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Name: Natalia Mora Alvarez

Supervisor: Somesh Sharma

Co-supervisor: Laura Quadros Aniche

Specialisation: Urban Environment, Sustainability and Climate Change

Country: Perú

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Summary

The population in cities is growing over the years, and it is estimated that by 2050 70% of the world population will live in cities. Urban sprawl can cause diverse issues related to economic, spatial, social, or environmental matters. Therefore, creating measures to overcome climate impacts is required and needs the collaboration of multiple stakeholders and disciplines. Correspondingly, the interrelationship between technology, innovation, policies, and public engagement is key to overcoming climate change and urban sprawl.

Nature-based solutions (NBS) aim to overcome climate change impacts while providing co-benefits like air quality, lowering high temperatures, mitigating water runoff, food provision, providing well-being, among others. There are multiple NBS like water squares, blue-green roofs, rain gardens, rooftop farms, etcetera. The importance of citizens' engagement is fully recognized, ensuring more legitimate outcomes. Moreover, volunteer engagement in the post-implementation process reinforces the sustainability of the NBS projects.

The present research analyzes which factors explain the volunteers' level of engagement in the post-implementation of NBS projects, analyzing the following factors, volunteers' socio-economic and demographic factors, personal motivations to engage, social networks, and enabling conditions. Furthermore, the possible levels of engagement go from non-participation to empowerment.

The research strategy is a multiple case study of NBS projects in Rotterdam, precisely three multifunctional rooftops: the Dakpark, DakAkker, and Hofbogen. Twenty-four semi-structured interviews were made to volunteers, project managers, implementing organization members, experts in multifunctional rooftops, and municipality officials to collect the data. The researcher applied participatory observation, attending to the areas, and engaging as a volunteer. Moreover, secondary data was collected from Instagram pages and official websites of the projects and Rotterdam's municipality.

The analysis of data shows that the implementing agency determines the level of engagement of the project. In the case of the Dakpark, the organization encouraged volunteers to lead their projects like having a beehive, creating an insect garden, among others. While in DakAkker and Hofbogen, the possible level of engagement that volunteers could reach was involvement since volunteers were not expected to be in charge of projects. However, they could provide inputs and ideas that could be considered for the upgrade of the rooftop.

The main factors related to higher levels of volunteer engagement are awareness of NBS, especially knowing the NBS concept and being aware that a natural hazard could impact the area. Additionally, the socio-economic and demographic factors showed the typical characteristics of volunteers.

Keywords

Nature based solutions, participation, co-benefits, volunteers, multifunctional rooftops

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Foreword

Kind of motivation for doing the particular study

Abbreviations

IHS	Institute for Housing and Urban Development Studies
IUCN	International Union for Conservation of Nature
NBS	Nature Based Solutions
OECD	Organization for Economic Co-operation and Development
ZUS	Zones Urbaines Sensibles

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Chapter 1: Introduction

1.1. Background information

Nowadays more than 50% of the world population is living in cities and projections estimate that this number will rise to 70% by 2050 (UN-Habitat, 2014). The exponential growth of cities and people living in them can lead to diverse problems related to economic, spatial, social or environmental matters.

Furthermore, climate change and urban sprawl have several impacts on ecosystem and the services that they give to society, having an impact on human well-being. Moreover, urban expansion and climate change make cities more vulnerable to natural impacts such as: floods, droughts, urban heat, among others, causing multiple social, economic and environmental impacts (Kalantari et al. 2018) In order to manage these problems, it is necessary that each government creates the conditions to have a positive development of cities where dwellers can benefit from the services cities provide (OECD/UN-HABITAT, 2018).

Accordingly, creating measures to overcome climate impacts, requires the interrelationship between technology, innovation, environmental policies and public engagement (Barclay et al. 2019). Correspondingly, participation and community involvement are required and equally important. It is crucial that communities participate in the creation and implementation of local measures. (Bradford et al. 2012).

NBS aim to consider the ecosystem to create solutions that promote adaptation and mitigation to climate change impacts, while providing multiple benefits like: air quality, water runoff mitigation, food provision, quality of life, wellbeing, aesthetics, etc. (Raymond et al. 2017). Moreover, stakeholder engagement in the post implementation phase of the NBS projects ensures the sustainability of the project. Identification of co-benefits in an early stage, relating them with the greenspace components and supporting urban planners to strengthen the multifunctionality of the NBS. (Ferreira et al. 2020).

In this context Nature Based Solutions (NBS) is an innovative alternative measure for infrastructure development, to implement adaptation measures related to impacts of natural hazards, while providing diverse benefits to citizens'. "Nature-based solutions are inspired by nature, use nature and/or are supported by nature" (Frantzeskaki 2019; p.101), to create solutions to make cities more resilient to climate change impacts. Additionally, NBS requires stakeholder engagement (Frantzeskaki 2019).

Therefore, the development and implementation of more integral approaches are needed, balancing protection, prevention and awareness, along with socio, economic and environmental benefits (Zevenbergen et al. 2016). Participation stakeholders in policy making and implementation especially related to climate change issues, is fully recognized. Moreover Arno et al. (2020) points out the importance of volunteers in maintenance of NBS to accomplish its optimal performance. Furthermore, according to Barclay et al. (2019) public participation leads to informed decisions, social learning, awareness, acceptance of the process and leads to a more democratic outcome.

1.2. Problem statement

NBS needs to be designed in a collective way considering the multiple actors in a community with diverse backgrounds and different levels of awareness and conflicting perceptions of risks (Santoro et al. 2019). Additionally, including the knowledge of relevant actors in the construction of NBS enables and contributes to tackle all aspects of sustainability (Nesshöver

et al. 2017). As such, it is fully recognized that active participation and public engagement are required in order to tackle diverse issues related to climate change and urban sprawl.

For the post implementation phase of NBS volunteering is critical to have sustainability (Arno et al. 2020) The importance of creation and implementation of NBS is clear, however little is known about the impact of volunteer engagement in the post implementation of NBS. What drives volunteers to engage and how important is their role in the sustainability of NBS.

Public participation happens in diverse ways and can be address in different forms. During a participatory process there could be diverse types of participation (only providing information, consulting stakeholders, involving participants in the process, and or making actors part of the decision-making) leading to different kind of citizens' engagement. Moreover, participatory process has to consider the factors that lead people to engage or not in the participation of a NBS projects.

Moreover, volunteers are a fundamental foundation of nature conservation and post implementation of environmental projects. In many cases without volunteers the maintenance of environmental projects would not be able (Gazenvoort and van den Born 2020; Arno et al. 2020). Therefore, is required to understand furtherly the factors that explain the level of engagement of volunteers in these projects.

Furthermore, engaging stakeholders in the implementation and maintenance of NBS is also a challenging issue. Ferreira et al. (2020) in an extensive literature review showed that cultural matters, poor social mobilization, lack of awareness in the benefits on NBS and poor political support can affect the level of engagement in implementation and maintenance of NBS.

Building upon the existing body of research, this study will add relevant information about volunteer participation in NBS, analyzing which factors impact on the level of citizens' engagement on the participatory process of NBS projects. Understanding what drives volunteers to engage in NBS projects, could provide information to strengthen the post implementation process in order to enhance the sustainability of NBS projects.

1.3. Relevance of the research topic

A review (Raymond et al. 2017) of major studies in this area confirmed the importance of participation in the different phases of policy making, development of projects, programs and plans. Participation is considered as key element in the different stages of the NBS projects, contributing to make these solutions more sustainable and inclusive. There are several investigations (Kabisch et al. 2016; Raymond et al. 2017) about the importance of the creation, implementation and maintenance of NBS and the co-benefits that it provides to the city. However, it is recognized that many citizens' do not know about NBS and the co-benefits that it can provide impacting the motivation of stakeholders to get involved in the participatory process (Raymond et al. 2017; Kabisch et al. 2016). Citizens will be more willing to participate as volunteers in the post implementation process if they perceive that the outcome of a project would impact beneficially in their wellbeing. Additionally, there are other factors that impact in the level of volunteer engagement in a NBS project like: trust, community attachment, sense of place, risk perception, existing plans, policies or laws that promote the creation and sustainability of NBS, socio-economic and demographic factors, social networks, among others.

Moreover, a systematic review of studies in the field (Ferreira et al. 2020) found that *“New studies are needed aiming to interconnect the theoretical conceptions and the practice of*

participation processes in NBS, in order to adjust the citizens' and stakeholders' expected difficulties and the ones faced in reality—mitigating, in accordance, eventual frustrations of those involved and promoting the maintenance of collaboration during the life cycle of the implemented NBS as well as in future projects” (p. 19-20).

1.4. Research Objectives

This study analyzes which factors explain volunteers level of engagement in the participatory process of the post implementation of three NBS projects in Rotterdam. The study is explanatory and the main goal is to explore a specific phenomenon. In literature, there are diverse articles about nature-based solutions, multifunctional rooftops, participation, citizen engagement, and volunteering, core concepts in this research. Additionally, in literature authors affirm that participation is fundamental in the implementation and sustainability of NBS in order to achieve more sustainable and inclusive outcomes (Raymond et al. 2017; Ferreira et al. 2020). However, in literature there is not much information about which factors explain the volunteers level of engagement in the post implementation process of NBS projects. The objective is to gather specific empirical data to analyze which factors affect the volunteer level of engagement in the post implementation of each NBS projects that will be studied.

Therefore, the research will analyze the socio-economic and demographic characteristics of stakeholders, personal and social motivation to engage in the participatory process like: existing social networks, trust in leaders, knowledge about NBS and it's co-benefits, while examining policies, plans, and norms that could impact the construction of NBS projects.

1.5. Main research question and research sub-questions

The research questions presented below are the final research questions that were revised after the literature review. Therefore, the questions are the following:

Main research question

Which factors explain the volunteers level of engagement in the post implementation of Nature Based Solutions projects?

Research sub-questions

- How do socioeconomic and demographic characteristics of volunteers affect their level of engagement in the post implementation of NBS projects?
- How does personal motivation and social network factors affect volunteers level of engagement in the post implementation of NBS projects?
- How do the enabling conditions affect volunteers level of engagement in the post implementation of NBS projects?

Box 1 presents the preliminary research questions that were defined before developing literature review.

Box 1: Initial research questions

Main research question

Which factors explain the citizens level of motivation to participate in Nature Based Solutions projects?

Research sub-questions

- What are the perceived benefits of citizens' in the creation, implementation and maintenance of Nature Based Solutions projects?
- What stages of implementation help gain more involvement of the citizens'?' and how do these impact on the outcomes of the Nature Based Solutions projects?

1.6. Scope and limitations

This thesis mainly focuses on the volunteers level of engagement in the post implementation phases of NBS projects in Rotterdam. The present study could be broader, analyzing a significant amount of NBS projects in Rotterdam in order to obtain more general data. But due to the time limitations the study will only focus in three case studies in Rotterdam.

Additionally, financial restraints have to be considered, since the researcher had limited financial capacity and did not hire an assistant that could enable and increase the data collection and processing. Finally, challenges and limitations related to data collection and methodology are detailed in section 3.6.

Chapter 2: Literature review/theory

The following chapter provides a literature review of the underlying concepts connected with the topic of research, that are: nature-based solutions, participation process, and motivation to participate—concluding with a conceptual framework of the study.

2.1. Nature-based Solutions

Nature Based Solutions (NBS) is also considered in spatial planning and managing strategies for cities to adapt to climate hazards (Kalantari et al. 2018). According to the International Union for Conservation of Nature (IUCN, 2019) "Nature-based solutions are actions to protect, sustainably manage and restore natural and modified ecosystems in ways that address societal challenges effectively and adaptively, to provide both human well-being and biodiversity benefits."

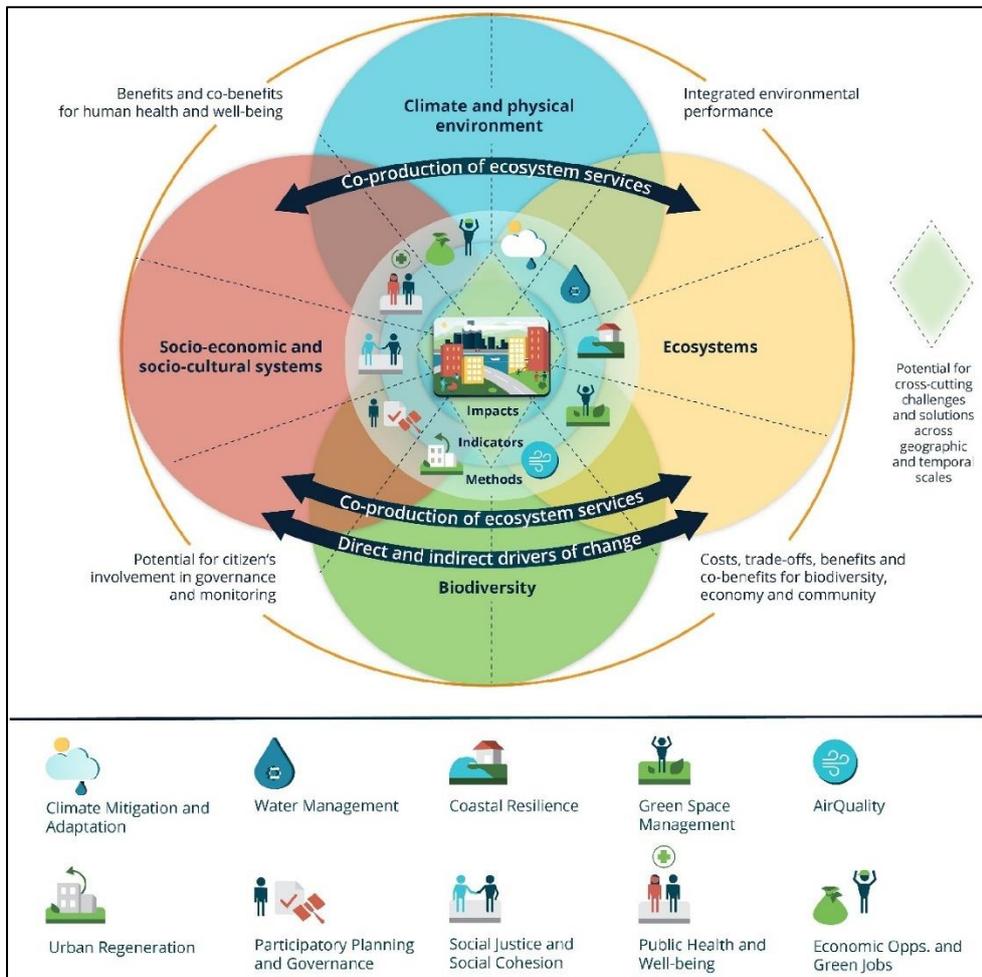
Furthermore, NBS projects aim to improve climate change resilience, restore degraded ecosystems, and create sustainable urbanization. In this matter, cities have developed NBS projects such as green and blue roofs, rain gardens, water storages, water squares, and green roofs, which positively impact the annual stormwater runoff. Still, these measures only have a small impact on large catastrophic events (Kabisch et al. 2017). In this sense, Kabisch et al. (2017) states that it is fundamental to combine spatial planning considering measures at different scales to adapt to diverse hazards and intensity of them.

Nature- Based Solutions is based on an ecosystem-related scope that aims to enhance and protect ecosystem services. Ecosystem services are defined as "the aspects of ecosystems utilized (actively or passively) to produce human well-being" (Fisher et al. 2009, p. 645). These services do not only have natural benefits as air quality, clean water, food, access to raw materials; they also provide cultural and regulating services. Cultural services are the ones created by social values like recreational, educational, aesthetical, or spiritual. While regulating services include water purification, protection against floods, climate regulation, and disease regulation (Braat and Groot 2012).

Implementation of NBS projects or strategies provides several ecosystem services like green jobs, social cohesion, air quality, and water management (Kabisch et al. 2017). "Nature-based solutions have largely evolved from previous ecosystem-based concepts and/or principles (e.g., ecosystem services, green infrastructures, ecosystem-based management, and natural capital), but it also pays attention to the social and economic benefits of resource-efficient and universal solutions that combine technical, business, finance, governance, regulatory, and social innovation)" (Ferreira et al. 2020, p. 2)

Raymond (2017) produced a framework to measure diverse co-benefits of NBS projects (see figure 1) The overarching co-benefits are : "1) co-benefits for human health and well-being; 2) integrated environmental performance; 3) trade-offs and synergies to biodiversity, health or economy; and 4) potential for citizen's involvement in governance and monitoring". For example, the creation of green roofs to avoid water runoff in a city can also provide health benefits by providing better air quality, more biodiversity, green jobs, participatory planning, and management, etc. Additionally, the city and its dwellers keep receiving the initiatives' benefits in the non-flood stage (Lawson et al. 2014).

Figure 1: Framework for the evaluation of NBS



Source: Raymond et al. 2017, p. 17

Additionally, Raymond et al. (2017) determined ten key aspects that affect cities and how can NBS projects are able to address them. Tackling issues related to the environment like: climate mitigation and adaptation, reinforcing coastal resilience, improving air quality or implementing projects to increase biodiversity. The key aspects also consider economic and social matters like generating green jobs or the monetary benefits of water reduction and promoting well-being or the creation of legitimate and transparent NBS projects that are accessible to the general public (see figure 1).

Furthermore, co-benefits in spatial planning also allow optimization of resources and make it more acceptable to citizens (Santoro et al. 2019). Also, the multiple benefits of NBS projects allow negotiating with different stakeholders. The community can support an initiative not because it makes the area more resilient to climate change, but because of the co-benefits that the NBS projects bring to the site.

Stakeholder engagement in blue-green initiatives provides various benefits to the process. Like support and acceptance, contributions and insights that could give socio-cultural or technical knowledge and involvement can contribute to a more legitimate outcome.

2.2. Participation process and stakeholders engagement

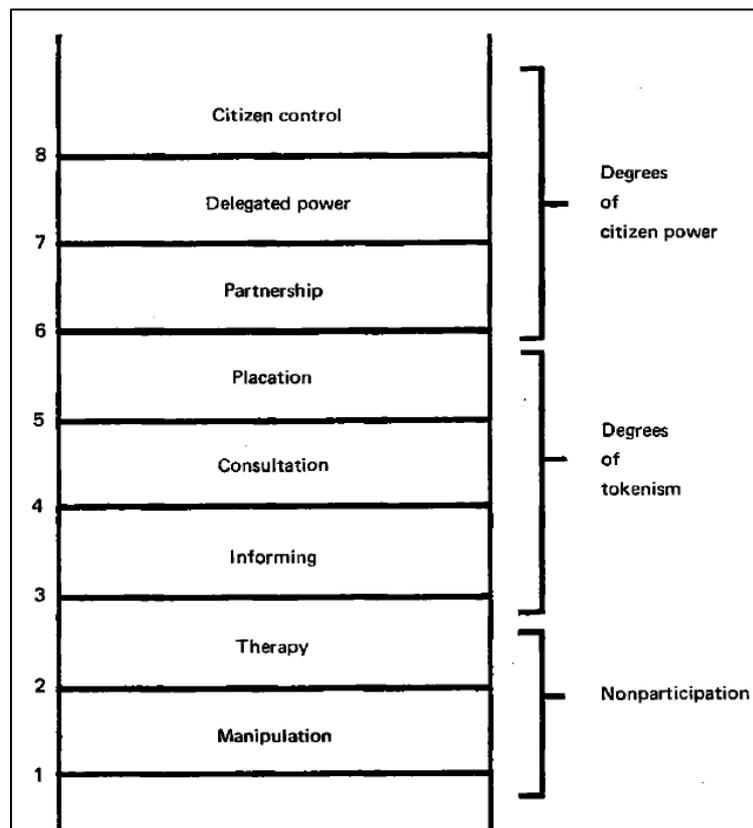
2.2.1. Levels of engagement in the participatory process

Volunteers' engagement is recognized as necessary in the maintenance of NBS projects (Arno et al. 2020.) Public participation is widely recognized as a key factor in NBS, which is needed to engage citizens", create awareness, and have legitimate outcomes (Barclay et al. 2019; Brody et al. 2003; Grafakos et al. 2010;).

The definition of participation has different meanings to various actors in theory and practice. "Participation can be used to evoke – and signify- almost anything that involves people" (Cornwall 2008, p. 269). Defining the different meanings of participation is vital to understand the process and the outcomes.

Arnstein's (1969) ladder of participation shows the different levels of participation. At the bottom, there is non-participation; that is when the ones in power decide what is better for the population, "educating" them in the process. Then there is the tokenism level where participants are only consulted or informed about the decisions and have no control or power over the decision-making process. At the highest level of the ladder, there is the citizen power; this is when citizens" are part of the decision-making process and actively participate in the process, including the levels of citizen control, delegated power, and partnership. (see Figure 2)

Figure 2: Ladder of participation



Source: Arnstein (1969, p. 217)

Is fully recognized, that the ideal participation process is the one that has more citizen empowerment (Brody et al. 2003). According to Laurian (2004, p. 53) “*a desirable public participation process is thus one that enables citizens’ to shape planning decisions and outcomes while increasing their levels of social and political empowerment*”. Moreover, working in partnerships with the full engagement of the community (citizens’ groups, academia, environmental interest groups, banks, etc.) can boost the implementation of projects, stimulating multiple community initiatives (Zevenbergen et al. 2016).

Despite considering different tools and mechanisms to promote citizen participation in a process or project, there are also several reasons for non- participation. In some cases, citizens’ do not participate because activities are too long or organized at a moment that is not suitable. This could have an effect on people who work, or that have small children to take care of or some cannot spend so many hours out of the household (Cornwall, 2008).

Another factor to consider, is the location where the activity takes place, in some cases not all of the stakeholders feel comfortable going to some locations. Also, self- exclusion, should be considered, where stakeholders do not feel confident enough to participate, they feel they do not have the required knowledge to contribute or they are afraid to be silenced by more powerful participants (Cornwall, 2008). Additionally, citizens’ who do not feel part of the community also are inclined not to participate.

Taking into consideration the stakeholders that decide not to participate in the process is crucial to understand the gaps in the participatory process. As stated by Cornwall (2008, p.279): “*participatory initiatives tend to be premised on the idea that everyone would want to participate if only they could. The active choice no to participate is barely recognized.*” Therefore, while analyzing the participation process in an NBS project it is important to study the motivation of stakeholders who do not engage in the process.

Laurian (2004) analyses the non-participatory responses in a locality that was implementing management of toxic waste. For the non- participatory process defines four main motives: trust on government to take care of the matter adequately, therefore the actors decide not to engage in the process, considering is not necessary. Then there is a lack of motivation, where stakeholders perceive that the problem will not be improve or be solved, therefore decide not to participate. Nevertheless, this kind of non- participation is not always passive, some stakeholders can have strong positions about the matter and express their discomfort in diverse ways (e.g. protesting, going to media, etc.). Thirdly there are actors that are not interested in the matter, so they decide not to engage. Lastly the author mentions the stakeholders that decide to leave the area because they perceive the threat is too risky.

Nare et al. (2011) from diverse literature presents another categorization of citizen participation that considers four levels information sharing, consultation, involvement and empowerment (Table 1).

Table 1: Types of participation.

Type of participation	Characteristic
<i>Information sharing</i>	Is equated with professionals giving information to lay people
<i>Consultation</i>	Involves people being asked for their opinions which may be considered when the final decision is made.
<i>Involvement</i>	Implies people being included as a necessary part of something.
<i>Empowerment</i>	Continuous process whereby individuals and/or communities gain the confidence, self-esteem, understanding and power necessary to articulate their concerns, ensure that action is taken to address them and more broadly, gain control over their lives.

Source: Adapted from Nare et al. 2011, p. 1064

Accordingly, the models presented by the authors Nare et al (2001) and Arnstein (1969) analyze and show a structure of participatory processes in a normative way, with “good” and “bad” levels of participation. Moreover, these typologies only mention how participation is organized from those who initiate the participatory process and not how the stakeholders dialogue is within the process. Once again it is recognized that the empowerment level is the ideal because the agency who implements the NBS can engage stakeholders at a level where they not only participate but also understand the importance of getting involved in such a project.

Another typology of participation was made by Cornwall (2008) where she differentiates the intention of the agency that promotes participation with the interests of the stakeholders to participate (Table 2).

Table 2: Typology of interests

Form	What ‘participation’ means to the implementing agency	What ‘participation’ means for those on the receiving end
Nominal	Legitimation- to show they are doing something	Inclusion- to retain some access to potential benefits
Instrumental	Efficiency- to limit funders input, draw on community contributions and make projects more cost- effective	Cost- of spent time on project-related labor and other activities.
Representative	Sustainability- to avoid creating dependency	Leverage- to influence the shape the project takes and its management.
Transformative	Empowerment- to enable people to make their own decisions, work out what to do and take action	Empowerment- to be able to decide and act for themselves

Source: Adapted from Cornwall, 2008, p. 273

Cornwall (2008) states that it can seem that some forms of participation are more ‘legitimate’ than others, but when participation is contextualized each type of participation can be as important as the other. For instance, information sharing can lead to less active engagement but could provide more information or transparency. While empowerment could contribute that the government gives more responsibility abnegating its responsibilities.

Consequently, is important to analyze the different purposes and type of participation that is required and which stakeholders need to be considered in the process. Moreover, understanding if the participatory process is a means to an end or both, if the process gives voice to the participants and engages them in the process; is it required to achieve a legitimate and effective outcome? In practice, all of the different levels of participation that are presented in the typologies, can be present in one project (Cornwall 2008).

Furthermore, to understand the participatory process it is fundamental to analyze how individuals and communities engage in it. Examining the depth (influence and inputs of the stakeholders) and width of the participation (which stakeholders are part of the participation process). Also, studying the quality of the participatory process, the opportunities for the stakeholders to debate and the outcomes of the argumentation and discussion process. “...*It becomes evident that different kind of participation imply significantly different levels of engagement*” (Cornwall, 2008, p. 280). Additionally, determining how available and accessible the information was for the stakeholders is also important, so they can make well-informed decisions (Edelenbos, et al. 2013).

Additionally, in academia, the empowerment level is defined as co-production or co-creation. Co-production refers to situations where citizens’’ contribute actively in the production of public services (Jong et al 2019). The term co-production was developed by Elinor Ostrom, in 1970s, to explain the citizens’’ active involvement in the production of public services, ensuring the quality or quantity of the service that is delivered (Ostrom, 1999). While other

scholars define co-production as the involvement of citizens'' during the design, implementation and decision making of a public initiative, giving inputs and actively participating during the process (Brandsen et al. 2018; Verschuere et al. 2012; Mees et al. 2017). Therefore, citizens that engage in public services providing inputs in the creation, implementation and post implementation phases of a project are known as co-producers.

In literature authors problematize the differences between co-production and co-creation. Brandsen et al (2018) argues that both terms refer to the citizens' inputs in public services, but the main difference is in the type of input that it delivered. Co-creation is when citizens propose or formulate a public service to solve a public issue that requires the implementation of government measures (Brandsen et al 2018; Jong et al. 2019). While, co-production "*is being considered as the involvement of citizens'' in the (co-)implementation of public services''*" (Brandsen et al 2018, p.15).

The co-production of a core service is when citizens'' are actively involved in the design, development and monitoring phases of the core actions. For example, in the construction of a waterpark in a neighborhood, the stakeholders are involved in the design, development and maintenance of the project together with the municipality (Brandsen et al. 2018).

For this research, the focus will be on the main factors that explain volunteers level of engagement in the post implementation phase of Nature-Based Solutions projects, specifically rooftop gardens. The research analyzes how the post implementation processes were conducted, what the aim(s) of the implementing agency were during this process and understanding what participation actually means in this context for those on the receiving end.

2.2.2. Factors of engagement

As stated in literature NBS projects require the citizens engagement, in order to have effective and legitimate outcomes (Barclay et al. 2019; Brody et al. 2003; Grafakos et al. 2010; Santoro et al. 2019). Thus, understanding what are the main drivers for stakeholders to participate in NBS projects, is a key factor to understand how the participatory process and citizen engagement could be strengthened.

According to Koehler and Koontz (2008) active participation is required in watershed management, but one of the main challenges is engagement of stakeholders and constant participation throughout the process. Furthermore, "*NBS effective governance and accuracy establishment increasingly require public input, and urban planners and policymakers are progressively aware of the need to take the perceptions and experiences into consideration. Understanding stakeholders' perceptions of, and preferences for green spaces and engaging them in the planning process can potentially bring benefits to residents and urban planners [23,26–28]. In addition to this understanding, considering the perceptions and preferences of citizens'' is seen as a first step in promoting and facilitating effective citizen participation and governance.*" (Ferreira et al. 2020, p. 8)

Ferreira et al. (2020) found that the main challenges for stakeholder to participate in NBS projects were the following: different perspectives and interests between stakeholders, the high expectations of stakeholders were not achieved, perceiving that participating is time consuming and expensive, lack of political support, bureaucracy, among others. While Ferreira et al. (2020) explored in several studies that the main drivers for people to engage in NBS projects are: protecting the environment and contributing to sustainability, improve community wellbeing, to create or reinforce social cohesion (e.g. promoting social interactions), sense of attachment to the neighborhood, interest in learning from the experience. Additionally, the

literature review showed that the willingness to participate grew when stakeholders were closer to a disturbance or risky area, on the other hand shows that some environments are more difficult for people to engage.

In order to analyze the factors that motivate volunteers' participation in local projects, several studies have been revised. Some of the studies are related directly with NBS, while others analyze the diversity of participation of citizens and volunteers related to environmental matters.

2.2.2.1. Socioeconomic and demographic characteristics

In literature review authors (Barclay et al. 2019, Laurian 2004; Gazenvoort and van den Born 2020; Johnson, L.K. Campbell et al. 2018; Zare et al. 2015) found that socio-economic factors like: income, education level, employment status, age, gender, ethnicity and household composition have an impact in the level of participation. Additionally, Laurian (2004) states that high-income or upper middle-class stakeholders are more likely to participate in projects related to environmental risks at a local level. Moreover, Ferreira (2020) in an exhaustive literature review found that a drawback for participation is the amount of time that the participatory process takes, especially for citizens' with low income who cannot afford investing long periods in participatory processes.

In an extensive literature review made by Gazenvoort and van den Born (2020) show that the average age of volunteers related to nature activities is middle age volunteers. Regarding the gender patterns the authors found that is most likely that women participate more than men. Nevertheless, some studies showed an even distribution between male and female volunteers. In relation to education level the study shows that volunteers tend to have a high academic background.

Conversely, Dekker (2007) found, in a study about neighborhood participation in distressed urban areas, that socio-economic status alone had no positive or negative impact in participation and that other factors to be taken in consideration to analyze participation levels. Additionally, literature review (Dekker, 2007) shows that women that have children tend to engage more in participatory process, addressing that they tend to have more social ties in the neighborhood, leading to impact in the willingness to participate. Furthermore, Dekker (2007) states that age has an impact on participation, where older people spend more time in the neighborhood and are more willing to engage on the activities related to the area.

In a literature review conducted by Laurian (2004) found that there are diverse findings related to ethnicity and participation on environmental matters, but the majority of studies state that minorities tend to engage less in the participatory process.

2.2.2.2 Personal motivation and Social network

Citizens are more likely to participate when they perceive that the outcomes of the process can be beneficial, favorable, and relevant. Moreover, stakeholders are willing to engage when they feel that the possible benefits can exceed the costs and enhance their life quality and will be of enduring importance (Alford 2009; Laurian, 2004; Verschuere et al 2012; Johnson, L.K. Campbell et al 2018).

Citizens individual motivation to engage can be material (e.g. a safer, cleaner or greener neighborhood) or non-material rewards their citizens are part of neighborhood watch and in exchange they have a safer street (Verschuere et al 2012; Alford 2009).

Dwellers are motivated to participate not only by self-interest but also by social values that drive them to engage. Engagement, can be motivated by the gratification of socializing, searching for group approval or to avoid disapproval (Verschuere et al 2012; Alford 2009). In this sense social network is a driver for participation showing that residents are more likely to engage when they are invited by a group or a person that they know or trust (Dekker, 2007; Laurian, 2004; Verba et al. 1995). Additionally, Ryan et al. (2001) states that volunteers can be driven to participate because of social benefits, like meeting new people that share similar interests.

- **Community attachment**

A literature review (Laurian 2004) shows that community attachment and sense of belonging to a neighborhood can increment the level of participation of stakeholders in local projects. Community attachment is related to the amount of time that citizens' have been living in an area or the type of house tenure they have (Laurian 2004; Dekker 2007). Accordingly, the authors (Laurian 2004, Dekker 2007) show that household owners are more likely to participate or invest in the area than tenants.

- **Risk perception**

A research developed by Baptiste (2014) showed that stakeholders that experience an environmental threat are more likely to support the implementation of environmental measures and engage in the process. Moreover, Santoro et al. (2019) shows that the implementation of strategies to overcome possible nature hazards have to consider the dynamics in the area of study. Understanding the main stakeholders and their relationship and role in management and prevention is important. Consequently, during the design of an initiative it is necessary to consider the main actors in the decision-making processes as they could have diverse and conflicting options about risk management. As defined by the Pidgeon *"I take risk perception to include people's beliefs, attitudes, judgements and feelings, as well as the wider cultural and social dispositions they adopt towards threats to things that we value"* (1998, p. 5).

Additionally, as stated by Bradford (2012), it is known that policies and measures that do not consider community perception to risk are more likely to fail. Therefore, risk perception, knowledge about possible hazards and attitudes to overcome or manage threats is influenced by socio-cultural factors and it varies between different cultures. The community and citizens' approach to risk can be modified, reinforced or weakened due to an interaction with the government, other members of the community or by the impact of nature. (Santoro, 2019).

- **Awareness in NBS projects**

According to Nesshöver et al. (2017), NBS is a concept that is not widely known and managed by the population, creating a barrier for people to participate and support the process. Consequently, the lack of awareness of the benefits and co-benefits of these initiatives can be an obstacle for citizen involvement and the implementation of a NBS project (Balian et al. 2016; Kabisch et al. 2016). Therefore, engaging the community and households during the planning process and providing information about the benefits and co-benefits is a key element for participation. Moreover, citizens' are more driven to engage if they perceive that the participation process can contribute to a better quality of life for themselves.

In literature (Barclay et al. 2019; Koehler and Koontz, 2008) is shown that the knowledge about the project and it's possible outcomes has a positive impact in the willingness to participate in a specific project. Contrariwise, when stakeholders do not understand or do not know the about the details of a project it can discourage participation. (Koehler and Koontz, 2008).

- **Trust**

According to Oxford dictionary trust is 1. to have confidence in somebody; to believe that somebody is good, sincere, honest, etc. 2. to believe that something is true or correct or that you can rely on it (2019).

Laurian (2004) states that trust in government agencies or agencies in charge of the process implies that stakeholders believe that the process will represent them and act for their interests, having a positive impact in the participation process. In contrast, Sabatier et al., (2005) states that in long term participation, high levels of trust in other stakeholders can lead to less participation because participants feel that participation is not necessary since they perceive that their interest are being ensured. *“In long-term stakeholder decision processes, then, it may be that greater levels of trust lead to less participation and greater levels of mistrust lead to increased participation”* (Sabatier et al., 2005, p. 9). Additionally, trust in the organization of the volunteering program can impact the volunteer's motivation to participate. Organizations or initiatives that are sporadic or unorganized hinder participation (Ryan et. al 2001)

Additionally, Dekker (2007) states that there are two kinds of trust, trust between residents and between residents and local authorities. Trust among citizens' is based on group identification and common rules. Moreover, literature (Barclay, 2019; Dekker, 2007; Laurian, 2004) highlights that, trust between the stakeholders, can boost the impacts in the collaborative outcomes or could lead to poor participatory processes if there is mistrust. In volunteering the social dimension (meeting new people, trusting their peers, etc.) it is an important factor for the stakeholders engagement. (Ryan et al. 2001)

2.2.2.3 Enabling conditions

Enabling conditions are the framework that the government provides to promote the creation of NBS that consider a participatory engagement throughout the process. Duguma et. al (2014) analyzes four enabling conditions to implement adaptation and mitigation measures in a specific context. Considering the following:

Box 2 Enabling conditions

- planned and/or existing national laws, policies and strategies;
- existing and planned financial means and measures;
- institutional arrangements in the country with specific reference to climate change issues; and
- planned and/or existing plans, programs and initiatives in the country.

Source: Duguma et. al 2014, p. 140

The enabling conditions presented are mainly related at impacts that are made at a national level can be used as an overarching scheme for the implementation of NBS, while the last

enabling factor is related to the local level where specific programs and plans are created to implement particular action in order to tackle a specific issues. (Duguma et al. 2014),

Moreover, Ferreira et al. (2020) in extensive literature review about NBS and participation, points out that the lack of political support, financial limitations and public involvement are the main challenges for implementation and sustainability of NBS. Accordingly, analyzing the normative, plans and political vision of the national, regional and local level to support the implementation of NBS and a participatory process that accompanies it, is fundamental to contextualize the participatory process.

2.2.2.4 Balance of engagement factors

In order to determine the factors presented in previous sections an extensive literature review was conducted about volunteers and citizens engagement factors to participate in environmental projects. The factors that were selected were the more recurrent ones and relevant regarding NBS and participation. Nevertheless, some factor were not considered like contributing to society, past experiences in volunteering, race and political views (Johnson et. al 2018; Gazenvoort and van den Born 2020).

2.3. Conclusion

The study examines the factors that explain volunteers’ level of engagement in the post implementation process of NBS projects, considering socioeconomic and demographic factors, personal and social motivations and enabling conditions. The personal and social motivations consider the factors that make dwellers perceive the project as important for their wellbeing, so having a bond with the locality, being aware of potential benefits and co-benefits of the NBS projects and perceiving how the NBS project can protect the area from possible hazards. Therefore, the study will examine if these factors have an effect in the personal motivation to engage.

According to the literature (Ryan et al. 2001; Sabatier et al., 2005), social networks is a motivating factor to engage in the participatory process where trust between community members, the citizens and local leaders and citizens and the implementing agency can have a positive or negative impact in volunteer engagement.

For socioeconomic and demographic factors, the study will analyze the characteristics of the stakeholders considering age, gender, ethnicity, income and household composition to examine to what extent these factors could impact the level of volunteers’ engagement in the process.

The enabling conditions refer to the legal framework to implement participatory process and NBS projects considering laws, policies and strategies, financial resources, institutional arrangements and implementation plans or programs at a local level.

The following table presents the definitions of the variables and sub-variables, in the context of this research:

Table 3: Definitions of variables and sub-variables

Concepts	Variables	Definition	Sub-variables	Definition
	Socio economic	Socio economic factors like: income, education	-	-

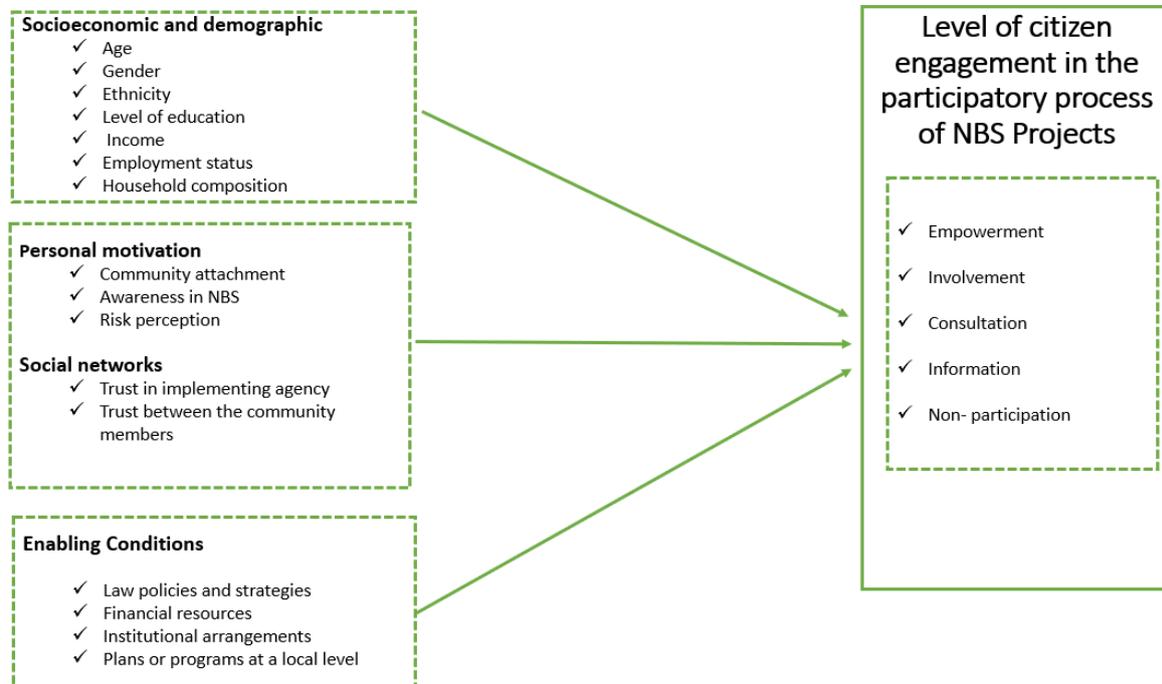
Factors for citizens engagement	and demographic factors	level, employment status, age, gender, ethnicity and household composition have an impact in the level of citizen participation (Barclay et al. 2019, Laurian 2004; Zare et al. 2015)			
	Personal Motivations	Personal factors that make citizens' engage in a project. These factors drive citizens' to engage or not, considering if the perceived outcomes of the initiative can possibly out weight the costs of it. (Laurian, 2004)	Community attachment	The sense of belonging to a neighborhood. Community attachment is related to the amount of time that citizens' have been living in an area or the type of house tenure the have (Laurian 2004; Dekker 2007).	
			Risk perception	Dwellers perception of being impacted by a hazard or a threatening event that can cause an impact in lives and material belongings. (Bradford et al. 2012)	
			Awareness in NBS projects	Knowledge about the benefits and co-benefits of NBS projects. (Kabisch et al. 2016). Moreover, having clear information about the purpose, design, costs and benefits of the project.	
	Social network	Belonging to formal and/or informal groups that have built a trust relationship between them. The relationship could be formal (has a clear hierarchy) or informal (individuals that gather around a common interest) (DFID, 1999)	Trust in government/ Implementing agency	Citizens' perception that the implementing agency and its employees are working for in something that is beneficial for them (Laurian 2004)	
			Trust between the community members	Trust between the people from the neighborhood. This aspect can boost the impacts in the collaborative outcomes (Dekker, 2007)	
	Enabling conditions	Framework provided by the government to promote the creation of NBS that consider a participatory engagement throughout the process.	Laws, policies and strategies	<i>"Planned and/or existing national laws, policies and strategies."</i> (Duguma et. al 2014, p. 140)	
			Financial resources	<i>"Existing and planned financial means and measures."</i> (Duguma et. al 2014, p. 140)	
			Institutional arrangements	<i>"Institutional arrangements in the country with specific reference to climate change issues."</i> (Duguma et. al 2014, p. 140)	
			Plans or programs at local level	<i>"Planned and/or existing plans, programs and initiatives in the country."</i> (Duguma et. al 2014, p. 140)	
	Participatory typologies	Level of participation	Level of citizen engagement in the participatory process	Non-participation	When citizens' do not engage in a participatory process. There are different reasons for non-participation like: lack of information, self-exclusion, time or budget limitations, lack of trust on stakeholders or

				implementing agency, among others. (Cornwall, 2008; Laurian, 2004).
			Information	When dwellers receive information about the process but they are not part of the decision making-process- (Nare et al. 2011; Arnstein 1969).
			Consultation	When citizens are asked to give their option about a process or project. The opinions of stakeholders can be considered or not by the decision makers (Nare et al. 2011; Arnstein 1969).
			Involvement	Implies citizens being part of the process or project and have an impact in the decision making, but the lead is from the implementing agency (Nare et al. 2011).
			Empowerment/ co-production	Process by which individuals and/or groups acquire the necessary confidence, capacity and knowledge to express their concerns and assure that action is taken to address them and that they can be active part of the process taking initiative (Nare et al. 2011; Arnstein 1969). <i>Co-production “is being considered as the involvement of citizens” in the (co-implementation of public services” (Brandsen et al 2018, p.15).</i>

Source: Author, 2020

2.4. Conceptual Framework

Figure 3: Conceptual Framework



Source: Author, 2020

According to the literature review, the theoretical framework analyses which factors explain the level of citizen engagement in NBS projects. The conceptual framework considers socioeconomic and demographic factors, personal and social motivation and enabling conditions as the independent variables that would affect the level of engagement of stakeholders in the participatory process of NBS projects, which would be the dependent variable.

For the level of citizen engagement five typologies of participation are considered from empowerment to non- participation. In the latter citizens would be actively part of the decision-making process.

Chapter 3: Research design, methods and limitations

3.1. Description of the research design and methods

The research strategy that was chosen for this study is a multiple case study with 3 selected NBS projects in Rotterdam. Within each case study semi-structured interviews will be applied to collect qualitative data. Moreover, secondary data will be collected to gather specific information about each case.

The research did not consider a quantitative research method because the total population size is not clear, since there was no information about how many volunteers could have been involved in participatory process of post implementation of each project.

According to Thiel (2014) the case study research is used commonly in Public Administration when analyzing specific social issues and trying to find detailed solutions for it. Case study strategy can focus in one or multiple cases analyzing them in depth. Additionally, the case study aims to provide detailed and wide description of the case or cases selected in order to provide an explanation of the research inquiry (Thiel, 2014).

This strategy enabled to collect rich qualitative data in order to understand the context, the participatory process of post implementation, the enabling conditions and volunteers personal and social motivation to engage in the NBS project. The researcher explored in depth which participatory approaches were used by the implementing agency, analyzing how the participatory process of post implementation was conducted, while understanding volunteer's motivations to engage in the process, the amount of time "invested" in the participatory process and the depth of the interventions of the volunteers throughout the process.

For each case study semi-structured interviews (see Annex 1) were applied to volunteers that were involved in the projects and experts that knew about the projects or were involved in the post implementation of the project. According to Thiel (2014) interviews are conversations between the researcher and one or more informants, with the aim of collecting specific data. Furthermore, semi-structured interviews have a guideline of questions so all the informants are asked similar questions, but it has a more flexible structure enabling the researcher to: adapt the language, make clarifications or change the order of the questions. Additionally, through this method the researcher can go in depth in some subjects accessing to detailed information.

Also, in order to collect primary data, the researcher applied participatory observation, attending to the areas and engaging as a volunteer. Moreover in one of the cases the researcher was added in the WhatsApp group where relevant information was gathered about the organization of volunteers.

Another collection method used was secondary data analysis. The data sources came mainly from the project webpages and Instagram. In these platforms specific information about each project was gathered and analyzed. Furthermore, on the Instagram pages the researcher found information about benefits and co-benefits of each project and the main activities that were developed.

Additionally, a different source of secondary data was plans, programs, policies and strategies at a local level related with NBS. These sources provided data about the enabling conditions for the NBS projects that were studied. The information of this type of secondary data was gathered mainly in the municipality website.

3.2. Sample size and selection

The study considered three case studies of NBS projects implemented in Rotterdam:

- Dakpark Rotterdam,
- Hofbogen
- The Dakakker

The NBS projects were chosen due to a comparability criteria, which considered the following characteristics of NBS projects:

- Based in Rotterdam
- Multifunctional rooftop
- Were implemented with the involvement of the Municipality of Rotterdam in some stage.

Within each case study semi-structured interviews were conducted with volunteers and experts that have specific information about each case study. For this matter, the researcher used a purposive sample choosing the volunteers who were involved in the participatory process of each of the selected cases and experts that were familiar with the cases. In order to find the volunteers, implementing agency and experts that were interviewed the researcher used the snowball technique. Snowball sampling is when the researcher asks the interviewees to provide names of other possible respondents (Thiel 2014). The sample size was determined on saturation concept where the researcher stopped making interviews to implementing agency and experts and volunteers when the information got repetitive. The stakeholders that were interviewed were the following:

Volunteers

- Volunteers in each case study.

Implementing agency and experts

- Project manager,
- The head of maintenance.
- Implementing organization members
- Municipality representative
- Expert in implementation and use of rooftops

Considering the saturation concept for participants of each case study and implementing agency and experts, the number of interviewees is presented in table 4. Furthermore, the table details the approximate number of participants per case study.

Table 4: Number of citizens and experts that were interviewed

Participants	Number of interviewees	Approximate number of volunteers per case study*
Dakpark	8	20
DakAkker	4	12
Hofbogen	3	10
Total participants interviewed	15	-
Experts	Number of interviewees	

Dakpark	4
DakAkker	1
Hofbogen	1
Hofbogen	1
Municipality	2
Independent organization	1
Total experts interviewed	10

Source: Author, 2020

*The number of participants is an estimate based on the information provided by the respondents and the observation. There is not a fixed number since the number of participants can vary during the year.

Volunteers provided in depth information about socio-economic and demographic factors, individual and social motivation, enabling factors and information about the participatory process. On the other hand, experts gave information about awareness of NBS projects, risks perception to possible natural hazards, social motivations, enabling conditions and the participatory process in each case study. In table 5 “Operationalization table”, there is detailed information about the type of data that was gathered from each type of actor. Additionally, in Annex 1 “Research instruments” the reader can find the semi-structured interviews that were applied to citizens and experts. In annex 2 there is a detailed table with a description of the stakeholders that were interviewed.

Participant observation of each case study focused on observing the type of participation in each project, focusing on how the interactions between the participants and the participants and the head of maintenance was developed. Also, observation allowed the researcher to triangulate the information gathered on the interviews, contrasting data and enriching it. Moreover, observation provided information about how each project was organized and the details of its implementation. Observation enriched data collection about awareness of NBS projects, trust in implementing agency and between participants and participatory typologies. During the observation the researcher considered the indicators on table 5 “Operationalization table”, to gather data and analyze it.

It is relevant to point out that in the initial methodology plan participant observation was not considered, this was a tool that was applied during data collection, since the researcher helped in each case study while applying the semi-structured interviews with the participants. While applying the interviews the researcher went to the rooftop gardens several times and helped in the daily tasks, during this process several information was noticed as valuable an enriching for the analysis. Therefore, this methodology was included.

3.3. Operationalization: variables, indicators

The main concepts, variables and sub-variables presented in the theoretical framework (see table 3) are operationalized in this section in order to translate them into conceptions that can be understood by the interviewees. For this matter each sub-variable is converted into indicators (see table 5) according with the conceptual framework (see table 3). These indicators were used as a guideline to develop the semi-structured interviews (see Annex 1). In order to have rich and deep information from the respondents the questions of the interviewees were guidelines used by the researcher during the conversation, but the interviews were also open for unexpected answers that enriched the data collection. Additionally, the researcher gathered

socio-economic and demographic information from the participants from each case studies that were interviewed.

Furthermore, the indicators (see table 5) were used as a guideline during the coding process in order to analyze the data.

Table 5: Operationalization table

Variable	Sub-variables	Indicators	References	Kind of values	Source of data	Data collection Method
Socio economic and demographic factors	-	Age (in years)	(Barclay et al. 2019, Laurian 2004; Zare et al. 2015)	Scale	Volunteers	Semi-structure interviews
		Gender (F, M, Other)		Nominal		
		Education level (three intervals) (see annex 1)		Ordinal		
		Household income in a year (Five intervals) (see annex 1)		Scale		
		Household composition (single, with partner, with parents, with children)		Nominal		
		Employment status		Nominal		
		Nationality		Text		
		Spoken language		Text		
Personal Motivations	Community attachment	Years living in the area	(Laurian 2004; Dekker 2007).	Scale	Volunteers	Semi-structured interviews
		Housing occupation condition (owners, tenant of the house, tenant of a room, other)		Nominal	Volunteers	
		Feel related to the neighborhood		Text	Volunteers	
	Risk perception to a possible natural hazard	Level of knowledge that the area could get impacted by a natural hazard	(Bradford et al. 2012)	Text	Volunteers Experts	Semi-structured interviews
		Perception that a natural hazard could impact their neighborhood or house		Text		
	Awareness of NBS projects	Knowledge and familiarity with NBS concept	(Kabisch et al. 2016).	Text	Volunteers	Semi-structured interviews
		Type of knowledge of the aim and effectiveness of NBS projects for a possible climate hazard.		Text	Volunteers Experts	
		Having knowledge about the benefits and co-benefits of NBS project in the area		Text	Volunteers	Secondary data
	Social network	Trust in government/ implementing agency	(Laurian 2004)	Text Text	Volunteers	Semi-structured interviews
Trust between the community members (neighborhood)		(Dekker, 2007)	Text	Volunteers Experts		
Enabling Conditions	Laws, policies and strategies	(Duguma et. al 2014)	Text	Experts	Semi-structured interviews	
	Financial resources	(Duguma et. al 2014)	Text	Experts	Secondary Data	

		Having knowledge of financial incentives for participating in a NBS project.		Text	Volunteers Experts		
	Institutional arrangements	Having institutional arrangements to impulse NBS as a measure to tackle climate change	(Duguma et. al 2014)	Text	Experts		
	Plans or programs at local level	Existing plans or programs in the municipality of Rotterdam that support the creation of NBS	(Duguma et. al 2014)	Text	Experts		
Participatory Typologies	Non-participation	Main perceived obstacles to engage in the process	(Cornwall, 2008; Laurian, 2004)	Text	Volunteers Experts	Semi-structured interviews	
	Information	Participation in informative meetings	(Nare et al. 2011; Arnstein 1969)	Text			
		Perceiving to have accurate and complete information about the NBS project		Text			
		Having knowledge of the details of the NBS project in all the stages		Text			
		Perceiving that all the stakeholders where invited to participate		Text			
		Levels of satisfaction of the participatory process		Text			
	Consultation	Participation in the consultation process	(Nare et al. 2011; Arnstein 1969)	Text			
		Perceiving that the inputs provided by citizens' where considered by the decision-makers		Text			
		Perceiving that citizens' where providing rich inputs		Text			
	Involvement	Amount of time "invested" in the NBS project	(Nare et al. 2011).	Text			
		Considering that the process was open for participation of citizens'		Text			
		Perceiving that citizens' could have an impact in the decision-making process of the project.		Text			
		Considering that the process was open for the participation of all stakeholders.		Text			
	Empowerment	Perceiving that citizens' were actively involved in the decision- making process	(Nare et al. 2011; Arnstein 1969; Brandsen et al 2018).	Text			Volunteers Experts
		Perceiving that citizens' could express their concerns openly		Text			
		Perceiving that that citizens' were encouraged to lead the process		Text			Volunteers

Source: Author, 2020

3.4. Validity and Reliability

In order to achieve a high reliability in a research, this must be accurate and consistent so that the information that is gathered responds to the reality (Thiel, 2014). Accuracy is using the most suitable instruments to collect the information. Moreover, the variables that are being measured should be phrased in a correct way, so the information gathered responds to the research question.

Furthermore, to ensure reliability, every step of the collection of data process was documented so it can be checked afterwards. Also, during the interviews was fundamental to build trust with the interviewees, for this matter, the questions were asked in a neutral way to avoid answers that are not consistent with the reality.

According to Thiel (2014) triangulation is used to increase reliability and validity, and has the aim to ensure that the data collection and research results are accurate. The present study applied the following triangulation methods:

- Semi-structured interviews to volunteers implementing agency and experts (primary data collection).
- Participant observation and interaction on WhatsApp group were the researcher observed how each project was managed, how interactions took place between stakeholders, analyzing the personal motivations, social network and participatory typologies (primary data).
- Revising Instagram pages and official websites of the three case studies and official webpage from the Municipality of Rotterdam. (secondary data).

External validity is one of the main challenges faced in case study strategy. External validity is the possibility to generalize the findings of the study and apply it in other contexts (Thiel, 2014). The present research has a low external validity because the information gathered is related to a specific context, therefore, the findings are not generalizable. The data was gathered through qualitative research. Therefore, the data collected provides in depth and detailed information about each case study.

3.5. Data Analysis

The data that was collected through semi-structured interviews were recorded with the approval of the interviewees. Every interview was transcribed manually by the researcher. Afterwards the interviews were read and the concepts and phrases aligned with the variables, sub-variables and indicators (see table 5) were highlighted. This process is called the coding that allows the researcher to analyze the data that was gather in detail. According to Thiel (2014, p.139) *“the researcher interprets the qualitative data, and subsequently to the different pieces of information”*.

In other to analyze the interviews in depth, the researcher used the software Atlas TI. Each interview was coded considering the sub-variables and it's indicators (see table 4 and 5). Therefore, the sub-variables considered for the coding process were: community attachment, risk perception to a possible natural hazard, awareness in NBS projects, trust in implementing agency, trust in local leaders, trust between community members, laws-policies and strategies, financial resources, institutional arrangements, plans or programs at local level, no-participation, information, consultation, involvement and, empowerment/ co-creation

During the data collection new information appeared that required considering new sub-variables or merging some of the existing ones. Accordingly, since community attachment was defined as the ties in the neighborhood this sub-variable was complemented with sense of place that refers to the connection volunteers have with the NBS project. Moreover, through the analysis volunteers made reference to this topic.

The sub-variable trust between the community members was redefined as trust between volunteers since it was more accurate for the analysis of the social network of volunteers in each project. Additionally, during the analysis the respondents mentioned this topic several times. Therefore, the sub-variable was redefined from “trust built between the volunteers” to “trust between the group of volunteers”.

Finally, the sub-variables laws, policies and strategies, institutional arrangements and plans or programs at a local level were merged in one sub-variable denominated “public policies, management instruments and institutional arrangements, since in the analysis it was more accurate to organize it this way.

The coding process of the interviews were done using Atlas TI, the researcher applied the Query Tool to analyze the relationship between codes in the different documents. Moreover, the researcher, could analyze each case study separately and separate the analysis of the experts and citizens.

Secondary data provided additional information about each project. The data was used to have a broader context about each project and provided rich information about enabling conditions, as well as awareness about the NBS project. The data was analyzed considering the sub-variables and indicators (see table 5), additionally the analyzed information was used to complement and contrast with the primary data gathered through semi-structure interviews and observation.

Additionally, the information gathered through observation complemented and enriching the information gathered through interviews and in secondary data. The main information gathered was related to sense of place, awareness of NBS projects, trust in implementing agency, trust between participants and the type of participatory process in each case study.

3.6. Expected challenges and limitations

It is fundamental to consider the current situation that we are facing with Covid-19 Pandemic and how can impact in the validity and reliability of the results, especially when gathering data. Online interviews can have several limitations like: interviewees that are not familiar with online platforms, not being able to have a proper connection with the informant, poor internet access, informants not being comfortable with a recorded online interview, among others. Considering this matters the researcher proposed the interviewees to have zoom meetings, but also asked is they were more comfortable with other platforms. Additionally, at the beginning of each interview the researcher explained the confidentiality of the information, and informed how much time will the meeting take. It is important to point out that most of the interviews were face to face, but thinking beforehand of the possible limitations made easier the few interviews that were conducted by online platforms.

Chapter 4: Presentation of data and analysis

This chapter presents detailed information of the three case studies that were investigated. Additionally, the chapter will present the analysis of the data and show the research findings according with the research Conceptual Framework providing details for the variables and sub-variables.

4.1. The case studies

This study analyzes three NBS projects in Rotterdam: Dakpark, DakAkker and Hofbogen. The location of the projects is as follows:

Figure 4: Location of the three case studies

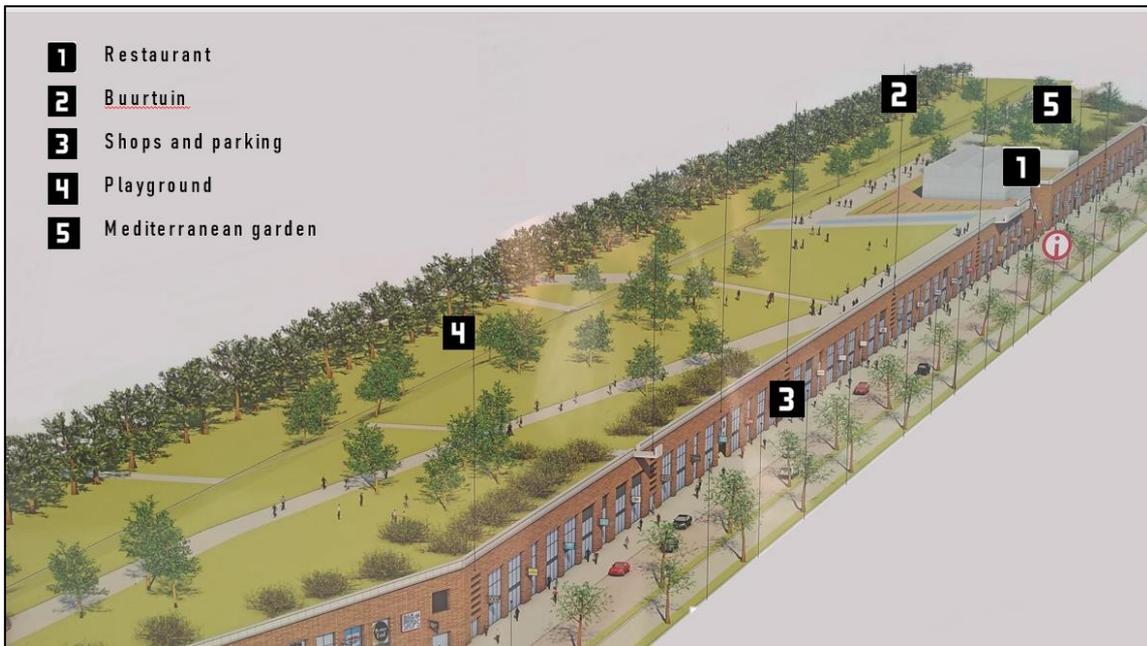


Source: Author, 2020. Images: Google my maps 2020

4.1.1. Dakpark

Dakpark is located in Delfshaven in Rotterdam. It is one of the largest rooftops in Europe, it is nine meters high and it has a length of about 1,200 meters. Dakpark is on top of a shopping center that includes a large garage park in between the roof of the shops and the park. The park has big green areas where people can barbecue, exercise or relax. (<https://www.dakparkrotterdam.nl/over-ons/>). It also has water staircases that are used by the children in the summer, being a place to play and a playground for children. Moreover, it has a community garden (Buurtuin) and a Mediterranean garden that is managed by Dakpark organization with an active involvement by volunteers. (see figure 5).

Figure 5: Dakpark map



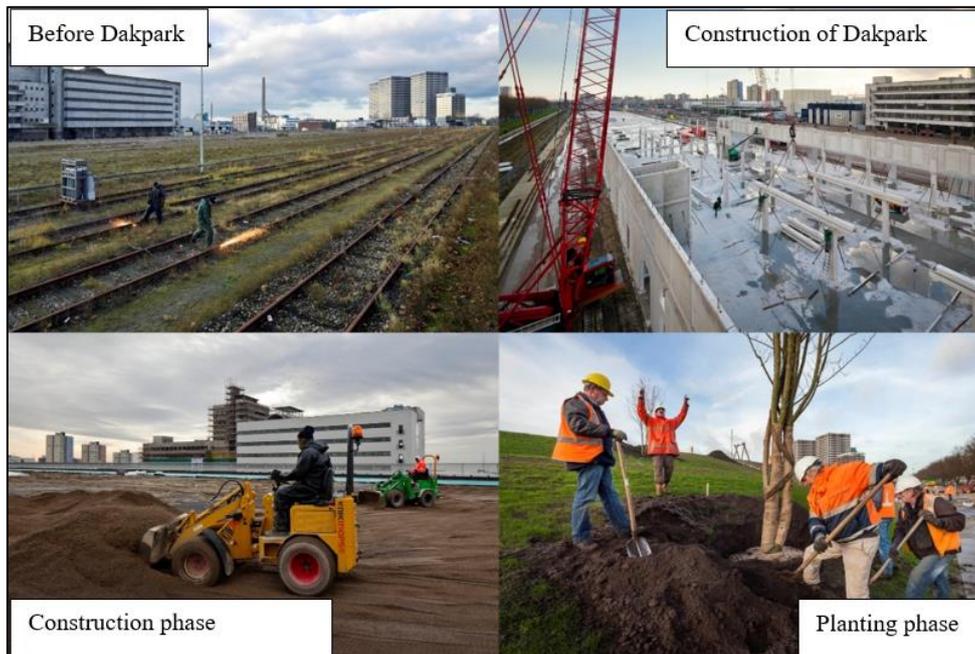
Source: Personal editing from Big Shop poster

Before Dakpark was built, the area for many years was an old railway line that was not used. In 1998 there commenced a conversation between the Municipality and the citizens, they started to consult about the development in the area.

“The idea, fifteen years old, and this was an old place where trains were an old train station, but it wasn't used for decades of years, I think, 20 years unused. So, it was a place for junkies and trash and not safe at all. So, they want to do something with this part. And then the government said we want shops, economy. And the neighbors said, no, we want green. There's no green in this area. And then they literally staples those plans by having the shop. So then they made a combination of those plans, shop downstairs and on top of it Dakpark” (DKPE 1)

After 15 years of debating between the neighbors and the municipality of Rotterdam about what should be done, the Dakpark project was delivered to the neighbors to manage the Buurtuin and the Mediterranean garden. Then they created the Dakpark organization. Figure 6 shows how the area was before the creation of the Dakpark and some pictures of the construction and implementation processes.

Figure 6: Before Dakpark and Construction phase



Source: Stijn Brakkee photos

Nowadays there are several groups involved in Dakpark in different ways, the following groups were set up to look after the Dakpark (<https://www.dakparkrotterdam.nl/over-ons/>)

“Buurtuin” or community garden. People can volunteer Tuesdays and Thursdays, normally there are around 8 volunteers engaged in this activity (participant observation in the area), which aims to develop the buurtuin, that is maintained with support from the volunteers. In the buurtuin there is a multipurpose house that was finished a few months ago (see figure 7) and was constructed by the volunteers, a beehive, a fruit garden, an insect garden, sheep, a composting unit and, a shed for storing the tools.

Figure 7: Dakpark and the Buurtuin 2020



Source: Buurtuin pictures Author, 2020. Dakpark picture. <https://www.dakparkrotterdam.nl>

Allotment garden. There are in total 24 plots, these are used by the neighbors. They are used to grow vegetables, flowers, fruits and herbs. (see figure 8). The allotment garden is in the buurtuin area.

Guides. There are a group of guides whose function is to show interested parties in detail how Dakpark works and the multiple benefits that the area has for the city.

Groengroep. There is a group of around 10 volunteers that help every Saturday to maintain the Mediterranean garden, the herbal garden and also work at the buurtuin maintaining the trees from the fruit path. In exchange, the municipality gives them capacity building lessons in gardening.

“The groen groep is one of the most constant factors in the last six years, we had an average attendance of 7.8 people each week. We were always working through, and our work before was not followed by the formalboard” (DPKE2)

The moestuin. On Wednesdays there are lessons for children. The children have a small plot to grow vegetables and fruits in the buurtuin. During this session the children also make projects and cook the harvest of the day. (see figure 8)

Figure 8: Allotment garden and Moestuïn activity



Source: Author, 2020.

4.1.2. DakAkker

In 2011 Rotterdam’s Municipality organized a contest called the “city initiative” in order to encourage public participation in the revitalization of the city. The project Luchtsingel competed for this prize and won 4 million euros for its implementation that consisted of 4 subprojects:

- ✓ A wooden pedestrian bridge of 390 meters
- ✓ The DakAkker on Schieblock
- ✓ A public area at the former station Hofplein
- ✓ A park Pompenburg

Source: <https://www.luchtsingel.org/en>

The project entailed connecting Rotterdam North with the Rotterdam's Central Station. The DakAkker is a rooftop farm that is 1,000 m² and is located on top of the Schieblock building. This rooftop farm grows vegetables, fruits and edible flowers. Furthermore, it has a beehive, composting units, and chickens. The restaurant Op het Dak is also located on the rooftop. This is a small restaurant that complements and creates dishes with the vegetables, herbs, fruits and edible flowers that grow on the rooftop farm.

Figure 9: Rooftop farmer at Dakpark

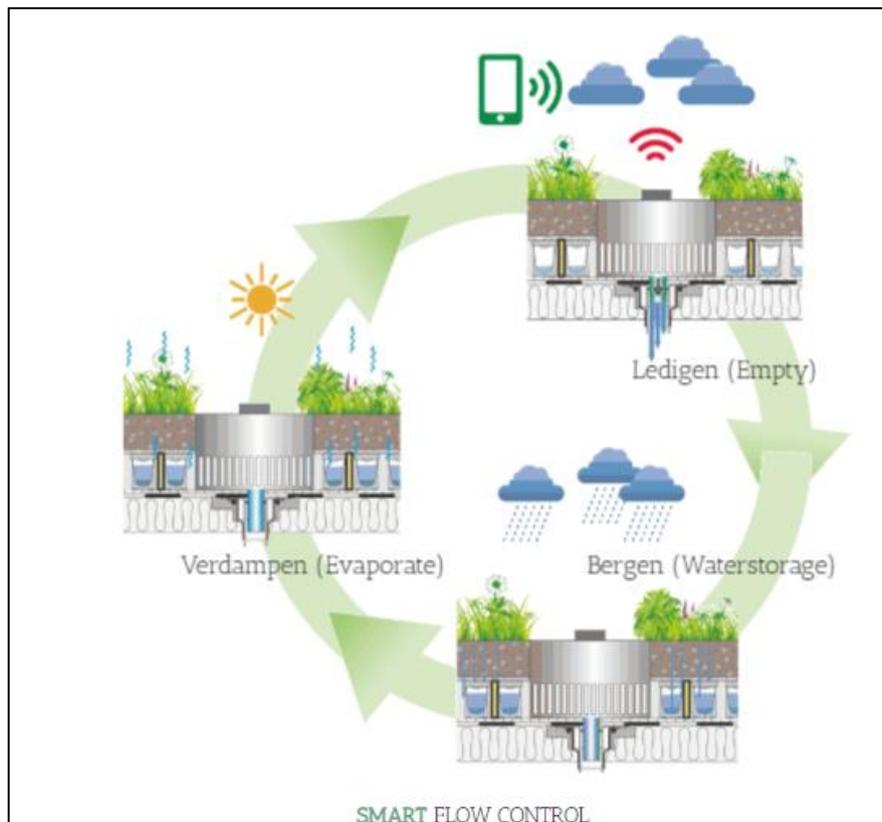


Source: Author, 2020

Additionally, the rooftop has a water storage capacity, and on top of the restaurant Op het Dak there is a smart roof that is connected with the weather forecast to release water at the precise moment to avoid that the sewerage system gets overloaded (see figure 10).

“The rooftop farm itself can store 60,000 litres of rainwater. So, when it's when it's dry and it will start raining and it's completely saturated at 60,000 but when it has rained the day before, and when it's completely saturated, almost all of the rain will go into the sewage but it takes some time to get there. Then there is the smart roof on top of the restaurant. It's creates eight centimeters high and on top of it there's a substrate and plants. There is a machine and it's called the smart flow control. And this machine has contact with the weather forecast. So it knows when it will ring. So, when the rooftop is full, 24 hours before it starts raining. The water level goes down. Exactly the amount of the rainwater that will fall the next day.” (DAKE1)

Figure 10: Smartroof system



Source: <https://dakakker.nl/site/#slimdak>

The rooftop farm is maintained by The Nature And Spatial Planning Consultant that is part of the Rotterdam Environmental Center, together with a group of approximately 14 volunteers who take care of the rooftop farm. Volunteers help every Friday between 9-12 am. Additionally, some volunteers have also been given the opportunity to volunteer some additional days in order to cuddle and look after the chickens. The main activities of the volunteers are: weeding, planting, harvesting flowers, fruits and vegetables. Their activities also include taking care of the bees and the chickens, collecting honey and extracting the water from the compost unit and bottling it. (This information was gathered by participant observation in the area).

The DakAkker is not only used as a rooftop farm, it is also a space where children can learn about the benefits of a green- blue rooftops, learning about biodiversity and water storage among others things.

“The children discover the roof top farm with a roof top map. They are introduced to everything that grows on the roof top farm, the bees, the worm hotels. In this way the children learn more about urban agriculture, healthy food and biodiversity.”
(<https://dakakker.nl/site/?lang=en#leerdoel>)

Moreover, the rooftop has several activities like tours and renting the rooftop for commercial shots and events (<https://dakakker.nl/site/#slimdak>). These activities produce a small fee that is used for the maintenance of the rooftop.

DakAkker has several sponsors that contribute to the sustainability and implementation of some activities and initiatives, for example the construction of the smart roof was possible with the resources from external financing.

“DakAkker Roof top farm is an initiative of ZUS [Zones Urbaines Sensibles] and Rotterdams Milieucentrum in cooperation with Optigrün Benelux en Binder daktuinen as part of the first city initiatives of Rotterdam: de Luchtsingel’. ‘Dakennie’ the education program for primary schools in Rotterdam on the roof top farm and is financially supported by Water sensitive Rotterdam, the municipality of Rotterdam and the Water board Hoogheemraadschap Schieland en de Krimpenerwaard.” (<https://dakakker.nl/site/?lang=en#leerdoel>)

4.1.3. Hofbogen

Hofbogen is located on the border between Rotterdam North and Rotterdam Centrum (Central Rotterdam). It was built on top of the Hofplein station and it was open to the public around 3 years ago.

The Hofplein viaduct was constructed between 1904 and 1908 and was the first electric railway line in The Netherlands, that connected Rotterdam with The Hague. The viaduct is 1.9 kilometers long and consists of several arches. In 1940 the Hofplein station was completely destroyed due to the bombing of Rotterdam city. Then in 1953 a new station was built and used until 2010. (<http://www.hofbogen.nl/luchtpark/>)

Figure 11: Hofbogen and arches



Source: Author, 2020

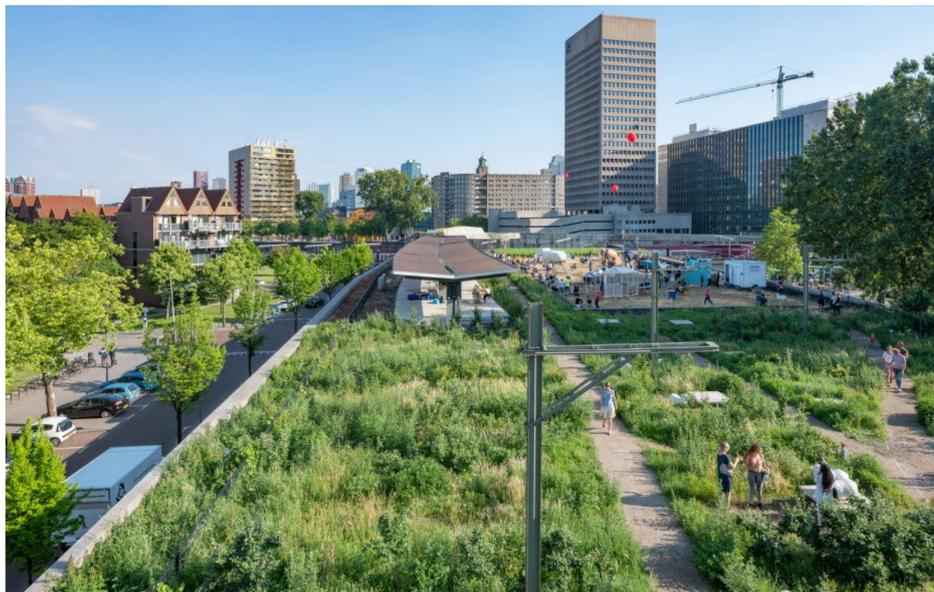
In 2002 the Hofplein railway station was considered a National monument. In 2006 the arches became property of a housing corporation Hofbogen BV while the railways were the property of pro-rail. In 2010 the railway company renovated the rooftop and hired Binder to design the rooftop garden with the collaboration of DakAkker foundation and Rotterdam Milieucentrum (Rotterdam Environmental Center), but it was closed to the public. Three years ago (2017), after several negotiations between the railway company, the local government the housing association and the neighborhood residents, Hofbogen was opened as a public rooftop garden. The main goal was to use the place as a public green space and to have a community garden.

“About 10 years ago the train stopped driving in these tracks. For the first few years not much happened. And then the roof was cleaned up, there was a they put up a layer of root resistant stuff and they put soil on it. And the trees were planted and lots of flowers and the herbs that are shown here, but the roof was still closed, it was not open for the public. Then the local municipality, asked us from Groen Goed (...) if we could organize the shared gardening here and that’s when it was open for a wider public (...) we started doing that about three now four years ago.” (HBE 1)

Since September 2019 the Dudok company owns Hofplein viaduct that includes 1.9 Kilometers of the old railway and the arches below. Apparently, the plan is to extend the roof garden to cover all of the 1.9 km.

Hofbogen was open to the public in January 2017 and it has been managed by Groengood, an organization in charge of participatory processes of community gardens in eight locations in Rotterdam. The post implementation of Hofbogen was done with the support of volunteers (around 8) that go every Tuesday from 11 am to 15 hours to weed, plant and harvest the garden. In the garden there are several fruit trees and vegetables. Educational activities with children are organized on the rooftop, the children are able to participate in harvesting the fruits and vegetables and they also learn about biodiversity, while having contact with nature. This area is also used as a public space, it has some tables and benches. Diverse activities as concerts and star viewing were also organized over the past few years, but now due to COVID-19 big gatherings are not possible.

Figure 12: Hofbogen general view



<https://dudokgroep.com/portfolio/commercieel-vastgoed/hofbogen>

4.2 NBS characteristic of Dakpark, DakAkker and Hofbogen

According to the literature review, NBS brings co-benefits for the environment, boosting biodiversity, reducing the urban heat island effect, improving air quality, and reducing water run-off. It is also beneficial for citizens as it contributes to its visitors and volunteers' physical and mental health and contributes to the creation of social ties. It also promotes social justice when the NBS project was made and maintained with stakeholders participation. Moreover, it has a function of upgrading the area where the NBS projects also adds beauty and can add safety to the neighborhood (Cohen-Shacham et al. 2016; Kabisch et al. 2016; Raymond et al. 2017).

Rooftop gardens or farms present multiple benefits, table 6 presents the multiple benefits that each project is implementing.

Table 6: Co-benefits in Dakpark, DakAkker and Hofbogen

Co-benefits	Dakpark	DakAkker	Hofbogen
Regulates water run-off	Smart rooftop for water storage	Permeable surface	Permeable surface
Contribute to Biodiversity	Planting a wide range of wild flowers. Insect garden Bees Planting native plants	Planting a wide range of wild flowers Bees Planting native plants	Planting a wide range of wild flowers
Education	Environmental workshop for kids	Environmental workshop for kids	Environmental workshop for kids
Well-being	Space for sports and contact with nature	Space to contact with nature	Space for sports and contact with nature
Accessibility	Open for everyone	Limited Open for specific events (rooftop tours, picking flowers, etc). People that go to the restaurant can enjoy the view.	Open for everyone
Social cohesion	Social ties between neighbors and volunteers	Social ties between volunteers	Social ties between volunteers

Source: Author, 2020

4.3 Data Preparation and Analysis

According to the analysis as explained in section 3.5 the researcher used the program Atlas Ti to process and analyze all of the data that was collected. Table 7 presents the number of quotations related to the codes that were determined by the researcher. The quotations were analyzed by case study in order to study the specifics of each project.

Table 7: Coding and quotations used in Atlas Ti.

General Code	Specific Code	Number of quotations per topic		
		Dakpark	DakAkker	Hofbogen
Personal Motivations	Risk perception	7	3	3
	Awareness of NBS	60	45	28
Social Network	Trust in implementing agency	15	7	8
	Trust between the volunteers	17	10	9
Enabling conditions	Financial resources	28	29	27
	Public policies, management instruments and institutional arrangements	25	25	25
Participatory Typologies	Empowerment	35	9	8
	Involvement	15	8	11
	Consultation	12	3	4
	Information	29	5	10
	Non- participation	0	0	0

Source: Author, 2020

The following chapters are organized by variables and sub-variables where the analysis of the data has been presented according to the conceptual framework (see figure 3) and the operationalization table (see table 5).

4.4 Socio- economic and demographic factors

Based on the literature review that was done in the previous chapter, socio-economic and demographic factors can have an impact in the level of participation (Barclay et al. 2019, Laurian 2004; Zare et al. 2015). For the research the following indicators were considered (i) age, (ii) gender, (iii) education level, (iv) employment status, (v) income, (vi) ethnicity and (vii) household composition.

Table 8: Socio-economic and demographic factors of volunteers that were interviewed in the case studies

Indicators	Dakpark	DakAkker	Hofbogen
Age (in years)			
20-29	-	-	1
30-39	5	-	-
40-49	-	2	1
50-59	2	1	1
60 and older	1	1	1
Gender			
Female	2	2	2
Male	6	2	1
Education level			
Primary	-	-	-
Secondary	-	-	-
University/Technical	8	8	8
Employment status			
Employed	6	2	2
Unemployed	2	2	1
Household net income per year (in euros)			
Less than 15,000	2	-	1
15,000- 20,000	1	-	1
20,000-25,000	2	-	-
25,000-30,000	1	1	-
More than -30,000	2	3	-
Household composition			
Single	6	2	1
Partner	2	2	2

Roommates	-	-	-
Partner and children	-	-	-
Only children	-	-	-
Parents	-	-	-
Ethnicity			
Dutch	7	4	3
Italian	1	-	-
Spoken language			
Dutch	8	4	3
English	8	4	3
Italian	1	-	-

Source: Author, 2020

The information presented in Table 8 comes from the interviewed volunteers that were involved in the maintenance of the projects. In the three case studies the age range of participants was quite diverse, going from volunteers in their mid-twenties to participants that were 60 years or more. Moreover, the gender indicator shows that as many men as women are interested in the projects. Additionally, during the data collection in each project, the researcher observed that the number of men and women was mostly balanced and sometimes varied from day to day. This shows that in the three case studies that all sexes are attracted to working in the gardens - there is not a tendency related to gender or age among the participants that are involved in the maintenance of the NBS projects.

Another aspect that was analyzed was the educational level of the participants, in the three case studies all of the respondents had either a technical education or had a university level of education.

Regarding the indicator of employment status, the data showed that this was quite variable in all the three cases, in DakAkker there was the same number of people employed and unemployed, in Hofbogen there were more respondents unemployed than employed and in Dakpark most of the interviewees were working except for two of them who were participating as part of a social welfare scheme.

Concerning the matter of annual net household income, the researcher used a scale of five ranges to measure this indicator. The findings showed that the income rate of the respondents was very different for all of the case studies. In the case of Hofbogen one of the respondents decided not to answer this question since it was a sensitive topic for her/him.

According to the literature review, both Laurian (2004) and Ferreira (2020) stated that it is most likely that high-income or upper-middle-class citizens are more inclined to participate in these types of projects. Furthermore, dwellers with a low income are often unable to afford to take time off to participate in unpaid participation processes. To analyze this matter, the information about household income and employment status was correlated. The findings show that in Dakpark, the two respondents who earned less than 15,000 euros per year as a net income were unemployed but participated in the projects as part of a social welfare scheme. As mentioned above, this scheme allows participants to receive a monthly allowance from the government, in exchange, the citizens have to collaborate in a specific matter, in this case engaging in the maintenance of Dakpark. Regarding DakAkker, the unemployed respondents had an annual net income of 25,000 euros or more. The participants of Hofbogen that were unemployed stated

that had an annual income of 20,000 or less (low income). In the case of Hofbogen the economic factor did not influence the participation of the citizens.

An interesting finding was that in the three projects the participants had a similar household composition. All of the participants that were interviewed were either living alone or with their partner, none of them were living with children, parents or roommates. These findings were contrary to the literature review, where Dekker (2007) stated that women with children tend to engage more in participation processes because they had more neighborhood ties.

Another aspect that was studied was ethnicity, the interviewees in the three case studies were mostly Dutch, only one interviewee was from Italy. Moreover, all of the interviewees spoke, read and wrote fluently in Dutch and spoke fluent English. The findings in the three projects were aligned with the literature (Laurian, 2004) which shows that in the majority of the studies regarding ethnicity, participation and environmental matters, they found that minorities tend to engage less in the participatory processes.

In relation to this indicator is important to point out that for the case study of Dakpark, during the participant observation process, the researcher met with five new volunteers who were all from different countries, although not all of them spoke Dutch but it was possible to communicate with them in English. Due to time limitations and because the data collection had already reached saturation, the researcher only interviewed one of them. Additionally, during the interview with one of the organization members at Dakpark, the researcher found that the people who had allotment gardens came from different backgrounds like from Morocco, Cape Verde, Turkey and also from The Netherlands.

“There are 24 allotment gardens and there are people from the neighborhood that take care of it, is quite diverse group from different nationalities it represents more the neighborhood. I want the people from the allotment gardens to get more engaged because in the stichting (organization) is all people mostly Dutch in their 40’s well educated and that is not the neighborhood. How do you get people to know that the board is for everyone? Is not about how you are educated is about your willing to help, is about motivation. So, we are also inviting the people to come to the meetings.” (DKPE1)

“There is a lady that never sent an email because she does not speak the language. That is also a problem because is not in their own language. Of course they can speak it, but some cannot write it. Also in speaking, it's not that good, but then you have like someone else from the neighborhood like her (referring to a woman that has an allotment garden) can help me translate.” (DKPE1)

“The allotment gardens are very mixed, actually mix men and woman, a lot of Turkish woman, they like it because I see they are a big group. They come here talk to each other and do because I don't I know only one of them because yes can speak Dutch, the other ones don't speak dutch. So I can't communicate with them. (DKPC6)

In the case study of the Dakpark there were diverse participation groups, as mentioned before the study analyzed mainly the Groengroep (Green Group) that meets on Saturdays and the volunteer group from Tuesdays and Thursdays, but it is important to mention that there is a diverse group of citizens that are involved in the allotment gardens. Moreover, it would be relevant for further analysis to study whether the language, ethnicity and household composition have an effect on the engagement of the people from the allotment gardens to participate in the other groups. In the case of DakAkker and Hofbogen there was only one participation group and from the interviews and the observation the researcher found that the participants were mainly Dutch.

4.5 Personal Motivations

In literature several authors present that citizens are more motivated to engage in a project when they perceive that the outcomes can be beneficial, valuable and pertinent (Alford 2009; Laurian, 2004; Verschuere et al 2012). Additionally, persons are motivated to engage in projects when they perceive that they can have material or non-material rewards such as greener areas, safer spaces, visual beauty, among other examples (Verschuere et. al 2012; Alford 2009).

4.5.1 Community attachment

The analysis of community attachment for each case study was grouped into three main topics (i) years living in the area and (ii) housing occupation condition (iii) feel related to the neighborhood; variables that were considered corresponding to the theoretical framework (see Table 5). The analysis of these sub-variables corresponds to the answers given by the volunteers that were interviewed in each case study.

The first matter discussed was the number of years living in the area. In the case of DakAkker and Hofbogen most of the respondents did not reside in the neighborhood. In DakAkker most of the interviewed volunteers (three out of four) did not live in the area and in Hofbogen one out of three resided in the neighborhood.

“It’s an hour bike to here, I live close to Delft.” (DKAC1)

“I live in the south, crossing the bridge on the bike. So its a whole workout, its like 35 minutes with a bike.” (HBGCI)

Furthermore, because the volunteers of the DakAkker and Hofbogen did not live nearby, the aspect of housing occupation conditions was not relevant, since this topic was meant to analyze community attachment. Likewise, the sense of community belonging was only mentioned by one of the interviewees in the case of Hofbogen.

“I wanted to help because of course I’m a neighbour, and I wanted to do something back for the city” (HBC2)

In the case of Dakpark, half of the respondents were residing in the area for more than five years (four out of eight respondents) and one interviewee was living in the area for two years. Additionally, half of the respondents that resided near Dakpark owned their own houses (three out of six), but in this case the indicator had to be analyzed in relation to the number of years that the residents had lived in the neighborhoods, because the two participants that were renting were also residing near Dakpark for more than ten years and were involved in the creation process of the park.

“...the government was going to use the area, so the people who are living here they have to get a voice in the decision.” (DKPC1)

In literature, community attachment was not only related to the amount of time that citizens’ have been living in an area; it is also associated with the type of house tenure they have. Authors (Laurian 2004; Dekker 2007) show that household owners are more likely to participate. In the case of Dakpark the researcher found that the type of tenure of the residence has to be contrasted with the time living in the area and community belonging. In this case, the amount of time in the area and the sense of community belonging had a more significant impact on the sense of community attachment of the interviewees.

Regarding the aspect of community belonging, most of the respondents (four of the six) that lived in the neighborhood mentioned this aspect, stating that the creation of the area was an improvement for the neighborhood. Moreover, they mentioned the importance of the Dakpark, stating that the neighborhood required a green space and that Dakpark upgraded the area, because before it was just a dangerous and abandoned place that attracted criminals.

“we bought a house nearby and there were already plans to make this area, well it was a long process. Then the park was almost ready and we started with a small group... it was in 2013, almost 7 years ago” (DKPC2)

“Before, this neighborhood was very, very bad with hookers, they were doing the job here in the rails, these old rails. And also people anticraak, people that were breaking the law. (...)we had also a lack of green in the neighborhood. And then this area is very expensive, the price of the grounds, are very high and they wanted to develop it with a lot of big shops, etc. And we said, no, we want green, green” (DKPE2)

Furthermore, in the case of the Dakpark it is important to highlight that during the research analysis it was found that community attachment played a fundamental role in the organization of the post-implementation upkeep of the Dakpark.

The Dakpark organization is in charge of the post-implementation processes. Is a bottom up initiative supported by citizens that live in the neighborhood and that are engaged as volunteers in the management of the project. The members of Dakpark organization that were interviewed live in the area for more than ten years and were also involved in the creation process of the Dakpark.

“... when there is a big project, then the municipality has to involve the people and they, sketch the plans and they talk about the ideas and developments, etc. and the people said we want green, we want green, green. Also everyone wanted a safe place(...) but it has to be green and open (...). So there was a group that for ten or nine years talking, and when the park was developed a group drawback, and now there is some people, some meetings still going on. So we made an organization. So it is the organization of Dakpark” (DKPE2)

“The planning is very, bottom up planning. So it's the current system is that the board organizes a meeting once a month a few people get together. The foundation supports the work and the ideas of the volunteers. The people from the foundation are also volunteers. So it is very bottom up” (DKPC5)

The organization wants everyone to feel empowered and to be able to lead their own projects as long as they are coordinated and aligned with Dakpark's aim and vision. The decisions are taken in group meetings considering the aim, the budget and the engagement of the people to support the initiative.

In the case of the DakAkker the community attachment did not play a fundamental role with the level of participation of volunteers. In the Hofbogen case there was an interesting finding since the main member, that was part of the decision-making processes and was quite engaged and expressed her/his ideas for the implementation was the only one that had a high community attachment.

4.5.2 Sense of place

Sense of place was a code that was not detailed in any sources that were found for the literature review but was included in the analysis because it appeared constantly in the interviews. According to Hashemnezhad et al. (2013) a sense of place is a complex term that involves emotions and the binding of people to places, it occurs when a person uses and interacts within a specific space and the people within it. Additionally, Dennis and James (2016) showed that

sense of place is a crucial element, it is the development of a group identity and that green areas can boost a positive sense of place among dwellers.

Furthermore, community attachment did not collect the information about the bond that the volunteers had with the project itself, since not all of the participants were living in the area. Accordingly, the main topics that were analyzed in this section were: (i) years volunteering in the project and, (ii) feeling happy of participating in the project

Regarding the years volunteering in the area, most (seven in Dakpark, three in DakAkker, and two in Hofbogen) of the interviewed volunteers participated for more than one year. At least one volunteer per project was volunteering since the beginning of the project, having a strong sense of place about the project. Also, all of the volunteers that were interviewed participated regularly. Through participatory observation, the researcher could confirm that most of the volunteers participated periodically.

In the DakAkker volunteers attended regularly every Friday and also, they went some days to cuddle and watch the chickens. There was even a google sheet created by the volunteers so that they could sign up to go and take care of the chickens during the week.

In the Dakpark some volunteers participated regularly on Saturdays (two of them) and others on Tuesdays or Thursdays (two of them). In some cases, volunteers did more intensive work in a specific season like during the summer with the sheep or when they were accomplishing a particular task (three of them).

The volunteers in Hofbogen also went to volunteer regularly, only in one case a volunteer could not attend for a long period because she/he had to work on the volunteering days.

“The difficult thing about gardening or well this garden is that you can only garden on Tuesday and that was my problem as well because I had conflicting work hours with my normal job.” (HBC 2)

“We come here every Saturday, even when it is raining or snowing.” (DKPC1)

Regarding the aspect of feeling happy of participating in the project, the volunteers used the words “nice”, “value”, “satisfied”, “feeling”; expressing how they appreciate engaging in the project. Correspondingly, volunteers felt fulfilled with the volunteering process.

“For me at this moment it's my life, so it is what it is (referring to the volunteering work at Dakpark)” (DKP7)

“In the Rooftop days we all decorated with flowers. It was from 8 or 9 until 6 or 7 pm standing all day. It was very tired but we were also very satisfied.” (DKAC4)

“We need motivated volunteers and so when I tell my colleagues that I am volunteer here they look a bit like why do you do that? That's funny or but they don't understand that it's really valuable to do work here. Without volunteers the garden will not be here.” (DKAC1)

“So I was like, okay, garden is a good thing. So I came here and it felt like this gives me a lot of vitality.” (HBC1)

In summary, it was found that the sense of place for all three projects was quite high, the majority of the volunteers were involved in the projects for a long period of time (more than a year), and they frequently assist in the projects and they feel gratified by the volunteering process.

4.5.3 Risk perception to a possible natural hazard

The main finding for this sub-variable was that most of the interviewed volunteers did not perceive that a natural hazard could impact their neighborhoods or their houses, although they recognized that natural hazards, especially flooding are a threat in Rotterdam.

The main aspects that were analyzed were: (i) level of knowledge that the area could get impacted by a natural hazard and (ii) perception that a natural hazard could impact their neighborhood or house.

In the case of the Dakpark only one out of eight respondents mentioned that they knew that the area could get impacted by flooding, nevertheless the respondent felt very protected by the dikes and storm barriers.

“I have that feeling. If I look at it does make this part of the dike stronger, but then there are some weak points at the end. Well this dike it should protect the area from storms, but of course a type of storm that is likely to happen 1 in 10 000 years so. As a feeling it probably does something but I am not completely sure. For rain maybe, I haven’t seen big rain accumulation in the park,” (DKPC4)

Furthermore, none of the respondents perceived that their house or their neighborhood could get impacted by a natural hazard like flooding, heat wave or droughts.

“Well, no I do not think a flood could impact my apartment, I live on the fourth floor, maybe with strong winds I may use a roof tile, but thats it” (DKPC8).

“Not really we havent experiences flooding, not in this area.” (DKPC3)

Most of the respondents at the DakAkker (three out of four) mentioned that they had knowledge that the area could get impacted with a natural hazard, especially flooding. Moreover, they associate the importance of the rooftop system to retain water and release it slowly in the sewerage system to buffer the impacts of heavy rains.

“It helps to avoid the impact of heavy rains at least, the water is retained here and released slowly” (DKAC3)

“the roof of the restaurant, that's a special water retention roof (...)for the storm storage and then whith the computer system they can tell if it's full and in a dry period they can let the water go” (DKAC1)

Also the person in charge of the post implementation in the DakAkker project explained the different water catchment systems that were working and how this system contributes to avoid an overcharge of the sewerage system.

“The rooftop farm itself can store 60,000 litres of rainwater (...) Then there is the smart roof on top of the restaurant. (...)there is a machine and it's called the smart flow control, and this machine has contact with the weather forecast, so it knows when it will rain. When the rooftop is full, 24 hours before it starts raining again the water level goes down. Exactly the amount of the rainwater that will fall the next day. So the good thing of that is when it's raining a lot all the water will stay on the roof and it will be released in another moment (...) The main asset is that the sewerage system doesn't get overloaded” (DKAE1)

In the case of Hofbogen, there was a volunteer that perceived that the area was not likely to get impacted by a natural hazard but recognized the importance of Hofbogen for water catchment. Additionally, the project manager recognized that the area could be impacted by floods and heat waves pointing out the importance of the project in these matters.

“Well I think it can help with water catchment. But here I haven’t experienced any flood. In Brabant we flooded and kids were going with boats to school.” (HBC1)

“The gardens or green space in general have a very important role to avoid flooding or urban heat waves, they contribute to adapt to climate change also.” (HBE1)

The experts that were interviewed mentioned that Rotterdam is exposed to several natural hazards, remarking that the NBS projects contribute to water catchment and could slightly contribute to reduce the temperature in the city. Nevertheless, they consider that the NBS projects cannot be considered as the only solution, they have to work together with other measures in order to tackle possible climate hazards.

“Rooftop could help with the rain water, but rooftops are not the solution alone (...) The second thing is the urban heat wave (...) but, I really think you would need a lot of green to really have an impact in that area.” (E2)

“The water plan was all about trying to find integral solutions for problems in periods of heavy rainfall. (E1)

4.5.3 Awareness of NBS projects

The main aspects that were addressed in this sub-variable were (i) Knowledge and familiarity with the NBS concept, (ii) Type of knowledge of the aim and effectiveness of the NBS projects against possible climate hazard, (iii) Type of knowledge about the benefits and co-benefits of the NBS project in the area.

The first aspect analyzed was the type knowledge about NBS projects. Nesshöver et al. (2017) states that the concept of NBS is not commonly known by citizens, this lack of information can create a barrier for people to participate and support the process. In the case of Dakpark, five out of eight volunteers were familiar with the concept of NBS. In the DakAkker project, three out of four respondents knew the concept and in the Hofbogen project, only one volunteer out of three knew the concept. Further analysis could discover if the lack of knowledge about the NBS concept has an impact in citizen engagement in this type of projects.

The second matter was the aim and effectiveness of the NBS projects against possible climate hazard. In Dakpark and Hofbogen half of the respondents were aware of this topic and in DakAkker all the interviewed volunteers mentioned the topic. The volunteers indicated that the rooftop gardens or farms avoid water runoff, improve air quality and helped with urban heat island impacts.

“it is also good for temperature and also for water problems and for water retention and then goes into the sewerage system. When the children come I tell them the purpose, like lower the temperature, water catchment.” (DKAC4)

“so it like it definitely beneficial for air quality and I think also to catch rain water. Again, speaking as a professional point of view air quality and to retain water. water retention and lowering the heat, if we are talking about natural hazards, I think those are the main themes.” (DKPC5)

Concerning the knowledge about the benefits and co-benefits of the NBS, all the volunteers and experts mentioned this aspect. In table 9 there is detailed information about the perceived benefits and co-benefits of each project.

Table 9 : Perceived co-benefits in Dakpark, DakAkker and Hofbogen

Benefits and Co-benefits	Dakpark	DakAkker	Hofbogen
	12 (volunteers + organization members)	5 (volunteers+ organization members)	4 (volunteers + organization members)
	N° of respondents	N° of respondents	N° of respondents
Access to green area	10	5	4
Biodiversity	3	2	1
Education	2	3	1
Health	7	3	4
Working with nature	9	3	4
Social benefits	7	3	4
Learning about greenery	8	3	3

Source: Author, 2020

Access to green area: Most of the volunteers and the people running the organizations mentioned the importance of having access to green areas within the city. The volunteers stated that the access to the green areas was important for them, but also for the people in the neighborhood. Likewise, the interviewees mentioned that the rooftops gardens provided green area to the neighborhood. Moreover, they recognized that the neighborhood before the creation of the rooftops had a lack of green spaces.

“This area has no parks, people have no gardens. We say it's a very, it is a concrete jungle. So having this park is just urgent and people use it a lot. If you come back here in the evening, not during the day, but in the evening, it's just really busy with people enjoying being outside, being in the green” (DKPE 1)

“Rooftop takes you out of the basic city life. Although you can hear the city it's still feels like a peaceful place, because you're not in contact with cars and stuff like that, and because you're in a green area, which is also very valuable, especially here in the city center, because they're not much.” (DAKC1)

Biodiversity: Only a few (see table 9) interviewees mentioned how the rooftop was important for increasing biodiversity and creating corridors for animals and insects. In both the DakAkker and the Dakpark projects the importance of the bees was pointed out.

“Well, in itself, these areas are important because of the diversity that's going on here. But also, we try to connect all these places, so they become a network or a web of green spaces. So you also have these these corridors of birds and . And hedgehogs and insects animals can use to travel around the city and that's how it helps in preventing climate problems and increasing biodiversity and increasing the capacity of the soil to sequester carbon these kind of things” (HBE 1)

“The biggest impact is ecologically speaking, because you have like quite a big habitats for both insects and small birds, small animals. Yeah. And also because it's very long, so it kind of becomes like a backbone” (DKPC3)

Education: A few of interviewees mentioned that the rooftops where also used for environmental education, where kids could learn about biodiversity, planting, harvesting and also cooking the food from the rooftop.

“On the Dakakker the kids learn to do things and we had two years ago we had also a tour with bureau the Stadsnature, the office for city nature. And they just went with little pots with children, they were looking for spiders and things like that on rooftops. Where does the city be in nature and do those things so that was really nice” (E2)

“I think it's important for the children to learn about how food grow, but also what you can do with it. And when they make it themselves, they also eat it. Last year there was a school coming in a holiday, and then they came to work here and they took the carrots and went to school” (DKAC4)

Health: In the Hofbogen and the DakAkker projects almost all the respondents mentioned this topic. In the case of the Dakpark project more than half of the interviewees mentioned it. The co-benefit of health is related to the opportunity to be more active, be outdoors, enjoy nature and have time to relax. Also some volunteers mentioned the impact that it had on their food habits in helping them to make healthy food choices. Furthermore, they mentioned that it positively impacted their mental health and they felt more happy while gardening.

“I really like working in the garden and it makes me happy (...) for me this is very nice work, is good for my health and takes my stress away.” (DKPC4)

“Then I was like I need something which makes me go outside, and at least be a little bit active and also outside. So, this was the perfect solution, because you are a bit busy and also a little creative and also you come to see the sun and being in the greens it's relaxing also.” (DKPC6)

Working with nature: Most of the respondents said that one of the main benefits of being a volunteer was the possibility of working in nature and be in contact with the earth. They also appreciated doing something manual and different from the regular office tasks.

“It's relaxing for me. I have an office job. You know just sitting in the office. And this is something different and being outside its what a like and to do something with your hands, to meet new people, learning something about gardening as well” (HBE2)

Social benefits: The interviewees mentioned the importance of meeting people and socializing while volunteering.

“The most important, I'm not sure if it is being in a green environment, being with the people and working well the social aspect” (HBC3)

“The main benefits are growing your veggies and meeting, with the neighbours, knowing the community” (DKPC7)

Learning about greenery: Volunteers from the three projects mentioned that volunteering was valuable for them because among other things, they could learn about gardening. In the case of the Dakpark and the DakAkker projects there are workshops for the volunteers are able to learn how to prune, they learn about food forestry in the city, etc. The workshops were very appreciated by the volunteers.

“I also learned things about gardening. So that's also valuable for me.” (HBC1)

“I been wanting to learn more about green management and I thought that learning by doing is the best way of learning (...) I really enjoy it and we also get little workshops on different things like pruning. They teach us how to prune hortensias, apples, this different plants.” (DPKC4)

In literature authors (Balian et al. 2016; Kabisch et al. 2016) stated that dwellers are more driven to engage in a process, if they perceive that it can contribute to a better quality of life for themselves. As presented in the three case studies the interviewed volunteers were aware of the co-benefits that the project provided and believed that engaging in the NBS projects improved their quality of life.

4.5.4. Summary of Personal Motivations

In this section the volunteers presented their main motivations to participate in the various projects. In order to analyze the data from the volunteers that were interviewed, the researcher determined the codes for each indicator (see table 10). After coding, a percentage of respondents that mention the code or satisfied the requirements was determined. Once the percentages were identified an average per sub-variable was calculated for each NBS project. Finally, with the average percentage a score of low, medium and high was given, considering the following:

- Low: less than 30%
- Medium: between 31- 50%
- High: more than 51%

Table 10: Personal Motivations

Sub-variable	Indicator	Coding/ basic requirements	Dakpark	DakAkker	Hofbogen
Community attachment	Years living in the area	More than 5 years living in the area	50%	0%	30%
	Housing occupation condition (owners, tenant of the house, tenant of a room, other)	Owner of the house Or renter with more than 5 years in the area	63%	25%	30%
	Feel related to the neighborhood	Mentioning being part of the neighborhood and the importance of being involved in the decisions of the locality	50%	0%	30%
Average			54%	8%	30%
Sense of place	Years volunteering	One year or more	88%	75%	67%
	Feeling happy in the NBS project	Express feeling part of the project and to recognize that the area is important for them	88%	100%	100%
Average			88%	88%	82%
Risk perception to a possible natural hazard	Level of knowledge that the area could get impacted by a natural hazard	Expressing that the area could get impacted by flooding, heat wave, drought	13%	75%	33%
	Perception that a natural hazard could impact their neighborhood or house	Expressing that their houses or lives could get impacted by a natural hazard	0%	0%	0%
Average			7%	38%	17%
Awareness of NBS projects	Knowledge and familiarity with NBS concept	Explaining what is a NBS	63%	75%	33%
	Type of knowledge of the aim and effectiveness of NBS projects for a possible climate hazard.	How the NBS can reduce the impact of natural hazard	50%	100%	67%
	Having knowledge about the benefits and co-benefits of NBS project in the area	Expressing the perceived benefit and co-benefits	100%	100%	100%

	Consider that the outcome of the NBS project that is implemented is positive for the area.	Expressing how positive is specifically for the neighborhood	75%	0%	0%
Average			71%	92%	67%

Accordingly, Table 11 presents the general findings for the volunteer’s personal motivation to engage in the process.

Table 11: Personal motivations

Sub- variables	Dakpark	DakAkker	Hofbogen
Community attachment	High	Low	Low
Sense of place	High	High	High
Risk perception to a possible natural hazard	Low	Medium	Low
Awareness of NBS Projects	High	High	High

Source: Author, 2020

The respondents in the Dakpark project showed a high level of community attachment since a group of interviewees were living in the area for more than five years, and they felt strongly related to the neighborhood. This high community attachment is related to the bottom-up creation of Dakpark, where residents decide to engage and sustain the post-implementation phase with volunteers' active help. The organization is quite challenging and requires consistency and effort, which shows the commitment of Dakpark citizens to make the project work and grow within the years.

In the case of Hofbogen and DakAkker, the community attachment was low since most of the interviewed volunteers did not live in the project's neighborhood. Nevertheless, the volunteers were entirely engaged in the projects, participating regularly, and more than a year. The variable sense of place was included showing how volunteers were committed to the project whether or not they lived in the area.

For the three case studies, the sense of place was high, since most of the interviewed volunteers were involved in the project for more than a year and felt happy participating in the project. Moreover, this aspect shows that volunteer work was well organized, trustworthy, and reliable.

Concerning risk perception, the Dakpark and the Hofbogen case studies showed a low-risk perception where respondents did not feel threatened by natural hazards. In the case of DakAkker, interviewees were aware that they could be impacted (mainly by floods) but did not perceive that a natural hazard would impact their lives. Interviewees recognized the importance of the rooftop gardens to contribute to water catchment in urban areas, avoid water runoff, and overload sewerages.

Regarding awareness of NBS projects the three case studies had a high level. Respondents expressed what were the most valuable things that they gained from the project. In summary, the benefits that are important for the majority of volunteers in all three case studies was: access to green, health, social benefits, working with nature and learning about greenery.

4.6 Social Network

Dwellers were motivated to participate not only due to their self-interest but also because of social values, both of these factors drive them to engage in such projects. Engagement, can be motivated by the fulfillment of socializing or being part of a group, where the social network can be an encouraging factor to engage in a project or an initiative. (Verschuere et al 2012; Alford 2009; Dekker, 2007).

In literature, Laurian (2004) presented that trust in the implementing agency has an impact on the stakeholder's willingness to engage and believe in the initiative. Furthermore Ryan et al. (2001) mentioned that organized programs were more trustworthy for volunteers allowing them to engage more in the decision-making processes.

4.6.1. Trust in the implementing agency

In the Dakpark case study almost all of the interviewees (seven out of eight) expressed that they trusted the implementing agency and the volunteers perceived that the implementing agency represented them as individuals, as well as representing the group and neighborhood interest.

"I am not every week here, but from what I've seen so far, it's good. I like it. Yes. I like the way it's going. There is enthusiastic people there are volunteers. People work on their garden. I like it. Yes, I'm happy with the way it's going over here." (DKPC3)

"I hope that we can continue like this and get more people from the neighborhood involved. This is my future hope." (DKPC5)

"I think the participation process here is going really well."(DKPC8)

"I think the stichting (organization) are really thinking what is good for the people who are using the park. They also think what is good for the people here too. This neighbourhood is lower income, not all of it, but generally speaking, so yeah, it's good to have a park where you can have free activities just walking, sporting a picnic. So you dont need to go to a different area." (DKPC6)

"Many parents from the area are here with their kids for them to see the animals. Also the path is really nice it has nice and diverse things (fruit path) . Also many people come take a seat here and have picnic, have lunch, it makes people get together." (DKPC6)

The exception was one stakeholder who considered that as a group they should find new ways to engage the participation of more diverse citizens from different backgrounds around the neighborhood.

"People that are using the park is very diverse, and is very strange that the foundation is mostly Dutch. I am not saying that it has to be one way or the other, but maybe we are not offering things that other people in the neighborhood feel like participating. So how do we get more people involved and how do we spread the word out." (DKPC4)

An interesting finding in this quote is that the respondent feels part of the Dakpark organization group ("we are not offering..."), trying to reflect how as a group they can improve the participation process. Furthermore, it is relevant to consider that the respondent was only contemplating the activities of the Groengroup on Saturdays and not considering the participation of citizens in the allotment gardens or the neighbors that participated on the children's workshop on Wednesdays where there was an involvement of diverse ethnicities.

In the rooftop gardens of DakAkker and Hofbogen, all of the volunteers that were interviewed expressed that their personal interests were considered by the implementing agency, showing a high trust in the person that led the organizing processes and the processes themselves.

Furthermore, volunteers felt that their expectations were met, that there was a possibility for them to learn new things while volunteering and they were also able to choose their own tasks.

“We can also give the ideas of what we want to learn about. Last time we got a course about fermenting vegetables. Now we can make it ourselves” (DKAC4)

“In the beginning Wouter, made a plan of crop rotation so you knew what to plant where. To put some things there, in the next year there, and to have plants for the future. But also sometimes he asked us, what do you want? Sometimes we could choose some vegetables or fruit to plant.” (DKAC4)

“Wouter also knows more than we do, when I came here I didn't know that much about gardening I also came here because it's more peaceful.” (DKAC2)

“They're quite open as I said before it was very easy for me to get involved, but also my fiance wants to be part of it he wants to learn about construction like this waste bins here or composting bins and this things, so he asked Daniel and he said that he can teach him, so when Daniel is building something for this area or the other gardens he can come.” (HBC1)

“We came here at 11 we start having coffee, then Daniel tells us generally what needs to be done, just like you saw and we pick what we like, if we don't know something we can ask and Daniel or someone can help us. Also you can say if you want to grow something you can also ask and you can do it.” (HBC1)

“I think It's working ok, it is very open and there are a lot of people coming to just see if it's something they would like to do and then they come just one time and then they don't come anymore. But, I think that is the way you should do it. Just let people be here. Let them decide if they like it. Or don't like it.” (HBC3)

Moreover, experts and project organizers pointed out the importance of having a leader in the process that represents the interest of the individuals but also that manages the plan for the year or the season. Therefore, having a structure on a fixed day, a specific period of time to volunteer makes the volunteering process more reliable. Volunteers know that they can join at that moment and that the group will be working. Additionally, having someone leading the process gives structure especially for new volunteers. The leading person tells the newcomers what tasks can they do, explains the dynamics, where to find the tools etc. It was also noted that other volunteers were also willing to assist a guide the newcomers.

“So if you come by the DakAkker there is Wouter and says, okay, people, we're going to do this, there are people and you see that okay, this is all well organized and I can fit in here. (E2)

“We ourselves, have to learn to communicate really clearly that this is one of our functions as Groengoes because the garden is from all the people that join but we have a function within a group of coordinating, but we do not try to make it hierarchical we are the ones that are always here.” (HBE1)

“For me working with volunteers is about giving tasks, also so people know what to do, of course they can choose, but if you don't tell the people sometimes they don't know how they can help. If you have your task, is you and your task, people feel more comfortable with a task.” (DKPE1)

Additionally, one of the project managers highlighted that an important task was to ensure that the group was always willing to receive new volunteers.

“I think that also happens sometimes with communal projects that the project develops a group of participants around it, and they have a lot of fun together. That's good because that's what makes them a group and keeps them engaged in the project, but that can also mean that it becomes so much of a group that becomes harder for a new people to join. A function of our

coordination is to prevent that from happening. Make sure that people always feel welcome. And it's always open to join. But yeah, it's not automatic process.” (HBE 1)

During the participatory observation the researcher was also able to work as a volunteer in all of the three cases and thus first hand observed the integration process of a new volunteer. In every project there was a person in charge of the organization that introduced the newcomer to the group, then the task of the person was to explain what different tasks could be done and normally the new volunteer would choose to work with some other volunteer with more experience in order to learn. If there were questions during the process the project manager or one of the other volunteers was questions and explain what was needed to be done.

4.6.2. Trust between volunteers

In all of the three projects all of the volunteers expressed that they felt welcome and comfortable with their peers. Also, the volunteers stated that they could rely on other volunteers to develop their ideas. Likewise, some volunteers mentioned that one of the main benefits of volunteering was the creation of social ties.

“I am really happy because I always see almost every day someone is engaged here. So, I think in general there is like s more or less 25 volunteers they are really engaged” (DKPC 6)

“We have ideas all the time. So, all the time we talk on email on the phone, if we have an idea. So what should we do? What are we gonna do on Tuesday or Thursday? There are a lot of ideas. So we are working to make them real.” (DKPC 7)

“Most people stay forever. (laughs) once you come here you dont want to leave. Well there has been a lot of people that came here for a little time or students or people that do not live in Rotterdam anymore.” (DKAC4)

“I think the social aspect. for me is the most important, and also, you can exchange ideas and thoughts.” (DKAC1)

“I have been working three months here and I really like it, I really feel very welcome in the group, I can pick what to do and I am learning a lot.” (HBC1)

“We come to work here and come to chat with each other and some of them have knownd each other for a longer time, so some friendships grow out of the garden, thats nice, not only plants and green grow here, so that's good.” (HBC3)

During the observation process, the researcher noticed how volunteers in the three projects spent time together during the breaks, helped each other when it was required and sometimes worked in groups and talked while working.

Trust between the community members was very high in the three projects since all of the volunteers metioned this topic. Additionally, in the DakAkker project the researcher was added to the DakAkker whasapp group, which gave a feeling of trust between the volunteers, they relied on each other to accomplish the tasks related to the area like: taking care of the chickens, helping with the insect camara, helping other volunteers identify the birds in the rooftop gardens, among many other activities.

4.6.3. Summary of Social network

In the three case studies a high social network was found (DakAkker and Hofbogen all the volunteers and in Dakpark seven out of eight), the volunteers stated that they trusted the implementing agency and that it represented their personal and group interests. Also,

volunteers expressed that they trusted their peers and valued the relationships that had been created while volunteering. (see table 12 and 13)

In order to analyze the data from the interviewed volunteers, the researcher determined the percentage of respondents that mention the code. When the percentages were identified an average per sub-variable was considered for each NBS project. Lastly, with the average percentage a score of low, medium and high was given, considering the following:

- Low: less than 30%
- Medium: between 31- 50%
- High: more than 51%

Table 12: Social Network

Variables	Sub-variables	Coding	Dakpark	DakAkker	Hofbogen
Trust in the implementing agency	Considering that the implementing agency represent the interests of stakeholders	Expressing that they feel that the implementing agency represents the individual and group interests	88%	100%	100%
Trust between the group of volunteers	Perception of social cohesion between the volunteers	Expressing that they enjoy spending time with their peers	100%	100%	100%
Average			94%	100%	100%

Source: Author, 2020

Table 13: Social Network

Sub- variables	Dakpark	DakAkker	Hofbogen
Trust in the implementing agency	High	High	High
Trust between the volunteers	High	High	High

Source: Author, 2020

4.7 Enabling Conditions

The enabling conditions are the frameworks that international, national and local governments give to promote the development of NBS projects. Ferreira et al. (2020) mentioned that the major challenges and limitations for the creation of NBS is the lack of enabling conditions, like financial limitations, political support and public involvement. Regarding this topic, the main information gathered came mainly from the experts and the project managers.

4.7.1 Public policies, management instruments and institutional arrangements

During the analysis of the sub-variables: (i) law, policies and strategies, (ii) plans and programs at a local level and (iii) institutional arrangements it was noted that these were quite intertwined. Therefore, the researcher decided to create an overarching sub-variable: “public policies, management instruments and institutional arrangements”.

The interviewees mentioned the local instruments that the city of Rotterdam has and how they are related to NBS projects, specifically to rooftop gardens. In an interview with a Rotterdam municipality official that works for the program of multifunctional roofs, (s)he mentioned that the area aimed to promote the use of multifunctional rooftops taking into consideration the following main pillars:

Figure 13: Multifunctional Roofs Programme pillars



Source: Gementee Rotterdam 2019, p. 19.

The Plan of Multifunctional Rooftops that was written by the Gementee Rotterdam (2019) (the municipality of Rotterdam) takes into consideration promoting the use of rooftops so citizens, private stakeholders, architects, among other actors are able to realize the potential of rooftops. The program supports and shows sample projects while encouraging strategic stakeholders to invest (A, B and C).

“We're trying to stimulate them and inspire them and facilitate them to do something on their building, which the whole municipality, the whole society profits.”(E3)

There is a connection between the multifunctional rooftops that are already used with the creation or implementation of new projects. In order to inspire and stimulate new projects it is necessary to show how the multifunctional rooftops work, how they are managed and the benefits and co-benefits that such projects can give to the participants, the neighbors, the environment. There are diverse initiatives in Rotterdam that show citizens about these rooftops, like Rotterdamse Dakendagen (Rotterdam Rooftop days), this is an organization that stimulates the use of rooftops. Rotterdamse Dakendagen organizes a rooftop festival every year, in this festival all three of the case study areas - DakAkker, Dakpark and Hofbogen participate. They also promote rooftop tours in diverse locations in Rotterdam, including DakAkker.

“We're in a nonprofit organization (referring to Rotterdamse Dakendagen) and with one goal and that is to stimulate rooftop usage and that's it and the, the way we think we can do that the best is to invite people up on the roof and show them the quality of rooftops of the space on rooftops because we know that we have 18.5 km² of rooftops, flat rooftops in Rotterdam.”(E2)

“Two more rooftop tours today for the #RotterdamRooftopDays = @dakendagen010 ... and the sun was shining just in time! Photos: #rooftopguide @robertcatwijck. The following #DakAkkertours are on August 1 and 15 (limited number of participants!). More information and ticket sales here: <https://dakakker.stager.nl/web/tickets>” (Dakakker Instagram, August 2020)

Furthermore, the pillars D and G are focused on adjusting laws and regulations to facilitate the implementation of projects.

“What we do, inform people, we inspire people stimulate, we develop policies. I mean, of course, it also has to land in policies. We work in this network, we stimulate innovation. And we try to influence for example, national laws, but also European politics.” (E3)

The Multifunctional rooftop plan shows the different types of rooftops usage and determines a color for each function (see box 3). A rooftop can combine different colors depending on the objective of the rooftop project and considering the characteristics of the location. Additionally, every type of rooftop provides diverse benefits to citizens and its environment and can be alligned with the implementation of existing plans and programmes at a national and local level.

Box 3: Type of rooftop by colors

- Green roofs (plants, greenery),
- Blue roofs (water storage),
- Yellow roofs (energy from solar panels or wind),
- Red roofs (social functions, like a playground or restaurant),
- Orange roofs (roof bridges, mobility),
- Purple roofs (topping up ‘tiny houses’),
- Grey roofs (transmission masts, window cleaning systems, etc),

Source: Gementee Rotterdam 2019, p. 2.

The experts that were interviewed stated that in one rooftop there were several uses that had multiple benefits.

“So, in the climate adaptation, world, we talk about green-blue roofs, the green is not enough you have to combine it with water storage because otherwise they don't make sense. And what I really like green, blue, yellow roofs, so solar panels above, the plans of water storage below, then you start to make smart connections” (E3)

“Orange is mobility, and especially the Hofbogen and the Dakpark. There are also routes that they are places to go from one to the other (...) there's a little bit of energy production also in DakAkker. But it's also a bit of a grey roof because of technical installations.” (E3)

“We have a multifunctional rooftop program (...) that considers elements of the built environment, the elemenst of the public space and the elements of the environmental issues.” (E2)

Table 15 presents the type of functions that the rooftops have. All of the cases are green, blue, red, orange rooftops, they all have vegetation, they contribute to water catchment and they are areas where it is possible to socialize and they have mobility. Dakpark and DakAkker also have a slight yellow roof due to the small solar panels. DakAkker also has a smart rooftop which is comprised of a diverse technical installation (see 4.1.2).

Table 14: Type of rooftop by case study

Colors	Dakpark	DakAkker	Hofbogen
Green	✓	✓	✓
Blue	✓	✓	✓
Yellow	✓	✓	
Red	✓	✓	✓
Orange	✓	✓	✓
Purple			
Grey		✓	

Source: Author, 2020.

Additionally, the plan for multifunctional rooftops identifies the programmes or strategies that are related to the construction of multifunctional rooftops, pointing out how the objectives of the plan contribute to each programme (see Table 16). The three case studies are aligned with: the climate adaptative, especially DakAkker that has a system to retain water and is able to discharge it when it is dry. In the case of the Dakpark and the hofbogen they avoid water runoff. Moreover, the analyzed rooftops contribute to the Clean Air Rate Note Programme, the resilience strategy and Dakpark and Hofbogen contribute to the mobility programme.

“The three projects are aligned with the adaptation plan and the water plan and also the health department.” (E1)

Table 15: Relationship of Multifunctional Roofs programme with related municipality programmes objectives

Programme/ Strategy	2019-2020 objective	Relation to this programme: target & ambition
Weather Word Climate adaptive	Making climate change manageable; drainage relieved by mountains of rainwater on roofs	Retention of rain water in roofs Ambition: 70mm
Solar energy acceleration starting note Energy transition	Sustainable generation from solar energy: 150 MW generated by the sun in 2022	Part of the generated capacity is planned to come from roofs. Ambition: 750MW in 2030
Wind energy acceleration starting note Energy transition	Sustainable generation from wind energy; small-scale projects	Ambition: innovative wind energy on roofs
Rotterdam is going Green Green task	Adding 20 hectares of green to the city	Adding green roofs Target: 60,000-80,000 m2
Rotterdam housing construction agreement The City’s Growth	Maintaining the quality of life in the city for the increasing number of residents (an additional 18,000 homes)	Addition of a second ground floor for social activities. Ambition: 16,000 m2
Mobility The City’s Growth	Keeping the city accessible for the increasing number of the residents (an additional 18,000 homes)	Addition of connection between roofs Ambition: 4,000 m2
Van Zoi naar Mooi Programma Circulair	Stimulating circular construction	Ambition: extending the lifespan & reusing raw materials for roof developments
Clean Air Rate Note Air quality	Improving air quality	Ambition: capture air pollution (CO2, NOx, PM10, etc.) via (green) roofs.
Resilient Rotterdam Resilience strategy	Preparing Rotterdam for the opportunities and challenges of the future	Ambition: realization of 1,000,000 m2 of multifunctional roofs by 2030

Environmental Policy Environmental law	Preparing Rotterdam for the implementation of Environmental Law	Target: Integrating multifunctional roof use in an environmental vision
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Source: Gementee Rotterdam 2019, p. 17.

Many of these strategies like the Green Task, resilience strategy or The City's growth is more related to the creation or implementation of multifunctional rooftops. While the Energy transition (solar and wind), the air quality programme can be implemented during the post implementation process of the NBS projects. Therefore, a blue-green roof can add the yellow component, or if it is maintained adequately it can contribute to the air quality.

4.7.2 Financial resources

The data analysis of the financial resources was organized into two main aspects (i) the existing budget for implementation of NBS solutions, specifically rooftop gardens and (ii) having knowledge of financial incentives for participating in these types of projects.

Regarding the first aspect, the volunteers, experts and the people in charge of the post implementation, recognized that there was a budget from local, national and international governmental levels which was used to create and implement the NBS programmes, but the budget was much less for the post implementation phases. For example, to create a green roof there were specific funds to apply for in the Municipality of Rotterdam to cover part of creation expenses.

“The municipality of Rotterdam they subsidies and if you want to bring your roof up, did they pay half or something? Or they used to pay half an hour there's no it's 30% or more but there there is an arrangement for you to do. Make it easier to have greenroof.” (E2)

“Rotterdam is also promoting the green groups with subsidiaries (...) it is really promotion of Rotterdam Municipality to get more green on roofs, because the area of roofs in Rotterdam is so big and you can do a lot. (...) Rotterdam is really trying to promote that, more greens in the city.” (DKAC3)

In the case of post implementation phase, the budget comes from different sources and it has to be related to specific projects, e.g.: beehives, the insect garden, water retention systems, environmental education, health and well-being, etc. If these implemented projects on the rooftop gardens are aligned with a program or a strategy, they are more likely to be granted a budget for the implementation of it. The Dakpark and the DakAkker have sponsors that come from the private and public sector. The budget has to be searched for per topic, in this matter it is fundamental to map the existing programs at local, national and international levels.

“If you just want to start an organization, you need to people who organize everything, you need to have money, you need to have income. So sometimes those projects (referring to DakAkker) started with money from the municipality and after a while they had to be, we say they have to keep up their own pants.” (E1)

It is recognized that there is no financial aid to cover the work that is done by volunteers, that is why their work is fundamentally for the sustainability of the project. Additionally, an expert pointed out that the benefits and co-benefits of a rooftop garden should be valued, in order for each project to be sustainable. An effort is needed to calculate the co-benefits that the area brings in relation to health, climate change, urban heat and water catchment etc. (see Figure 4). Additionally, it is important that during the creation phase of any of these projects there should a budget should be incorporated into the initial planning for the following years of the project,

the post-implementation phase, payment of someone in charge of organizing the volunteers, budget for tools, for volunteer's capacity building among should be considered and budgeted for.

"I'm a construction engineer by education and project manager. So I, I know how to build something and we are quite good at getting the project Together, getting the money together organizing and getting it done, and which is much harder is to maintain it to keep it alive (...) But how do you keep the volunteer from Dakpark? How do you keep that alive? Because a lot of times the finance part falls right in the hole, like after the investment has been done and the project has been delivered. There's no huge money to keep the volunteers around to pay them or to make them happy" E3

"The thing that I don't like is that in a way, the business model isn't viable (referring to the rooftop gardens). So you cannot do that if you don't have all the volunteers." (E2)

"these projects you get a lot of different things back, like you get green, biodiversity, clean air... well a lot of good things that we all need, but we cannot buy and not convert into money. So, you want people to invest in it, in the infrastructure, in the physical stuff but you need to calculate how much worth it is, how much value does it have. So, what is the value of a tree or of one cubic meter of water that doesn't go to the sewerage system, all those things" (E3)

In the three case studies there was an specific budget for the creation and implementation processes, but for the post implementation phase there was not a specific budget, therefore the organizations that were in charge had to find ways to sustain their projects. Volunteers were the main strength for the sustainability, and the creation of their own funds by selling products from the rooftop and or searching for specific funds to implement projects were also used to finance the projects.

The Dakpark was created with a Municipality budget, but once it was delivered to the citizens, they manage diverse ways to make the Buurtuin and the Mediterranean garden sustainable.

"when I started here, the Dakpark was delivered, was ready for one year. So I joined the Dakpark at the second year of its existence. The main thing was ready. But where I'm the most active, which is in the "Buurtuin", the neighborhood garden, that was not ready at all of course, because it needs to be done by the people (...) the municipality does not give a specific budget for the buurtuin." (DKPE1)

"If budget is required, then you write a little, a couple of sentences, say what you need and write, how so if you have what you will do it. Written that down and if you already discuss it in a meeting then it's good to go. So we go to the Municipality and there is always a foundation that can be interested in the topic but is important to be clear on what you ask and why is it necessary" (DKPE3)

In the case of the DakAkker, the initial project was financed with budget from a contest that was promoted by the city, called "the stads initiative." Nowadays, the budget for the maintenance of the DakAkker comes from diverse initiatives that are generated from the rooftop garden, like renting the area for commercials, making tours, educational programs and selling of the produce.

"But stads initiative was one of those things which were organized by the municipality, because we know that there are good ideas amongst the population." (E1)

"So when they joined to the contest, they had this plan of the of the yellow bridge with all these hotspots and the rooftop farm was one of the hotspots. And well they won the contest. And then they got 4 million euros. And of that money, also the rooftop farm was made. When the rooftop farm was made, there was no money to maintain it. So we said, okay, we are an Environmental Center. We work quite with a lot of volunteers, so we can try to work on the roof and see what happens." (DKAE1)

“Well, a couple of different sources (for maintenance) We give tours on the roof. Last year 160 tours. And so school classes pay less and companies pay more. And it's an average of about 100 euros a tour. So that's a good income. And then we also have to pay the guide of course, but this gives us some money to buy the seeds and the plants.” (DKAE1)

Hofbogen is owned by a private company and the voluntary work for the management of the rooftop garden is organized by the association Groen Goed. As explained in section 4.1.3., Groen Goed manages eight community gardens in Rotterdam. For the post implementation phase, Groen Goed applies for different funds, mainly from the municipality, in order to implement activities in all of the gardens. This year the budget source has changed for Hofbogen, the new private owner has its own specific budget.

“This year the budget comes from the owner but before it came from the local municipality mainly (...) “Municipality is divided in lots of different domains. So sometimes you get a subsidy for a specific aspect of our work for example the education part. But we do not get finance for a specific garden but we get finance for a lot of garden in a specific topic. So sometimes they finance of one garden is consist of different subsidies. So we bring together subsidy that we get for education, well-being, or health (...) it's rare that we get finance for one location specifically.” (HBE1)

Regarding the aspect of having financial incentives for participating in these types of projects, most of the respondents mentioned that they had no knowledge about incentives from the government for engaging in the participatory process. The only exception was the group of citizens that were participating in the Dakpark every Tuesday and Thursday, they were part of a welfare program and received a subsidy, and in return they had to work for the city. The people on welfare can choose among diverse jobs, one of these jobs is helping to maintain green spaces.

“Because I'm on welfare, voluntary work is mandatory. My demands were to work somewhere non commercial, in our neighborhood, so I wouldn't have to use public transport. So this place came out (...) It's supposed to be short term and in the meantime, you have to go look for a real job.” (DKPC8)

4.7.3. Summary of enabling conditions

The three case studies are aligned with the political instruments at a local level having a framework for the initiatives. Most of the plans and strategies support the creation of multifunctional rooftops but they are not involved in the post implementation processes. Regarding the financial resources, it was found that the three projects were created with the support of the Rotterdam municipality. For the post implementation phase all of the projects work with volunteers and search for funding to develop specific subprojects. DakAkker also generates income creating activities on the rooftop or by selling the rooftop products.

Table 16: Enabling conditions

Sub- variables	Dakpark	DakAkker	Hofbogen
Public policies, management instruments and institutional arrangements	<p>The three case studies are aligned with the following political instruments:</p> <ul style="list-style-type: none"> ✓ Plan of Multifunctional rooftops ✓ The climate adaptative, ✓ Rotterdam is going green, ✓ Air quality and ✓ Resilience strategy <p>Most of the plans and strategies support the creation of rooftop gardens but not the post implementation process.</p>		
Financial resources	Created with municipal resources.	Created with municipal resources- Stads Initiative.	Created with public and private resources.
	Maintenance is managed by the community organization applying to funds from the municipality or other sources.	Maintenance is auto managed with diverse source of income that they generate.	Groen Goed manages the community garden they applying to funds from the municipality or other sources. This year the financial resources come from the owner of the area.
	Some volunteers are part of a welfare program. The rest of the volunteers help without receiving or expecting and economic incentive.	Volunteers help without receiving or expecting and economic incentive.	Volunteers help without receiving or expecting and economic incentive.

Source: Author, 2020

4.8 Participatory Typologies

From the literature review the researcher identified five types of participation: i) empowerment, ii) involvement, iii) consultation, iv) information, and, v) non-participation (Nare et al 201; Arnstein 1969). The findings show that the three case studies, had several types of participation during the post implementation phases.

Table 17: Participatory typologies

Dakpark	DakAkker	Hofbogen
<p>Empowerment</p> <ul style="list-style-type: none"> ✓ The person that leads on the participation process is part of the Dakpark organization. ✓ Bottom up organization, the citizens are leading the participatory process. ✓ Everyone is invited to participate. ✓ Participants perceive that it was easy to engage in the participatory process. 	<p>Involvement</p> <ul style="list-style-type: none"> ✓ There is a person in charge of being there every Friday and leading that is part of an organization (Rotterdam Milleu Centrum) ✓ Everyone is invited to participate. 	<p>Involvement</p> <ul style="list-style-type: none"> ✓ There is a person in charge of being there every Tuesday and leading the voluntary process that is part of an organization (Groen Goed) ✓ Everyone is invited to participate.

<ul style="list-style-type: none"> ✓ Citizens were actively involved in the participatory process. ✓ Citizens could express their concerns openly. ✓ Perceiving that citizens were encourage to lead the process 	<ul style="list-style-type: none"> ✓ Participants perceive that it was easy to engage in the participatory process. ✓ Participate regularly on Fridays and some weekdays. ✓ Participants can impact in the decision-making process. ✓ Participate in organization meetings. 	<ul style="list-style-type: none"> ✓ Participants perceive that it was easy to engage in the participatory process. ✓ Participants can impact in the decision-making process. ✓ Participate in organization meetings.
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Source: Author, 2020.

The level of participation is given by the implementing agency and the volunteers do not have an impact on this. DakAkker and Hofbogen have an involvement level where volunteers can engage within the possibilities of the volunteering scheme. The persons in charge of the rooftops are open to receive new ideas and these can be implemented, but the organization does not expect volunteers to lead processes. Therefore, volunteers are able to become really involved in a project but the responsibility is not deliberately put on them. Additionally, the findings show that every project has its own consultation levels. All of the projects presented levels of information and consultation.

4.8.1 Dakpark

The majority of the volunteers (five out of eight respondents) recognized that their level of engagement in the post implementation was empowerment. Respondents expressed that they were not only informed and consulted about the activities that were happening at the Dakpark, but they were also invited to lead their own ideas and express them freely.

“The foundation supports the work and the ideas of the volunteers. The people from the foundation are also volunteers. So it is very bottom up” (DKPC 5)

Volunteers explained how they were able to express their ideas and present them to the organization. If the idea has the support of a majority of the group, then the person is encouraged to lead the process of realizing the project and leading the process.

“So if someone wants to organize something in the buurtuin then they explain the idea and if it is interesting for other people and a lot of people say yes, then you can do it. If money is required you have to fill in some forms explaining why is important, what do you need and what do you want to do.” (DKPE 2)

“It is like more or less if you have an idea, and you also want to do it, or you want to happen, then you have to do it yourself. So the project leader is the person who had the idea.” (DKPC 5)

“I suggested about the bee hive and they were very happy with it and then they asked me also to come and join whenever they have discussions about the planning of Dakpark. So there are special days where they gather and they share ideas.” (DKPC 3)

It is a bottom up organization that is lead by the community itself. This organization was created with some of the neighbors that were engaged on the consultation process for the creation of the area.

“So there was a group that for ten or nine years talking, and when the park was delivered then a group drawback but there were some meetings still going on. So we made an organization. So it is the organization of Dakpark.” (DKPE2)

“The people who were involved had a big voice even in the color of the lanterns. It was a project from the neighborhood. But of course the government made it and designed it. But they had a big voice in it”. (DKPE 1)

All participants perceived that it was easy to engage in the participatory process and that participation is open for everyone.

“They have a very relaxed attitude. Like you don't have to, subscribe or anything. You just have to show up if you feel like it, so for me it's perfect and that's how I came here. I am here completely voluntary.” (DKPC5)

“Is very open source, you can come when you want” (DKPC4)

“I started searching on the internet for gardens and there it popped up and I met Hetty and we had a good click” (DKPC7)

“It was about the whole Dakpark management so if you like something to plant, if you can give any input, or if you wish something that should happen and you can take initiative, so there is chance actually, they are looking for volunteers. If someone is really enthusiastic and has time can definitely get involved here.” (DKPC 6)

During the observation process, the researcher saw how the volunteers made suggestions during the implementation of the insect garden or for the creation of an area for water plants. The inputs were considered in the process. Additionally, the researcher attended an organizational meeting where the board members and some volunteers made the planning for the future including the rest of the year. In the meeting, there were representatives from the moestuin on Wednesdays, volunteers from the sheep group, the person in charge of the allotment gardens and the group on Tuesdays and Thursdays, representatives from the Groengroep and a person in charge of the chickens. The diversity of the group shows that there are different ways of engaging with the helpers in the Dakpark.

“So I started first to tell people like, hey, you're welcome to join. So that was the most important step. And then we had brainstorm evenings, like, what would you like to have in this garden? And then from those evenings, we started to make a design” (DKPE1)

According to the representatives, one of the biggest challenges in the organization was to get more people involved from the neighborhood in the participatory processes and also in the board so more neighbors can lead the processes.

“we need new volunteers who can step into the board. (...) We met with the board and said, okay, what we need is an intermediate board, where some volunteers could step in and we can have a fresh start. Start a new phase. (...) And maybe in a few years already, at first we thought one year, but now we think will take two years, for other members to step in and get in charge of the board”. (DKPE3)

4.8.1.1 Relating the type of engagement with socio-economic factors, personal motivation and social network and enabling conditions.

Most of the volunteers had an empowerment level of engagement (five out of eight). The main factors that affected the level of engagement were:

All the interviewed volunteers were Dutch, lived alone or with their partner and had university education level.

In relation with the personal motivation and social network.

- An interesting finding is that three participants with low community attachment had an empowerment level of engagement, this sub-variable was more related to the neighborhood and not the project itself. While the sense of place was directly related to the project was high for all of the five volunteers.
- The awareness of risk perception to a possible natural hazard was medium. Volunteers were aware that the area could be impacted by a natural hazard but perceived that the natural hazard would not impact their daily lives.
- There was a high level of awareness of NBS projects. All of the volunteers were familiar with the NBS concept, most of them (four out of five) knew the positive effects of NBS projects and all of them were aware of the benefits and co-benefits of NBS projects.
- High social network with a high trust in the implementing agency and between the volunteers.

Regarding enabling conditions only one person was aware of the financial resources for the implementation and s/he had no information about plans, policies or institutional arrangements that could support the post implementation process.

On the other hand, the minority of interviewed volunteers (three out of eight) had an involvement level of engagement having the following motivation factors:

These interviewees were all Dutch, lived alone or with their partner, one of them had a university education level and the other two a technical level.

In relation with the personal motivation and social network

- The majority of the volunteers (two out of three) had a high sense of place but only one of them had a high community attachment.
- The three of them had a low awareness in NBS projects expressing the importance of the benefits and co-benefits but none of them had knowledge of what is an NBS project or the effectiveness of the NBS projects for a possible natural hazard.
- The three volunteers had a low risk perception to possible hazards. None of the respondents knew that the area could be impacted by a natural hazard. Concerning the social network two of the three interviewees mentioned that they trusted the local leaders and all of the three of them trusted the other volunteers.

Regarding the enabling conditions the three volunteers did not know about them.

From the analysis the main factors that affected the volunteers level of engagement in the Dakpark were the personal motivations, specifically the awareness in NBS projects and their risk perception to a possible natural hazard. Volunteers that are aware of the factors were more likely to have an empowerment level of engagement.

4.8.2 DakAkker

In this case study, the type of participation is involvement. All of the volunteers expressed that they were engaged regularly in the project. Three out of four volunteers were engaged in the rooftop garden between 4 to 8 years, attending regularly on Fridays. Moreover, all of the volunteers mentioned that it was quite easy to get involved and that everyone was welcome to participate. The only issue is that in some cases there were too many volunteers so, they had a waiting list, but apart from that everyone is welcome to join and no experience is required.

“You just apply and then just oh I sent an email. And there was a short waiting list. But I think after half a year or so, I got an email that I could join.” (DKCA2)

“Lots of people want to know about it, at a certain point it exploded. Everybody wants to come in here not only to help but also to feel more in green.” (DKCA4)

When it comes to the perception of having an impact on the decision-making processes volunteers considered that they can provide inputs, but the main decisions and overarching plan was made by the implementing agency.

“he also knows more than we do (referring to the nature and spatial planning consultant), when I came here I didn't know that much about gardening” (DKCA3)

“I also have some groups from my work, sometimes that come from abroad and they want to see the roof, so I ask Wouter is it ok and I show them” (DKCA1)

“But also sometimes he asked us, what do you want? Sometimes we could choose some vegetables or fruit to plant” (DKCA4)

Regarding the participatory observation, the researcher observed that the volunteers were very engaged in all of the processes, for instance when the nature and spatial planning consultant went on vacations, the group of volunteers organized to keep the maintenance of the rooftop garden. There was also an active communication between the volunteers through a whatsapp group. Moreover, since recently chickens were brought to the rooftop area, the volunteers organized a google spreadsheet, to ensure that someone could be on the rooftop frequently to check and make sure that the chickens had enough food and water.

Additionally, in the case of empowerment all of volunteers said that they could express their ideas openly, but there was no reference to the other two aspects (ii) perceiving that citizens were actively involved in the decision-making process and (iii) citizens are encouraged to lead the process.

“So sometimes, you know, when we have ideas or when I have an idea, I just say, can we do this and Wouter says, Oh, that's a good idea or maybe not, but also we have some freedom. We can leave some plants and others we take out so we have some influence on how it develops.” (DKCA1)

4.8.2.1 Relating type of engagement with socio-economic factors, personal motivation and social network and enabling conditions.

The four volunteers had an involvement level of engagement and one of them had an empowerment level. The main factors that affected the involvement level of engagement were:

The interviewed volunteers were Dutch, they either lived alone or with their partner and had university education level and high to medium income.

Personal motivation and social network

- A sense of place was medium for one volunteer, and low for the other, since was only engaged in the process for two months. Moreover, both had a high sense of place.
- The awareness of risk perception to a possible natural hazard was medium for both volunteers. One of the volunteers was conscious that the zone could be impacted by a natural hazard but perceived that the natural hazard would not affect them directly.
- The volunteers had a high level of awareness of NBS projects, being familiar with the concept, all of them recognized benefits and co-benefits of NBS projects.
- All the volunteers had a high social network with a high trust in the implementing agency and their fellow volunteers.

In relation with the level of participation the volunteers felt that they had an impact in the decision- making and that could express their concerns openly. The volunteers knew the importance of their work for the sustainability of the project. Moreover, could get engaged in several activities and help in their implementation, but considered that the process was led and organized by the implementing agency.

4.8.3 Hofbogen

Hofbogen case study was also considered. The participatory process was involvement considering that two out of three volunteers expressed that they were engaged regularly in the project.

“I been participating since three years ago, but I have a full time job, as well. So that's why last year I only went once because I had to work” (HBE2)

“Every week, some people come every few weeks, some people come in, to garden not to garden but to bring a cake or to make some music when we have an event or you can be involved in lots of different ways.” (HBE1)

The second aspect was that the participation process was open for all stakeholders, two out of the three volunteers expressed that it was quite easy to participate and it was open for everyone and there was no specific procedure to become a volunteer.

“I called Daniel and then I called him and I told him I would like to learn something more about gardening and he said yeah come and see.” (HBC 1)

“Yes it was quite easy to participate, you just have to come” (HBC 3)

Additionally the person from Groengloed pointed out the importance of showing that the space was open to everyone and that one of the main tasks for the person in charge of the volunteers was to ensure that the space was welcoming and that the volunteers have the required information and necessary tools to engage in the processes.

“We ourselves, have to learn to communicate really clearly that this is one of our functions as Groengloed, because the garden is from all the people that join but we have a function within a group of coordinating, but we do not try to make it hierarchical we are the ones that are always here” (HBE1)

“It's also a function of our coordination to make sure that as always, people always feel welcome. And it's always open to join. But yeah, it's not automatic process that once you have a group, you know, you have something that defines the group, and that might make it harder for other people to join. So I don't know what the solution is, I don't know what kind of effort you would have to put into it.” (HBE1)

A third aspect that was considered was that all of the interviewees perceived that they could have an impact on the decision-making processes. All of their ideas and concerns were taken into consideration in the planning of the year, but also concerning possible changes that the rooftop could phase into the current program.

“There's always one or two meetings every year, where we discuss what we think, what we want to plant, If we have wishes. So that's good. And there is also the app group and the email. I think you can also discuss or tell about what's going on”. (HBC 3)

“So we're talking with Daniel as well with the Gementee (Municipality) about the new owners of the Hofbogen of what do we want the roof to be. We want this to be a meeting place, of course a green roof, but that's what everybody want.” (HBC 2)

Concerning the empowerment level, three of the four volunteers perceived that they could express their ideas but none of the respondents considered that they were encouraged to lead

the process. Moreover, none of the volunteers perceived that they were actively involved in the decision - making processes.

4.8.3.1 Relating type of engagement with socio-economic factors, personal motivation and social network and enabling conditions.

All of the volunteers had an involvement level of engagement and one of the had an empowerment level. The main factors that affected the involvement level of engagement were:

Socio economic factors

- All the interviewed volunteers were Dutch, they either lived alone or with their partner and had university education level and high to medium income.

Personal motivation and social network

- A sense of place was high for two volunteers, and medium for the other one since was only engaged in the process for three months.
- The awareness of risk perception to a possible natural hazard was medium for two of the volunteers and a low for the other one. One of the volunteers was conscious that the zone could be impacted by a natural hazard but perceived that the natural hazard would not affect them directly.
- Both volunteers had a middle level of awareness of NBS project and only one of them was familiar with the NBS concept, all of them recognized benefits and co-benefits of NBS projects.
- All the volunteers had a high social network with a high trust in the implementing agency and their fellow volunteers.

Chapter 5: Conclusions and Recommendations

5.1. Conclusion

5.1.1. Research sub-question 1: How does socioeconomic and demographic characteristics of participants affect their level of engagement in the participatory process of NBS projects?

The socioeconomic and demographic characteristics that were analyzed in the research was based on the responses of the interviewed volunteers that were participating in the post implementation of each case study. Age, gender, household income and employment status were fluctuant in the three NBS projects. Therefore, the research cannot conclude that these indicators affected the citizens level of engagement in the participation process.

Regarding to education level it was found that all of the respondents had either a technical or university education level. Additionally, the participants in the three NBS projects were mostly Dutch and spoke fluent Dutch and English. Within the extensive literature review Laurian (2014) pointed out that ethnic minorities have a tendency to be less involved in participatory processes.

Regarding this matter in the case of the Dakpark, during the observation processes the researcher identified that citizens from different nationalities were engaged in the participation of allotment gardens in the area, but they were not involved in the maintenance groups that were analyzed (Groen Groep that work on Saturdays and the group that worked on Tuesdays and Thursdays). Further analysis could investigate the difference of participation between the engagement in allotment gardens and in the maintenance and creation of the common spaces of NBS projects.

With respect to the household composition, in the three case studies the participants were either living alone or with a partner. Contrary to what was found in the literature review, for example Dekker (2007) noted that women with children tend to participate more in projects near the neighborhood.

In conclusion the participants that engaged in the three NBS projects that were analyzed were mainly Dutch, with a university or technical education level and were living alone or with their partners.

5.1.2. Research sub-question 2: How does personal motivation and social network factors affect volunteers level of engagement in the post implementation phase of the Nature Based Solutions projects?

According to theory, personal motivations to participate are not related with personal interest but also to social values and benefits (Verschuere et al 2012; Alford 2009; Ryan et al. 2001). The findings show that the main values for volunteers to engage were working outdoors, access to green areas, social benefits, well-being among others.

Findings related to personal motivation show that in the Dakpark volunteers have a high community attachment but also a high sense of place. An interesting finding is that volunteers

that had a high sense of place but a low community attachment were engaged in the project at an empowerment level, leading initiatives and involved in the decision-making process.

Community attachment was low for the DakAkker and Hofbogen since most of the interviewed volunteers did not live in the area. Nonetheless, sense of place was high having volunteers participating regularly and being engaged with the site for more the one year.

Regarding risk perception to a possible natural hazard, DakAkker had a medium rate and the Dakpark and the Hofbogen had a low rate. Is important to note that the respondent in the three cases were aware of the possible impact of natural hazards in Rotterdam but did not feel that their lives could be impacted by a natural event.

Finally, in relation with the awareness of NBS projects it was noted that all of the volunteers identified co-benefits of the rooftop garden. It was possible to identify several topics that were repeatedly mention by all the respondents like, etc. (see table 9). In relation to the familiarity with the concept of NBS the volunteers at the Dakpark and DakAkker had a high level of response and in Hofbogen had a low level since only one of the interviewed volunteers knew the concept. A noteworthy finding is that in the Dakpark and the Hofbogen all the respondents that were aware of the NBS concept were engaged at a empowerment level.

Regarding to the social network, in the case of the Hofbogen and the Dakpark projects the participants perceived that the area was important for the neighborhoods and that it also represented the neighbors' interest, since the space was regularly used for gatherings, sports, etc.

Experts and project managers also expressed the importance of having structure within the volunteering schemes, they mentioned that it was important to have a leader, fixed days and times for the workers and volunteers to attend and a person that has a general vision of all of the tasks that are required. The experts and project managers expressed that the structure needs to provide a reliable schedule that the volunteers can trust. Moreover, during the observation, the researcher could analyze how the organization was important to guide and welcome new volunteers.

Concerning the trust between the community members they expressed feeling comfortable with the groups and in some cases, volunteers expressly mentioned the personal value of the social ties that were created.

5.1.3. Research sub-question 3: How do the enabling conditions affect volunteers level of engagement in the post implementation phase of the Nature Based Solutions projects?

The three case studies were aligned with the political instruments at a local level having a framework for the initiatives. Most of the plans and strategies supported the creation of multifunctional rooftops but not the post implementation process. Regarding the financial resources, it was found that the three projects were created with the support from the Rotterdam municipality. For the post implementaion phase DakAkker and Dakpark were able to obtain financial subsidies or partners for the implementation of specific initiatives (beehive, smart rooftop storage, environmental education programs, among others). In the case of Hofbogen the financial resources were from Dudok the owner of the area. All of the projects work with volunteers and search for funding to develop their specific subprojects. DakAkker was also

able to generate its own income by implementing activities on the rooftop or by selling the rooftop products.

The enabling conditions were quite important for the sustainability of the projects. The analysis of the three case studies showed that the enabling conditions were not a factor that affected the volunteers level of engagement in the participatory process, since only one volunteer per case study knew about the existing enabling conditions.

5.1.4. Main research question: Which factors explain the volunteers level of engagement in the post implementation phase of the Nature Based Solutions projects?

First it was found that the levels of engagement were determined by the implementing agency, were the Dakpark encouraged their volunteers to have empowerment level of engagement in the post implementation phase. While the DakAkker and Hofbogen encouraged an involvement level.

Is important to point out that there is not a better level of participation and an analysis on the aims and type of organization of the implemented agency is furtherly analyzed. As Cornwall (2008) affirms all types of participation are important and have their own objective. Instead of look at participation as good and bad or higher or lower level it should be analyzed within the context and considering its objectives.

In the case of Dakpark the creation of the park was bottom-up, involving the active participation of citizens. Once the project was finished the municipality delivered two areas for the citizens to manage, the buurtuin and the Mediterranean garden. The organization of the post implementation process is conducted by the citizens that made the Dakpark organization and work on it as volunteers. Therefore, is important for the Dakpark organization to have volunteers that take lead their own projects.

It was found that the level of engagement for the post implementation phases was given by the implementing agency and the type of organization that was running the rooftop garden. Considering the options that were given by the established organization, the volunteers decide how much they want to engage in the participatory processes. Thus, some of the volunteers have an engagement level and level of information where they participate as volunteers but decide to only be informed of the tasks that they can accomplish, and they are aware of the details of the rooftop garden. Nevertheless, they choose to decide not to engage in a consultation, involvement or empowerment level.

In summary, with the case of the Dakpark, DakAkker and Hofbogen the socio economic factors gave a general view of the characteristics of the interviewed volunteers. They were mainly Dutch, with a university or technical education level and were living alone or with their partners. Moreover, these characteristics did not directly affect the level of engagement in the post implementation phases of the projects.

In the case of the Dakpark it was noted that volunteers that had knowledge of the concept of NBS and had medium risk perception were more likely to involve in the engagement level of participation in the post implementation phase.

In DakAkker and Hofbogen all of the participants had an involvement level of participation and their main factors is that they had high sense of place and a high level of awareness where all the volunteers enjoyed being outdoors and getting engaged with nature. Moreover, they

were aware of the importance of NBS projects for the environment. Almost all the participants were engaged for more than one year in the project and had a high level of trust on the implementing agency.

5.2. General recommendations

- The three projects rely on volunteers for the execution of activities. It was fully recognized in the three NBS projects and by the experts that the only viable way of developing the post-implementation process is with volunteers' engagement. Therefore is vital to manage the volunteer network in a reliable, organized, and trustworthy manner is vital for a successful post-implementation phase and the three case studies can be role models for other NBS projects that work with volunteer participation.
- For the sustainability of rooftop gardens is important to have an organized implementing agency, weather it promotes engagement or involvement. A solid and organized implementing agency generates trust and volunteers perceive it as reliable and invites volunteers to engage for longer terms.
- The creation and implementation phase of NBS projects specifically rooftop gardens should consider a small budget for the post-implementation phase in order to hire a person that organizes the volunteering process and to be able to give volunteers certain incentives, as capacity building workshops and the necessary tools to develop the work. Elements that were present in the three projects and that the volunteers recognized as valuable.
- It was noticed that for Hofbogen and Dakpark one of the main concerns was to engage more volunteers in the process. Analyzing, which channels of information and communication are more efficient to invite more volunteers to engage is fundamental. Considering that most of the volunteers wanted to have contact with nature and valued the work in open spaces a good tactic could be informing specific groups related to nature and outdoor hiking to join in the volunteering process.
- The co-benefits (green areas, clean air, social space that the NBS project bring to the city and specifically to volunteers could be measured.

5.3. Future research scope

The study has only analyzed the main factors that drive volunteers to engage. It could also be relevant to analyze if there are some factors that exclude citizens to engage as volunteers in NBS projects. Moreover, it would be enriching to analyze if specific factors boost the level of engagement of volunteers and encourages them to participate for long terms. Additionally, in the three NBS projects was fully recognized that participation is a key element for the post implementation of the NBS projects. Therefore, having a clear view of how can more people get engaged in the process of post implementation will be beneficial for the sustainability of these types of projects.

Bibliography

- Alford, J. 2002. Why do public-sector clients co-produce? Toward a contingency theory. *Administration & Society*, 34(1), pp. 32-56. <https://doi.org/10.1177/0095399702034001004>
- Ando, A. W., Cadavid, C. L., Netusil, N. R. and Parthum, B. 2020. Willingness-to-volunteer and stability of preferences between cities: Estimating the benefits of stormwater management. *Journal of Environmental Economics and Management*, 99 pp. 102274
- Arnstein, S. 1969. A Ladder of Citizen Participation. *Journal of the American Institute of Planners*, 35 (4), pp. 216-224. Available at: <https://doi.org/10.1080/01944366908977225>
- Balian, E., Berhault A., Eggermont H., Lemaître F., von Korff Y., Young J. C., 2016. Social innovation and nature-based solutions. EKLIPSE/EPBRs/BiodivERsA Joint Foresight Workshop: Brussels, 6-7 December. Workshop Report.
- Barclay, N., Klotz, L., 2019. Role of community participation for green stormwater infrastructure development. *Journal of Environmental Management*. 251 (109614), pp. 1-9. Available at: <https://doi.org/10.1016/j.jenvman.2019.109620>
- Bouwens, C. J. L., 2017. Flooding observations in Rotterdam: mapping of flood-prone locations, flood vulnerability and risk analysis. TU Delft, Delft. <http://resolver.tudelft.nl/uuid:92cb3817-11f3-4fea-ae7d-a841f805d6d1>[Accessed on 20-05-2020].
- Braat, L. C., & Groot, R. de (2012). The ecosystem services agenda: Bridging the worlds of natural science and economics, conservation and development, and public and private policy. *Ecosystem Services*, 1(1), pp. 4-15. Available at: <https://doi.org/10.1016/j.ecoser.2012.07.011>
- Bradford R., O'Sullivan J., Van der Craats I., Krywkow J., Rotko P., Aaltonen J., Bonaiuto M., De Dominicis S., Waylen K., Schelfault K., 2012. Risk perception – issues for flood management in Europe. *Natural hazards and earth system sciences* 12(7), pp. 2299-2309. Available at: <https://doi.org/10.5194/nhess-12-2299-2012>
- Brandsen, T., Honingh, M., 2018. Definitions of Co-production and Co-creation. *Co-Production and Co-Creation Engaging Citizens in Public Services*. pp. 9-17. Routledge, New York. Available at: <https://doi.org/10.4324/9781315204956>
- Brody, S., Godschalk, D., Burby, R., 2003. Mandating citizen participation in plan making: six strategic planning choices. *Journal of the American Planning Association*, 69(3), pp. 245-264. Available at: <https://doi.org/10.1080/01944360308978018>
- Calliari, E., Staccione, A. and Mysiak, J., 2019. An assessment framework for climate-proof nature-based solutions. *Science of The Total Environment*, 656 (15), pp.691-700. Available at: <https://doi.org/10.1016/j.scitotenv.2018.11.341>
- Cohen-Shacham, E., Walters, G., Janzen, C. and Maginnis, S. (eds.) (2016). *Nature-based Solutions to address global societal challenges*. Gland, Switzerland: IUCN. xiii, pp. 97. Available at: <http://dx.doi.org/10.2305/IUCN.CH.2016.13.en>
- Cornwall, A. 2009. Locating Citizen Participation. *IDS Bulletin* 33(2), pp. i – x. Available at: <https://doi.org/10.1111/j.1759-5436.2002.tb00016.x>

- Cornwall, A. 2008. Unpacking 'Participation': models, meanings and practices. *Community Development Journal* 43(3) pp.269-283. Available at: <https://doi.org/10.1093/cdj/bsn010>
- Dekker, K. (2007) Social Capital, Neighbourhood Attachment and Participation in Distressed Urban Areas. A Case Study in The Hague and Utrecht, the Netherlands, *Housing Studies*, 22 (3), pp. 355-379. Available at: <https://doi.org/10.1080/02673030701254103>
- Dennis, M. and James, P. 2016. User participation in urban green commons: Exploring the links between access, voluntarism, biodiversity and well-being. *Urban Forestry & Urban Greening*, 15 pp. 22-31 Available at: <https://doi.org/10.1016/j.ufug.2015.11.009>
- DFID, 1999. Sustainable livelihood guidance sheets. Department for International Development (DFID), London. Available at: <https://www.enonline.net/attachments/872/section2.pdf> [Accessed on 23-09-2019].
- Döll, P., Jiménez-Cisneros, B., Oki, T., Arnell, N.W., Benito, G., Cogley, J.G., Jiang, T., Kundzewicz, Z.W., Mwakalila, S. & Nishijima A. 2015. Integrating risks of climate change into water management, *Hydrological Sciences Journal*, 60(1), 4-13. Available at: <https://doi.org/10.1080/02626667.2014.967250>
- Duguma, L. A., Wambugu, S. W., Minang, P. A. and van Noordwijk, M., 2014. A systematic analysis of enabling conditions for synergy between climate change mitigation and adaptation measures in developing countries. *Environmental Science & Policy*. 42, pp. 138-148. Available at: <https://doi.org/10.1016/j.envsci.2014.06.003>
- Eijk, C. van, Gasco, M., 2018. Unravelling Co-producers. Who are they and what motivations do they have? *Co-Production and Co-Creation Engaging Citizens in Public Services*, pp. 64-76. Routledge, New York. Available at: <https://doi.org/10.4324/9781315204956>
- Ferreira, V, Barreira, A., Loures, L., Antunes, D., Panagopoulos, T., 2020. Stakeholders' Engagement on Nature-Based Solutions: A Systematic Literature Review. *Sustainability*. 12. 640. [10.3390/su12020640](https://doi.org/10.3390/su12020640).
- Fisher, B., Turner, R. K., Morling, P. 2009. Defining and classifying ecosystem services for decision making. *Ecological Economics*, 68 (3), pp. 643-653. Available at: <https://doi.org/10.1016/j.ecolecon.2008.09.014>
- Ganzevoort, W. and van den Born, R. J. G. 2020. Understanding citizens' action for nature: The profile, motivations and experiences of Dutch nature volunteers. *Journal for Nature Conservation*, 55 pp. 125824 Available at: <https://doi.org/10.1016/j.jnc.2020.125824>
- Gementee Rotterdam, 2019. 2019-2022 Multifunctional Roofs Programme Plan. Colophon, Rotterdam.
- Grafakos, S., Flamos A., Oikonomou, V., Zevgolis, D., 2010. Multi-criteria analysis weighting methodology to incorporate stakeholders' preferences in energy and climate policy interactions. 4 (3), pp. 434-461. Available at: <https://doi.org/10.1108/17506221011073851>.
- Hashemnezhad, H., Heidari, A., Mohammad Hoseini, P. (2013). 'Sense of Place' and 'Place Attachment', *International Journal of Architecture and Urban Development*, 3(1), pp. 5-12. Available at: <https://doi.org/10.1080/17506221011073851>

http://ijaud.srbiau.ac.ir/article_581_a90b5ac919ddc57e6743d8ce32d19741.pdf
[Accessed 11-08-2020]

- IUCN. 2019. Nature-based Solutions. <https://www.iucn.org/regions/europe/our-work/nature-based-solutions> [Accessed on 09-05-2019]
- Jha, A., Lamond, J., Bloch, R., Bhattacharya, N., Lopez, A., Papachristodoulou, N., Bird, A., Proverbs, D., Davies, J. and Barker, R., 2011. Five feet high and rising: cities and flooding in the 21st century. World Bank, Washington.
- Johnson, M, Campbell, L., Svendsen, E., Silva, P. 2018. **Why count trees? Volunteer motivations and experiences with tree monitoring in New York City.** *Arboriculture & Urban Forestry*, 44 (2) (2018), pp. 59-72
- Jong, M., Neulen, S., Jansma, S. 2019. Citizens' intentions to participate in governmental co-creation initiatives: Comparing three co-creation configurations. *Government Information Quarterly*, 36 (3), pp. 490-500. Available at: <https://doi.org/10.1016/j.giq.2019.04.003>
- Kabisch, N., Frantzeskaki, N., Pauleit, S., Naumann, S., Davis, M., Artmann, M., Haase, D., Knapp, S., Korn, H., Stadler, J. and Zaunberger, K., 2016a. Nature-based solutions to climate change mitigation and adaptation in urban areas: perspectives on indicators, knowledge gaps, barriers, and opportunities for action. *Ecology and Society*, 21(2). Available at: <https://doi.org/10.5751/ES-08373-210239>
- Kabisch, N., Stadler, J., Korn, H., and Bonn, A., 2016b. Nature-based solutions to climate change mitigation and adaptation in urban areas. Federal Agency for Nature Conservation, Malmö. <https://www.bfn.de/fileadmin/BfN/service/Dokumente/skripten/Skript446.pdf> [Accessed on 20-04-2020].
- Kalantari, Z., Santos Ferreira, C., Keesstra, S., Destouni, G., 2018. Nature-based solutions for flood-drought risk mitigation in vulnerable urbanizing parts of East-Africa. 5, pp. 73-78. Available at: <https://doi.org/10.1016/j.coesh.2018.06.003>
- Koehler, B., Koontz, T.M.C 2008. Citizen Participation in Collaborative Watershed Partnerships. *Environmental Management*. 41(2):143-54. Available at: <https://doi.org/10.1007/s00267-007-9040-z>.
- Laurian, L. 2004 Public participation in environmental decision making: findings from communities facing toxic waste cleanup. *Journal of the American Planning Association*, 70(1), pp.53-65. Available at: <https://doi.org/10.1080/01944360408976338>
- Lawson, E., Thorne, C., Ahilan, S., Allen, D., Arthur, S., Everett, G., Fenner, R., Glenis, V., Guan, D., Hoang, L., Kilsby, C., Lamond, J., Mant, J. Maskrey, S., Mount, N., Sleigh, A., Smith, L., Wrigh, N. 2014. Delivering and evaluating the multiple flood risk benefits in Blue-Green Cities; an interdisciplinary approach. *WIT Transactions on Ecology and the Environment*. Available at: <https://doi.org/10.2495/FRIAR140101>.
- Marsalek, J., Chocat, B., 2002. International Report: Stormwater management. *Water science and technology: a journal of the International Association on Water Pollution Research*. 46. pp. 1-17. Available at: <https://doi.org/10.2166/wst.2002.0657>.
- Nare, L., Odiyo, J. O., Francis, J. and Potgieter, N., 2011. Framework for effective community participation in water quality management in Luvuvhu Catchment of South Africa.

- Physics and Chemistry of the Earth, Parts A/B/C. 1063-1070. Available at: <https://doi.org/10.1016/j.pce.2011.08.006>
- Nesshöver, C., Assmuth, T., Irvine, K.N., Rusch, G.M., Waylen, K.A., Delbaere, B., Haase, D., Jones-Walters, L., Keune, H., Kovacs, E., Krauze, K., Külvik, M., Rey, F., van Dijk, J., Vistad, O.I., Wilkinson, M.E., Wittmer, H., 2017. The science, policy and practice of nature-based solutions: an interdisciplinary perspective. *Science of The Total Environment*, 579(1), pp. 1215-1227. Available at: <https://doi.org/10.1016/j.scitotenv.2016.11.106>
- OECD, 2019. Applying the OECD principles on water governance to floods: A checklist for action, OECD studies on water, OECD, Paris. Available at: <https://doi.org/10.1787/d5098392-en>
- OECD, 2013. Water and Climate Change Adaptation: Policies to Navigate Uncharted Waters, OECD Studies on Water, OECD Publishing, Paris. Available at: <https://doi.org/10.1787/9789264200449-en>.
- OECD/UN-HABITAT. 2018. Global State of National Urban Policy. OECD Publishing, Paris/UN-HABITAT, Nairobi. Available at: <https://doi.org/10.1787/9789264290747-en>.
- Ostrom, E., 1996. Crossing the great divide: Coproduction, synergy, and development. *World Development*, 24 (6), pp. 1073-1087. Available at: [https://doi.org/10.1016/0305-750X\(96\)00023-X](https://doi.org/10.1016/0305-750X(96)00023-X)
- Pidgeon, N., 1998. Risk assessment, risk values and the social science programme: why we do need risk perception research. *Reliability Engineering & System Safety*, 59 (1), pp. 5-15. Available at: [https://doi.org/10.1016/S0951-8320\(97\)00114-2](https://doi.org/10.1016/S0951-8320(97)00114-2)
- Raaijmakers, R., Krywkow, J., van der Veen, A. 2008. Flood risk perceptions and spatial multi-criteria analysis: an exploratory research for hazard mitigation. *Nat Hazards* 46, pp. 307–322. Available at: <https://doi.org/10.1007/s11069-007-9189-z>
- Raymond, C.M., Frantzeskaki, N., Kabisch, N., Berry, P., Breil, M., Nita, M.R., Geneletti, D. and Calfapietra, C., 2017. A framework for assessing and implementing the co-benefits of nature-based solutions in urban areas. *Environmental Science & Policy*, 77, pp.15-24. Available at: <https://doi.org/10.1016/j.envsci.2017.07.008>
- Ryan, R., Kaplan, R. and Grese, R., 2001. Predicting Volunteer Commitment in Environmental Stewardship Programmes, *Journal of Environmental Planning and Management*, 44 (5), pp. 629-648. Available at: <https://doi.org/10.1080/09640560120079948>
- Santoro, S., Pluchinotta, I., Pagano A., Pengal, P., Cokan, B. Giordano, R. 2019. Assessing stakeholders risk perception to promote Nature Based Solutions as flood protection strategies: The case of the Glinščica river (Slovenia). *Science of The Total Environment*, 655, pp. 188-20. Available at: <https://doi.org/10.1016/j.scitotenv.2018.11.116>
- Sarzynski, A. 2014. Public participation, civic capacity, and climate change adaptation in cities. *Urban Climate*, 14 (1) pp. 52-67. Available at: <https://doi.org/10.1016/j.uclim.2015.08.002>
- Sullivan-Willey, K., Short Gianotti, A. 2017. Risk Perception in a Multi-Hazard Environment. *World Development*, 97, pp. 138-152. Available at: <https://doi.org/10.1016/j.worlddev.2017.04.002>

- Tanner, T., Mitchell, T., Polack, E., Guenther, B. 2009. Urban governance for adaptation: Assessing climate change resilience in ten Asian cities IDS Working Paper 315 ADS, Brighton, pp. 1-47 https://onlinelibrary.wiley.com/doi/epdf/10.1111/j.2040-0209.2009.00315_2.x [Accessed 08-02-2020]
- Thiel, S van (2014) *Research Methods in Public Administration and Public Management*, an introduction. London/New York: Routledge.
- UN-Habitat 2014, *The evolution of national urban policies*, ed. UN-Habitat, United Nations Human Settlements Programme. UN-Habitat, Nairobi. Available at: <https://unhabitat.org/the-evolution-of-national-urban-policies> [Accessed 08-03-2020]
- Verschuere, B., Brandsen, T., & Pestoff, V. 2012. Co-production: The state of the art in research and the future agenda. *Voluntas*, 23(4), pp. 1083-1101. Available at: <https://doi.org/10.1007/s11266-012-9307-8>
- Zare, S.; Namiranian, M.; Feghhi, J.; Fami, H.S. 2015. Factors encouraging and restricting participation in urban forestry (Case study of Tehran, Iran). *Arboricultural Journal*, 37(4), pp. 224-237. Available at: <https://doi.org/10.1080/03071375.2015.1136154>
- Zevenbergen, C. , Herk, S, Rijke J. 2016. Future-Proofing Flood Risk Management: Setting the Stage for an Integrative, Adaptive, and Synergistic Approach. *Public Works Management & Policy* 22(1), pp. 49-54. Available at: <https://doi.org/10.1177/1087724X16674473>

Annex 1: Research Instruments

- I. **Interview Guide** for: project manager, municipality representative or the head of maintenance.

Good day, I am a master student from the Institute for Housing and Development Studies at Erasmus University, in Rotterdam and I am doing a research about citizen engagement in **Dakpark, Hofbogen and Dakakker** in the city of Rotterdam. The objective of the study is to understand the what makes citizens engage in the participatory process of these projects. For this matter I would please ask you to provide information about each project and also indicate if you find differences and similarities among the participatory process of the projects.

I ask your permission to record the interview in order to facilitate the transcription process and to be able to focus on the conversation so I do not have to take notes constantly. I will assure that this information will be confidential and only used for research purposes.

Introduction

1. How long were you involved in the project?
2. What was/is your role in the project?

Personal and social motivations

3. What was the main motivation to create and implement the project?
4. In your opinion what are the main benefits of this project?
5. Does the project make the neighborhood more prepared to natural hazards? In what matter or why not?
6. Do you perceive that residents value the project? In what ways? Or why not?
7. In your opinion how much knowledge do residents have about the benefits of the project? Has this knowledge changed throughout the project? If so, in what ways?
8. Where there any key groups for the implementation of the project? What was/is the main assets of this groups?
9. How involved were the neighbors in the process?
10. Did the project impact the life of the residents? Can you explain me more about it?

Enabling factors

11. Do you consider that this project is aligned with national plans and strategies? If so in what way?
12. Do you consider that this project is aligned with plans, programmes or strategies of the Rotterdam Gementee (i.e. Adaptation plan, Rotterdam Waterplan)? If so in what way?
13. Do you consider budget allocation was sufficient for the implementation of the projects? What funding mechanisms were considered?
14. Are there any incentives that Rotterdam Gementee gives the residents for participating in the process? If so, which incentives?
15. Does the Gementee incentive or impulse the creation and maintenance of this type of projects?

Types of participation

16. How was the participation process conducted? In what stages of the project were the citizens' involved?
17. In your perception why do you think citizens' were moved to get involved in the project?
18. In your perception do you think some citizens' did not want to be part of the process? Why?
19. Which mechanisms and strategies were used to involve the stakeholders in the process?
20. Do you think the inputs of stakeholders helped in the process? In which stages of the process were the inputs more relevant?
21. How were the inputs of the stakeholders included in the project?
22. Do you consider participants were actively involved in the participatory process and decision- making process?
23. Do you think citizens could openly express their concerns and ideas about the project?
24. Would you improve something in the participation process?
25. What was the most challenging part of the participatory process?
26. How do you think the project will develop in the future?
27. Is there any additional information you would like to provide?

Thank you very much, in order to continue with the research, I wanted to ask you if you know other key actors or residents that were involved in the participatory process of the projects so I can contact them for an interview? Is it ok if I contact you later, only in case I need to clarify some information? Thanks again for your time and the valuable information. This interview will be completely confidential and will be used one for research purposes.

II. **Interview Guide** for: volunteers.

Good day, I am a master student from the Institute for Housing and Development Studies at Erasmus University, in Rotterdam and I am doing a research about citizen engagement in Dakpark, Hofbogen, and Dakakker in the city of Rotterdam (Only name the project that corresponds to the resident area). The objective of the study is to understand the what makes citizens' participate in this project. I am going to ask you about information of the participatory process of the (name of the project that corresponds).

We ask your permission to record the interview and assure that this information will be confidential and only used for research purposes.

General information (socio- economic and demographic factors)

- Gender F M
- How old are you?
- Which is your highest level of education completed
- What is your nationality
- Do you speak Dutch fluently?
- Do you write in Dutch?
- What is your housing occupation condition?
- Who do you live with?
- Are you currently working?

- What is your annual net income? in euro
 - a. Less than 15,000
 - b. 15,000 – 20,000
 - c. 20,000 – 25,000
 - d. 25,000 – 30,000
 - e. More than 30,000

Individual motivation and social network

1. How did you know about the project?
2. Do you live or work in the area?
3. How long have you been living/working in the area?
4. Do you know what is a NBS project? explain
5. Did you participate in the project? (explain why not)
6. Why did you decide to participate?
7. What is the aim of the project?
8. Do you consider that the project is important for the area? To what extent.
9. What kind of impacts does the project have in the area? Explain.
10. Have you ever experienced a natural hazard in the area?
11. Did the natural hazard impact your house or business?
12. Did the natural hazard impact your daily routine?
13. Do think the project helps avoid the impact of a natural hazard?
14. Do you consider that the project leaders represent your personal interests?
15. Do you consider that the project leaders represent neighborhood interests?
16. Are there organized groups in the area that participate in the project?
17. Are you part of the organized group?
18. Did the group invite you to participate in the project?
19. Do you think the neighbors are interested in participating in the project? Why?

Enabling conditions

20. Does the government provide economical or financial benefits for engaging in the participatory process?

Types of participation

21. In which stage of the project did you participate? (creating, monitoring, maintenance)
22. How often did you participate?
23. How did you engage in the participatory process?
24. Where their information meetings about the project? Did you attend to the meetings?
25. Do you consider that the participatory process provided clear information about the project?
26. Do you perceive that all citizens´ where invited to participate? How was the invitation process?
27. Where you satisfied with the participation process? Explain
28. Was there a consultation process? Did you participate?
29. Do you consider that the inputs of the participants were considered in the decision-making process?
30. Do you consider that citizens provided relevant and significant inputs for the project?
31. Do you consider participants were actively involved in the participatory process and decision- making process?
32. Do you think citizens could openly express their concerns and ideas about the project?

33. Would you improve something in the participation process?
34. Where you satisfied with the information provided about the project? Please detail further.

Socioeconomic and demographic factors

Conclusion

35. How do you think the project will develop in the future?
36. Is there any additional information you would like to provide?

Thank you very much, in order to continue with the research, I wanted to ask you if you know other key actors or residents that were involved in the participatory process of the projects so I can contact them for an interview? Is it ok if I contact you later, only in case I need to clarify some information? Thanks again for your time and the valuable information. This interview will be completely confidential and will be used one for research purposes.

Annex 2: List of interviewees

Code	Interviewee	Description	Duration
DKPC 1	Volunteer	Volunteer in the Groen Group that was involved in the creation, implementation and maintenance of Dakpark	35 min
DKPC 2	Volunteer	Volunteer in the Groen Group that was involved in the creation, implementation and maintenance of Dakpark	24 min
DKPC 3	Volunteer	Volunteer in the Groen Group but also in other groups, participates some Tuesdays and Thursdays	23 min
DKPC 4	Volunteer	Volunteer in the Groen Group but also in other groups, participates some Tuesdays and Thursdays	39 min
DKPC 5	Volunteer	Volunteer that participates in the Dakpark some Tuesdays and Thursdays.	35 min
DKPC6	Volunteer	Volunteer at the Dakpark involved in several groups and participates in the board meetings.	26 min
DKPC7	Volunteer	Volunteer at Dakpark every Tuesday and Thursday	22 min
DKPC8	Volunteer	Volunteer at Dakpark every Tuesday and Thursday	31 min
DKPE 1	Organization	Organizes the volunteers at Dakpark.	1 hour and 19 min
DKPE 2	Organization	Part of the Dakpark organization involved in the creation, implementation and maintenance of Dakpark and volunteer at Groen Groep.	32 min (with DKPE 3)
DKPE 3	Organization	Part of the Dakpark organization involved in the creation, implementation and maintenance of Dakpark and volunteer at Groen Groep.	32 min (with DKPE 2)
DKPE 4	Organization	Member that is not part of the board but was involved in the creation of the park and participates in the Groen Groep	28 min
DKAE 1	Organization	Leads the post implementation process in DakAkker has been part of the project since the beginning	31 min
DKAC 1	Citizen	Volunteer at Dakakker	32 min
DKAC 2	Citizen	Volunteer at Dakakker	29 min (with DKKC 3 and DKKC 4)
DKAC 3	Citizen	Volunteer at Dakakker	29 min (with DKKC 2 and DKKC 4)
DKAC 4	Citizen	Volunteer at Dakakker	29 min (with DKKC 2 and DKKC 3)
HBE 1	Organization	Leads the post implementation process at Hofbogen, has been part of the project since the beginning	39 min
HBC 1	Volunteer	Volunteer at Dakakker	13 min
HBC 2	Volunteer	Volunteer at Dakakker	24 min
HBC 3	Volunteer	Volunteer at Dakakker	13 min
E1	Expert	Expert that works in the Municipality of Rotterdam and knows about the 3 case studies.	49 min
E2	Expert	Expert in multifunctional rooftops and is engaged their implementation in Rotterdam. Knows about the three case studies.	47 min
E3	Expert	Expert in multifunctional rooftops from the municipality. His department has been working 12 years on the implementation of rooftop areas. Familiar with the three case studies.	58 min

Source: Author, 2020

Annex 3: IHS copyright form

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