. However, this thus does not guarantee equal outcomes, as shown. This specifically relates to the capability of citizens. For example, citizens with a bigger garden tend to benefit more from the subsidy, because they have more room for relatively simpler and cheaper measures.

Monitoring the effects of the climate subsidy is not explicitly done, however. The property-level measures are small-scale, which makes them impractical and less relevant for the municipality of Kampen to monitor. However, regarding the costs, separating one square metre of the surface from the rainwater drainage is €8 in subsidies for private terrain and €27 in the public space. This difference is explained by personnel costs, soil research and other environmental aspects which need to be

considered in the public space. The government does have more control over the public space than over the property-level measures. The municipality of Kampen has reserved €100.000 per year for the climate subsidies. The subsidy has been available for one year, and €50.000 has been used for climate adaptation on private terrain, which is less than expected. The comparable municipality of Deventer sees a stagnation in subsidy applications after a few years:

“I think we do notice that the low-hanging fruit has been picked, so to speak, because we have had that arrangement for a number of years.” [We merken wel dat volgens mij een beetje het laaghangend fruit geplukt is, zeg maar, doordat we die regeling al een aantal jaren hebben.] (External municipal official 1)

Therefore, new incentivisation is needed to keep citizens interested. However, this also depends on whether the existing subsidy is known by citizens. In Kampen, 66.7% of the citizens are not familiar with the climate subsidies. In total, 4.4% of the respondents have made use of it (5 out of the 114 respondents). Most of them used it to purchase a rain barrel. For all of them, the subsidy has been a financial aid that helped them over the line. The most common reasons not to have used it for people who do know the subsidy are that they can pay it on their own, they have not decided on it yet and are still thinking about it, or they cannot take measures due to practical reasons like the lack of space.

Rainwater coaches

The support of the municipality does not end with a financial incentive. Apart from the availability of resources, the know-how often is a barrier. Providing advice on the implementation and usage of pluvial flood risk mitigation measures can convince people to take action. That is why the municipality of Kampen started a project to train so-called rainwater coaches who can provide advice to citizens. To stimulate pluvial flood risk mitigation action, the municipality tries to make it as easy as possible for the citizens.

“And then we have come up with a few measures that are really accessible and cost little money, but are also easy to implement.” [En dan hebben we een paar maatregelen bedacht die echt heel laagdrempelig zijn en weinig geld kosten, maar ook makkelijk te maken zijn.] (Consultancy firm representative 2)

In Kampen, this project just started in 2024. This project has proven to be successful and significantly contributes to pluvial flood risk mitigation in other municipalities.

5.4 Motivation of citizens to engage in co-production in pluvial flood risk management

One of the driving factors of citizen engagement in co-production is the motivation of citizens. This is examined by the indicators of pluvial flood risk awareness, pluvial flood risk perception and perceived responsibility, according to the analytical framework.

Pluvial flood risk awareness

Engaging and activating citizens starts with raising awareness. For the government, this seems even more important than making sure citizens take measures.

“If citizens are not aware and it does happen to them, yes, they will of course always point to someone else... Then, the government has done it.” [Als bewoners niet bewust zijn en dat overkomt ze wel, ja, dan wijzen ze natuurlijk altijd naar een ander... Dan heeft de gemeente het gedaan.] (Consultancy firm representative 1)

This also shows the issue of distribution of responsibilities when the pluvial flood risk awareness is generally low. On a scale from 1 to 10, people estimate the pluvial flood risk in the future to be 4.46 in

severity on average. Citizens who have not experienced pluvial floods estimate this severity at 4.17 on average, while citizens indicating to have experienced pluvial floods 7 times or more in the past 12 months estimate the severity much higher, at 7.44 out of 10 on average.

To raise awareness, the municipality of Kampen focuses on greening the garden in general, instead of explicit pluvial flood risk mitigation. This is a missed opportunity and is not always effective either:

“Green is a bit more appealing, but it is also difficult. Not everyone is enthusiastic about greenery.” [Groen spreekt wel wat meer aan, maar is ook moeilijk hoor. Lang niet iedereen is warm te maken voor groen.] (External municipal official 4)

Pluvial flood risk perception

Communication between the municipality and the citizens is key in any type of co-production. Regarding pluvial flood risk management, communication is used to raise awareness among the citizens to warrant action. This is done by information evenings in which stress tests are used to show the pluvial flood risk. The municipality also engages in so-called risk dialogues with citizens to approach the bottlenecks in the municipality, places with higher pluvial flood risk. If a stress test shows a relatively high pluvial flood risk, a risk dialogue is started in that area. From there, a collaboration between the municipality and the citizens is built. However, when the pluvial flood risk is not recognised by the citizens, these places will not undergo any changes. On the other hand, when citizens experience a pluvial flood or (minor) disruption, they start the dialogue with the municipality themselves.

The pluvial flood risk needs to be perceived by the citizens as such, that action is warranted. Therefore, the municipality must be flexible and responsive to weather conditions.

“If as a government you want people to do something, you must respond immediately to these types of weather conditions.” [Als je als overheid wil dat mensen iets doen, moet je gelijk reageren op dit soort weersomstandigheden.] (Consultancy firm representative 2)

After a very rainy 2023 and spring 2024 and several pluvial floods elsewhere in the Netherlands, it is more likely that people are more aware of the pluvial flood risk and thus find it important to take action. On average, citizens rate the importance of taking pluvial flood risk mitigation action 8.01 out of 10. However, results show that people who are not engaged in pluvial flood risk management rate the importance of taking pluvial flood risk mitigation action at 7.98 on average and people who are engaged at 8.03, which is a very small difference.

There is a weak, positive correlation between the pluvial flood risk perception and the pluvial flood risk awareness, $r(112) = 0.28$, $p = 0.003$.

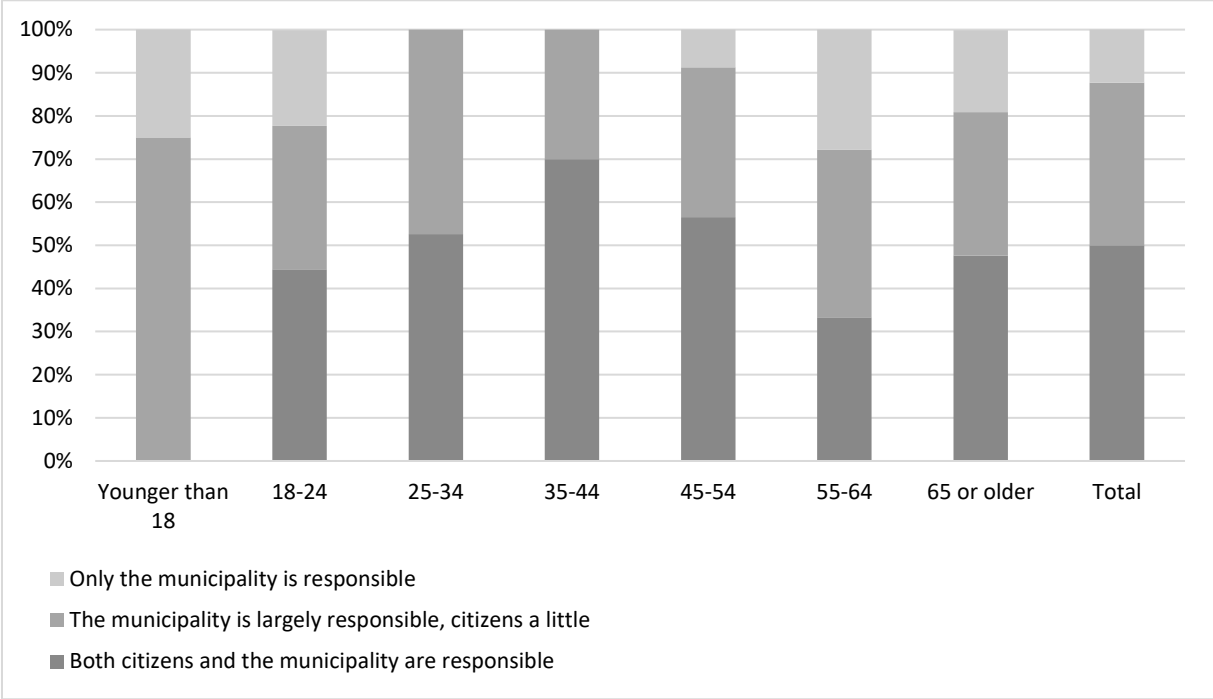
Perceived responsibility

The perceived responsibility is about citizens understanding that it is partly their own responsibility to take pluvial flood risk mitigation measures. Managing the pluvial flood risk is ideally a collective matter.

“But you also always have to consider with pluvial floods, so who is affected by it and who is the cause? Because, of course, the person at the lowest place suffers the most, while the entire environment can of course take measures to prevent it from happening there.” [Maar je moet ook altijd wel kijken met wateroverlast, dus wie heeft er last van en wie is de veroorzaker? Want degene op de laagste plek heeft er natuurlijk het meeste last van, terwijl de hele omgeving natuurlijk maatregelen kan nemen om te voorkomen dat het daar gebeurt.] (Consultancy firm representative 1)

According to the survey results, 12% of the citizens of the municipality of Kampen think taking action in pluvial flood risk management is the responsibility of the municipal organisation only. 38% think it is mainly the responsibility of the municipality and the citizens a little, while 50% of the citizens think both the citizens and the municipality are equally responsible for pluvial flood risk management. No one assigns more or all responsibility to the citizens.

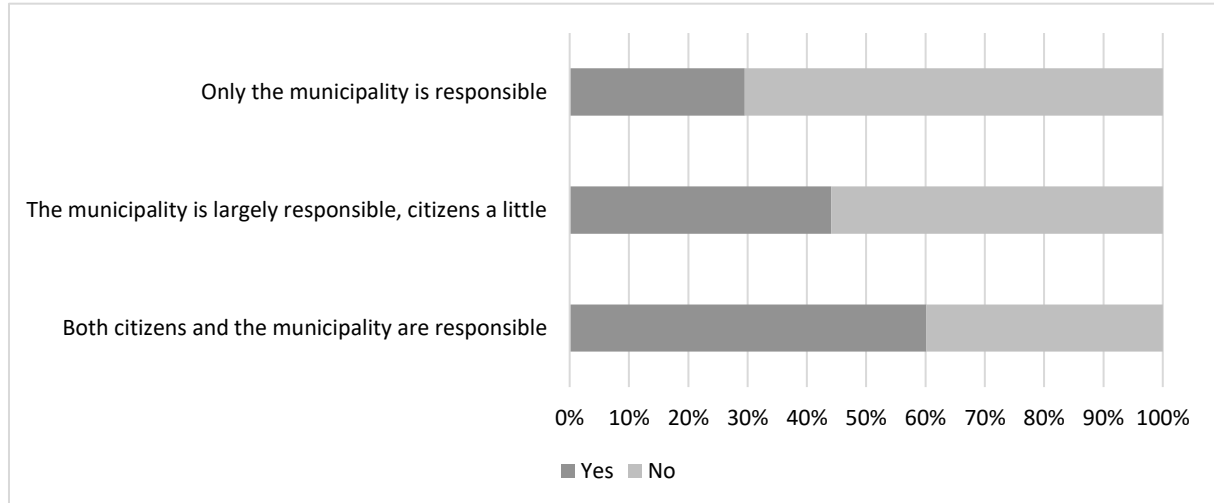
Figure 5.4: Perceived responsibility to take pluvial flood risk mitigation action by age



Based on the results, 70% of citizens out of the age group of 35-44 think that citizens and the municipality are both responsible for taking pluvial flood risk mitigation action. None of the citizens from 25 to 44 years old think that only the municipality is responsible. The younger and older age groups generally assign more responsibility to the municipality.

It is also important to study if there is a link between the perceived responsibility and whether to engage in pluvial flood risk management (see figure 5.5). Results show that the more citizens assign responsibility to themselves, the more likely they are to be engaged. However, this relationship is not statistically significant, $X^2(2, N = 114) = 5.36; p = 0.069, V = 0.22$.

Figure 5.5: Perceived responsibility indicating whether to engage in pluvial flood risk management



Additionally, the more people assign responsibility to citizens, the more likely it is that they are familiar with the climate subsidies of the municipality. From the people who think that only the municipality is responsible, no one is familiar with the climate subsidies. 30.2% of the people who assign little responsibility to the citizens know about the climate subsidies and for the people who think both the citizens and the municipality are responsible, this is 43.9%.

5.5 Capability of citizens to engage in co-production in pluvial flood risk management

The other important factor of citizen engagement is the capability, examined by the indicators of knowledge, resources and self-efficacy in the following sections.

Knowledge

To be capable of taking pluvial flood risk mitigation action, citizens must first know how to do this. As said, 32.7% of the citizens who are not engaged, indicate that this is because they do not know which measures they can take or are available to them. This amounts to 14% of all the respondents explicitly indicating that this barrier stops them from taking pluvial flood risk mitigation measures. Half of this group does not have a garden, making pluvial flood risk mitigation action more difficult. However, the other half of this group, 7% of total respondents, does have a garden but still does not possess the knowledge to take pluvial flood risk mitigation action. This can be seen as a missed opportunity from a municipal organisational point of view.

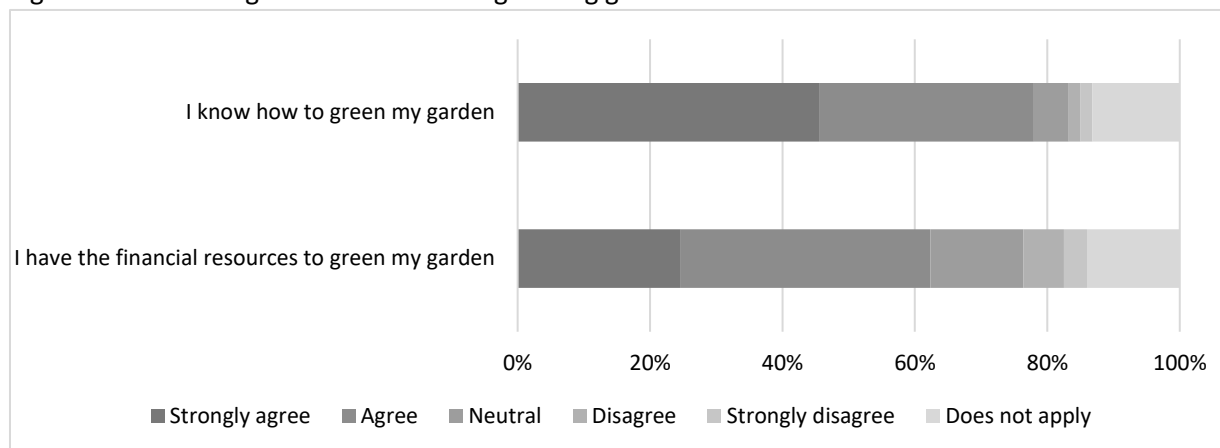
To study the knowledge of pluvial flood risk mitigation measures of citizens, the awareness of the subsidy may be an indicator. As already mentioned, 66.7% of the respondents do not know about the climate subsidy. Of that group, 47.4% are still engaged in pluvial flood risk management. Of the group who do know about the climate subsidy, 76.3% are engaged. The relationship between familiarity with the subsidy and citizen engagement in pluvial flood risk management is significant, $X^2(1, N = 114) = 8.66; p = 0.003, V = 0.28$.

Also, the citizens are asked to rate their eagerness to learn more about what can be done in pluvial flood risk management by citizens. This shows their degree of interest in pluvial flood risk mitigation action on a scale of 1 to 10. The average of the eagerness to learn is 5.68 and there is no significant difference to be seen between citizens who are engaged in pluvial flood risk management (5.82) and citizens who are not engaged (5.49).

There is a weak, positive correlation between eagerness to learn and pluvial flood risk awareness, $r(112) = 0.27$, $p = 0.004$. Additionally, there is a moderate, positive correlation between eagerness to learn and pluvial flood risk perception, $r(112) = 0.40$, $p < 0.001$.

On a Likert scale, 32.5% agree and 45.6% strongly agree with the statement of knowing how to green the garden (see figure 5.6). Only 4 respondents in total state that they do not know how to green their garden. From all the statements on the Likert scale, this is the most uniformly answered statement, with the highest average score of 4.36 out of 5 and the smallest dispersion ($s=0.851$).

Figure 5.6: Knowledge and resources for greening gardens



Resources

12.2% of the people who are not engaged in pluvial flood risk management indicate the lack of resources as their main reason not to engage. This amounts to 5.3% of all the respondents who explicitly indicate that they do not take pluvial flood risk mitigation measures because they do not have the resources to do something. None of them are familiar with the climate subsidy.

However, the awareness of the climate subsidy is not enough to take pluvial flood risk mitigation measures on private terrain. The climate subsidies do not fully cover the costs of the measures but should be considered as a push in the right direction. However, a few of the stated reasons why citizens have not used the subsidies is that the subsidies are too low. Some citizens find it too much effort to apply for a relatively small compensation.

In this regard, pluvial flood risk management is distinctly different from other sectors. Regarding energy, for example, making your house more sustainable by installing solar panels is profitable over time. However, the economic motive for taking pluvial flood risk mitigation measures, or climate adaptive measures as a whole, is more difficult to explain to citizens. The profit of taking pluvial flood risk mitigation measures is namely the prevented damage by pluvial floods that thus does not have to be restored. Although this cost-benefit analysis has a time span of decades and is therefore maybe hard to comprehend, it can show citizens whether investing in pluvial flood risk mitigation measures is worth it.

With the statement 'I have the financial resources to green my garden', 37.7% agree and 24.6% strongly agree. 14% of the respondents have chosen neutral and 9.6% (strongly) disagree (see figure 5.6). Incentives like the climate subsidy can especially help the respondents who have not indicated 'strongly agree' or 'agree' over the line.

Self-efficacy

The belief that the citizens themselves can contribute to a more effective pluvial flood risk management is measured on a scale of 1 to 10. The average score of self-efficacy is 6.50 and there is a slight difference to be seen between the citizens who are engaged in pluvial flood risk management (6.86) and citizens who are not engaged (6.02).

The belief that individual pluvial flood risk mitigation measures contribute to a more effective pluvial flood risk management can also be dependent on pluvial flood risk awareness and pluvial flood risk perception. There is a weak, positive correlation between self-efficacy and pluvial flood risk awareness, $r(112) = 0.24, p = 0.01$. Additionally, there is a moderate, positive correlation between self-efficacy and pluvial flood risk perception, $r(112) = 0.46, p < 0.001$.

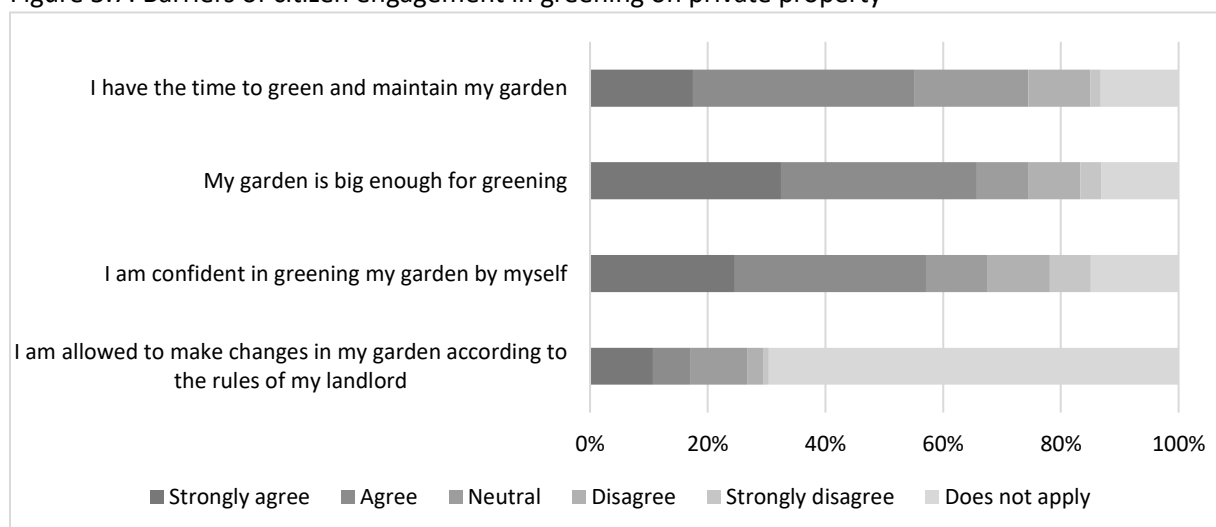
Looking at the eagerness to learn more about taking pluvial flood risk mitigation measures, there is a moderate, positive correlation between self-efficacy and eagerness to learn, $r(112) = 0.46, p < 0.001$.

5.6 Barriers of co-production in pluvial flood risk management

For the municipality, the biggest barrier concerns reaching all the citizens, who also require different approaches, because the municipality exists of different citizen profiles, mostly not proactive in cooperating with the government. To be able to reach the different citizen groups, the limitations that the citizens experience themselves are important to understand. Of course, the six pillars of the analytical framework are key conditions, which also could be seen as barriers if they are not met. In this paragraph, barriers to citizen engagement are identified and examined.

The possession of adequate knowledge and resources (paragraph 5.5) is studied on a Likert scale, together with the barriers of time, space, confidence and whether the landlord allows changes in the garden. Since 68.4% have indicated that this last barrier does not apply to them, it is left out of the reliability analysis. The reliability analysis based on the remaining five statements indicates a questionable internal consistency with Cronbach's Alpha = 0.645. The internal consistency does not become higher when one of the statements is left out. These five statements are thus a valid measuring instrument for the barriers of co-production in pluvial flood risk management to some extent. The means on the statements show that the citizens are on average positive about their ability to take pluvial flood risk mitigation measures in their gardens (see appendix 3.3 and 3.4). In figure 5.7, the results of the identified barriers of greening on private property are shown.

Figure 5.7: Barriers of citizen engagement in greening on private property



Time and effort

Individual citizen initiatives and their maintenance in gardens require time and effort. This can potentially form a barrier, especially for the busy families (see paragraph 5.2). According to the results, 17.5% strongly agree and 37.7% agree with the statement of having enough time. So, in total, more than half of the citizens of the municipality have enough time to green and maintain their gardens to a certain extent.

Space in the garden

Individual citizen initiatives in gardens are also limited by space. 32.7% of the people who do not engage in pluvial flood risk management do not have a garden, which is thus a direct practical barrier. In total, 80% of the people who do not have a garden live in an apartment. Only 11.1% of the respondents living in an apartment have a garden. So, the limited space has to do with the dwelling type, but also with the size of the garden. Many of the people who do have a garden often want a place for a barn, a terrace and a walking space in between. This may leave little space for pluvial flood risk mitigation measures, like a wadi. On the Likert scale, 32.5% strongly agree and 33.3% agree with the statement of having enough space in the garden. An important note to make here is that many people already indicated to have a green garden or façade and/or removed pavement. Still, 65.8% of the citizens of the municipality of Kampen indicate to have no lack of space.

Confidence and comfortableness

Additionally, not every citizen is comfortable with taking pluvial flood risk mitigation measures on their own terrain. Especially the advanced measures like an underground infiltration facility are not easy to take. A certain kind of fear in taking a pluvial flood risk mitigation measure may be the cause of this lack of confidence.

“And, I also think, some people are afraid that this will cause more pluvial floods.” [En, ik denk ook wel, sommige mensen zijn bang om daardoor juist meer wateroverlast te krijgen.] (External municipal official 1).

Regarding the confidence in greening the garden as it is posed, 24.6% strongly agree and 32.5% agree with the statement. However, this statement has the highest percentage of disagreement, namely with 10.5% disagreeing and 7.0% strongly disagreeing, and the lowest mean score of 3.67 out of 5.

Other barriers

Specific cases in which the citizen does not have (full) ownership of the dwelling are limiting the freedom of residents to make changes to their living space and garden. However, according to the results, 68.4% of the citizens of Kampen indicate that this does not apply to them. Additionally, 16.7% agree or strongly agree with the statement, and thus are allowed to make changes in their garden (to a certain extent).

Furthermore, citizens also might have to deal with a language barrier. Also, cultural differences may play a role. Some people in the municipality of Kampen might not be used to expressing their opinions and being engaged with plans and projects from the government. Approaching these citizens is a challenge for the municipality. This indicates again that customisation and flexibility are required from the municipal organisation to increase effectiveness in pluvial flood risk management.

6. Discussion and conclusion

The main question of this research is “How can local governments enhance co-production to increase effectiveness in pluvial flood risk management in urban areas?” In the municipality of Kampen, citizens are mainly encouraged by incentives to become engaged in pluvial flood risk management or come up with initiatives and pluvial flood risk mitigation measures themselves.

In theory, the value of citizen engagement in both policymaking and implementation in planning processes is emphasised. However, in practice, this often turns out differently, where effective citizen engagement is sometimes difficult. The municipality of Kampen is proactive in citizen engagement in pluvial flood risk management, but the awareness and engagement of the citizens have not reached their full potential. This can be clearly seen within different types of co-production in the case study. The municipality of Kampen is most often the initiator and aims for an incentivised form of co-production. However, the municipal organisation has difficulties in reaching the diverse citizen groups, resulting in differences in citizen engagement, for example between age groups (Wehn et al., 2020). The difficulties the municipality of Kampen has, specifically relate to the awareness raising and the encouraging of citizens to take pluvial flood risk mitigation measures. This is different from the findings from Forrest et al. (2021), where citizens had a sense of urgency to take measures. Especially the point of pluvial flood risk awareness decreasing as time goes by after a pluvial flood and thus the timing sensitivity of incentivisation of pluvial flood risk mitigation measures is reflected in this research (Lamond & Proverbs, 2009). Furthermore, a clear connection between pluvial flood risk awareness and perception and citizen engagement in pluvial flood risk management is absent, as practical barriers, like the lack of resources, dominate this relationship. Additionally, despite having a moderate, sometimes high awareness of the pluvial flood risk, familiarity with the climate subsidy, a prominent incentivisation instrument from the municipal organisation, is little. The crucial importance given to pluvial flood risk awareness in this research is only reflected in the literature to a certain extent.

The concept of co-production is approached and understood differently in the literature. This emphasises the free nature of the concept and especially its practice but also makes addition to the existing theorisations on this topic difficult. The extent of co-production that is present in the municipality of Kampen is debatable. The municipal organisation incentivises citizens to take pluvial flood risk mitigation measures and bottom-up initiatives are also present, resembling incentivised and deliberative co-production respectively. A lot of aspects of the incentivisation by the municipal organisation and bottom-up initiatives resemble forms of co-production, but some aspects are missing. On the one hand, the municipal organisation works together with citizens to take measures. This happens mainly via co-funding, as the support of the municipal organisation is mainly financial, via the climate subsidies. Co-production of knowledge, including the sharing and gathering of knowledge as well as advocacy activities, is also visible in the municipality of Kampen. Awareness on climate adaptation is raised and the climate subsidies are promoted on information evenings and via various communication channels. On the other hand, the extent of co-production can be considered low, because the municipal organisation is in many cases the initiator. The citizens of the municipality of Kampen are only following the participation process of the climate subsidies in this regard, if they participate at all. This shows a very different type of collaboration than the emancipatory co-production types Broto et al. (2022) discuss. The initiatives that are present in Kampen barely extend beyond consultation or participation, as how co-production is defined (Wiewiora et al., 2016). When citizens are using the climate subsidies, they are active agents of services to some extent, but not because they strive for more equal outcomes (Broto et al., 2022). To consider the use of climate subsidies as co-

production is debatable because Mees et al. (2018) do define this as co-production. However, the climate subsidies in the municipality of Kampen are not prominently used by the citizens. So, in pluvial flood risk management in the municipality of Kampen, citizens themselves do not take a lasting role.

The extent to which co-production is present in the municipality of Kampen does not particularly increase legitimacy and equality. The climate subsidies resemble the egalitarian approach, in which there are equal opportunities in the distribution of resources. However, this minimum level of available resources that is available for everyone does not result in equal outcomes (Mees et al., 2017). Many citizens lack the capability to benefit from the climate subsidies. Since co-production in general does not necessarily increase equality, this is to an even lesser extent the case in Kampen. In co-production, the distribution of responsibilities can increase legitimacy and equality, but thus also comes with the limitation of capacity, as can be seen in Kampen. Many citizens are not engaged and have a moderate perceived responsibility, as the initial responsibility in pluvial flood risk management is in the hands of the local government according to most of the citizens. Also, many of the citizens do not consider their living environment or potential measures they can take as a part of pluvial flood risk management, not realising individual pluvial flood risk mitigation action may be beneficial to the area as a whole. This particularly marginalises the citizens who are most vulnerable to pluvial floods. The Rawlsian approach in which the most vulnerable benefit the most in co-production is not applied by the municipality of Kampen, since the most pluvial flood-prone citizens are not given special financial support to take pluvial flood risk mitigation measures.

Regarding the main research question, the effectiveness of co-production in pluvial flood risk management is implicitly approached in this research. The citizen engagement in pluvial flood risk management of the municipality of Kampen increases effectiveness to a certain level. Citizens are more aware of the local reality, which does increase the effectiveness of pluvial flood risk management via risk dialogues and information evenings. They can also better assess the effectiveness of potential pluvial flood risk mitigation measures on their own property. However, this thus results in the issue of equality, in which many citizens do not engage in pluvial flood risk management because they do not experience any pluvial flood risk themselves and might not consider the vulnerability of the area as a whole. In the municipality of Kampen, citizens are sometimes engaged in bottom-up initiatives, in which they have more control themselves, compared to only using the climate subsidies to take one of the prescribed pluvial flood risk mitigation measures. The municipal organisation has less control over these bottom-up initiatives and thus can monitor the effectiveness of these initiatives to a lesser extent. However, these bottom-up initiatives almost always end up involving the municipal organisation, therefore moving towards a form of deliberative co-production instead of purely bottom-up. This also reflects the contradiction of citizen control and dependence on institutional settings, where the latter is advantageous to the initiatives. Involving the municipal organisation can namely result in the provision of resources, which the initiator is often not capable of (Galuszka, 2019). Still, the bottom-up initiatives, if at all considered as deliberative co-production, are not prominently present in the municipality of Kampen, which thus does not increase effectiveness in pluvial flood risk management. From the three external municipalities included in this research, the municipalities of Deventer and Raalte show similar results, in which incentivisation is the most prominent mechanism in pluvial flood risk management, thus making the extent of co-production debatable. In the municipality of Deventer, the practical support for taking pluvial flood risk mitigation measures is advanced further than in Kampen. However, pluvial flood risk management in the municipality of Zwolle mainly consists of bottom-up initiatives. These mainly happen in deliberative forms of co-production, in which the municipal organisation offers financial support on request and customisation is central.

All in all, local governments can enhance co-production to increase effectiveness in pluvial flood risk management in urban areas in several ways. With regulation generating resistance among citizens in the long term, incentivisation and customisation turn out to be more effective in pluvial flood risk management. Before encouraging citizens to implement pluvial flood risk mitigation measures, governments should put effort into awareness raising, hence it is the first key condition of citizen engagement. The awareness raising should be more specific to the problem of pluvial flood risk, instead of using greenery or climate adaptive measures in terminology. The climate subsidy also must be included in the awareness raising, emphasising its communicative function. Without genuine pluvial flood risk awareness, it is impossible to build a long-term pluvial flood-resistant community. Awareness building should be done via multiple information channels to make it as accessible for the citizens as possible.

The provision of information and practical support needs to be intensified as well, to foster individual action in pluvial flood risk management. Informing should be combined with encouraging as much as possible, in any setting. Since attendance may vary strongly on information evenings, every opportunity must be taken advantage of to increase awareness. Creative forms of informing and encouraging are also included here. A significant part of the citizens come across practical barriers stopping them from taking individual action, even if the key conditions are met. Therefore, practical support should take place in the form of personal consultations by the rainwater coaches and help with the implementation of pluvial flood risk mitigation measures, tackling the barriers of confidence as well as time and effort. Making information and practical support as accessible as possible is of vital importance for the enhancement of co-production to increase effectiveness in pluvial flood risk management. Regarding pluvial flood risk awareness, the awareness and use of financial support in the form of climate subsidies and practical support, there is still much to be gained by the municipal organisation.

In the incentivisation by the government, customisation needs to take one step further, regarding the timing and the area. To increase awareness of pluvial flood risk mitigation, campaigns and subsidies should be directly adapted to the weather conditions or time of the year. In this way, the government can take advantage of the sense of urgency, which is proven to be temporary. This calls for flexibility in the incentivisation techniques from the government. Also, incentives like subsidies should be adapted to specific areas, in order to particularly aim at bottlenecks. This might bring some organisational difficulties but can significantly contribute to a pluvial flood-resilient living environment. Important here is that the pluvial flood risk mitigation measures on private terrain are well implemented. Alongside financial support, practical support is of importance here.

Incentivisation customised to the area also means taking the citizens themselves into consideration. The generated citizen engagement profiles should be considered more often, both in project developments initiated by the government and in encouraging citizens to take pluvial flood risk mitigation measures themselves. This also calls for better coordination within the municipal organisation, involving the neighbourhood directors in any planning process. The neighbourhood directors are in close contact with the citizens, which is why they are essential in customising information and incentivisation approaches. Incentivisation thus needs to be customised more to the time, area and citizens, to enhance co-production to increase effectiveness in pluvial flood risk management in urban areas.

7. Reflection and limitations of research

Based on this research, a few reflections and limitations need to be addressed. Regarding the data collection, the combination of expert knowledge and citizen input made sure that co-production in the municipality could be analysed thoroughly, including multiple perspectives. Regarding the citizen survey, formulating the questions as simply and understandably as possible has increased the reliability and validity of the research. Theoretical concepts have been directly transformed into simple formulated questions. For example, the six key conditions of citizen engagement in co-production are directly referred to in the survey. Also, the possible incentives that can enhance co-production to increase the effectiveness of pluvial flood risk management in urban areas have been directly addressed in the interviews. The internal validity of the research is ensured by interviewing a wide array of experts and reaching survey respondents in several ways. Although this research involves a single case study, interviews with representatives from three other municipalities, the water board and two consultancy firms are included as well, as verification and to prevent the risk of the single case being an outlier or extreme example from which the results cannot be generalised. The results of these interviews have not indicated that Kampen is a special case. The lessons learned in the municipality of Kampen are therefore generalisable to the rest of the Netherlands to a certain extent, particularly to similar-sized municipalities that also face challenges of pluvial flood risk mitigation. More importantly, this research has been carried out in a period where there have not been pluvial floods for a significant amount of time, so pluvial flood risk awareness is not influenced by a sense of urgency. Conclusions thus arrive from research which is not influenced by any major pluvial flood events or other campaigns or events which could have stirred up the awareness of citizens. This makes this research unique and applicable to other urban areas as well. However, the customisation and context-based character of the issue of pluvial flood risk make its external validity debatable. Still, this is more related to the issue of pluvial flood risk itself, which thus highly depends on the location and its context, rather than on the way how this research is conducted.

This research is mainly limited by aspects regarding the methodology. Regarding the citizen survey, the respondents were sometimes unable to fully explain their answers. This also considers the way of answering on a Likert scale or giving a rating from 1 to 10: quantifying people's opinions and experiences may result in different insights and interpretations. Semi-structured interviews with the citizens would have given more detailed information on people's opinions and experiences. Additionally, the survey questions have created differences in measuring scales, posing difficulties in the analysis of the results. Some results of the survey are difficult to directly statistically compare with other results. Still, the choice for a survey has resulted in clear statistical outcomes, which have been necessary to examine the level of citizen engagement in the municipality of Kampen. Also, the choice for formulating the questions as simply as possible over choosing the best terminology and measuring scales is made to stimulate more and proper responses.

For the interviews with the experts, possible solutions and future incentivisation are not fully included, like the capability for customising incentivisation approaches to the area or time of the year. These could have been gained by focussing more on opportunities instead of the existing forms of co-production. Additionally, other municipal officials from more disciplines could have been interviewed. However, current conclusions derive from municipal officials more specific to the theme of pluvial flood risk management as well as external municipal officials and water board and consultancy firm representatives, to include more impartial perspectives.

Further research can be done on the disciplines this research touches upon, but which it does not investigate thoroughly. An example of this is communication, which is important in awareness raising and encouraging citizen engagement. Especially reaching different citizen groups proves to be difficult for the municipal organisation. Additional research on this should include municipalities, but also other public authorities. Private organisations can also be included here since these are often aimed at citizens. Their communication techniques can be studied and possibly implemented or at least tested by public authorities. Regarding communication and the way of approaching citizens, this further research should also include differences between municipal organisations and the implications of these differences. Whether colleagues are aligned on the way citizen engagement is implemented should be included in further research on the vision on citizen engagement of a municipal organisation.

Additionally, comparing the findings to another sector, for example, incentivisation in the energy sector, will supposedly show differences in co-production. Incentivisation may work out differently in other disciplines. Mapping how co-production works out differently can enhance citizen engagement and incentivisation in different disciplines within the municipal organisation.

Stakeholders other than citizens are left out in this research, offering an opportunity for further research into stakeholder engagement in pluvial flood risk management. For example, in planning processes that are initiated by the government, private organisations can also be stakeholders alongside citizens. Co-production could play out or be incentivised differently when the full range of stakeholders is considered, something which is underexposed in this research. An organisation like the water board could also incentivise effectiveness in pluvial flood risk management via co-production. Stakeholder engagement could be researched in the implementation, but also in the decision-making process of pluvial flood risk management. This research does not include the different stakeholders and power relations in the governance structures within the decision-making process, that precede the implementation phase of pluvial flood risk mitigation measures.

Though this research is particularly focused on co-production in implementation, there is often a call in literature that successful implementation cannot take place without citizen involvement in policymaking as well. Therefore, citizen engagement in the policymaking and governance of pluvial flood risk management should be considered in further research. Possible causes and effects of different ways of citizen engagement in policymaking could offer new insights into the effectiveness of pluvial flood risk management in urban areas.

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Appendix

1. Interview guide

1.1 Interview guide (English translation)

Practical information interviewer	Date: Start and end time: Number respondent: Age respondent:
Introduction	<p>I am Constantijn Kats, a student of the Master Spatial Planning at the University of Utrecht.</p> <p>The purpose of this interview is to provide insight into how citizens are engaged in water management, pluvial flood risk management more specifically, in the municipality of Kampen.</p> <p>The interview lasts approximately half an hour. The interview consists of open questions.</p> <p>The data is treated according to GDPR legislation, which means that personal data is not used for purposes other than research. The respondent remains anonymous. The information obtained therefore remains confidential and statements cannot be traced back to the respondent.</p> <p>The interview will be recorded, and the recording file will be kept for three months and then permanently deleted. The data will only be used for research. This way it can still be listened to and analysed. Do you agree with this?</p> <p>If you want, I can send the transcript to you and ask if you agree with it. Would you like that or do you not think it is necessary?</p> <p>Do you have any further questions before we start the interview?</p>
Starting question	<ol style="list-style-type: none"> 1. Can you introduce yourself? <ul style="list-style-type: none"> ➔ What is your profession? ➔ What is your role within the organisation? ➔ To what extent are you involved in citizen engagement? ➔ Are you often in contact with citizens? In what context?
Water management	<ol style="list-style-type: none"> 2. To what extent is this region around Kampen as a whole (West-Overijssel) vulnerable to heavy rainfall? <ul style="list-style-type: none"> ➔ Are there any urging problems regarding pluvial floods (floods occurring because of rain)? ➔ Is the city of Kampen itself vulnerable to heavy rainfall? ➔ Are certain parts of Kampen more vulnerable to pluvial floods than others?
	<ol style="list-style-type: none"> 3. What is the general policy in this region to prevent pluvial floods? <ul style="list-style-type: none"> ➔ To what extent is the three-stage strategy of retention, storage and discharge used? How? ➔ Are there any measurements used? For example, stress tests? ➔ What are the current limitations of this policy? ➔ To what extent is there a barrier in policy regarding the difference between private and public terrain?
	<ol style="list-style-type: none"> 4. To what extent do other stakeholders have responsibilities in pluvial flood risk management? <ul style="list-style-type: none"> ➔ What stakeholders are involved? ➔ How are responsibilities and tasks divided?
Citizen engagement	<ol style="list-style-type: none"> 5. Do you believe it is important for citizens to be engagement in pluvial flood risk management? Why?

	<ul style="list-style-type: none"> ➔ Is everyone at the municipality aligned on this? ➔ To what extent is citizen engagement effective? ➔ What role can citizens play in pluvial flood risk policy? ➔ What type of citizen engagement is common? Hierarchical (by rules), stimulated (for example by subsidies) and/or deliberative (no fixed instruments, different per case, initiator differs)? ➔ What do you think is most effective?
	6. What rules generally apply to private terrain regarding the retention, storage and discharge?
	<p>7. To what extent are citizens engaged in pluvial flood risk management in the municipality of Kampen?</p> <ul style="list-style-type: none"> ➔ Are there any private individual efforts? ➔ Are they often involved as a community? ➔ To what extent is citizen engagement stimulated by the government?
	<p>8. How are citizens getting engaged?</p> <ul style="list-style-type: none"> ➔ To what extent are they informed? ➔ To what extent are they encouraged to take pluvial flood risk mitigation initiatives themselves? ➔ To what extent are there any incentives (e.g. financial incentives)? ➔ How is the communication between the citizens and the municipality?
	<p>9. How effective are citizen initiatives on private terrain?</p> <p>10. To what extent are effects measured?</p>
	<p>11. What are the limitations of citizen engagement?</p> <ul style="list-style-type: none"> ➔ To what extent is there a lack of citizen motivation? ➔ To what extent is there a lack of citizen capability? ➔ To what extent is citizen engagement only superficial? ➔ Are there financial barriers? ➔ Are there any regulations holding back effective citizen engagement? ➔ To what extent is the communication between the government and the citizens a barrier?
Closing	<p>From the conversation we have just had, is there anything important you think we are missing? Do you have any questions? Or anything to add?</p> <p>Thanks ever so much.</p>

1.2 Interview guide (Dutch original)

Praktische informatie interviewer	Datum: Begin- en eindtijd: Nummer respondent: Leeftijd respondent:
Introductie	<p>Ik ben Constantijn Kats, student van de Master Spatial Planning aan de Universiteit Utrecht.</p> <p>Het doel van dit interview is om inzicht te geven in de wijze waarop inwoners betrokken zijn bij het waterbeheer, en meer specifiek overstromingsrisicobeheer, in de gemeente Kampen.</p> <p>Het interview duurt ongeveer een half uur. Het interview bestaat uit open vragen.</p> <p>De gegevens worden behandeld volgens de AVG-wetgeving, wat betekent dat persoonsgegevens niet voor andere doeleinden dan het onderzoek worden gebruikt. De respondent blijft anoniem. De verkregen informatie blijft op deze manier vertrouwelijk en verklaringen zijn niet te herleiden tot de respondent.</p> <p>Het interview wordt opgenomen en het opnamebestand wordt drie maanden bewaard en daarna definitief verwijderd. De gegevens zullen uitsluitend voor onderzoek worden gebruikt. Zo kan het toch beluisterd en geanalyseerd worden. Gaat u hiermee akkoord?</p> <p>Als u wilt, kan ik u het transcript toesturen en vragen of u het ermee eens bent. Zou u dat willen of vindt u dat niet nodig?</p> <p>Heeft u nog vragen voordat we aan het interview beginnen?</p>
Startvraag	<p>1. Kunt u uzelf voorstellen?</p> <ul style="list-style-type: none"> ➔ Wat is uw beroep? ➔ Wat is uw rol binnen de organisatie? ➔ In welke mate bent u betrokken bij inwonersbetrokkenheid? ➔ Heeft u vaak contact met inwoners? In welke context?
Watermanagement	<p>2. In hoeverre is deze regio rond Kampen als geheel (West-Overijssel) kwetsbaar voor hevige regenval?</p> <ul style="list-style-type: none"> ➔ Zijn er urgente problemen met betrekking tot pluviale overstromingen (overstromingen die optreden als gevolg van regen)? ➔ Is de stad Kampen zelf kwetsbaar voor hevige regenval? ➔ Zijn bepaalde delen van Kampen kwetsbaarder voor wateroverlast dan andere?
	<p>3. Wat is het algemene beleid in deze regio om overstromingen te voorkomen?</p> <ul style="list-style-type: none"> ➔ In welke mate wordt gebruik gemaakt van de drietrapsstrategie van vasthouden, bergen en afvoeren? Hoe? ➔ Worden er metingen gebruikt? Bijvoorbeeld stresstesten? ➔ Wat zijn de huidige beperkingen van dit beleid? ➔ In hoeverre is er sprake van een barrière in het beleid ten aanzien van het onderscheid tussen privaat en openbaar terrein?
	<p>4. In hoeverre hebben andere belanghebbenden verantwoordelijkheden op het gebied van overstromingsrisicobeheer?</p>

	<ul style="list-style-type: none"> → Welke stakeholders zijn erbij betrokken? → Hoe zijn de verantwoordelijkheden en taken verdeeld?
Inwonersbetrokkenheid	<p>5. Vindt u het belangrijk dat inwoners betrokken worden bij het regenwaterbeheer? Waarom?</p> <ul style="list-style-type: none"> → Zit de gemeente Kampen hierin op één lijn? → In hoeverre is de inwonersbetrokkenheid effectief? → Wat voor soort komt er vaak voor? Hiërarchisch (door regels), gestimuleerd (door bijvoorbeeld subsidies) en/of in overleg (geen vaste instrumenten, per casus verschillend, initiatiefnemer verschilt)? → Wat is het meest effectief volgens u?
	6. Welke regels gelden er doorgaans op privéterrein met betrekking tot het vasthouden, opslaan en afvoeren van water?
	<p>7. In hoeverre zijn inwoners betrokken bij de waterveiligheid in de gemeente Kampen?</p> <ul style="list-style-type: none"> → Zijn er individuele initiatieven? → Zijn inwoners vaak als gemeenschap betrokken? → In hoeverre wordt inwonersbetrokkenheid gestimuleerd door de overheid?
	<p>8. Hoe raken inwoners betrokken?</p> <ul style="list-style-type: none"> → In hoeverre worden zij geïnformeerd? → In hoeverre worden zij aangemoedigd om zelf initiatief te nemen om overstromingen tegen te gaan? → In hoeverre zijn er stimulansen (bijvoorbeeld financiële stimulansen)? → Hoe verloopt de communicatie tussen de inwoner en de gemeente?
	<p>9. Hoe effectief zijn inwonersinitiatieven op particulier terrein?</p> <p>10. In hoeverre worden effecten gemeten?</p>
	<p>11. Wat zijn de beperkingen van de betrokkenheid van inwoners?</p> <ul style="list-style-type: none"> → In hoeverre is er sprake van een gebrek aan motivatie bij inwoners? → In welke mate is er sprake van een gebrek aan vermogen bij de inwoners? → In hoeverre is de betrokkenheid van inwoners slechts oppervlakkig? → Zijn er financiële barrières? → Zijn er regels die effectieve inwonersbetrokkenheid in de weg staan? → In hoeverre vormt de communicatie tussen overheid en inwoners een barrière?
Afsluiting	<p>Is er iets belangrijks dat we volgens u missen uit het gesprek dat we zojuist hebben gehad? Heeft u nog vragen? Of iets toe te voegen? Heel erg bedankt.</p>

2. Citizen survey

2.1 Survey invitation (English translation)

Survey on preventing pluvial floods - take part!

Due to climate change, we are experiencing drier and hotter summers and more heavy rain showers. The municipality takes measures to limit pluvial floods, heat and drought. For example, we are focusing on more greenery and squares and streets are being redesigned. You can also green your environment yourself and create space for water. That is why the municipality of Kampen makes subsidies available, for example for a rain barrel or a green roof.

We would like to know if you are familiar with this and what you think about it. The results of this research provide the municipality with more insight into improving cooperation between the municipality and residents in this area.

This questionnaire takes approximately 5 to 10 minutes. Scan the QR code and participate!

Thank you!



2.2 Survey invitation (Dutch original)

Enquête voorkomen van wateroverlast - doe ook mee!

Vanwege klimaatverandering krijgen we te maken met drogere en hetere zomers en meer hevige buien. De gemeente neemt maatregelen om wateroverlast, hitte en droogte te beperken. Zo zetten we in op meer groen en worden pleinen en straten opnieuw ingericht. U kunt ook zelf uw omgeving vergroenen en water de ruimte geven. Daarom stelt de gemeente Kampen subsidie beschikbaar, bijvoorbeeld voor een regenton of een groen dak.

Graag willen we van u weten of u hiermee bekend bent en hoe u hierover denkt. De resultaten van dit onderzoek bieden de gemeente meer inzicht in het verbeteren van de samenwerking tussen de gemeente en de inwoners op dit gebied.

Deze vragenlijst duurt ongeveer 5 tot 10 minuten. Scan de QR-code en doe mee!
Hartelijk bedankt!



2.3 Citizen survey (English translation)

How do we deal with rainwater floods?

Participate to prevent rainwater floods

How nice that you want to participate in this research by the Municipality of Kampen about preventing rainwater nuisance.

Due to climate change, we are experiencing drier and hotter summers and more heavy rain showers.

The municipality takes measures to limit rainwater floods, heat and drought. For example, we are focusing on more greenery and squares and streets are being redesigned. You can also green your environment yourself and create space for water. That is why the municipality of Kampen provides money to green your garden through climate subsidies (<https://www.kampen.nl/subsidies-voor-het-klimaat>), for example for a rain barrel or a green roof.

This research is about measures against rainwater floods that residents of Kampen can take in collaboration with the municipality. The results of this research provide the municipality with more insight into improving cooperation between the municipality and residents in this area.

Completing this questionnaire takes approximately 5 to 10 minutes.

Your participation is completely voluntary. The answers are completely anonymized, so they cannot be traced back to the person.

Thank you.

1. How often have you experienced nuisance through rainfall around your house in the last 12 months?

Disruption through rainfall can for example be: a flooded basement due to water from the street, water over the threshold or puddles of water in your garden for more than four hours.

- 0 times
- 1 time
- 2-3 times
- 4-6 times
- 7 times or more

2. How severe would you rate the flood risk and disruption that can be caused by rain on a scale from 1 to 10? Here, 1 is not severe and 10 is very severe.

1	2	3	4	5	6	7	8	9	10
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3. How would you rate the importance to take action to counter water nuisance on a scale from 1 to 10? Here, 1 is not important and 10 is very important.

1	2	3	4	5	6	7	8	9	10
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4. Who is responsible for taking action in rainwater management?

- Only citizens are responsible
- Citizens are largely responsible, the municipality a little
- Both citizens and the municipality are responsible
- The municipality is largely responsible, citizens a little

- Only the municipality is responsible
5. Do you do anything in rainwater management?
- Yes
 - No (->10)
6. Briefly describe what you do in rainwater management.
7. Is the government involved in this initiative?
- Yes
 - No (->9)
8. How is the government involved?
9. Who started this initiative? (->11)
10. What is your most important reason to not have taken rainwater flood risk mitigation action?
- I don't understand/see the problem
 - I don't think it is necessary
 - I don't think it is my responsibility
 - I don't know what I can do
 - I don't have the resources to do something
 - I don't think my individual actions help
 - Other:
11. The municipality of Kampen makes subsidies available for measures against rainwater floods, such as €50 for a rain barrel and €20 per square metre of green roof. Were you already aware of the climate subsidies in Kampen?
- Yes
 - No
12. Have you used the climate subsidies?
- Yes
 - No (->16)
13. What climate subsidies have you used?
- Uncouple rainwater
 - Green roof
 - Wadi
 - Destoning
 - Planting trees
 - Vertical garden or green façade
 - Install a reservoir
 - Rain barrel
 - Underground infiltration
 - Other:

14. Why have you used the climate subsidies?

15. Describe your taken actions. (->17)

16. Why haven't you used the climate subsidies?

17. Please indicate to what extent you agree with the following statements.

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Does not apply
I know how to green my garden						
I have the financial resources to green my garden						
I have the time to green and maintain my garden						
My garden is big enough for greening						
I am confident in greening my garden by myself						
I am allowed to make changes in my garden according to the rules of my landlord						

18. To what extent would you be open to learning more about what you can do by yourself on a scale from 1 to 10? Here, 1 is not at all and 10 is very open.

1	2	3	4	5	6	7	8	9	10
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19. How would you rate the effectiveness of potential individual action in mitigating the risk and disruption of floods caused by rain on a scale from 1 to 10? Here, 1 is very low and 10 is very high.

1	2	3	4	5	6	7	8	9	10
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20. What kind of dwelling do you live in?

- Apartment
- Corner house
- Terraced house
- Semidetached house
- Detached
- Other:

21. Do you have a front garden and backyard?

- Yes, I have both
- No, only a front garden
- No, only a backyard
- None

22. In which town do you live?

- 's-Heerenbroek
- Grafhorst
- IJsselmuiden
- Kampen
- Kampereiland
- Kamperveen
- Reeve
- Wilsum
- Zalk
- Other:

23. What is your age?

- Younger than 18
- 18-24
- 25-34
- 35-44
- 45-54
- 55-64
- 65 or older

Thanks for completing the survey.

24. Do you want to receive the results of this research, fill in your e-mail address:

25. Do you have further questions or comments?

2.4 Citizen survey (Dutch original)

Hoe gaan we om met regenwateroverlast?

Meedoen om regenwateroverlast te voorkomen

Wat fijn dat u mee wilt doen met dit onderzoek van de Gemeente Kampen over het onderwerp regenwateroverlast voorkomen.

Vanwege klimaatverandering krijgen we te maken met drogere en hetere zomers en meer hevige buien.

De gemeente neemt maatregelen om wateroverlast, hitte en droogte te beperken. Zo zetten we in op meer groen en worden pleinen en straten opnieuw ingericht. U kunt ook zelf uw omgeving vergroenen en water de ruimte geven. Daarom geeft de gemeente Kampen geld om uw tuin te vergroenen via de klimaatsubsidies (<https://www.kampen.nl/subsidies-voor-het-klimaat>), bijvoorbeeld voor een regenton of een groen dak.

Dit onderzoek gaat over maatregelen tegen regenwateroverlast die inwoners van Kampen in samenwerking met de gemeente kunnen nemen. De resultaten van dit onderzoek bieden de gemeente meer inzicht in het verbeteren van de samenwerking tussen de gemeente en de inwoners op dit gebied.

Het invullen van deze vragenlijst duurt ongeveer 5 tot 10 minuten.

Uw deelname is geheel vrijwillig. De antwoorden worden volledig geanonimiseerd, waardoor ze niet te herleiden zijn naar de persoon.

Bedankt.

1. Hoe vaak heeft u regenwateroverlast ervaren rond uw huis in de afgelopen 12 maanden? Regenwateroverlast kan bijvoorbeeld zijn: een ondergelopen kelder door water van de straat, water over de drempel of plassen water in uw tuin voor meer dan 4 uur lang.
 - 0 keer
 - 1 keer
 - 2-3 keer
 - 4-6 keer
 - 7 keer of vaker

2. Hoe ernstig schat u de regenwateroverlast rond uw huis in de toekomst in op een schaal van 1 tot 10? Hier is 1 niet ernstig en 10 heel ernstig.

1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	----

3. Hoe belangrijk vindt u het nemen van maatregelen om regenwateroverlast tegen te gaan op een schaal van 1 tot 10? Hier is 1 niet belangrijk en 10 heel belangrijk.

1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	----

4. Wie is verantwoordelijk voor het nemen van maatregelen tegen regenwateroverlast volgens u?
 - Alleen inwoners zijn verantwoordelijk
 - Inwoners zijn grotendeels verantwoordelijk, de gemeente een beetje

- Zowel inwoners als de gemeente zijn verantwoordelijk
 - De gemeente is grotendeels verantwoordelijk, inwoners een beetje
 - Alleen de gemeente is verantwoordelijk
5. Doet u zelf iets om regenwateroverlast tegen te gaan?
- Ja
 - Nee (->10)
6. Beschrijf kort wat doet u om regenwateroverlast tegen te gaan.
7. Is de gemeente hierbij betrokken?
- Ja
 - Nee (->9)
8. Hoe is de gemeente hierbij betrokken?
9. Wie is hiermee begonnen? (->11)
10. Wat is voor u de belangrijkste reden dat u geen maatregelen neemt tegen regenwateroverlast?
- Ik begrijp/zie het probleem niet
 - Ik denk dat het niet nodig is
 - Ik denk niet dat het mijn verantwoordelijkheid is
 - Ik weet niet wat ik kan doen
 - Ik heb niet de middelen om wat te doen
 - Ik denk niet dat mijn individuele acties helpen
 - Andere:
11. De gemeente Kampen stelt subsidie beschikbaar voor maatregelen tegen regenwateroverlast, zoals €50 voor een regenton en €20 per vierkante meter groen dak. Kende u de klimaatsubsidies van de gemeente Kampen al?
- Ja
 - Nee
12. Heeft u gebruikgemaakt van de klimaatsubsidies?
- Ja
 - Nee (->16)
13. Van welke klimaatsubsidie(s) heeft u gebruikgemaakt?
- Afkoppelen regenwater
 - Groen dak
 - Wadi
 - Ontsteden
 - Bomen planten
 - Verticale tuin of groene gevel
 - Reservoir plaatsen
 - Regenton

- Ondergrondse infiltratie
- Andere:

14. Waarom heeft u gebruikgemaakt van de klimaatsubsidies?

15. Beschrijf wat u precies gedaan heeft. (->17)

16. Waarom heeft u geen gebruikgemaakt van de klimaatsubsidies?

17. Geef aan in hoeverre u het eens bent met de volgende stellingen.

	Helemaal eens	Eens	Neutraal	Oneens	Helemaal oneens	Niet van toepassing
Ik weet hoe ik mijn tuin kan vergroenen						
Ik heb de financiële middelen om mijn tuin te vergroenen						
Ik heb de tijd om mijn tuin te vergroenen en te onderhouden						
Mijn tuin is groot genoeg voor vergroening						
Ik zie het zitten om zelfstandig mijn tuin te vergroenen						
Ik mag volgens de regels van mijn verhuurder mijn tuin veranderen						

18. In hoeverre zou u meer willen leren over wat u zelf kunt doen tegen regenwateroverlast op een schaal van 1 tot 10? Hier is 1 totaal niet en 10 heel graag.

1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	----

19. In hoeverre denkt u dat het helpt als u zelf maatregelen neemt tegen regenwateroverlast op een schaal van 1 tot 10? Hier is 1 totaal niet en 10 heel erg.

1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	----

20. In wat voor soort huis woont u?

- Appartement
- Hoekhuis
- Rijtjeshuis
- Twee-onder-een-kapwoning
- Vrijstaand
- Andere:

21. Heeft u een voor- en achtertuin?

- Ja, ik heb beiden
- Nee, alleen een voortuin
- Nee, alleen een achtertuin
- Geen van beiden

22. In welke plaats woont u?

- 's-Heerenbroek
- Grafhorst
- IJsselmuiden
- Kampen
- Kampereiland
- Kamperveen
- Reeve
- Wilsum
- Zalk
- Andere:

23. Wat is uw leeftijd?

- Jonger dan 18
- 18-24
- 25-34
- 35-44
- 45-54
- 55-64
- 65 of ouder

Bedankt voor het invullen van deze enquête.

24. Wilt u de resultaten van dit onderzoek ontvangen, dan kunt u hier uw e-mailadres invoeren:

25. Heeft u verder nog vragen of opmerkingen?

3. Statistical output citizen survey

3.1 Citizen engagement statistics

Citizen_engagement * Age Crosstabulation

		Age							Total	
		17 or younger	18-24	25-34	35-44	45-54	55-64	65 or older		
Citizen_engagement	Yes	Count	1	4	11	13	19	10	7	65
		% within Age	25.0%	44.4%	57.9%	65.0%	82.6%	55.6%	33.3%	57.0%
		% of Total	0.9%	3.5%	9.6%	11.4%	16.7%	8.8%	6.1%	57.0%
No	Count	3	5	8	7	4	8	14	49	
		% within Age	75.0%	55.6%	42.1%	35.0%	17.4%	44.4%	66.7%	43.0%
		% of Total	2.6%	4.4%	7.0%	6.1%	3.5%	7.0%	12.3%	43.0%
Total	Count	4	9	19	20	23	18	21	114	
		% within Age	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	3.5%	7.9%	16.7%	17.5%	20.2%	15.8%	18.4%	100.0%

Barrier

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		65	57.0	57.0	57.0
	I don't have any problems with it myself	11	9.6	9.6	66.7
	I don't have the resources to do something	6	5.3	5.3	71.9
	I don't know what I can do	16	14.0	14.0	86.0
	I don't think it is my responsibility	2	1.8	1.8	87.7
	I don't think it is necessary	7	6.1	6.1	93.9
	I don't think my individual actions help	3	2.6	2.6	96.5
	I don't understand/see the problem	1	.9	.9	97.4
	Other	3	2.6	2.6	100.0
	Total	114	100.0	100.0	

3.2 Citizen's motivation statistics

Pluvial flood risk awareness

Report

Risk_awareness			
Experienced_nuisance	Mean	N	Std. Deviation
0 times	4.17	81	2.252
1 time	3.33	12	2.015
2-3 times	5.22	9	2.333
4-6 times	5.33	3	3.055
7 times or more	7.44	9	1.130
Total	4.46	114	2.365

Experienced_nuisance

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0 times	81	71.1	71.1	71.1
	1 time	12	10.5	10.5	81.6
	2-3 times	9	7.9	7.9	89.5
	4-6 times	3	2.6	2.6	92.1
	7 times or more	9	7.9	7.9	100.0
	Total	114	100.0	100.0	

Pluvial flood risk perception

Report

Citizen_engagement		Risk_awareness	Flood_perception
Yes	Mean	4.32	8.03
	N	65	65
	Std. Deviation	2.339	1.879
No	Mean	4.63	7.98
	N	49	49
	Std. Deviation	2.413	1.974
Total	Mean	4.46	8.01
	N	114	114
	Std. Deviation	2.365	1.912

Descriptive Statistics

	Mean	Std. Deviation	N
Risk_awareness	4.46	2.365	114
Flood_perception	8.01	1.912	114
Eagerness_to_learn	5.68	2.462	114
Self_efficacy	6.50	2.203	114

Correlations

		Risk_awareness	Flood_perception	Eagerness_to_learn	Self_efficacy
Risk_awareness	Pearson Correlation	1	.279**	.266**	.239*
	Sig. (2-tailed)		.003	.004	.010
	N	114	114	114	114
Flood_perception	Pearson Correlation	.279**	1	.401**	.463**
	Sig. (2-tailed)	.003		<.001	<.001
	N	114	114	114	114
Eagerness_to_learn	Pearson Correlation	.266**	.401**	1	.461**
	Sig. (2-tailed)	.004	<.001		<.001
	N	114	114	114	114
Self_efficacy	Pearson Correlation	.239*	.463**	.461**	1
	Sig. (2-tailed)	.010	<.001	<.001	
	N	114	114	114	114

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Perceived responsibility

Perceived_responsibility * Age Crosstabulation

		Age							Total	
		17 or younger	18-24	25-34	35-44	45-54	55-64	65 or older		
Perceived_responsibility	Both citizens and the municipality are responsible	Count	0	4	10	14	13	6	10	57
		% within Age	0.0%	44.4%	52.6%	70.0%	56.5%	33.3%	47.6%	50.0%
		% of Total	0.0%	3.5%	8.8%	12.3%	11.4%	5.3%	8.8%	50.0%
	The municipality is largely responsible, citizens a little	Count	3	3	9	6	8	7	7	43
		% within Age	75.0%	33.3%	47.4%	30.0%	34.8%	38.9%	33.3%	37.7%
		% of Total	2.6%	2.6%	7.9%	5.3%	7.0%	6.1%	6.1%	37.7%
	Only the municipality is responsible	Count	1	2	0	0	2	5	4	14
		% within Age	25.0%	22.2%	0.0%	0.0%	8.7%	27.8%	19.0%	12.3%
		% of Total	0.9%	1.8%	0.0%	0.0%	1.8%	4.4%	3.5%	12.3%
Total	Count	4	9	19	20	23	18	21	114	
	% within Age	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	
	% of Total	3.5%	7.9%	16.7%	17.5%	20.2%	15.8%	18.4%	100.0%	

Perceived_responsibility * Citizen_engagement Crosstabulation

		Citizen_engagement		Total	
		Yes	No		
Perceived_responsibility	Only the municipality is responsible	Count	5	9	14
		% within Citizen_engagement	7.7%	18.4%	12.3%
		% of Total	4.4%	7.9%	12.3%
	The municipality is largely responsible, citizens a little	Count	22	21	43
		% within Citizen_engagement	33.8%	42.9%	37.7%
		% of Total	19.3%	18.4%	37.7%
	Both citizens and the municipality are responsible	Count	38	19	57
		% within Citizen_engagement	58.5%	38.8%	50.0%
		% of Total	33.3%	16.7%	50.0%
Total	Count	65	49	114	
	% within Citizen_engagement	100.0%	100.0%	100.0%	
	% of Total	57.0%	43.0%	100.0%	

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	5.359 ^a	2	.069
Likelihood Ratio	5.385	2	.068
N of Valid Cases	114		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 6.02.

Symmetric Measures

	Value	Approximate Significance
Nominal by Nominal	Phi	.217
	Cramer's V	.217
N of Valid Cases	114	

Crosstab

			Perceived_responsibility			Total
			Only the municipality is responsible	The municipality is largely responsible, citizens a little	Both citizens and the municipality are responsible	
Subsidy_awareness	No	Count	14	30	32	76
		% within Perceived_responsibility	100.0%	69.8%	56.1%	66.7%
		% of Total	12.3%	26.3%	28.1%	66.7%
	Yes	Count	0	13	25	38
		% within Perceived_responsibility	0.0%	30.2%	43.9%	33.3%
		% of Total	0.0%	11.4%	21.9%	33.3%
Total	Count	14	43	57	114	
	% within Perceived_responsibility	100.0%	100.0%	100.0%	100.0%	
	% of Total	12.3%	37.7%	50.0%	100.0%	

3.3 Citizen's capability statistics

Knowledge

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Knowledge	99	1.00	5.00	4.3636	.85062
Resources	98	1.00	5.00	3.8571	1.04536
Time	99	1.00	5.00	3.6768	.99825
Space	99	1.00	5.00	3.9495	1.11916
Confidence	97	1.00	5.00	3.6701	1.24768
Allowed	34	1	5	3.76	1.130
Valid N (listwise)	33				

Barrier * Garden Crosstabulation

		Garden		Total
		No	Yes	
Barrier	Count	4	61	65
	% within Barrier	6.2%	93.8%	100.0%
	% of Total	3.5%	53.5%	57.0%
I don't have any problems with it myself	Count	3	8	11
	% within Barrier	27.3%	72.7%	100.0%
	% of Total	2.6%	7.0%	9.6%
I don't have the resources to do something	Count	1	5	6
	% within Barrier	16.7%	83.3%	100.0%
	% of Total	0.9%	4.4%	5.3%
I don't know what I can do	Count	8	8	16
	% within Barrier	50.0%	50.0%	100.0%
	% of Total	7.0%	7.0%	14.0%
I don't think it is my responsibility	Count	0	2	2
	% within Barrier	0.0%	100.0%	100.0%
	% of Total	0.0%	1.8%	1.8%
I don't think it is necessary	Count	1	6	7
	% within Barrier	14.3%	85.7%	100.0%
	% of Total	0.9%	5.3%	6.1%
I don't think my individual actions help	Count	2	1	3
	% within Barrier	66.7%	33.3%	100.0%
	% of Total	1.8%	0.9%	2.6%
I don't understand/see the problem	Count	0	1	1
	% within Barrier	0.0%	100.0%	100.0%
	% of Total	0.0%	0.9%	0.9%
Other	Count	1	2	3
	% within Barrier	33.3%	66.7%	100.0%
	% of Total	0.9%	1.8%	2.6%
Total	Count	20	94	114
	% within Barrier	17.5%	82.5%	100.0%
	% of Total	17.5%	82.5%	100.0%

Crosstab

		Citizen_engagement		Total	
		No	Yes		
Subsidy_awareness	No	Count	40	36	76
		% within Subsidy_awareness	52.6%	47.4%	100.0%
		% of Total	35.1%	31.6%	66.7%
Yes	Count	9	29	38	
	% within Subsidy_awareness	23.7%	76.3%	100.0%	
	% of Total	7.9%	25.4%	33.3%	
Total	Count	49	65	114	
	% within Subsidy_awareness	43.0%	57.0%	100.0%	
	% of Total	43.0%	57.0%	100.0%	

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2- sided)	Exact Sig. (1- sided)
Pearson Chi-Square	8.662 ^a	1	.003		
Continuity Correction ^b	7.521	1	.006		
Likelihood Ratio	9.033	1	.003		
Fisher's Exact Test				.005	.003
N of Valid Cases	114				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 16.33.

b. Computed only for a 2x2 table

Symmetric Measures

	Value	Approximate Significance
Nominal by Nominal Phi	.276	.003
Cramer's V	.276	.003
N of Valid Cases	114	

Report

Eagerness_to_learn

Citizen_engagement	Mean	N	Std. Deviation
No	5.49	49	2.607
Yes	5.82	65	2.358
Total	5.68	114	2.462

Knowledge

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Strongly agree	52	45.6	45.6	98.2
Agree	37	32.5	32.5	32.5
Neutral	6	5.3	5.3	52.6
Disagree	2	1.8	1.8	34.2
Strongly disagree	2	1.8	1.8	100.0
Does not apply	15	13.2	13.2	47.4
Total	114	100.0	100.0	

Resources

Barrier * Subsidy_awareness Crosstabulation

		Subsidy_awareness		Total
		No	Yes	
Barrier	Count	36	29	65
	% within Barrier	55.4%	44.6%	100.0%
	% of Total	31.6%	25.4%	57.0%
I don't have any problems with it myself	Count	9	2	11
	% within Barrier	81.8%	18.2%	100.0%
	% of Total	7.9%	1.8%	9.6%
I don't have the resources to do something	Count	6	0	6
	% within Barrier	100.0%	0.0%	100.0%
	% of Total	5.3%	0.0%	5.3%
I don't know what I can do	Count	10	6	16
	% within Barrier	62.5%	37.5%	100.0%
	% of Total	8.8%	5.3%	14.0%
I don't think it is my responsibility	Count	2	0	2
	% within Barrier	100.0%	0.0%	100.0%
	% of Total	1.8%	0.0%	1.8%
I don't think it is necessary	Count	6	1	7
	% within Barrier	85.7%	14.3%	100.0%
	% of Total	5.3%	0.9%	6.1%
I don't think my individual actions help	Count	3	0	3
	% within Barrier	100.0%	0.0%	100.0%
	% of Total	2.6%	0.0%	2.6%
I don't understand/see the problem	Count	1	0	1
	% within Barrier	100.0%	0.0%	100.0%
	% of Total	0.9%	0.0%	0.9%
Other	Count	3	0	3
	% within Barrier	100.0%	0.0%	100.0%
	% of Total	2.6%	0.0%	2.6%
Total	Count	76	38	114
	% within Barrier	66.7%	33.3%	100.0%
	% of Total	66.7%	33.3%	100.0%

Resources

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	28	24.6	24.6	96.5
	Agree	43	37.7	37.7	37.7
	Neutral	16	14.0	14.0	71.9
	Disagree	7	6.1	6.1	43.9
	Strongly disagree	4	3.5	3.5	100.0
	Does not apply	16	14.0	14.0	57.9
	Total	114	100.0	100.0	

Self-efficacy

Report

Self_efficacy			
Citizen_engagement	Mean	N	Std. Deviation
No	6.02	49	2.323
Yes	6.86	65	2.053
Total	6.50	114	2.203

3.4 Barriers of co-production statistics

Time and effort

Time_effort

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	20	17.5	17.5	98.2
	Agree	43	37.7	37.7	37.7
	Neutral	22	19.3	19.3	80.7
	Disagree	12	10.5	10.5	48.2
	Strongly disagree	2	1.8	1.8	100.0
	Does not apply	15	13.2	13.2	61.4
	Total	114	100.0	100.0	

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.645	.651	5

Inter-Item Correlation Matrix

	Knowledge	Resources	Time	Space	Confidence
Knowledge	1.000	.310	.226	.246	.366
Resources	.310	1.000	.237	.229	.341
Time	.226	.237	1.000	.252	.322
Space	.246	.229	.252	1.000	.186
Confidence	.366	.341	.322	.186	1.000

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Knowledge	15.16	8.660	.435	.199	.583
Resources	15.66	8.018	.417	.181	.583
Time	15.86	8.354	.388	.156	.597
Space	15.57	8.290	.324	.118	.629
Confidence	15.86	7.041	.451	.234	.566

Space in the garden

Citizen_engagement * Garden Crosstabulation

		Garden		Total	
		No	Yes		
Citizen_engagement	No	Count	16	33	49
		% within Citizen_engagement	32.7%	67.3%	100.0%
		% of Total	14.0%	28.9%	43.0%
	Yes	Count	4	61	65
		% within Citizen_engagement	6.2%	93.8%	100.0%
		% of Total	3.5%	53.5%	57.0%
Total	Count	20	94	114	
	% within Citizen_engagement	17.5%	82.5%	100.0%	
	% of Total	17.5%	82.5%	100.0%	

Dewlling_type * Garden Crosstabulation

		Garden		Total	
		No	Yes		
Dewlling_type	Apartment	Count	16	2	18
		% within Dewlling_type	88.9%	11.1%	100.0%
		% of Total	14.0%	1.8%	15.8%
	Corner house	Count	1	19	20
		% within Dewlling_type	5.0%	95.0%	100.0%
		% of Total	0.9%	16.7%	17.5%
	Detached	Count	0	17	17
		% within Dewlling_type	0.0%	100.0%	100.0%
		% of Total	0.0%	14.9%	14.9%
	Other	Count	2	3	5
		% within Dewlling_type	40.0%	60.0%	100.0%
		% of Total	1.8%	2.6%	4.4%
	Semi-detached house	Count	0	20	20
		% within Dewlling_type	0.0%	100.0%	100.0%
		% of Total	0.0%	17.5%	17.5%
	Terraced house	Count	1	33	34
		% within Dewlling_type	2.9%	97.1%	100.0%
		% of Total	0.9%	28.9%	29.8%
Total	Count	20	94	114	
	% within Dewlling_type	17.5%	82.5%	100.0%	
	% of Total	17.5%	82.5%	100.0%	

Space

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	37	32.5	32.5	96.5
	Agree	38	33.3	33.3	33.3
	Neutral	10	8.8	8.8	64.0
	Disagree	10	8.8	8.8	42.1
	Strongly disagree	4	3.5	3.5	100.0
	Does not apply	15	13.2	13.2	55.3
	Total	114	100.0	100.0	

Confidence and comfortableness

Confidence

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	28	24.6	24.6	93.0
	Agree	37	32.5	32.5	32.5
	Neutral	12	10.5	10.5	68.4
	Disagree	12	10.5	10.5	43.0
	Strongly disagree	8	7.0	7.0	100.0
	Does not apply	17	14.9	14.9	57.9
	Total	114	100.0	100.0	

Other barriers

Allowed_landlord

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		2	1.8	1.8	1.8
	Strongly agree	12	10.5	10.5	99.1
	Agree	7	6.1	6.1	7.9
	Neutral	11	9.6	9.6	88.6
	Disagree	3	2.6	2.6	10.5
	Strongly disagree	1	.9	.9	100.0
	Does not apply	78	68.4	68.4	78.9
	Total	114	100.0	100.0	