Stimulating climate adaptive community initiatives

The individual conditions that explain and increase membership of a green roof community initiative in a Dutch urban area

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Green roof example in the city of Rotterdam (source: groenvandaag.nl)

Abstract

Community initiatives have an indispensable role to play in tackling climate adaptation, by their ability to increase the uptake of climate adaptation measures among households. This study focuses on increasing the uptake of green roofs among households specifically. Despite the potential of community initiatives in increasing this uptake, they often reach only a small portion of a neighborhood. Arguably, by enhancing membership numbers of green roof community initiatives, the overall success of green roof implementation in the Netherlands may be enhanced as an effective no-regrets adaptation measure. A novel framework of individual conditions has created a holistic overview of the relevant individual conditions that move people to participate in pro-environmental community initiatives. This study applies this framework to a case study in the Dutch city of Deventer. In doing so, this study takes a multi-method in-depth approach that has not been applied to this framework before. This results in an understanding of which individual conditions are most important in driving people to join a climate adaptation community initiative. The results show that all individual conditions of the framework were relevant and led to green roof initiative membership when all present. Yet, the most important individual conditions were found to be *peer pressure, objective capacity,* and *sense of own responsibility*. Accordingly the following aspects were highly influential in this case for driving green roof initiative membership: (1) citizens will need to have (access to) the required skills, competencies, information and knowledge, and resources to install a green roof, (2) citizens will have to feel like participating in such an initiative is part of the social norm of the group that they identify themselves with, and (3) they need to believe that they are responsible for addressing the issues caused by climate change. These findings were discussed with a selection of practitioners to assess their validity and generalizability, and were placed within the broader scope of environmental behavior literature. Recommendations for future research are provided, as well as recommendations for practitioners that aim to stimulate citizens to participate in climate adaptive neighborhood initiatives.

Key words

Citizen initiatives, nature-based solutions, neighborhood climate adaptation, framework of individual conditions, green roofs

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1. Introduction

1.1 Urban climate adaptation

The Northern hemisphere summer of 2021 has been dubbed a 'summer of extremes' by the World Meteorological Organization due to the extreme weather events that played out across the world (WMO, 2021). Examples are the deadly flash floods in western Europe and central China (Cornwall, 2021; Feng, 2021), unprecedented heat in parts of Canada, the US, Scandinavia and Greenland (Dewan, 2021; DW, 2021; Turner, 2021), and more frequent wildfires in the American West and Siberia (Jones, 2021; Kottasová, 2021). Global temperature rise is a driving force behind such extreme weather events, as it increases both the frequency and intensity with which these events occur (Ebi et al. 2021).

In light of this knowledge, it is particularly alarming that the Royal Netherlands Meteorological Institute (KNMI) recently issued a warning that global temperature rise may be progressing faster than previously thought (de Wijk, 2021). Namely, a recent study has found that the global temperature may have already increased more than 1,5 °C (and possibly 2,3 °C), compared to pre-industrial levels (Zhou et al. 2021). This means that the Paris Agreement goal to keep global warming well below 2 °C and preferably below 1,5 °C (UN, 2015), would already be surpassed. As the global temperature continues to rise, so does the urgency with which the world has to adapt to this warmer climate and its extreme weather effects such as flooding, heat stress, and droughts. Climate adaptation is 'taking action to prepare for and adjust to both the current effects of climate change and the predicted impacts in the future' (EC, n.d.).

In this paper, the focus lies on climate adaptation in urban areas, and in particular on Dutch urban areas. Cities are especially vulnerable to climate change effects; heat waves are more intense due to the urban heat island effect (Borg et al. 2021), air pollution is exacerbated (Harlan & Ruddell, 2011), and as cities expand to accommodate population growth, many expand into areas that are more prone to floods (Tellman et al. 2021). Adding to this vulnerability is the fact that cities are home to over half of the global population (Rosenzweig et al. 2011) and this number is only increasing (Sun et al. 2020). The Netherlands is no exception to this: around three quarters of the population resides in urban areas, making the Netherlands one of the most urbanized countries of Europe (Nabielek & Hamers, 2015).

Cities are not only at the forefront of climate vulnerability, they are also at the forefront of taking action for climate adaptation, and are in unique positions to do so as they are often centers of economic activity (Rosenzweig et al. 2011). Dutch cities specifically are considered to be pioneers when it comes to climate adaptation measures. In particular, the Dutch cities of Rotterdam and the Hague are mentioned to be 'leaders and pioneers of urban climate adaptation measures in The Netherlands and globally' (Dabrowski, 2017, p. 843).

1.2 Green roofs as an NBS in Dutch cities

In order for a city to adapt to the above mentioned effects of climate change, a variety of measures can be taken. This study focuses on an important measure that falls in the category of 'Nature-based Solutions' (NBS). NBS are 'solutions to societal challenges that are inspired and supported by nature' (Raymond et al. 2017, p. 15). Such solutions are growing in popularity when it comes to climate adaptation (Anderson & Renaud, 2021; Wamsler & Pauleit, 2016) and they prove to be effective and cost-efficient in helping urban areas adapt to certain climate change effects (Keesstra et al. 2018; Raymond et al. 2017). The NBS that is highly relevant for urban climate adaptation, and that is the focus of this study, is the adoption of green roofs.

The fact that green roofs offer benefits related to the climate change effects that cities are most vulnerable to, is what makes them so relevant for adaptation in urban areas. First and foremost, green roofs have a cooling effect due to evaporation and decrease the amount of heat flux from the roof to the inside of the building, thereby moderating the heat island effect (Berardi et al. 2014). Next, depending on the slope of the roof, green roofs are great for water retention, with traditional green roofs being able to reduce water runoff by 57% during a storm (Kikuchi & Koshimizu, 2013). Moreover, intensive green roofs can reduce air pollution, although this depends on the type of vegetation used (Berardi et al. 2014). Besides these benefits, green roofs may also help to increase urban biodiversity and they offer economic and aesthetic benefits for those that adopt them (Berardi et al. 2014; Shafiq et al. 2018). Even if the effects of green roofs for climate adaptation are small scale, green roofs are generally regarded as a 'no regret' adaptation measure (Mees et al. 2013), due to all mentioned benefits and the fact that they do not take up much space. This was recently highlighted in the new EU Strategy on Adaptation to Climate Change: "Blue-green (as opposed to grey) infrastructures are multipurpose, 'no regret' solutions and simultaneously provide environmental, social and economic benefits and help build climate resilience. […] It is vital to better quantify their benefits, and to better communicate them to decision-makers and practitioners at all levels to improve take-up" (EU, 2021).

The city of Rotterdam has been said to be the leading agent in green roof adoption in the Netherlands (Mees, Driessen, Runhaar & Stamatelos, 2013). Together with cities like Groningen and the Hague, Rotterdam has an active subsidy policy in which anyone that owns a roof can apply to subsidize the installation of a green roof (WUR, n.d., simplysedum.nl). Yet, despite these favorable institutional conditions, in 2010, green roofs covered less than 1% of the space available in Rotterdam (Mees et al. 2013). Although the uptake has increased since then, the goal of the municipality of Rotterdam to cover 800.000m2 in green roofs by 2030 (Geisler et al. 2014), is a long way from being accomplished, as so far around just 234.000m2 has been covered (van der Meulen, 2019). In order to increase the uptake of green roofs, an increased uptake among private actors, like houseowners, is needed. This is due to the fact that a substantive part of the urban area in the Netherlands is privately owned by citizens: on average 50-70% (Bor & Mesters, 2018). Governing to steer more private actors towards adopting green roofs is thus a wise course of action.

Deventer is the Dutch city that is the focus of this paper. Compared to Rotterdam, Deventer has a slightly less accessible green roof subsidy policy. A green roof subsidy policy that requires more effort on the part of the citizens: citizens only qualify for the subsidy if they organize themselves and apply for the subsidy collectively rather than individually. On the one hand, the barrier to adopt green roofs might be higher for citizens in cities with this type of subsidy policy. On the other hand, once citizens do organize, such collective action has also shown to increase the adoption of climate measures, as elaborated upon in the next section.

1.3 Green roof community initiatives in Dutch cities

Bottom-up community initiatives show promising ability in increasing the uptake of climate adaptation measures amongst Dutch citizens. In this mode of governance, citizens take on a central role in the decision making and implementation process. This has been argued to lead to increased implementation of adaptation measures (Kumar et al. 20 20; Puskás, Abunnasr & Naalbandian, 2021) and to these measures being more effective in producing environmental and social benefits (Ferreira et al. 2020; Frantzeskaki, 2019). Adding to these benefits, it has also been found that such environmental community initiatives further promote

environmentally friendly behavior change amongst the citizens that participate (Middlemiss, 2011; Sloot, Jans & Steg, 2018). In other words, not only can those initiatives increase the uptake of green roofs among Dutch citizens, they also result in those citizens behaving more environmentally friendly in other areas of their lives.

Perhaps equally important is that community initiatives for climate adaptation have various non-environmental benefits for the community as well. Overall, they can empower individuals by providing knowledge, connections, and capital, and they can reduce reliance on the government for goods or services related to climate protection (da Silva, Horlings & Figueiredo, 2018). Moreover, particularly concerning initiatives focused on greening urban areas, they can result in a higher appreciation of one's living environment (Bulten et al. 2017; Raymond et al. 2017) and enhance both the mental and physical health of the community members (Raymond et al. 2017; van den Berg et al. 2015). However, greening urban areas can also lead to so called green gentrification, resulting in increased environmental injustice. In such cases, an integrative sustainability policy is needed to make sure that everyone benefits and benefits equally (Wolch et al. 2014). Having said that, community initiatives have a promising and necessary role in addressing current and future challenges of our changing climate, and can arguably improve the quality of life for communities.

Yet, as promising as these initiatives are, they are not quite reaching their potential impact. Namely, a challenge that community initiatives face is that involvement from the community can be relatively low (Bomberg & McEwen, 2012; Klein et al. 2018).This is a critical issue, as the longevity of such initiatives depends on the number of people that show interest and become members (Wiekens & Germes. 2017). Therefore, increasing the membership numbers for such community initiatives is desirable and an important challenge to tackle.

1.4 Knowledge gaps addressed by this study

The knowledge gaps that this study addresses are three-fold. Starting with the most central gap, this study looks into the potential causal pathways of the individual conditions that influence citizens to participate in community initiatives. Then, specific attention is paid to two of these individual conditions; conflicting evidence and arguments regarding the individual condition of *group identification* and *peer pressure* are addressed. And lastly, the suggestion of a possibly influential role of in person communication in the recruitment phase of community initiatives is explored.

1.4.1 Causal pathways of individual MCO conditions

Previous research has looked into the conditions that might motivate or hinder citizens in becoming community initiative members. Mees (2019) recently identified these conditions from the extensive literature across various disciplines that has been done on the subject, and brought them together in one novel conceptual framework. This Motivation Capacity Ownership (MCO) framework divides eight individual conditions across the three dimensions of motivation, capacity and ownership. This current master thesis builds upon the results of a previous master thesis by van den Born (2020), in which the MCO framework was applied to three green roof community initiatives and compared across those cases. This study is a relevant follow-up as it provides a more in-depth analysis of the MCO framework by adopting a different methodology. Instead of comparing three cases, this study zooms in on one case and is thereby able to perform a Qualitative Comparative Analysis (QCA) analysis to look into the causal relationships between the eight individual MCO conditions. With this specific analysis,

multiple causal relationships can be discovered and each of the eight conditions can be evaluated on the extent to which they are sufficient or necessary for citizens to become members of a green roof community initiative.

1.4.2 Conflicting findings on the role of group identification and peer pressure

As this study takes an in-depth look into the (relationships between) individual MCO conditions, another knowledge gap is addressed. Previous studies that have tested the MCO framework on a variety of cases found conflicting evidence for the importance of two of these individual conditions: *group identification* and *peer pressure*. Based on the literature that lies at the foundation of the MCO framework, it is to be expected that both *group identification* and *peer pressure* are important motivators for citizens to join a community initiative (Mees, 2019). To illustrate, multiple studies suggest that people can be motivated by their community to become active in environmental initiatives (Shandas, Nelson & Arendes, 2010; Dóci & Vasileiadou, 2014; Hoffman & High-Pippert, 2010), and that they are susceptible to be influenced by the pro-environmental actions of their peers (Dogmusoz, 2019; Sinasac, 2017; Zhang, Fukuda & Lui, 2019). More specifically, environmental psychology research suggests that the factor of *group identification* (defined by Sloot and colleagues (2019) as 'being involved in one's local community') could even be especially influential in motivating citizens to participate in local community initiatives, as it was found to be more important than factors that relate to financial benefits (Sloot, Jans & Steg 2019). Similarly, a recent study highlights the role that social influence and social norms (i.e. mechanisms that closely reflect the condition of *peer pressure* as it is defined in the MCO framework) play in citizen participation in environmental community actions (Broska, 2021).

Contrastingly, the results from some studies that have tested the MCO framework thus far, assigned a different importance to *group identification* and *peer pressure* as a community initiative membership enhancer. Namely, compared to the other conditions, group identification scored neutral in terms of importance for two community energy initiatives in the province of Groningen (Mees & Haitsma, 2021) and did not show to be an important influencing factor for citizens to become members for three green roof initiatives (van den Born, 2020). Similar for the condition of *peer pressure* in these same cases, peer pressure was not an influencing factor for membership of the three green roof initiatives (van den Born, 2020), just as it was not an influencing factor for the two community energy initiatives (Mees & Haitsma, 2021).These findings could indicate a case specific sensitivity to these two conditions, and thereby show that these conditions are not as important in some cases. However, as this directly contrasts the established literature in this field so far, it is wise to take into account two other explanations for these contrasting findings.

One explanation for these unexpected low scores of the *group identification* and the *peer pressure* factors in these studies can be due to the study's reliance on citizen self-report (Mees & Haitsma, 2021). Sloot and colleagues (2019) showed that indeed self-reported importance of *group identification* for example was low, whereas regression analysis showed it to be one of the most important factors. That is, in three studies that looked at the importance of community, environmental and financial motivations to join a community initiative, members and non-members were questioned on the extent to which each of these three was important for them. Based on self-report it could be concluded that community motives do not play a role in becoming an initiative member (Sloot et al. 2019), in line with the results from van den Born (2020) and Mees and Haitsma (2021). Yet, a regression analysis in the same study (Sloot et al. 2019) showed that members had higher community motives than non-members

after all, and that the community motives were even more strongly related to membership than financial motives were. This means that citizens might have underestimated the extent to which *group identification* influenced their decision. This is a plausible explanation for the *peer pressure* condition as well, as it has been argued that people are generally unaware of the extent to which they conform to the social norm, and often underestimate its influence on them (Keizer & Schultz, 2018).

A slightly different explanation could have to do with the possibility that people may be socially sensitive about admitting that they have been influenced by others. The operationalization of the statements in the questionnaire is crucial as some operationalizations are more sensitive to socially desirable answers than others. For instance, direct questions have proven to be vulnerable to socially desirable answers when it comes to sensitive personal attributes (Meisters, Hoffmann & Musch, 2020). Social desirability affects the validity of the construct, and statements that are sensitive to this should thus be avoided. Generally, all statements of the MCO framework could be sensitive to social desirable answer, yet the conditions of *group identification* and *peer pressure* may be particularly so. Namely, in both studies (Mees & Haitsma, 2021; van den Born, 2020), the operationalization of the factors *group identification* and *peer pressure* includes possibly problematic statements that could increase their sensitivity to socially desirable answers. Namely, participants of both studies were asked a direct question for the *group identification* condition about whether they felt that the decision of others to participate in the initiative had influenced their own decision. Without this direct statement, the average score for *group identification* would have been significantly higher in both studies as participants did score high on the other statements related to *group identification*. The statements of the *peer pressure* condition are all very directly phrased. For example, one of the statements said: 'I experience peer pressure from my neighbors to install a green roof'.

This study takes these two explanations into account in order to bring more clarity to the conflicting findings regarding the importance of the *group identification* and *peer pressure* conditions. Even though this study relies on citizen self-report, the in-depth systematic analysis may still be able to pick up differences between participants and non-participants and the extent to which *group identification* and *peer pressure* was necessary or sufficient in their decision to (not) join the initiative. Regarding the latter explanation of the conflicting findings, the operationalization of *group identification* and *peer pressure* in this study differs slightly from the ones used in the studies by van den Born (2020) and Mees and Haitsma (2021) in order to reduce this social desirability effect.

1.4.3 Exploration of the role of in person communication

Research suggests that in person communication (i.e. face-to-face communication can possibly play a role in enhancing the membership numbers of environmental community initiatives, by interacting with the condition of *group identification*. A meta-analysis of social influence approaches showed that in person communication was an effective method for getting groups of people (e.g. employees, students, farmers, hotel guests) to change their behavior in accordance with the environmental norms of the groups that they identified with (Abrahamse & Steg, 2013). Moreover, literature on social influence theory indeed eludes to the importance of communication in strengthening group identification (Postmes, Haslam & Swaab, 2005), which is strengthened specifically when using face-to-face communication rather than online communication (Bouas & Arrow, 1996). Add to that the experience from practice, which indicates that in person communication seems to be important for success in recruiting new

initiative members, and leads to more membership numbers (Buurkracht, 2020). This study explores this suggested positive effect of in person communication by interviewing both initiative members and non-members about the type of contact they have had with the recruiting team. Thereby, this study contributes knowledge to this gap surrounding the possibly enhancing effect of in person communication on initiative membership numbers.

1.5 Study aim and research questions

Bringing together these three knowledge gaps, the main aim of this study is to get a detailed insight into the causal pathways of (combinations of) individual MCO conditions that play a role in becoming a member of a green roof initiative. In doing so, this study shines a light on the relevance of the *group identification* and *peer pressure* condition in the MCO framework. Moreover, potential differences in motivation are explored for those citizens that had in person contact with the initiative team and those that have only received a flyer with information about the initiative. In order to do this, both qualitative and quantitative research is done with a case study in Zandweerd, Deventer: a green roof community initiative that has led to the adoption of 700 m2 of green roof on private property up until now. Ultimately, this study results in recommendations for intermediary organizations such as Buurkracht and governmental bodies who aim to facilitate the development of such community initiatives on how to increase the initiatives' potential. In line with the aim of this study, the main research question to be answered is:

Which (combinations of) individual conditions are most important for people to join a green roof community initiative?

In answering this question, the following sub-questions are addressed:

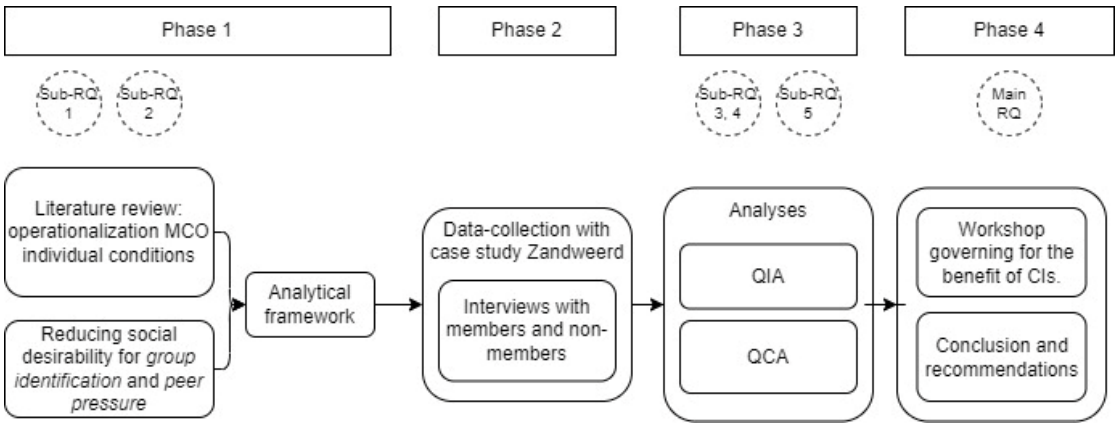
1. *How can the individual MCO conditions be operationalized for green roof community initiatives?*
2. *How can the individual MCO conditions of group identification and peer pressure additionally be operationalized to reduce social desirability?*
3. *What is the relevance of the MCO conditions and what are the most important similarities and differences between members and non-members of the Zandweerd green roof initiative regarding the individual MCO conditions?*
4. *What are the most important similarities and differences regarding the individual MCO conditions, between those that had in person communication with the Zandweerd initiative team in the recruitment phase of the initiative and those that have not?*
5. *Which (combinations of) MCO conditions are identified to be necessary or sufficient motivators for membership of the Zandweerd green roof initiative?*

1.5.1 Research Framework

The figure below illustrates the steps that are taken in this study in order to answer all research questions. In the first phase, the first and second sub-questions are answered which further explores the most important contributions in this area, which then informs the questions that are focused on in the interviews with community members (i.e. the analytical framework). In the next phase, data collection commences and interviews are taken with members and non-members of a green roof community initiative in Zandweerd. The third phase is the data analysis, which consists of multiple steps. Namely, to address the third and fourth sub-questions, a qualitative interpretive analysis (QIA) is performed. To address the fifth sub-

question a qualitative comparative analysis (QCA) analysis is done. In the fourth phase, an interactive workshop is held to discuss the results from phase 3 with relevant stakeholders, which helps to add another perspective to the results for answering the main question. The results from the sub-questions come together in this phase to formulate an answer to the main research question.

Figure 1. *Research framework.*



1.6 Scientific relevance

This study takes a novel in-depth approach to analyzing the sufficiency and necessity of the individual MCO conditions that help to explain community initiative membership. In doing so, causal relationships between (combinations of) conditions and initiative membership may be revealed. This contributes to filling a relevant gap in scientific literature as such an in-depth approach has not been taken yet in studying these conditions. Moreover, by improving the operationalization of the condition of *group identification*, this study contributes to the reliability of the MCO framework and creates more insight regarding the conflicting findings on the importance of this condition. Finally, the results of this study may contribute to another scientific knowledge gap, as the possibly enhancing role of in person communication on community initiative membership is explored.

1.7 Social relevance

As established in the introduction, besides their potential for creating non-environmental benefits for the community in terms of empowerment and quality of life, community initiatives have an indispensable role to play in tackling climate adaptation. The uptake of these climate adaptation community initiatives does not yet reach its potential. Arguably, by enhancing membership numbers of green roof community initiatives, the overall success of green roof implementation in the Netherlands may be enhanced as an effective no-regrets adaptation measure. The results of this study can help to enhance community initiative membership by improving recommendations for governing practices regarding the individual conditions that make it more likely for people to join community initiatives. This is relevant for practitioners that steer community initiatives towards success, such as organizations like Buurkracht, or governmental bodies. Moreover, practitioners have already learned from experience that in person communication is important for enhancing initiative membership (Buurkracht, 2020). By exploring this phenomenon scientifically, this study contributes to this practical knowledge and ultimately strengthens governing practices that steer community initiatives with a scientific evidence base.

1. Theory

This chapter first elaborates on the governance mode and governance challenges of community initiatives, and why this study used the MCO framework to address these challenges. Next, this study's first two sub-questions are answered: an operationalization of the individual MCO conditions for green roof community initiatives is provided, and the operationalization of *group identification* and *peer pressure* specifically is improved. The operationalization of the other core concepts of this study are provided as well. Lastly, this chapter includes the detailed analytical framework that was used to collect data.

2.1 Bottom-up group co-production and the MCO framework

The concept of co-production as a governance practice was first introduced by Elinor Ostrom as way of explaining how citizens can play a role in the production of public services (Ostrom, 1996). Nowadays, it is a widely used term described as '[…] an umbrella concept that captures a wide variety of activities that can occur in any phase of the public service cycle and in which state actors and lay actors work together to produce benefits' (Nabatchi, Sancino & Sicilia, 2017, p. 769). Community initiatives, in which a group of citizens gets together and takes collective action, are an example of a group co-production practice. The goal of such a co-production practice is to produce a service that is beneficial for the group and that would otherwise not be produced (Brandsen & Honingh, 2015; Nabatchi et al. 2017). Key to such group co-production is the joint input of citizens to the development and achievement of services in their community, rather than just individual input (Bovaird et al. 2014). It has been suggested that group-based input can significantly enhance the achievements of co-production practices, amplifying the value of contributions of individual citizens (Bovaird et al. 2016). Yet, group co-production may not be as widely implemented as individual co-production in several EU countries, and therefore still has much unfulfilled potential (Bovaird et al. 2014).

Unlike group co-production practices in which the initiator is often a state actor inviting citizen participation, community initiatives stand out in that they are a form of bottom-up group co-production. They have organized themselves to address a community need (such as the need to adapt to climate change) and initiate collaboration with state actors (van Meerkerk, 2019). Such community initiatives are valued for how they are able to provide services that the (local) government is not (able to be) providing (Kleinhans, 2017). Applied to the implementation of climate adaptation measures like green roofs, bottom-up citizen action is necessary to increase the uptake of green roofs on private property specifically.

The governance challenge is to increase the number of citizens participating in group co-production (Bovaird et al. 2016), and particularly regarding bottom-up co-production practices, the challenge is to keep them running and to keep having invested and motivated participants in the long run (van Meerkerk, 2019). As mentioned in the introduction, the longevity of environmental community initiatives indeed depends on the number of motivated people that become initiative members (Wiekens & Germes. 2017). The individual conditions that lead to citizens engaging in bottom-up group co-production governance are thus important to understand. Yet, the study of these individual conditions has been relatively underrepresented in co-production literature specifically.

Only recently the knowledge on these conditions from a variety of academic disciplines has been brought together in a comprehensive MCO framework of individual conditions (Mees, 2019). This framework specifies eight conditions over three dimension that have been shown to be important for citizens in the process of becoming a community initiative member;

Motivation (*expected return on investment, perceived salience, group identification*), Capacity (*objective capacity, subjective capacity*) and Ownership (*peer pressure, sense of own responsibility, environmental values*) (Mees, 2019). Survey and interview studies have applied this framework to environmental community initiatives and have shown its explanatory value regarding initiative membership (e.g. Mees & Haitsma, 2011; van den Born, 2020). This current study both tests and builds upon this theory further, as is elaborated upon in section 2.4 below.

2.2 Operationalization of the individual MCO conditions for green roof initiatives

As mentioned, this study builds upon the study by van den Born (2020) in which the MCO framework was applied to three green roof community initiatives. In the process of her study, van den Born (2020) identified the relevance and importance of the MCO conditions for leading to participation in coproducing nature based solutions and to membership of climate adaptation community initiatives. This section provides an overview of van den Born's (2020) findings for each of the eight conditions, categorized per dimension, and supplemented with insights from recent literature. Note that despite the division of conditions in dimensions, these dimensions do not exist separately but instead are considered to be interrelated (Mees, 2019). The findings reported in this section together answer the first sub research-question of this study: '*how can the individual MCO conditions be operationalized for green roof community initiatives?*'.

2.2.1 Motivation

The first dimension of the MCO framework, includes three individual conditions that relate to motivations for an individual to want to participate in providing a climate service for themselves or for their community.

Expected return on investment

The essence of this condition is described as: "What is in it for me or for my community? Is the reward worth the effort?" (van den Born, 2020, p. 25). In order for this condition to be regarded as a motivator for participation in providing a climate service, the return on investment (i.e. the reward) should outweigh the costs of the investment. This reward is subjective and can take on many forms. For example, in the case of participation in a green roof community initiative, the reward may be monetary (money saved thanks to the subsidy awarded to those that participate, or possibly money saved due to a reduction in energy costs after implementation of the climate service), social (increased social interaction/connection with neighbors, appreciation /compliments from peers), intrinsic (opportunity to act in alignment with ones values, such as contributing to a sustainable world) and/or normative (increased influence in own environment) (Mees, 2019; van den Born, 2020).

Examples from the literature have shown that the expected return on investment indeed mediates the extent to which people are willing to coproduce NBS or other climate services. Namely, this willingness seems to be high when no financial investment is required (Baptiste, Foley & Smardon, 2015), yet in case a financial investment is required, people find this to be a participation barrier (Barnhill & Smardon, 2012). Still, the expectation of a financial reward, due to long term economic benefits that come with implementation of the climate service, does make people more willing to participate in coproducing NBS (Baptiste et al. 2015; Brown et al. 2016). People's evaluation of this balance between the costs of investment and the expected return of investment can be impacted positively when a subsidy is provided that covers (part of) the costs of investment for an NBS (Lim, 2018). Additionally, depending on the cultural context and type of NBS, in some cases, residents expected that the environmental return on

investment of the climate service would outweigh the costs of the investment needed (Chelleri et al. 2015; Derkzen et al. 2017). This is in line with research from Ferreira and colleagues (2020), who argue that environmental protection and sustainability are the strongest motivators for participation in coproduction of NBS, together with social rewards through increased interaction with neighbors (Ferreira et al. 2020).

Focused on the importance and relevance of the expected return on investment in particular for green roofs, some studies find that "high initial cost" are the most significant barrier for installation (Chen et al. 2019; Mahdiyar, 2020; Prins, 2021). Yet again, subsidies are found to provide sufficient incentive to make people more willing to invest in green roofs (Burszta-Adamiak & Fialkiewicz, 2019). Interestingly, a recent study in the Netherlands indicated that besides high initial costs, the most frequently mentioned barrier for installing a green roof as an individual, was the hassle of applying for a subsidy (Prins, 2021). Importantly, community initiatives can reduce these two barriers for individuals, by applying for subsidy on behalf of their members. Moreover, on the positive side, the two most frequently mentioned rewards of investment, were the pleasing aesthetic of green roofs and their positive effect on biodiversity (Prins, 2021). Again, this is in line with Ferreira's finding that environmental and social rewards are the strongest motivators for implementation of an NBS (2020). All in all, this literature shows that a favorable expectation of return on investment could serve as a motivator for people to participate in the coproduction of NBS in general, and is also relevant for green roof initiatives in particular.

Perceived salience

This condition entails the question of 'how important is the issue/service for me, my community?' (van den Born, 2020, p. 25). In order for individuals to be motivated to participate in coproducing a climate service, the service and issue that it addresses should be salient enough for them. In other words, those that are more aware of the issue and the service that provides a solution to this issue, tend to be more likely to act and participate in providing said service (Beery, 2018; Derkzen et al. 2017). Education amplifies this effect as education increases one's awareness of (unmet) needs in one's environment (Bovaird et al. 2014; Voorberg et al. 2015; as referenced in Mees, 2019). Besides that it can increase awareness of climate issues, education also increases people's perceptions of the benefits of NBS as an answer to the issues. For instance, people that are aware of the benefits of NBS – such as stormwater management, biodiversity benefits, pleasing aesthetics, interaction with nature, reduced air pollution and reduced urban heat island effect for example – are more likely to help implement or coproduce NBS (Baptiste et al. 2015; Chelleri et al. 2015; Derkzen et al. 2017; Lee, Huh & Park, 2016; Sun & Hall, 2016), than are people that are not aware of the benefits (Turner, Jarden & Jefferson, 2016). This lack of public awareness has been identified in multiple cases to be a significant barrier to green roof implementation (Adriaanse, 2019; Wilkinson & Reed, 2009; Zakeri & Mahdiyar, 2020)

The most direct way, and arguably the most effective way to increase perceived salience of a climate issue or NBS service, is actual experience with either one of those. Some studies argue that experience with climate issues such as flooding or drought in one's own community contributes to their willingness to adopt NBS (Baptiste et al. 2015; Beery, 2018; Bos & Brown, 2015; Clar & Steurer, 2021). Moreover, as mentioned by van den Born (2020), Brown and colleagues (2016) found that people were more willing to adopt NBS after viewing a working example of the NBS and learning about its benefits in that way. This shows the relevance and

importance of the individual condition of perceived salience for leading to NBS and potentially green roof initiative membership.

Group identification

This third and last condition of the Motivation dimension relates to the question of: "how important is it for me to belong to a certain community of citizens?" (van den Born, 2020, p. 26). As mentioned in the introduction, multiple studies suggest that people can be motivated by their community to become active in environmental initiatives (Shandas et al. 2010; Dóci & Vasileiadou, 2014; Hoffman & High-Pippert, 2010). For example, residents mentioned in a survey that they feel more motivated to take action when they see that other neighbors are involved as well (Shandas et al. 2010). Moreover, psychology research that analyzed motivating factors for participation in an renewable energy community initiative, found that *group identification* was one of the strongest motivators (Sloot et al. 2019). This is in line with a recent study that highlighted the strength of group settings to motivate individuals to take environmental action, even if they have little concern for the environment: 'the social need to be part of a community was a major motivator to participate in these sustainable projects' (Broska, 2021). This condition is thereby considered to be relevant and important for leading to coproduction of NBS and green roof community initiative membership in particular.

As mentioned, this study does take a slightly different approach to the operationalization of this condition in order to reduce risk of social desirable answers. The use of one statement in particular has been avoided, as the directness of the language may have made it more sensitive to social desirability (Meisters et al. 2020). The statement was as follows: 'the fact that other neighbors also participated was an important factor in my decision'. Instead, this study only includes the less direct statements that aim to tease out how important it is for the participant to belong to the Zandweerd community. Moreover, the wording of some of the other statements has been adjusted to more closely reflect the operationalization of the survey done by Sloot and colleagues (2019). This will allow for a more accurate comparison of results with this study, which can help to provide insight into the thus far conflicting findings on the importance of group identification. The specific statements that have been used in this study can be found in the appendix (A and B).

2.2.2 Capacity.

This second dimension of the MCO framework identifies the extent to which an individual is able to participate in providing a climate service; separated into two conditions, an individual's objective and subjective capacity.

Objective capacity

The objective capacity condition encapsulates, 'the extent to which a citizen has the required skill, competencies, information, knowledge, and resources to install a green roof' (van den Born, 2020, p. 26), and 'institutional entitlements' (Mees, 2019). An important factor for this condition is the extent to which a person's roof is suitable for installation of a green roof, for example in terms of slope and weight to be carried (Sun & Hall, 2016). Apart from the suitability of the roof indicator, a challenge for the operationalization of this condition, is that the value for this 'objective' measure is determined by the researcher based on the participant's socio-economic factors, like income, education level, gender and profession (Mees, 2019). For instance, as mentioned by van den Born (2020), multiple studies have identified financial costs to be a barrier for implementation of NBS (Barnhill & Smardon, 2012; Lieberherr & Green,

2017; Beery, 2018; Turner et al. 2016). This shows that a certain level of financial resources is needed for individuals to be able to participate in a green roof community initiative and install a green roof. A higher education level, or increased knowledge about the specific NBS practice, can also increase this objective capacity (Beery, 2018; Clar & Steurer, 2021; Kalantari, Gezelbash & Yagmaei, 2016; Lake, Milfont & Gavin, 2012; van den Born, 2020). Therefore, these socio-economic factors are used to measure the objective the individual's objective capacity.

Subjective capacity

This condition differs from the objective capacity in that it is about the extent to which the individual feels like being capable to coproduce the NBS. "Do I have sufficient resources to provide a public/climate service? Do I think my climate actions are effective, can I make a difference? Do I think our collective actions are effective, can we together make a difference?" (van den Born, 2020, p. 26). Mees (2019) and van den Born (2020) identified that the literature shows that three efficacy beliefs together provide a relevant indication of an individual's subjective capacity regarding participation in producing an NBS. Accordingly, this condition captures the extent to which an individual feels capable of participating in the climate service (self-efficacy)(Baptiste et al. 2015; Sinasac, 2017; van Valkengoed & Steg, 2019), feels that their action of participating will be effective in delivering the climate service (response-efficacy)(Bovaird et al. 2014) and/or feels that the collective action of the community participation will be effective in delivering the climate service (collective outcome-efficacy)(van den Born, 2020). Interesting to note is that the objective and subjective capacity are interrelated, as for example having had higher education could lead to a higher perceived response-efficacy by those individuals (Bovaird et al. 2014, van den Born, 2020).

2.2.3 Ownership.

The third and final dimension of the MCO framework, as defined by Mees (2019), covers the extent to which an individual feels that participating in providing a climate service is 'the right thing to do'. Three conditions are thought to play a part in this.

Peer pressure

This condition is defined in this study as "do I conform to the social norm of my group?". Humans are social animals and their connection to their peers makes them sensitive to what their peers consider to be the 'right thing to do'. In other words, people are generally sensitive to the perceived social norm of the peer group that they identify themselves with, and tend to behave in accordance with this social norm when it comes to pro-environmental behavior (Keizer & Schultz, 2018). As mentioned by van den Born (2020), peer pressure in the shape of social norms has shown to be an influential factor for participation in NBS within communities (Dogmusoz, 2019; Sinasac, 2017; Zhang, Fukuda & Lui, 2019). In addition, a recent study that looked at six case studies in Germany, found that social influence and social norms were a major factor in getting people with low concern for the environment to participate in pro-environmental community initiatives (Broska, 2021).

Note that this study uses a slightly different definition of peer pressure than the one used in van den Born (2020). This is done in accordance with the previously mentioned need to reduce this condition's sensitivity to social desirability. The operationalization of peer pressure in this study is therefore made less explicit by substituting three out of the six statements used by van den Born (2020) with one indirect statement. An example of one these three direct

statements that was replaced is "I experienced peer pressure from my neighbors to install a green roof" (van den Born, 2020, p. 53). Again, the statements that have been used in this study instead can be found in the appendix (A and B).

Sense of own responsibility

The essence of this condition is described as "Do I believe that I am responsible for solving an issue such as climate change?" (van den Born, 2020, p. 23). Some citizens may feel that it is the sole responsibility of the government to solve the issues, whereas others may feel that it is a shared or individual responsibility. It has been argued that this sense of own responsibility motivates action to participate in initiatives that provide solutions to address climate change, and vice versa, that an individual who places the responsibility on another party like government is less likely to participate in that (Butler & Pidgeon, 2011; Mees, 2019). In order to increase this sense of own responsibility it can help to inform or educate citizens about their role in contributing to the climate issue. Those that have a more detailed understanding of their own contribution to the problem seem to be more motivated to take action against the problem in the form of participating in NBS (Brown et al. 2016), sometimes out of a sense of guilt that strengthens their sense of own responsibility (Asah & Blahna, 2012). A distrust in the capabilities or motivation of the government to handle climate issues can also be a factor that prompts citizens to take up more action (Mees, 2019), however this may not be directly linked to the extent that they feel that it is their own responsibility to do so.

Environmental values

This condition entails: "Do I want to protect the environment? Do I care about climate change?" (van den Born, 2020, p. 27). In the field of environmental psychology, environmental values are considered to be strong predictors of pro-environmental behavior (Asilsoy & Oktay, 2018; de Groot & Thogersen, 2018; Lim, 2018; Steg & Vlek, 2009; Steg et al. 2014). This pro-environmental behavior includes participation in pro-environmental community initiatives (Broska, 2021; Sloot et al. 2019). Environmental values more specifically translate into "desirable goals, varying in importance, that serve as guiding principles in people's lives" (Schwartz, 1992, as referenced in Steg et al. 2014, p. 107). These values influence behavior mostly indirectly via behavior-specific beliefs (like the response-efficacy beliefs, talked about in the section on the subjective capacity condition above), attitudes, and norms (like the social norms mentioned in the section on the peer pressure condition above). Pro-environmental attitudes and environmental concern have indeed been argued to be influential in increasing participation in in NBS coproduction (Lewis, Home & Kizos, 2018; Turner et al. 2016). Lastly, this environmental values condition is linked to the objective capacity condition as well, as generally people with a higher education level and increased awareness about climate issues, portray higher concern for the environment (Alonso et al. 2019; Latif et al. 2012; Mees, 2019).

2.3. Operationalization community initiative membership and in person communication

2.3.1 Community initiative membership

The dependent variable of this study that is expected to be influenced by the above MCO conditions is community initiative membership. Initiative membership can be defined in multiple ways depending on the extent of commitment to the initiative (Sloot et al. 2019). This study is interested in the final phase of membership: people that have made the commitment to participate in the initiative by accepting the green roof quotation. This is the most relevant stage

of membership for this study as this concludes whether or not the climate adaptive measure is going to be implemented. On top of that, this operationalization of membership is practical as it is a straight-forward measure: one has either accepted the green roof quotation or not.

2.3.2 In person communication

This study explores the possibility that *in person communication* may be an intervening variable regarding the MCO conditions and their effect on community initiative membership. *In person communication* is defined by this study as face-to-face offline communication. As mentioned in the introduction, there is reason to suspect that in person communication could be a factor in enhancing community initiative membership (illustrated by the conceptual model in figure 2). This possibly enhancing effect was recently suggested by Sloot and colleagues (2021) after conducting an experiment with messaging on flyers that did not result in enhanced community initiative membership. Other sociological research seems to be supportive of this suggestion. A study that interviewed members of a community energy initiative, found that 'trust' in the neighborhood team was mentioned by all participants to be the decisive factor for them to become a member (de Wilde & Spaargaren, 2017). In reading the quote from a participant that is used to illustrate this trust, it seems that this trust may stem from *group identification* and *in person communication* that they had with the initiative takers: 'It [the initiative] originated in our neighborhood', 'The initiative taker lives a few doors down from here', and 'Neighbor came to my door and that's how the process started' (de Wilde & Spaargaren, 2017, p. 17, quotes translated from Dutch). The researchers mention that *identification* with and familiarity of neighbors specifically can generate this trust that makes people want to take part in the green energy community initiative (de Wilde & Spaargaren, 2017). On top of that, 80% percent of the study participants mentioned that *in person communication* with a mediating organization (such as Buurkracht) led to them trusting the initiative (de Wilde & Spaargaren, 2017). Interestingly, members of the Buurkracht green energy community initiative, emphasize that it is the *in person contact* with their neighbors that helped them decide to participate (de Wilde & Spaargaren, 2017).

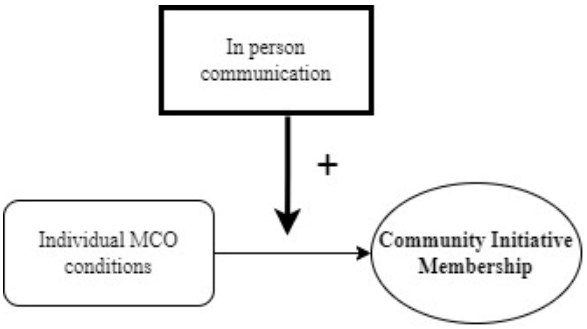
Caution should be taken when generalizing these findings to other types of community initiatives, such as to the green roof initiative that is the object of this present study. Namely, co-production success factors may differ depending on their specific context (Bovaird et al. 2016). Moreover, as the study by de Wilde and Spaargaren (2017) relied solely on self-reporting, the relationships between these variables and the causal pathways that led to membership (possibly through these variables) remains unclear. For example, the variable of trust and how this relates to in person communication, group identification and initiative membership is not taken into account in the exploration of this current study. Still, these participant quotes do suggest that *in person communication* and could indeed have an influential role to play in enhancing membership of community initiatives in general.

2.4 Testing and building theory

By testing and building upon the theory above, this study takes both a deductive and an inductive approach. First, by applying the MCO framework to a case study in order to test the sufficiency and necessity of the individual conditions. Second, this study builds upon the theory behind the MCO framework: the in-depth analysis will provide new insights into the (combinations of) conditions that are most relevant for explaining, predicting and enhancing climate adaptation community initiative membership. All eight conditions of the MCO framework are included for this purpose. However, this study also explores the theory surrounding the enhancement of community initiative membership regarding the possibly

enhancing role of in person communication. Figure 2 below shows the relationship that is explored by this study and that is suggested by literature. It is suggested that in person communication may be a moderating variable that, if present, may result in a stronger relationship between group identification and subsequently enhance community initiative membership. This study however also explores other potential relationships between in person communication and the other seven conditions.

Figure 2. *Conceptual model of the relationship between the eight MCO framework conditions and membership, and the assumed relationship between in person communication, the MCO conditions and becoming a community initiative member.*



2.5 Analytical framework

The above mentioned eight conditions of the MCO framework by Mees (2019) with indicators that are specifically relevant for green roof community initiatives by van den Born (2020), forms the basis of the analytical framework of this study. The findings from the literature review of this study on operationalization of each condition for green roof community initiatives is added to the framework. An overview of the resulting framework is presented in the table below.

Table 1. *Analytical framework consisting of the MCO framework applied to green roof community initiatives (as adapted from van den Born (2020) and adjusted to the literature review in this study accordingly).*

Condition	Description	Indicators
MOTIVATION		
1 *Expected return on investment*	"What is in it for my community? Is the reward worth the effort?"	• Financial and time investment for personal or communal benefits (Baptiste et al. 2015; Brown et al. 2016; Burszta-Adamiak & Fialkiewicz, 2019; Chelleri et al. 2015; Chen et al. 2019; Derkzen et al. 2017; Maydiyar et al. 2020; Prins, 2021). • Contribution to sustainability (Ferreira et al. 2020). • Social interaction (Ferreira et al. 2020).

2	*Perceived salience*	"How important is the issue/service for me, my community?". In climate change this concerns the perceived climate risk and actual experience with a climate threat.	• Previous experience with a climate threat (Baptiste et al. 2015; Beery, 2018; Bos & Brown, 2015). • Awareness of climate problems and threats (Beery, 2018; Derkzen et al. 2017). • Education level (Bovaird et al. 2014; Mees, 2019; Voorberg et al. 2015). • Knowledge on the benefits of and solutions by NbS (Adriaanse, 2019; Baptiste et al. 2015; Brown et al. 2016; Chelleri et al. 2015; Derkzen et al. 2017; Lee, Huh & Park, 2016; Mees, 2019; Sun & Hall, 2016; Wilkinson & Reed, 2009; Zakeri & Mahdiyar, 2020)
3	*Group identification*	"How important is it for me to belong to a certain community of citizens?"	• Social cohesion (Dóci & Vasileiadou, 2014; Hoffman & High-Pippert, 2010). • Actions of other neighbours (Shandas et al. 2010). • Sense of community and belonging (Broska, 2021; Sloot et al. 2019).
CAPACITY			
4	*Objective capacity*	The extent to which a citizen has the required skills, competencies, information and knowledge, and resources to install a green roof.	• Suitable roof (Sun & Hall, 2016) • Financial resources and income level (Barnhill & Smardon, 2012; Beery, 2018; Radtke, 2014). • Education level and knowledge (Beery, 2018; Derkzen et al. 2017; Radtke, 2014 Shandas et al. 2010).
5	*Subjective capacity*	"Do I have sufficient resources to provide a public/climate service?" "Do I think my climate actions are effective, can I make a difference?" "Do I think our collective actions are effective, can we together make a difference?"	• Education and income levels (Bovaird et al. 2014; Mees et al. 2017). • Self-efficacy (Baptiste et al. 2015; Sinasac, 2017; van Valkengoed & Steg, 2019 • Response-efficacy (Bovaird et al. 2014; Mees, 2019) • Collective outcome-efficacy (van den Born, 2020).
OWNERSHIP			
6	*Peer pressure*	"Do I conform to the social norm of my group?"	• Social influence and social norm (Broska, 2021; Dogmusoz, 2019; Keizer & Schultz, 2018; Sinasac, 2017; Zang, Fukuda & Lui, 2019).

7	*Sense of own responsibility*	"Do I believe that I am responsible for solving an issue such as climate change?"	• Own versus government responsibility (Butler & Pidgeon, 2011; Mees, 2019) • A sense of guilt (Asah & Blahna, 2012) • Understanding the role of citizens in creating the climate problem (Brown et al. 2016).
8	*Environmental values*	"Do I want to protect the environment? Do I care about climate change?"	• Improving the environment as a desirable goal (Asilsoy & Oktay, 2018; de Groot & Thogersen, 2018; Lim, 2018; Steg & Vlek, 2009; Steg et al. 2014). • Pro-environmental attitudes (Lewis et al. 2018; Turner et al. 2016). • Education level (Alonso et al. 2019; Latif et al. 2012; Mees, 2019).

2. Methods

3.1 Case study in Zandweerd, Deventer

The research design utilized in this study is a single case study with two embedded units of analysis: residents that (1) participated in the green roof community initiative, and residents that (2) did not participate. This is an in-depth case study approach that focuses on the green roof community initiative in the neighborhood Zandweerd in the Dutch city of Deventer. For the past years, several community initiatives have been active in this neighborhood, most of which related to the 'sustainability team' that is active in multiple neighborhoods in the city (dcdeventer.nl). The green roof initiative under study is also being executed by this well-established enthusiastic neighborhood team. The membership sign-up for this initiative quickly reached their capacity for the first round of implementation: a total of 43 citizens each adopted a green roof via the initiative.

This green roof community initiative is being supported in their efforts by the organization Buurkracht. This Dutch name translates to 'neighborhood strength', which aligns with their philosophy. They support these initiatives by establishing a neighborhood team of enthusiastic and knowledgeable community members, who they then support in the process of recruiting initiative members, networking with relevant stakeholders, and support with the implementation process.

3.2 Case selection

Selecting a representative case serves the aim of this study – which is to get insight into importance of (combinations of) individual MCO conditions in becoming a member of a green roof initiative. The representativeness of the case helps to generalize the findings of this study to a broad range of comparable community initiatives.

In terms of case selection, the argument can be made that the Zandweerd case is a *typical or representative* case that has been successful in their aim. Members of the initiative enjoyed a subsidy of 50% of the total green roof costs, provided by the regional waterboard of the Drenthe and Overijssel provinces (wdodelta.nl/klimaat-actief). Considering the institutional context of the Zandweerd case, a subsidy policy of up to 50% of the costs is on the high end of what Dutch municipalities usually offer (groendak.nl). Yet, when comparing the application procedure for green roofs of the Deventer municipality with those of other municipalities, Deventer has slightly less favorable conditions. Namely, the municipality currently does not provide a subsidy for green roofs directly, thus some coordination and organization is needed by citizens in order to secure a collective subsidy from other stakeholders such as the regional waterboard. Still, it seems like this is comparable with many municipalities that currently do not offer a green roof subsidy and in which its citizens are dependent on subsidies from other parties (groendak.nl). Besides, within the context of community initiatives, the Zandweerd initiative is one of the many climate adaptation initiatives that is being supported by an organization such as Buurkracht, and that is so far considerably successful in increasing the uptake of green roofs. Taking these conditions into account, the Zandweerd case is an appropriate, representative case to select for this study.

3.3 Data collection

For this study, residents of Zandweerd are considered to have become a member of the initiative once they accept a quotation from the initiative for a green roof on their property. People that became a member of the initiative as well as people that did not become a member of the

initiative are included. This study included interviews with a total of 15 members and 30 non-members. This is sufficient to perform a qualitative analysis on (Schlosser et al. 2009), yet not too much that it does not fit within the time-constraints of this study.

Members were recruited via an invitation email and via door to door invitations to participate in an online interview. Non-members were recruited door-to-door as it was not possible to reach them another way. Importantly, during this method of data collection, the researcher maintained 1.5 meters of distance from participants and remained outside in order stay within boundaries of the Dutch government's COVID-19 measures. The members' e-mail was noted in case they wanted to participate, and deleted after data collection was finished. Before the start of every interview, the aim of the study and the conditions for participation of the study were fully explained to all participants, after which they gave their informed consent. Moreover, every member that was interviewed online gave their consent to the recording of the interview audio for data processing purposes. The introduction of the interview that includes the informed consent information can be found in the appendix as well (appendix A).

3.4 Online interviews

The interviews were structured around the eight individual MCO conditions by Mees (2019), including at least one open question per condition and several statements for which participants could indicate the extent to which they agreed to them on a 5-point Likert-scale. This combination of open ended and closed questions allowed for the interviews to leave space for participants to elaborate more on topics important to them, while at the same time making sure that every indicator for every MCO condition was covered. Thereby, this method of data collection is suitable for both the explorative side and the theory testing side of this study. The detailed overview of all interview questions and statements can be found in the appendix for both members of the initiative (appendix A1) and non-members of the initiative (appendix A2). Analysis of the open ended questions and of the statements provides an answer to this study's third, fourth and fifth research questions of *which (combinations) of MCO conditions are necessary or sufficient motivators for membership of the Zandweerd green roof initiative*, and of *what are the most important similarities and differences regarding the individual MCO conditions.* The latter question was explored during the data analysis specifically as well for differences between those that had in person communication with the Zandweerd team and those that only received a flyer about the initiative.

3.4.1 Survey interviews

As mentioned, non-members of the initiative were recruited by going door-to-door in the Zandweerd neighborhood. This was a necessary step in order to reach the non-members of the green roof initiative. Only non-members and one member were interviewed via a handed out survey. All other members that took part in this study were interviewed online. The richness of data gathered via handed out surveys is considerably smaller compared to online interviews. The structure and content of the survey however, was identical to that of the online interviews (see appendices A1 and A2 for the full versions of the surveys). Moreover, the lack of richness per participant may be compensated for to a certain extent as twice as much non-members were recruited than members.

3.5 Data analysis

This study used a multi-method design in analyzing the interview results. This allowed for data triangulation which helped to increase the validity of the results. The two specific analysis that were used in this study are elaborated upon below.

3.5.1 Qualitative Interpretive Analysis

Answers to the open ended questions in the interview and survey were analyzed using the technique of Qualitative Interpretive Analysis (QIA). In applying this method, the respondents answers were first coded using NVivo, in accordance with the MCO framework. Within these codes, additional codes were created by the researched to capture the themes that arose relevant to each MCO condition. This process was iterative and codes were revised when needed in order to capture the essence of any overarching themes. The coded interview responses give insight into which themes are most salient for member and non-members in discussing the various MCO conditions, as well as give insight into the frequency with which members and non-members express certain opinions.

3.5.2 Qualitative Comparative Analysis

In order to capture the complexity of the role that each of the conditions in the MCO framework by Mees (2019) has in becoming an initiative member, Qualitative Comparative Analysis (QCA) is used. This method of analysis, developed by Charles Ragin in 1970 (Intrac, 2017), is a method used to explore which causal pathways are present in a complex situation. It has the capacity to differentiate between individual MCO conditions that are more or less sufficient or necessary for the outcome variable (becoming an initiative member) to occur.

Applied to this study, QCA is a useful tool that can also show not just *if* the use of in person communication in this case study was effective, but it can show *how* and via which causal pathways it may have resulted in an increase or no increase of initiative membership numbers. Namely, QCA identifies which combinations of conditions are present for each case that had a specific outcome: either the person did become an initiative member or did not become an initiative member. It identifies this causal path for each interview participant, and then accumulates these paths to find which conditions are necessary and which are sufficient to be present in order to lead to someone becoming an initiative member, or not becoming an initiative member. This method of analysis differs from statistical analysis in that it allows for the simultaneous existence of multiple causal pathways leading to the same end-result (Cooper & Glaesser, 2015; Pappas & Woodside, 2021). When a condition is deemed sufficient by the QCA method, this means that

3.6 Expert session: governing for the benefit of community initiatives workshop

After analyzing the interview results, an interactive workshop was organized with relevant stakeholders and practitioners. The stakeholders present had expertise in facilitating citizen-institution collaboration regarding green roofs, expertise in collaborating with citizens, municipalities and housing corporations to increase the uptake of green roofs, in increasing the adaptation and mitigation potential of roofs, in promoting climate adaptation measures within neighborhoods, in advising municipalities on their sustainability practices, and in organizing a green roof initiative as part of a neighborhood team. This workshop served two goals at once: to facilitate knowledge transfer from this study to stakeholders in practice so it may benefit their governance practices, and to help further inform the practical recommendations that the results

of this study have for those stakeholders. This may also help to explain possible unexpected results and may help identify more areas for future study.

3.7 Validity and ethics

The internal validity of this study relates to the extent to which cause-and-effect relationships that are found in this study can be explained by the factors within the study, and are not caused by outside factors. This validity is assumed to be sufficient as any cause-and-effect relationships that are tested in this study are founded on an extensive literature review that the MCO framework is based on. The data triangulation applied in this study may further increase the validity of the results of this study. The external validity of this study can be assumed to be more problematic, as this study only includes a small sample size and is based on a single case study. Discussion the results of this study in an expert session can help assess the external validity of the results by assessing the extent to which the results are recognizable for experts in their experiences. Moreover, by discussing the results again in the context of the broader literature, a more accurate indication can be given of the external validity and generalizability of the results of this study.

In terms of the ethical responsibility of this study, no harmful effects of participation in this study was expected to occur, and this study did not use any deception techniques. Moreover, participation in this study was anonymous and voluntary, and every participants gave their informed consent ahead of participation. The participants that were recorded on audio all gave their consent for this as well prior to starting the recording. Privacy of participants was taken into account fully in every phase of the research, ensuring that Zandweerd residents could only be contacted via email after they had indicated an interest in participating in the study and ensuring that their interview contributions were included in this study anonymously.

4. Results: overall relevance of MCO conditions and QIA

The results of the analyses are divided in multiple chapters which are guided by the research questions of this thesis. First, the results that are relevant for sub-question three are provided. This regards the relevance of the MCO conditions for initiative membership, followed by the most important similarities and differences between the MCO conditions for members and non-members. These results provide a first indication of the most important results and an in depth overview per MCO condition. In the next chapter, the results regarding the role of in person communication are discussed. Last but not least, in chapter six, the results that help to answer sub-question four are provided, meaning that more insight is provided in the combination of the MCO conditions together. Moreover, in answering sub-question four, a few MCO conditions are highlighted in terms of their possible necessity for leading to initiative membership. In each chapter, the results are integrated with the previously discussed analyses, in order to produce one complete picture of which (combinations of) individual conditions are most important for people to join a green roof community initiative.

4.1 Overall relevance of the MCO conditions

This section provides an overview of the overall relevance of the MCO conditions for both members and non-members of the Zandweerd green roof initiative. The mean and standard deviation for each condition was calculated via SPSS, after the scale reliability of each condition was measured with a Cronbach alpha test (Taber, 2017). The reliability was deemed sufficient for each scale, except for the peer pressure condition. This means that the statements in this peer pressure scale did not measure the same construct reliably enough. After removing the statement 'I place value on the opinions of those in my environment (neighbors, family, friends)' however, this scale was found reliable too. The removal of this statement is further justified by the social desirability theory discussed. Compared to the other two statements in the peer pressure scale, this statement was phrased most directly, and thereby risked more socially desirable answers. The means and standard deviations of the importance that participants gave to each MCO condition are shown in table 2 below. This regards the mean score on a scale of one to five. One meaning that the importance given to the condition is very low, and five meaning that the importance to the condition is very high. Members (N = 15) comprised of 33% men and 67% women. This group's average age was in the higher end of the age category 45 to 55, with most aged between 45 or above (80%). Non-members (N = 30) comprised of 39% men and 61% women. This group's average age was in the lower end of the age category 45 to 55, with also the majority above 45 years of age (64%%).

Looking at table 2, the first obvious observation is that members gave substantially more importance to each MCO condition compared to non-members. The mean difference is at least half a point higher for each condition in the member group. This is a clear first indication that the conditions of the MCO framework are all relevant for explaining green roof community initiative membership. Moreover, the MCO scores for members are also considerably high. Almost all conditions score around a four, meaning that the conditions are positively identified by the members to be important to them.

Looking more closely at the gap in mean importance between MCO conditions for members and non-members: this is especially large for the conditions objective capacity, subjective capacity and peer pressure. Further QIA and QCA analysis will identify the extent to which these conditions carry an increased importance for leading the community initiative membership. Overall, based on the mean scores of the MCO statements each condition shows to have played a role for the members of the green roof initiative in Zandweerd.

Table 2. *Mean scores of the non-members and members on the MCO conditions.*

	Non-member			Member		
Condition	*N*	Mean	SD	*N*	Mean	SD
Return of investment	30	**3.25**	0.71	15	**4.06**	0.41
Perceived salience	29	**3.48**	0.52	15	**4.19**	0.43
Group identification	29	**3.35**	0.57	15	**4.02**	0.57
Objective capacity	30	**2.67**	0.76	15	**4.67**	0.61
Subjective capacity	29	**3.20**	0.71	15	**4.51**	0.41
Peer pressure	30	**2.47**	0.67	15	**3.47**	1.04
Own responsibility	29	**3.18**	0.68	15	**3.96**	0.56
Environmental values	30	**3.76**	0.71	15	**4.45**	0.47

4.2 Members of the Zandweerd green roof initiative

Before going into the most important similarities and differences between members and non-members regarding the MCO conditions, this section first provides an in-depth overview of the demographic and qualitative characteristics that define the members of the Zandweerd initiative in this study sample. Starting with the demographics. Most members in this sample are part of a multi-person household (N = 11), most with kids (N = 9), and some without kids (N = 3). Two members have a single-person household (without children), and one member identified their household to be 'other'. The majority of members have an education level in between MBO 2-4 and WO-bachelor (73%), and have a monthly household income of roughly between 3.000-7.5000 euro (73%). The current professions that members hold vary widely, with four members being retired and only one member having had a career in the environmental field.

Next, the qualitative interpretive analysis adds an important layer of depth to the quantitative results above. Participants were asked in the interviews about their general motivation for participating in this green roof initiative. Most participants (N = 10) mentioned that they had been wanting to adopt a green roof already before the initiative started. One participant even mentioned a previous effort to obtain a green roof subsidy only to be deterred by the fact that it was only possible to collectively secure a subsidy. Others mention that they already have a green roof but had space for one more, or that they "[…] just want it. And I have been wanting it for a long time. I just like it and I see the utility of it". The initiative therefore was a helpful tool for residents with a pre-existing interest, as it helped them to put this interest into action and do so with a discount via the collective subsidy.

Aside from this pre-existing interest in green roofs, other frequently mentioned reasons for participating were the aesthetics of a green roof and the benefits for biodiversity. Some participants mentioned the aesthetics as a welcome side-effect whereas others gave more importance to the nice visual of a green roof: "I also receive a lot of joy from it. It is not just about the environment, it is also that I have my own place which I want to be cozy, beautiful and cool [temperature-wise]". Regarding the motivation to increase biodiversity, there was a frequent mention of how it would help insects thrive or how more green in general would be beneficial for nature. Next to the fact that most members had an existing interest in green roofs, biodiversity was most explicitly mentioned as a motivator. Examples are: "I want to take all measures that are relevant for these times. For the climate in a broader sense all the way to help biodiversity. […] I hope that the sedum, that is on top of it, I hope that it will attract insects. That is also the main purpose.", and "[my] motivation is sustainability mostly, and to add more

biodiversity, plants, birds and butterflies in this neighborhood". Greening the local environment has additional climate adaptation benefits to it as was discussed in the introduction of this thesis. These heat-reducing water-capturing benefits were mentioned by only six participants at the very start of their however. Thereby they were not as saliently mentioned as a motivator as were the overall interest in green roofs, its aesthetics and biodiversity benefits.

4.2.1 Qualitative results of the MCO conditions for members

4.2.1.1 Motivation

Expected return of investment

Moreover interesting to delve deeper into, are the above presented mean scores per MCO conditions. Starting with *expected return of investment*, the members in this sample have given a high score to this condition. This means that, in general, they had a positive view of the balance between the investment you have to make and the benefits that are generated when adopting a green roof via this initiative. Interestingly, while three members in this sample reference the subsidy as a motivating factor to participate, many members ($N = 8$) explicitly say that the monetary cost of investment was not an important factor for them in deciding to participate. "Saving money [by participating in the initiative] was not the big argument for me. Even if the costs would have been higher than they were now, I still would have done it". This can also be seen by the extent to which participants agreed to the statement 'the costs that I could save by participating in this initiative were a motivating factor to participate'. While members gave an average score of 4.06 to the *expected return of investment* conditions, on average they only gave a 3.33 score to the statement relating to saving money (see appendix B for the full table of average condition statement scores).

It is clear that members find the costs of a green roof in terms of money acceptable. Time- and effort-wise, members acknowledge that the initiative reduced this investment for them as well: "If it is better [doing it with the initiative]? Yes absolutely, now you do not have to do anything for it yourself" and "Yeah I just really wanted it, and now it was just very low effort, all you had to do was say yes". In terms of what the green roof delivers in benefits, members refer back to a selection of the reasons they gave for the question about what motivated them to participate: biodiversity benefits, aesthetics, and climate adaptation – more specifically heat stress adaptation. One member further noted that the social aspect of participation had been enjoyable, as it was great to see neighbors being so enthusiastic.

Perceived salience

Moving on to the *perceived salience* condition, these same themes of biodiversity, aesthetics and heat stress adaptation keep coming back. Yet, as this condition pertains the extent to which participants believe that green roofs help adapt to the consequences of climate change, some new themes arise. Judging from the high mean score that members gave to this condition, they are generally positive about this contribution of green roofs. Still, members almost all agree that this contribution may not be very large. A phrase that dominates this condition is "every little bit helps", to which two members comment that the larger result lies in the efforts and 'little bits' of everyone taken together. Another interesting addition to the theme of climate adaptation, is the mention of water retention. Up until this point, members had only referenced heat stress adaptation when it comes to the climate adaptation benefits of green roofs. This suggests that the issue of heat stress may be more salient for people than the issue of increased precipitation.

Within this condition, the perceived salience of the extent to which participants view

climate change and its consequences as an issue are also shortly measured. These results reveal that – as can be seen in detail in appendix B - members are generally aware of the issues that climate change evokes in urban settings. Furthermore, while they may begin to worry about the future effects of climate change in their neighborhood, opinions vary when it comes to the question of whether Zandweerd has already felt the effects of climate change. All-in all, the members that were interviewed view the effects of climate change as issues to be addressed and find that green roofs help to adapt to these effects.

Group identification

The next condition that was discussed in the interview was *group identification*. During the discussion of the extent to which participants experience a feeling of community in the neighborhood, members were generally positive yet critical that this feeling did not stretch to the entire neighborhood. For example, members mention that "well, that is a bit less in this part compared to the part of the neighborhood near the playground", and "It depends on the street, there is less contact with other streets of course. A tight-knit community will not be the case everywhere here". Members generally do however feel that they are able to find enough connection with their neighbors in terms of being in regular contact or through the various organized activities in the neighborhood. To illustrate the variety of organized activities in the neighborhood, one member mentions "[…] last year we even set up a neighborhood association to increase social cohesion in the neighborhood a little. And we are not the only ones, there is another neighborhood association on the other side, and a playground association and another smaller scale neighborhood association." Two members even mentioned how the greenery in the neighborhood allowed them to more easily make social connections with fellow Zandweerd residents. This condition therefore shows that while the social cohesion in the neighborhood as a whole may not be strong, the members of this initiative feel generally satisfied with the extent to which they are connected to others in the neighborhood.

4.2.1.2 Capacity

Objective capacity

The following condition, *objective capacity*, differs from all other conditions in the sense that this condition is calculated by the researcher on the basis of socio-economic indicators. When participants mentioned that their roof was not suitable for a green roof this was also taken into consideration when estimating the objective capacity. In the case of another initiative, this may be a more relevant indicator for subjective capacity. Yet, in this case, it was only possible to participate in this initiative if your roof had a slope of 25 degrees or less. Having spent multiple days walking around the neighborhood, I have noticed that most houses in Zandweerd have a slope of at least 30 degrees or more. So in this case, participation in the initiative was only feasible if you have an extension or shed with a roof that is less steep. This condition is therefore not fully self-reported. The socio-economic indicators that were taken into account when calculating this condition were the participant's education level and their income level in relation to their household situation. It is important to note that this only provides a rough indication of one's objective capacity and this condition does not provide one unanimous answer to the question of whether someone is able to adopt a green roof via this initiative. It does however shed light on the fact that these socio-economic factors do play a role in whether or not someone participated in this green roof initiative. This is clearly shown above in the large difference in means for members and non-members.

Besides this, nine members mentioned that the timing really worked in their favor. They just had done a renovation or extension of the house of some sorts that made it more easy for them to adopt a green roof. For example, they mention "[…] and you see, I am able because I have recently moved and then you change everything around anyways", or "it [the green roof] could be put on right away, we had just finished renovating so the carrying capacity and everything was okay", and "one year ago we had the roof cover redone, so at that time we were already conscious to do that in such a way that nothing else would need to be done later [before placing a green roof]". Even though previous studies on the MCO conditions have not taken this factor into account when estimating objective capacity, this seems to be a large influencing factor that makes it objectively easier for some people to participate than others.

Subjective capacity

Similar to objective capacity, yet a world of difference, is the condition *subjective capacity*. This is the extent to which participants feel that they have access to the right means (financial, knowledge, skills, institutional support) to be able to adopt a green roof via this initiative. Once again, members of the initiative have a positive outlook on this condition. The theme that returned here was that the financial side was no barrier to the members. A new theme that arose in their open question answers, is that many are confident in their own ability to put the green roof on their roof themselves, or at least find it to be a very low effort activity. Others mention the fact again that there was little for them to do, as they could easily arrange for the green roof to be installed by the supplier: "financially we were able to do it, and we did not have the right knowledge or anything in terms of the technical side of it, but we just had it installed for us. Then you do not have to think about it yourself". Another theme that arises is the appreciation that the members have for the fact that the initiative took care of finding the right supplier in the first place. "Yes, that really was a reason for me to participate now, because that was being taken care of. […] I really appreciated that the neighborhood initiative found this local guy that supplied sedum roofs. […] It was really great that this neighborhood initiative, who have no financial stake in the matter, did this research on my behalf, and that I could just trust this and know that I was not being taken advantage of". It thus seems that the members felt confident in their overall capacity to participate and perceived the required capacity to be relatively low.

Moreover, part of the subjective capacity is the (collective) outcome efficacy beliefs. Members of the initiative did not mention this in their responses to the open-ended questions. Yet, when looking at the average score of the specific statements within the subjective capacity condition that concern this, members did give an equally high score to these statements as they did to the other subjective capacity statements. From this it can be concluded that members expect that their green roof(s) contribute to a better climate and help to adapt to local climate change effects.

4.2.1.3 Ownership

Peer pressure

With regards to the *peer pressure* condition, based on the average score, members gave slightly less importance to this condition yet still gave it a positive score on average. Meaning that participants do agree in general that they perceive that their peers have a positive attitude towards green roofs and that they are generally viewed by their peers to be the type of person to participate in an initiative like this. Some members mentioned that they did not feel equipped to assess the extent to which other neighbors were supportive of the green roof initiative. Still, members predominantly discussed a general feeling that their environment reacts positively to the idea of a green roof. They reference the fact that a substantial amount of people participated

in this initiative round, while also acknowledging that those that did not participate perhaps just do not have a suitable roof or sufficient resources despite being enthusiastic about the idea. Members do note that they also expect there to be another group of people for whom it is not so much about lacking resources but more so about lacking a general interest in about climate change. They do not identify themselves with those neighbors.

Still, many members mention explicitly say that they can imagine that the people that participated now are the people that have an interest in it because they can easily afford it. One member even states that "What bothers me a little is that this is also the group of people that receives the subsidy. I would have also adopted a green roof without this subsidy. I understand that this is an unintentional effect, but I am now benefiting from this, even though I would have done the same without it". The interplay between having the financial means and being concerned for the environment was also mentioned: "I also think that people who are less concerned with nature and the climate are less inclined to do it, because you do have to pay for it. It is different from an investment in say solar panels".

Another theme that was discussed in the *peer pressure* condition is the expectation of members that their actions would now positively impact their peers: "perhaps if they now see the beautiful roof that we have that they will start wanting one too". Interestingly, this is exactly what motivated one of the members to participate themselves, as they said "A colleague of mine had a green roof installed on her shed during the COVID period by her neighbor. She told me about it and that made me interested as such that I mentioned it at home that this is actually really nice and that we should see if we could do the same. That is when the flyer of the initiative arrived, and then we said okay we are doing this." This illustrates how the influence of peers may contribute to increasing the membership of a green roof initiative.

Sense of own responsibility

In the *own responsibility* condition, around half of the members agreed that they feel personally responsible for contributing to a better climate, and half agreed that they feel a shared responsibility in the sense that they are as responsible as other parties are. In general these two halves do seem to agree that in any case, they feel the need to personally contribute their share towards a solution. Thinking about the next generation was referenced often as a motivation for doing so. The members were further split when it came to the statement of whether they felt guilty about their contribution to the climate issue, as can be seen in the average score that members gave to this statement (see appendix B). Some mention that they feel responsible for contributing to a better climate even though they do not feel that they are guilty for the worsening of the climate in the first place. Others do feel this guilt and mention that making a contribution to a better climate does help to alleviate this guilt. Still, the general response of the members to this condition was a resounding "Yes, of course I also feel responsible".

Environmental values

The *environmental values* condition closely linked to the *sense of own responsibility* condition, yet took it one step further in that participants mentioned their moral obligation to take action. This prompted members to discuss the daily actions they take to mitigate climate change. "Yes of course, […] I walk my dog every morning and when I feel like it I bring a garbage bag and I pick up trash on the way". "When we build this house we added a set of solar panels and now we got one extra. Our entire house is perfectly insulated, you can keep it warm with a candle, and we only use LED lights throughout the house". "We plant a tree every month to compensate our footprint". Using water and electricity sparingly was also frequently mentioned. Based on

this condition, it seems that members of the initiative in this sample are conscious of their effect on the environment and try to take steps to reduce their impact and do what they can.

4.2.1.4 Overall profile

In sum, the overall profile of the Zandweerd green roof initiative members that participated in this study, is characterized by the following. Members have a relatively high initial interest in biodiversity in general, and green roofs specifically. Most of them say that saving money on a green roof investment was not their motivation to participate, however most also do appreciate the money, time and effort that was saved thanks to the initiative. They further appreciate the biodiversity benefits, aesthetics and heat stress adaptation qualities of green roofs and have a positive outlook on the effect of their (collective) green roofs in terms of 'every little bit helps'. Most are satisfied with their social connection within the neighborhood, and most have a relatively high income level and roof that was already suitable for a green roof in terms of carrying capacity and steepness. Members are further confident in their capacity to take part in the green roof initiative, and generally view the entire process of acquiring the green roof up until installing the green roof to require rather low effort. Furthermore, members expect that their peers have a positive attitude towards green roofs and that their peers do not find it out of character for them to participate in such an initiative. Lastly, members feel a strong sense of own responsibility for contributing to a better climate and also show environmentally-friendly behavior in other aspects of their lives.

4.3 Non-members of the green roof initiative in Zandweerd

It should be noted, that within the groups of member and non-member, the members were highly similar in their responses, whereas the non-members showed much diversity. The results regarding the non-member group should thus be interpreted extra carefully. Therefore, the non-members were separated into two categories for the QIA: non-members and in-betweeners. The in-between category is for those that did not participate in this round due to unfortunate timing but that have communicated a clear interest to participate in the next round of the green roof initiative in Zandweerd, or are installing a green roof on their own initiative. Moreover, it is to be taken into account that the responses from the non-members were less elaborate as well. This is due to the difference in data collection. Whereas members were interviewed over the phone, non-members received a paper questionnaire and provided their open-question answers that way. For that reason, the responses from non-members are to be interpreted more carefully as well.

This section first provides an in-depth overview of the demographic and qualitative characteristics that define the in-betweeners and non-members of the Zandweerd initiative in this study sample. Starting with the demographics. The in-betweeners (N = 2) have a multi-person household and an 'other' categorized household. They have an education level of between HBO and PhD, and broadly ranging monthly household income varying between 3.000-7.500 euro. Most non-members (N = 27) are part of a multi-person household without kids (36,7%) or a household that they identify as 'other' (33,3%) as well. The majority of non-members have an education level in between MBO 1 and WO-bachelor (73,3%). When it comes to household income, the non-members are almost split into two groups again, those that have an income of between 1.000-3.000 euro (43,3%), and those that have an income of between 4.000-7.500 euro (36,6%). This difference is further elaborated below in the section that discusses the objective capacity condition for non-members.

Contrasting to the question phrased to members, in-betweeners and non-members were asked in the interviews about their general motivation for not participating in this green roof initiative. The motivation for the in-betweeners to not participate is related to the element of timing and to the fact that one of them has already invested in a green roof on their own initiative. The non-members mostly reference the barriers related to finance and time. Some say they do not have the budget for it or do not find the investment appealing as it does not result in much financial return of investment: "It is too expensive for me right now", "Due to my low consumption, it is not profitable. I want to install air-conditioning, an electric boiler and solar panels, in order to reduce my gas consumption and to always have heating and cooling available", and "because it would concern my garage roof, it would not be profitable in terms of heating costs". In terms of lacking time, non-members mention that "I do not have the time nor the budget right now", or "I do not have time to consider this option right now". Timing in this sense played a role as well. A non-member participants mentioned that they only recently moved to Zandweerd and therefore did not have time to assess the suitability of their new roofs, another mentioned they will be moving away from Zandweerd soon, and five other mentioned that their roofs are not suitable right now. Another six non-member participants indicated that they were not familiar with the initiative in general. This is interesting as they did receive a flyer in their mailbox. Apparently the flyer or the initiative itself was not salient enough for them as they did not register it.

4.3.1 Qualitative results of the MCO conditions for in-betweeners and non-members

4.3.1.1 Motivation

Expected return of investment

The in-betweeners resemble the members in their response on this condition. A positive effect on biodiversity and the climate is mentioned as well as the nice aesthetics. They had a neutral to positive attitude towards the balance between the investment and the benefits. Out of all the non-members on the other hand, eight explicitly mentioned that they found this balance to be positive for one reason or another. This varied from statements like "I believe that this could be a good balance, it just does not fit with my own plans" to "I have no idea what the costs and benefits would be, but if others in our street are doing it then we can only assume that they did a cost/benefit analysis and that this must have been positive". Other non-members either made a general statement that they did not find this to be a good balance or explicitly referred to the lack of financial benefits in terms of a return of investment as they mentioned in their general motivation for not to participate. Examples are "I have my doubts about the usefulness of green roofs compared to the investment needed", and "our kitchen roof is too small in terms of costs and profitability". Evidently the non-members differ highly in their opinion regarding the return of investment on green roofs.

Perceived salience

In-betweeners agree that green roofs are a useful tool that can help adapt to climate change in the sense of stormwater retention, its cooling effect on the local temperature and its contribution to biodiversity. Non-members however, are highly divided with regards to this condition. On the one hand, ten non-members react positively to this condition and agree that even though the contribution of a green roof may be small "every initiative is welcome". On the other hand, nine non-members react negatively to this condition and say that green roofs would not contribute to a better climate enough to be effective, or would not contribute at all. Non-

members did not comment on the salience of the issue of climate change in general. Yet, non-members generally have not noticed or experienced hinder from climate change effects in their neighborhood. This becomes clear from their low average score on two of the statements of the perceived salience condition (see appendix B). This score is also low when compared to the score the members gave to these statements.

Group identification

In terms of the extent to which participants experienced a sense of social cohesion in the neighborhood, the in-betweeners found this to be reasonably okay. One mentioned that "it does vary highly per street. Now that we have been living here for a longer time we are increasingly familiar with our neighbors, yet this did take a while". Most non-members actually agree with the in-betweeners for this condition. Half of all non-members mention that they are fine with the extent to which they experience social cohesion in the neighborhood. Five non-members however, do explicitly state that they do not experience any social cohesion at all or find that they themselves are not included: "I do not experience it", "none at all", and "mediocre, I feel like I am a bit of a misfit". Moreover, comparable to the members, around six non-members also notice that the existence of social cohesion within the neighborhood varies greatly on street level: "not really in the Zandweerd neighborhood, but in our street [I do experience social cohesion].

Non-members do seem to have a generally lower interest in partaking in activities with their neighbors, based on their score on the related statement (see appendix B). Especially when compared to the score that member gave to this statement. This eludes to a possible disinterest within the non-member group to increase their social connection with their neighbors. One non-member for example mentions that the social cohesion in their neighborhood "[…] is sufficient for us, we know and say hi to our neighbors, more than that is not necessary for us". This is an important finding as this should be taken into account if this condition is utilized to increase the membership numbers of a neighborhood initiative. Yet it is hard to interpret this finding due to the unknown causality of these factors. Are these participants less interested in partaking in activities with neighbors and therefore experience less social cohesion? Or do these participants experience less social cohesion and are therefore less interested in partaking in activities with their neighbors?

4.3.1.2 Capacity

Objective capacity

As mentioned previously, this condition is calculated based on a participants socio-economic factors in combination with the objective suitability of their roof. With regards to the suitability of the roof, this is positive for the in-betweeners. Most non-members however indicate that their roof would not be suitable. Four non-members however indicate that their roof would be fully suitable for a green roof to be placed on top. This illustrates that the suitability of the roof can be a barrier but does not necessarily act as a motivator once a roof is deemed suitable. Interestingly, some of these non-members with a suitable roof, did mention that their access to the necessary means to adopt a green roof was non-existent. This precludes the important role of subjective capacity. Two other non-members indicated that they have a suitable roof as well, yet they were not familiar with this green roof initiative.

Looking at the average score on objective capacity, the non-member group indeed scores substantially lower than the member group. This means that the non-members that participated in this study, on average, did have a lower income and education level. At the start of section 5.3 it was already mentioned that the group of non-members can be split into two

groups however, based on income level. One group with an monthly household income between 1.000-3.000 euro (43,3%), and one group between 4.000-7.500 euro (36,6%). Looking more closely at the differences between these two income groups, some interesting similarities and differences arise in their response to the MCO conditions. Specifically, these groups have different relation to the *perceived salience* and *own responsibility* conditions. First all, both groups are similar in the fact that they frame the contributions of green roofs to a better climate in a way that focuses mainly on mitigation contributions instead of adaptation contributions. In doing so, they conclude that green roofs are not a worthwhile contributor to the mitigation of climate change and thus they would prefer taking other measures instead. Moreover, both groups are similar in the sense that they place the responsibility for contributing to a better climate on other parties first: namely, large international corporations, governments, major polluters. Their reasoning is that these parties should go first and lead the way, as they can make a real impact whereas the individual contribution of the residents in Zandweerd does not matter. It could be argued that this reasoning also results from a 'mitigation-framing' that focuses on the responsibility for climate change mitigation on the global scale instead of the responsibility for climate adaptation on a local scale.

These groups differ however in that the lower income group generally either finds the investment of a green roof to be too high, or finds that it takes too much effort. They focus on the financial aspects of the expected return of investment and find that there is 'nothing in it for them' financially. The higher income group finds timing to be a larger barrier than finances. Multiple people in this group are planning to move away in the near future and one just recently moved to Zandweerd. This group also indicated more often that the suitability of their roof is the main barrier rather than the green roof being too expensive. The participants that indicated that they were not familiar with the green roof initiative yet are those in the lower income group. This could be due to a bias within the initiative team that led to the team distributing less flyers to those with lower incomes. Or it could be due to a bias in the way that this groups filters information that they do not find interesting. The latter would mean that this group has a lower interest in green roof initiatives. Lasty, and perhaps the most interesting difference between these two groups is that the condition of *peer pressure* has a lower average score for the higher income non-member group than the lower income non-member group.

This is interesting because the reverse is true for all other conditions. It means that the higher income group in particular expects that their peers are not interested in green roof initiatives and feel like their peers would find it out of character for them to participate in such a thing. Perhaps this is an accidental anomaly that only occurs in this specific sample. Or perhaps it could be indicative of a relationship between income level and *peer pressure*. In the case of the latter, it may be that people with a relatively lower income expect their peers to not be able to invest in green roofs due to budget constrictions, whereas people with a higher income cannot come to this conclusion about their peers with a higher income. Perhaps this higher income group therefore expects that their peers are just not as interested in green roofs, because that would explain why their peers do not have green roofs despite being able to afford it. It could be interesting, for future research, to look into such a possible relationship.

<u>Subjective capacity</u>

Regarding the subjective capacity, the in-betweeners again expect this to be positive in the sense that they have the resources and are able to arrange for the green roof to be installed for them. The non-members are less positive about this condition in general, yet there seems to be a split in this group again. Around five non-members mention they expect to have access to the needed

resources to install a green roof or have it installed for them. Around five non-members mention that they do not think they would have access to this. Especially the statement that regards to the extent to which they have the required knowledge and time regarding the installation and maintenance of the green roof was scored low by the non-members. "[My access to the required resources is] not enough. It is also about the long term vision of the yearly maintenance. Who will go up on the roof to do the maintenance?". This indicates that this group may not be aware of the extent to which the initiative can help with arranging the green roof to be installed and the maintenance of the green roof once it is installed. The statements that concern the (collective) outcome efficacy of the green roofs in terms of contributing to a better climate, do not deviate from the scores that non-members gave to the other statements in this condition. This score does remain low, which indicates that non-members do not expect the green roofs in Zandweerd to contribute much to the reduction of climate change effects in the direct environment.

4.3.1.3 Ownership

Peer pressure

The in-betweeners both indicate they are not really sure to which extent their neighbors are enthusiastic about the green roof initiative. They did see some positive reactions, yet other neighbors reacted with doubts about the effort that would be required in terms of maintenance of the green roof. The majority of the non-members on the other hand clearly state that they do not think that the neighborhood has much interest in an initiative like this. In the open questions they respond with answers like "Not really, I have not heard my neighbors talk about it. I also do not think that they would have the financial resources for it and some of them do not care about the climate". "The people here do not really concern themselves with the climate / climate change". It is noteworthy that the non-member group does not seem divided on this condition. As mentioned in the *objective capacity* condition, a difference in *peer pressure* score does appear when comparing lower income non-members with higher income non-members, and that difference would be interesting to explore in future studies. Overall, it is clear from this study that non-members expect that their peers are not interested in green roof initiatives and feel like their peers would find it out of character for them to participate in the initiative.

Sense of own responsibility

The in-betweeners resemble the members in their answer and indicate that they personally feel responsible to contribute to a better climate and find that in an ideal world everyone would take this responsibility seriously. The non-members seem to mostly agree however that they themselves are personally responsible, yet they place the focus on the fact that everybody should share this responsibility. Moreover, some non-members add to this that they would only feel called to action after large polluters or governments for example start pulling their weight in terms of contributing to a better climate. An example being: "This is not possible for an individual. As long a big powers like China, India etcetera pollute as much as they do, there is not much that a small European country can do, let alone a citizen in a medium-sized town". Other non-members add to this shared responsibility that they chose to act on this responsibility by taking other actions that did not include a green roof. For example, "I already have a green garden, this contribute a little. And at this time I am financially not able to do more, however I would like to do more in the future", and "everybody has this responsibility, and by ending my gas consumption I am contributing in my own way".

Environmental values

Again, in-betweeners are similar to members in their response to this condition, and share that they feel the moral obligation to contribute to the adaptation to climate change effects as well. Non-members respond to this condition similarly as they did to the *sense of own responsibility* condition. Yet in this condition they increasingly highlight the fact that they take other actions to fulfill the moral obligation that they feel to contribute to a better climate. The theme that arises for non-members in this condition is that "you should do what lies within your range of possibilities". "We already try to separate our waste and yes reduce our car use in the city […], putting the heater on a lower setting always helps". "We do what we can". As can be seen in table 2 above, the overall score of this condition for non-members is relatively positive. In that sense it can be said that the non-members in this sample generally care for the environment and are indeed 'doing what they can' to address this in their own way.

4.3.1.4 Overall profile

In sum, the overall profile of the Zandweerd green roof initiative in-betweeners and non-members that participated in this study, is characterized by the following. Starting with the in-betweeners, they do not seem to differ from the member group in terms of the MCO conditions, except for the factor of timing. The non-members on the other hand differ from the members in numerous ways, as will be elaborated upon in the next section. They also differ highly among themselves on every condition except for the *peer pressure* and *own responsibility* condition in which they seem to agree with each other. For this reason it is hard to portray just one overall profile of the 'typical' non-member in this Zandweerd case study. What can be said is that non-members mostly refer to finance and time when they talk about the barriers they experience for participation. These financial barriers stem from both a lower *objective capacity* that characterizes the non-member group, and a 'mitigation-framing' that makes non-members draw the conclusion that the environmental contributions of green roofs are not worth the investment. Most non-members further seem to be satisfied with the amount of social cohesion they experience in Zandweerd, yet on average indicate a quite low interest in partaking in activities with their neighbors. Moreover, a group within the non-members does not feel any social cohesion in Zandweerd or does not feel included in it. In terms of capacity, the non-member group consists of a lower income group and a higher income group with each differing subtly in their motivations for not participating in a green roof initiative. As mentioned, the non-members agree with each other mostly on the *peer pressure* and *sense of own responsibility* conditions in the Ownership dimension. They do not except their peers to have a supportive attitude towards the green roof initiative, and further place more emphasis on the responsibility of the collective rather then on their own. Still, non-members do generally care for the environment and indicate to do what is within their power to contribute.

4.4 Most important similarities and differences between members and non-members

Next in this section, the comparison of the QIA of the members and non-members specifically shows the similarities and differences in focus that members and non-members have for their motivation for (not) participating in the green roof initiative in general and for each MCO condition more specifically. The in-between participants are highly similar to the members on each category (except for the objective capacity) and are thus not mentioned separately for each condition.

4.4.1 Motivation

When asked spontaneously (prior to the statements) about their motivation to join the initiative, members most frequently talk about how they had been wanting to adopt a green roof for a longer time, how they like the aesthetics of greens roofs, how they want to help increase biodiversity, and largely how saving money with the initiative's subsidy was **not** the main reason for their participation. A small majority indicated that they would have also participated in the initiative if the subsidy would have been less or non-existent. Adaptation benefits of green roofs such as heat-reducing and water-capturing benefits were not as saliently mentioned as a motivator as were the overall interest in green roofs, its aesthetics and biodiversity benefits. The in-between participants were highly similar in their motivations to the members, yet for them the timing was not right due to for example a newborn baby or a near-future move. Non-members on the other hand, when asked about their motivation to not join the initiative, were mainly concerned with a lack of financial means or time, with considering the upkeep of the roof to be too much effort, and with a general lack of interest in green roofs or not being familiar with the green roof initiative at the time.

Expected return on investment

Members talk about how money was not an important factor for them; they find that the return of investment is not monetary or even personal gain, rather they mention biodiversity and adaptation benefits as the expected return of investment that they appreciate about the green roofs. Around half of the non-member group also seem to agree with the members that the balance is good, yet they generally do not elaborate on how they have come to this conclusion. The other half of the non-members on the other hand, talk about return of investment in a financial sense (saving electricity costs) and do not find this to be profitable. This monetary focused reasoning could have to do with the fact that current generations are used to this reasoning when it comes to investing in climate mitigation measures like solar panels. In those cases the reasoning is that it is beneficial for them to do so as they will see a financial return of investment within a certain time period. This same reasoning is not beneficial for the adoption of green roofs. A senior participant mentioned this: "we are a two person household (seniors), we would not see the return of investment in our lifetime". In general it is evident that members refer to the adaptation benefits of green roofs when talking about their contribution to the climate, whereas non-members with a negative score on this condition focus is more often on climate mitigation instead of on adaptation. "We try to be frugal with our energy use, and use up less energy than a comparable household", "I already consume less gas then I used to, and I would really like to be able to cook without gas in the future". For the expected return of investment condition, the most important differences are thus that members frame benefits in non-monetary terms and refer to biodiversity and adaptation benefits as the return of investment, while the non-members that are negative about the return of investment frame the benefits in monetary terms and refer to monetary profit and mitigation benefits (and lack thereof) as the return of investment.

Perceived salience

This is also the most important difference between members and non-members when participants are asked directly about the extent to which green roofs can help to address the consequences of climate change. Whereas members tend to focus on biodiversity, aesthetics, and adaptation effects again, non-members more often talk about how green roofs are not the best option for mitigating climate change: "Awareness on frugal energy use is more effective [for addressing the consequences of climate change]". An interesting similarity between the

members and non-members for this condition is that both groups agree that while the contribution of the green roofs in Zandweerd may not be very large, they agree that "every little bit helps". Once again however, around half of the non-members group does not agree with this sentiment and finds that green roofs would not contribute to a better climate enough to be effective, or would not contribute at all, in terms of mitigation specifically. In assessing whether participants found issues due to climate change effects salient in Zandweerd, there is a broader disagreement. Members are split on this aspect, with some mentioning that they have already noticed changes. Other members have not noticed this and non-members in general agree with this latter group and indicate a lower salience as well.

A theoretical relationship between education level and environmental awareness and interest possibly holds true in this particular sample. The mean education level shows to be slightly lower on average for the non-member group (Mean = MBO) compared to the member group (Mean = HBO). This fits with the lower overall score that non-members gave to the perceived salience condition compared to members. Still, looking at the interview answers, some members are sometimes as unfamiliar with the adaptation benefits of green roofs as most non-members seem to be. The difference between them is that in those cases, the members did partake in adopting a green roof as they could afford this mainly for the purpose of aesthetics.

Group identification

The member group frequently mentions that they have regular contact with their neighbors and/or mention the abundance of activities being organized in the neighborhood. While they also feel that social cohesion in the neighborhood as a whole may not be strong, the members of this initiative feel generally satisfied with the extent to which they are connected to others in the neighborhood. This is partly in contract to the non-member group. Though non-members generally mention that they are satisfied with how connected they are in the neighborhood, there seems to be a group of non-members that does not feel any social cohesion at all. Moreover, based on the difference in descriptive means, some non-members generally show a lower interest in undertaking activities with their neighbors. A more thorough investigation is needed to conclude if this concerns the same group that experiences less social cohesion. Importantly, based on the important difference in the extent to which social cohesion is experienced, it can be said that social cohesion indeed fluctuates throughout the neighborhood and that this may influence someone's decision for joining a community initiative.

4.4.2 Capacity

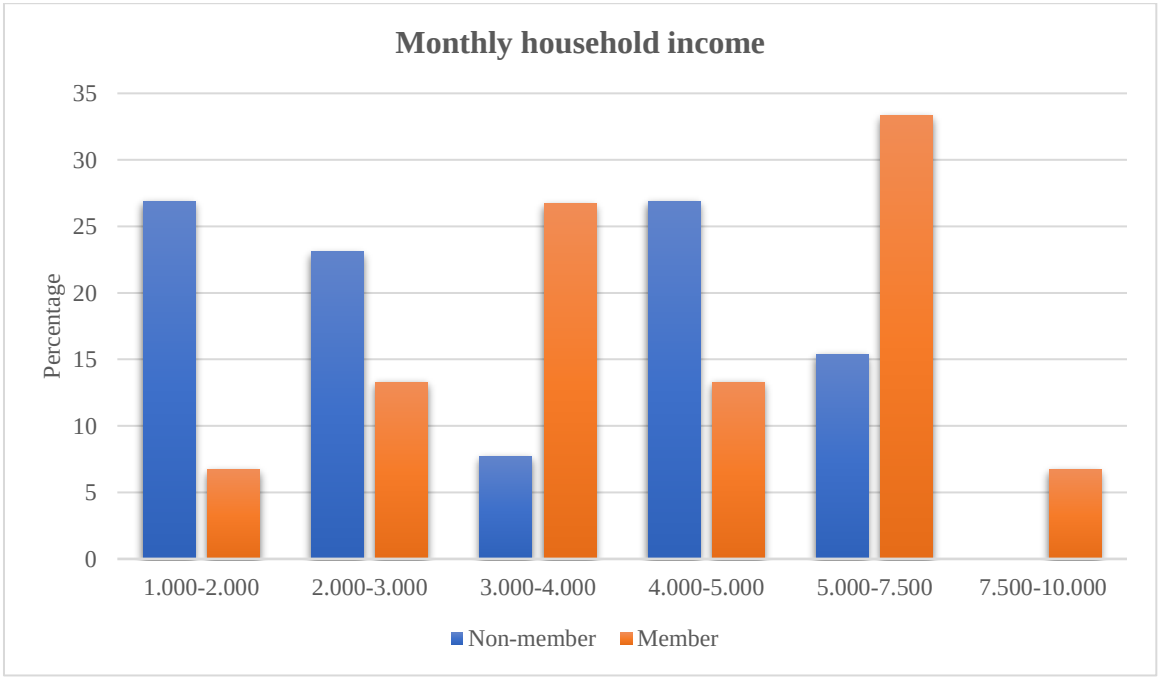
Objective capacity

In terms of objective capacity, one of the most important differences between members and non-members, is the factor of timing. For members, timing generally worked in their favor, showing it to be a large influencing factor that made it easy for them to participate. For some non-members that generally were positive about the other MCO conditions, the timing factor was a large barrier for them for participating, mostly in the form of planning to move away or being in the middle of a move to Zandweerd. Another important difference is the extent to which their roof was objectively suitable in terms of its slope. Among the non-member group, multiple participants self-reported that their roof would not be suitable for a green roof. Considering the requirement for the roof to have slope of less than 25 degrees, it is reasonable to assume that this is indeed an objective barrier for many non-members.

The other most important difference between members and non-members is their difference in income level. In figure 3 below, it can be seen that the member group on average

has a higher monthly household income, compared to the non-member group. The previously mentioned split in income level for the non-member group is also illustrated by this figure, as you can see how there is a group of non-members with an income below 3.000, and a group of non-members with an income above 3.000. In general this results in a higher *objective capacity* for members and for half of the non-member group, compared to half of the non-member group with a lower income. More specifically, this lower income seems to co-exist with a subtly different response to the other MCO conditions. As discussed these difference relate to the fact that the lower-income non-member group finds the financial and time investment to be too high, while the higher-income non-member group finds mentioned a barrier in terms of timing and roof suitability rather than finances and effort. Lastly, the fact that the *peer pressure* condition was lower for the higher-income non-member group compared to the lower-income group, is an effect that may be worthwhile to look into further.

Figure 3. *Self-reported monthly household income for members and non-members.*



Subjective capacity

Despite that members indicated a to have a higher subjective capacity to install a green roof via this initiative, some non-members are similar in their response and agree that they think they would have access to the needed resources. Going beyond having access to the necessary financial means, these participants also agreed that they perceive the whole project to be rather low-effort for them in general. Especially the members look at it as an easy project, something they could also easily do themselves. They further mention the role that the initiative played in lowering this effort for them. The most important difference between the members and non-members regarding the subjective capacity condition is that once again a group of non-members does not feel like they have the capacity. More specifically, this non-member group either does not know which resources are needed or seems to feel that they lack access to the required knowledge and time regarding installation and maintenance of the green roof. On top of that,

non-members in general have a lower regard for the contribution that the Zandweerd green roofs may have in terms of addressing local climate change effects than do the members.

4.4.3 Ownership

Peer pressure

This is one of the conditions that showed very little similarity between members and non-members. In fact, aside from the fact that some members and some non-members both indicated to find it hard to assess the extent to which their neighbors would be supportive of the initiative, the responses from members and non-members to this condition were quite opposite. Members perceive that their peers have a positive attitude towards green roofs and that they are generally viewed by their peers to be the type of person to participate in an initiative like this. Non-members expect that their peers are not interested in green roof initiatives and feel like their peers would find it out of character for them to participate in the initiative. Important to note is that there are no non-members that disagreed and found that their peers would be generally interested in green roofs. This is a highly important difference between members and non-members for the following reasons. First of all, due to the unambiguity of the difference between them, it seems that this condition may be particularly influential. Second of all, this finding contradicts previous findings that found a low to non-existent influence of *peer pressure* after testing the MCO framework in community initiative case studies (Haitsma 2020; van den Born, 2020).

Sense of own responsibility

An important similarity between members and non-members regarding their *sense of own responsibility* to contribute to a better climate, is that both state to feel this responsibility and agree that it is a responsibility that everyone should share. Moreover, both members and non-members, seemed almost equally aware of how humanity negatively impacts the environment, yet non-members often do not find that green roofs are a good example of taking their responsibility to contribute to a better climate. Another important difference, is that members conclude that a shared responsibility means that they personally feel called to action too, yet non-members conclude that other parties with a larger responsibility should act first. In doing so, they highlight the role of the governmental and business sector more often, and mention that they would only personally feel more inclined to act if these big players made a better effort first. Interestingly, the non-member group does not seem divided on this condition. These responses further give the impression that these non-members may have responded to this condition from a mitigation perspective again. It remains the question to which extent these non-members also hold these other parties responsible for facilitating climate adaptation in the local context of Deventer.

Environmental values

When talking about the underlying values that play a role in wanting take on the challenge of climate change mitigation and adaptation, participants often talk about the actions that they already undertake. The difference between members and non-members however, is that members talk about these actions to show that they take action for the environment besides the adoption of the green roof, whereas non-members mostly mention these actions to show that they already do what they can, and that that is enough for them. “We do what we can. Green garden, cycling instead of taking the car, separating waste etc. Green roofs is a step too far for us, we don’t think our house is suitable for this”. In this case the suitability judgement may be more subjective than objective as this participant mentioned that their garage roof would be

suitable, after possibly needing strengthening. All-in all however, the most important similarity between members and non-members is that both generally seem to care for the environment, and they show this in their own ways.

4.5 Answer to the sub-research question

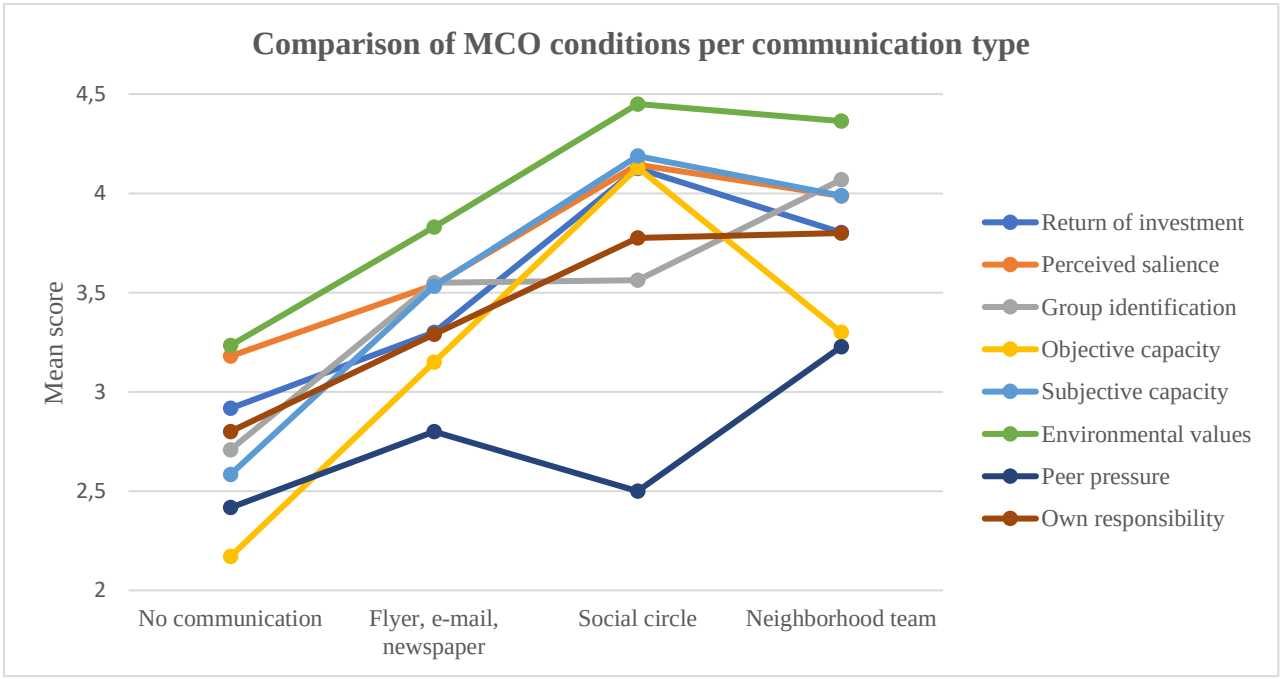
This results chapter provides an answer to the following sub-research question: *What is the relevance of the MCO conditions and what are the most important similarities and differences between members and non-members of the Zandweerd green roof initiative regarding the individual MCO conditions?*

First of all, as could be concluded from the substantial difference in means between members and non-members on each MCO condition (see table 2), every MCO condition is deemed to be relevant in this case study. Members experience each condition more positively than non-members and this means that each MCO condition has a role to play in explaining membership for a green roof community initiative. The in-between members resemble the member group in their answers to the conditions, except for the *objective capacity* condition. Second of all, after zooming in with a QIA however, it becomes obvious that this difference in higher and lower mean scores for members and non-members are not that black-and-white. Among the non-members there is a group that seems to resembles the member (and in-between) group a bit more in the extent to which they positively experience most MCO conditions: namely the higher income non-member group. The most important difference that this more positive non-member group does show however, when compared to the member group, is a difference on two conditions: *peer pressure* and *sense of own responsibility*. Namely, this non-member group – that scores relatively high on each MCO condition – does score low on the *peer pressure* and *sense of own responsibility* conditions. Thereby, this reveals that these conditions are particularly important for this group in explaining their decision to not join a green roof neighborhood initiative. Lastly, another important difference between the member and the non-member group is related to the *objective capacity* condition. Evidently, it is clear that the income indeed has an influence on membership, as members had a generally higher income compared to non-members. Moreover, across all conditions, (most) members frequently mention how they could have afforded the green roofs without the subsidy, yet a substantial part of the non-members find the financial investment to be too high.

5 Results: the effect of personal communication on the MCO conditions

This chapter provides an answer to the question: *what are the most important similarities and differences regarding the individual MCO conditions, between those that had in person communication with the Zandweerd initiative team in the recruitment phase of the initiative and those that have not?* The answer to this exploratory question was found by placing all participants (N = 45) in either one of four communication categories, and comparing their quantitative MCO conditions scores. Rather than placing participants in only two categories based on their in person communication with the initiative team, four communication categories were identified to more closely resemble the experienced communication by the participants. These four categories resemble the four types of communication that participants of this study had regarding the green roof initiative in Zandweerd. Namely, (1) participants either had no recollection of any communication about the initiative at all, (2) participants had received a flyer, an e-mail or had read about the initiative in a local newspaper or on social media, (3) participants had a face-to-face conversation about the initiative with someone in their social circle, or (4) participants had face-to-face contact with (a member of) the neighborhood team that had organized the green roof initiative. At the start of the interview and at the beginning of the questionnaire, participants were asked about the way they had become familiar with the Zandweerd green roof initiative, and what kind of communication they had with the initiative team afterwards. During the interviews and in the remainder of the questionnaire it became clear that some participants did not have any personal communication with the initiative yet did speak about it within their social circles. Therefore the category of face-to-face contact within their social circle was also included as a category. In total, six participants fell into the first category, twenty in the second, eight into the third and eleven in the fourth. The differences in average MCO condition scores for these four groups can be seen below in figure 4.

Figure 4. *The mean score for each MCO conditions presented per type of communication that participants had regarding the green roof initiative in Zandweerd.*



Caution is to be taken when interpreting the means in this figure. These results are exploratory and do not represent any causal relationships between communication type and the MCO conditions. Having said that, these results do hint towards possible trends and provide food for further thought. For example, first and foremost, a trend that is interesting is that personal (i.e. person-to-person) communication about the green roof initiative, corresponds with higher scores on most MCO conditions than does non-personal communication (i.e. via a flyer, e-mail, newspaper or social media) in this sample. Not only does it correspond with higher scores, importantly, it corresponds with positive scores above the neutral threshold of 3. This eludes to a possible enhancing effect that personal communication may have on the MCO conditions, as was suggested in the introduction chapter of this study. Importantly, future research is needed to validate such an effect and to identify any causal relationships. The relevance of further investigating this possibly enhancing effect of personal communication on the MCO conditions is high, as the previous result chapter has shown that higher MCO conditions correspond with membership of the green roof initiative.

Looking at figure 4, another trend meets the eye concerning the no communication group. Regardless of the type of communication, there is a large difference in MCO condition scores between those that had any type of communication and those that did not recollect communication in general. This is somewhat to be expected as awareness and saliency of environmental problems and solutions can be spread and increased through communication. It should be noted however, that the participants that indicated to have not had any communication about this topic, did receive a flyer in their mailbox. The fact that this group does not recollect this may have to do with a low interest in the topic. That would also explain their low score on each MCO condition.

Zooming in on the individual MCO conditions, three conditions behave differently than the other conditions. *Peer pressure*, *group identification*, and *objective capacity* deviate from the pattern that other conditions follow in relation to the different communication types. In this sample, it seems that those being informed about the initiative via someone in their social circle generally experience less *peer pressure* and *group identification* then do those that had personal communication with the neighborhood team and that received only a flyer / read about it in an email, local newspaper, or on social media. This particular interaction with group identification and peer pressure could be due to the fact that some members of the initiative that were told about the initiative by someone in their social circle, do not live in Zandweerd themselves. That explains why they would not identify with the Zandweerd neighborhood nor have a clear idea of the extent to which they think people in their neighborhood would participate in a green roof initiative.

The deviating pattern of the *objective capacity* condition tells two stories. On the one hand it shows the effectiveness of this green roof community initiative in increasing the uptake of green roofs among those that are objectively less capable to do so without such an initiative. Namely, six of the participants that had personal communication with neighborhood team ended up becoming a member of the initiative. On the other hand, it shows that *objective capacity* can be the sole barrier to participation among residents that are motivated to such an extent that they have engaged in personal communication with the neighborhood team. Namely, five of the participants that had personal communication with the neighborhood team did not become a member.

5.1 Answer to the sub-research question

The most important similarities and differences regarding the MCO conditions, between participants in the four communication categories are the following. First of all, those that had in person communication about the green roof initiative with either their social circle or the initiative team, scored higher on most MCO conditions, than those that did not have this type of communication. This could mean that personal communication has an enhancing effect on the MCO conditions, yet this cannot be firmly concluded based on this study and should be further investigated in future studies. Second of all, those that say they have not seen any non-personal communication, and that did not have any personal communication, are also those with fairly low and negative scores on the MCO conditions. These results therefore provide an interesting incentive for future research to look into the added benefits that personal communication might bring (on top of text communication like flyers, e-mails, newspapers and social media posts) to motivating citizens to participate in green roof initiatives.

6 Results: sufficiency and necessity of MCO conditions for membership

Last, but not the least of the results chapters, this chapter shows which (combinations of) MCO conditions are necessary or sufficient motivators for the Zandweerd green roof initiative. The answer to this question is provided on the basis of the results of an fsQCA analysis, performed on participants' quantitative answers to the MCO condition statements ($N = 45$). These answers were given on a five point Likert-scale. So the first step of this analysis was to calibrate the Likert-scale MCO scores. In doing so, a threshold is set for each MCO condition that identifies whether a participant (1) fully agrees with the condition, (2) is intermediate about the condition, or (3) fully disagrees with the condition. These three groups are calibrated per condition, using the corresponding Likert scores as thresholds, namely 4 (fully agree), 3 (intermediate) and 2 (fully disagree). Previous studies suggest the use of these cut-off values when working with a 5 point Likert-scale (Pappas & Woodside, 2021). After the calibration was executed in the fsQCA software, each participant now had a score of a value in between 0 and 1 that indicated the extent to which they agree with a condition. With this data set, the truth table was generated. (see table 3 below). This table visually presents all of the existing pathways within this sample that led to membership or non-membership of the Zandweerd green roof initiative. For example, the first row of the table shows a pathway that was followed by 13 participants. These participants all agreed with all MCO conditions, and this pathway led to green roof initiative membership in around 70% of the cases. The threshold for this raw consistency measure was set at 0.70 for this sample. The only configuration that consistently leads to membership is therefore represented by the pathway in this first row of the truth table: the pathway in which a participant agrees with all MCO conditions. Still, this raw consistency score is arguably low (0.705), due to the fact that three cases deviate from this pattern. In other words three non-members of the initiative scored high on each individual condition, yet did not participate in the initiative. When looking at the QIA results from these three specific cases however, it becomes clear that one of these cases was defined by the QIA as an 'in-between' case, meaning that this participant did want to become a member of the initiative, yet due to timing issues it was not possible yet. The other two cases did not show full membership to each MCO condition but fell on the cut-off point for objective capacity, and peer pressure, and one of the two also fell on the cut-off point of own responsibility. This could mean that if these participants would have more strongly agreed with the conditions of *objective capacity, peer* pressure and *own responsibility,* these participants might have become members.

The first row of the truth table is the only pathway of MCO conditions that reliably leads to green roof initiative membership. This is an impactful finding in itself as it is in line with the conclusions of the previous result chapters that all MCO conditions are relevant for green roof community initiative membership. Still, it is interesting to look further and decipher what the other rows in the truth table show. For example, all other rows display the pathways that are present among the non-member participants of this study. An interesting pattern for this group can be seen in this truth table in the second row. The eleven participants that followed this pathway agreed with all MCO conditions except for the *peer pressure* condition. Interestingly, these participants are indeed mostly non-members of the green roof initiative. This eludes to a possible important role that peer pressure may play in green roof initiative membership. In a similar fashion, the remainder of the truth table can be interpreted. Yet, fsQCA software includes a truth table analysis that runs this analysis automatically and in the process identifies the MCO conditions that are necessary or sufficient for leading to green roof initiative membership.

Table 3. *fsQCA truth table that shows that pathways that participants (N = 45) took and that either led to green roof initiative membership or not. The in-between participants were part of the non-member group for this analysis.*

QReturn	QSalience	QGroupID	QSubCapac	QObjCapac	QValues	QPeer	QResponsability	number	Deelname	cases	raw consist.	PRI consist.	SYM consist
1	1	1	1	1	1	1	1	13	1	cases	0.703568	0.703568	0.703568
1	1	1	1	1	1	0	1	11	0	cases	0.418029	0.418029	0.418029
1	1	1	1	1	1	1	0	1	0	cases	0.287749	0.287749	0.287749
1	1	0	1	1	1	0	0	1	0	cases	0.234938	0.234938	0.234938
1	1	0	1	1	1	0	1	2	0	cases	0.205507	0.205507	0.205507
0	1	1	1	1	1	0	0	1	0	cases	0.13996	0.13996	0.13996
0	1	1	1	1	0	0	0	1	0	cases	0.100452	0.100452	0.100452
1	1	1	1	0	1	1	1	5	0	cases	0.0987823	0.0987823	0.0987823
1	0	0	0	1	1	0	0	1	0	cases	0.0701508	0.0701508	0.0701508
1	1	1	1	0	1	0	1	1	0	cases	0.0672818	0.0672818	0.0672818
0	0	1	0	0	0	1	0	1	0	cases	0.0277778	0.0277778	0.0277778
1	1	0	0	0	0	0	0	1	0	cases	0.027451	0.027451	0.027451
0	0	0	0	0	0	0	0	1	0	cases	0.0241463	0.0241463	0.0241463
0	1	1	0	0	1	1	1	2	0	cases	0.0188679	0.0188679	0.0188679
1	0	1	0	0	1	0	0	1	0	cases	0.0178162	0.0178162	0.0178162
0	0	1	0	0	1	0	0	1	0	cases	0.0174607	0.0174607	0.0174607
1	1	0	0	0	1	0	0	1	0	cases	0.0163208	0.0163208	0.0163208

Truth table analysis

Further analysis of the truth table leads us to the answer to the question of which (combinations of conditions) are sufficient or necessary for leading to membership. The fsQCA truth table analysis brings forth two solutions that are of relevance for this study; the complex solution, and the parsimonious solution. Solution refers to 'a combination of configurations that is supported by a high number of cases, where the rule "the combination leads to the outcome" is consistent' (Pappas & Woodside, 2021, p. 11). The complex solution shows both the core conditions (necessary conditions) as well as the peripheral conditions (sufficient conditions). The parsimonious solution however, only shows the core conditions. If a condition is identified to be a core condition, this indicates a strong causal relationship with the outcome variable (Fiss, 2011; Pappas & Woodside, 2021). This means that the core solutions cannot be left out of any solution as their presence or absence is highly influential for the membership of a green roof initiative in this case.

Starting with the complex solution. As is to be expected based on the truth table, all MCO conditions are included in the complex solution, as the combination of all MCO conditions together reliably leads to the outcome of membership. This means that all MCO conditions can be regarded as being at least relevant for consistently leading to the outcome of membership when they are all present. The consistency of this solution is around 0.70 and thus deemed reliable enough for this study. This result is not surprising as the relevance of each condition has been identified by previous literature, and was identified in the descriptive and qualitative results in this study as well.

What is slightly more surprising however, is the result of the parsimonious solution. The parsimonious solution is a simplified version of the complex solution in which only the most important conditions are represented (necessary conditions). The result of this analysis shows that three of the eight MCO conditions are necessary conditions in this sample that are highly influential for the outcome variable of green roof initiative membership. These three conditions are the following: *objective capacity*, *peer pressure*, and *sense of own responsibility*. Once again, this means that the absence or presence of these three conditions is highly influential for the outcome variable. The consistency score for this solution is around 0.71 and therefore above the cut-off value for this study.

Looking back at the descriptive and qualitative results in the previous result chapters, the importance of these three conditions was already teased out. Timing and income level were important barriers to participation in terms of *objective capacity*. Part of the participants did have a wish to participate in the initiative, yet this capacity held them back. Therefore it makes sense that this is a core, make or break condition. *Peer pressure* and *sense of own responsibility* were highlighted in the QIA for the fact that non-members did not seem to be divided regarding these conditions but rather all mostly disagreed with it. Comparing these results to previous studies however, this finding that *peer pressure* plays such an indispensable role in leading to initiative membership, is a contrasting result. Arguably, one aim of this study was to reduce the effect of social desirability on *peer pressure*. This study did improve the operationalization of the *peer pressure* statements, reducing the statements that were too directly phrased and thereby invited a socially desirable answer. Moreover, by testing the scale reliability of the conditions and their statements, one more statement was removed from the *peer pressure* condition as it did not seem to measure the same construct as the other *peer pressure* statements. Therefore, it could be the case that this study reduced the social desirability effect for the *peer pressure* condition, thereby revealing its true effect and importance. Furthermore, even though *group identification* may not be one of the core conditions, this condition is deemed relevant for

explaining and contributing to green roof initiative membership in this study, despite a previous case study finding that it was not relevant (van den Born, 2020). As the statements for this condition were altered as well, it may be the case that this study reduced the social desirability response for *group identification* as well, and thereby also showed its true effect. Future study would be needed to see if these findings replicate.

This QCA finding that shows that *objective capacity*, *peer pressure* and *sense of own responsibility* are the core condition of the MCO framework in this setting of a green roof community initiative within Zandweerd, underscores the findings of the QIA. It shows that the accompanying themes of these conditions indeed carry more weight than the other conditions. These themes are the following: (1) the suitability of a roof, income level and timing, (2) the expectation of an approving or disapproving attitude of peers towards (joining a) green roof initiative, and (3) the inclination to place the responsibility to act 'first' on other actors (governments, institutions, large polluters in general) and an unwillingness to take action before these actors drastically change.

6.1 Answer to the sub-research question

The answer that this chapter provides to the following sub-research question is rather straightforward. *Which (combinations of) MCO conditions are identified to be necessary or sufficient motivators for membership of the Zandweerd green roof initiative?* When all combined, all MCO conditions are identified to be sufficient motivators for membership of the Zandweerd green roof initiative. This means that the positive presence of all MCO condition combined, by itself is sufficient to lead to someone to become a member of a green roof initiative. Within this group of MCO conditions, the conditions *peer pressure*, *objective capacity*, and *sense of own responsibility* are core conditions. This means that at least the combination of these three conditions must be present in order for someone to become a member of a green roof initiative.

7 Results: Expert session, governing community green roof initiatives

The key results of the previous chapters were discussed in the setting of an expert session to facilitate knowledge transfer from this study to stakeholders in practice, and to help further inform the practical recommendations that follow from the results of this study. The first general feedback from the attending experts was that they found the results relevant for informing their practices of including citizens in climate adaptation action. Moreover, multiple experts mentioned that they recognize the influence of the MCO conditions in their own experiences with involving citizens in climate adaptation action. This is a important feedback as the number of participants in this study and thus its generalizability is limited. The fact that despite that, the results are generally recognizable in other settings suggest that these findings can have merit when applied to different green roof initiative contexts as well. After these initial reactions, the discussion was focused on the main results of this study: the importance of *objective capacity*, *peer pressure*, and *sense of own responsibility*. Subsequently, based on this discussion the following nuances were added to the findings of this study.

Starting with the role of *objective capacity* and the influence of a low household income specifically. Part of this study's results regarding this condition, is the finding that an unequal distribution of climate adaptation support (i.e. the green roof subsidy) is an unintended side effect of the green roof neighborhood initiative. One expert suggested a technical policy approach to equitably distributing climate adaptation subsidies to those most in need due to lack of their own financial means. Namely, upcoming technology such as blockchain, may provide an opportunity for governmental institutions to supply subsidies based on income level, without infringing on the privacy of the subsidy applicant. Those with a higher income would receive a lower subsidy amount or would not be eligible to receive anything, while those with a lower income could then receive more than they would have received if the total subsidy amount would be equally distributed to everyone regardless of income level.

Further brainstorming about ways to successfully reach those groups within a community that are most vulnerable to climate change effects (those with low *objective capacity)* yet also most disengaged from climate change action, led to the mentioning of an example of a successful personal communication approach. The findings of this study regarding a potential enhancing effect of personal communication on the MCO conditions were not explicitly discussed during the expert session due to limited time. Yet, through the suggestion of one practitioner, this potential effect was mentioned to have resulted in citizen participation among vulnerable groups in an energy saving initiative, via the *peer pressure* condition. Specifically, the example featured an approach in which members of the more vulnerable community, went into their neighborhood as 'energy-coaches', and aimed to foster a social connection first. These women were relatable to the other residents of the neighborhood and often spoke the same language. They took note of the struggles and needs of the residents first. An example of such a struggle was that the residents of this area did not feel confident in fully participating in society (i.e. when calling a local GP, or asking for assistance in the grocery store) due to their lack of knowledge of the Dutch language. By genuinely concerning themselves with the needs of these residents first, assisting them with finding opportunities to learn Dutch, and thereby building trust that they had the residents' best interest at heart, the neighborhood energy-coaches were able to include this neighborhood in their energy-saving program that gave these residents some tools to help lower their energy bills. If they would have started the interaction by simply offering these energy-saving tools in the first place, they would have stood in front of a closed door. This highlights the effectiveness of the strategy of taking

a personal approach, listening to the needs of those most vulnerable, and then focus on creating social capital first. Moreover, as the energy coaches were part of the vulnerable group, residents were able to identify themselves with the energy coaches and see that their peers were actively involved in climate mitigation. This further validates the influence of *peer pressure* as well as further suggest an important role of personal communication in increasing citizen participation in community initiatives.

Next to applying this personal approach strategy to reach those with lower *objective capacity*, it was mentioned during the expert discussion that this may also be helpful in addressing *sense of own responsibility*. More specifically, one expert suggested that distrust (in the government or other authorities) could be at the root of a low score on this condition, and could present itself as the attitude that governments and major polluters should set the example for climate responsible action first before they would change their personal behavior. She acknowledge that a low income does a play a role of course, yet suspected that this mistrust may be more influential. The question then becomes how to move from this place of mistrust towards a more trusting position. Another expert responded to this notion by sharing the experience that residents seem to show more of this mistrust when the adaptation (or mitigation) measures is being implemented top-down rather than bottom-up. In other words, when a local government for example is initiating a shift within a neighborhood towards a gas-free neighborhood, citizens show more resistance than when fellow neighbors are proposing to implement a green roofs together. In the example of the energy-coaches that were able to get vulnerable groups to participate in climate mitigation, it was mentioned that they were often asked whether or not they were associated with the municipality, confirming that a mistrust in such an institution can be a barrier for citizen participation. At the same time, another expert mentioned that citizens would also ask neighborhood teams if they would profit from the initiative in one way or another, showing that this trust is also important among neighbors.

One of the experts added another relevant added layer of nuance to add to the *sense of own responsibility* condition. Namely, residents do not seem to be aware that they are actually responsible and liable for any losses and damages due to climate change effects on their own property, such a water damage for example. This might shift their perspective on their sense of responsibility for taking measure to adapt to these changing effects too.

Lastly, apart from the discussion of the main results, other creative ideas were provided during the session about how to encourage a broader variety of citizens to participate in climate adaptation initiatives. For example, an elaborate Q&A list was created to address common questions that citizens may have regarding green roofs that form a barrier for participation. This included questions about the chance of leakage, whether a green roof would increase the amount of insect bites, or if a green roof could be blown away by a storm. Another idea was mentioned that schools could be visited in order to create enthusiasm and awareness amongst children, who can then bring this enthusiasm to their parents. Also, housing corporations could perhaps be included in local initiatives, thereby increasing the uptake of green roofs and reaching yet another citizen demographic. This latter suggestion is outside the scope of this study, yet could be interesting points for further investigation for future studies. Different conditions may be of importance in such a case, as for example the role of subsidies is expected to be greater in the case of motivating real estate investors to construct green roofs on their buildings (Claus & Rousseau, 2012).

8. Discussion

The aim of this study was to get a detailed insight into the causal pathways of (combinations of) individual MCO conditions that play a role in becoming a member of a green roof initiative. In doing so, this study identified the relevance of every condition in the MCO framework. Moreover, potential differences in motivation were explored for those citizens that had in person contact with the initiative team or someone else in their social circle, and those that have only received a flyer with information about the initiative. Both qualitative and quantitative research was done and combined surrounding a case study in Zandweerd, Deventer: a green roof community initiative that has led to the adoption of 700 m2 of green roof on private property up until now. These results are discussed here in terms of their place in the current NBS and coproduction literature and the broader sustainable behavior debates, as well as in terms of interpretation and generalization. Ultimately, these results lead to recommendations for intermediary organizations such as Buurkracht and governmental bodies who aim to facilitate the development of such community initiatives on how to increase the initiatives' potential. These recommendation are discussed in the next and final chapter of this thesis: the conclusion.

8.1 Placement of the results in the current literature

In this section, the results are discussed and placed in the broader scope of current literature per individual condition. This discussion first elaborates how the relevance and sufficiency of the MCO conditions in leading to green roof initiative membership in this case study, are in line with the theoretical and empirical findings upon which the MCO framework was build. In doing so, a comparison is made with a previous study on MCO conditions in three green roof initiatives (van den Born, 2020) and differences in outcome are discussed per condition. The findings of this study regarding the necessity of three conditions in leading to green roof initiative membership are new results that are further discussed for the three conditions it concerns below. The findings for each condition are also placed within the broader debate surrounding the promotion of environmentally friendly behavior. Special attention is given to the lower income target group as these are more vulnerable to climate issues (Blok, 2020) and showed to be scoring especially low on the MCO conditions. Together with the exploratory findings that suggest a relationship between personal communication and positive MCO conditions, the findings of this study affirm the existing foundation of the MCO framework and builds upon this further.

<u>Expected return of investment</u>

Based on NBS and coproduction literature, it was to be expected that the extent to which people are motivated to participate in a green roof community initiative depends on their evaluation of this expected return of investment. In case a financial investment is required, a subsidy (Lim, 2018) or long-term financial benefits could positively impact this evaluation (Baptiste et al. 2015; Brown et al. 2016). In some cases, expected environmental return of investment and the social rewards of participating could outweigh the monetary investment needed, thereby motivating participation in coproducing an NBS (Chelleri et al. 2015l Derkzen et al. 2017; Ferreira et al. 2020). Lastly – specific to motivation for green roof initiative membership – the aesthetics of the green roofs and their benefits for biodiversity were recently indicated by participants in a Dutch study to be an important reward of a green roof investment (Prins, 2021).

The findings of this study fall in line with these expectations. Namely, the expected environmental benefits, aesthetics of the roof and contribution to biodiversity were indeed the

most important motivators for the *expected return of investment* condition. Social rewards of participation were not focused on as much by members of the Zandweerd initiative as a main driver for participation. Among members the focus was clearly on the environmental rewards connected to the investment, whereas non-members had a more monetary focus in assessing the extent to which the rewards would be worth it. The latter either concluded that the initial cost would be too high or concluded that they did not expect any worthwhile monetary reward to come from an investment in green roofs.

Van den Born (2020) found similar results in that environmental rewards were a main driver of green roof community initiative participation, and that social rewards were less focused on by residents. A difference with this present study is that van den Born (2020) found that monetary savings resulted in a positive balance between investment and rewards for those that participated in the green roof initiatives. This contrasts the findings in this current study that find that the majority of members did not find this to be a main motivator for them. While the findings from van den Born (2020) do fit with previous research that assigns importance to financial incentives to participate in NBS initiatives (Baptiste et al. 2015; Brown et al. 2016; Lim, 2018), it is not that surprising that participants in the current study partly contradict this. Namely, the finding that members were not necessarily motivated by monetary gain, supports previous research as well.

Even though psychology studies debate the extent to which monetary considerations are influential for leading to pro-environmental behavior, there does seem to be convincing evidence that while influential, money is often overestimated in its importance as a motivator for environmentally friendly behavior (Poortinga & Whitaker, 2018; Rajapaksa et al. 2019; Sloot et al. 2019). Importantly, people prefer to see themselves as the kind of person that cares for the environment rather than a person that cares for their wallet, and thus people tend to respond more positively to biospheric appeals than monetary appeals (Bolderdijk et al. 2012). That is not to say that it may not still be an important barrier, especially for those with a lower income. For this group, stronger institutional support may be needed to help remove this financial barrier. At the same time, that should not be the sole motivator for getting this group to partake in a climate adaptive community initiative. Because while money may be a barrier up until a certain point of income, the stronger motivators in this case are the expected rewards in terms of biodiversity, climate adaptation outcomes and an overall enjoyment of the increased greenery and the act of acting in line with ones values.

Perceived salience

Participation in coproducing an NBS – like the participation in the Zandweerd green roof initiative – is furthermore expected to be motivated by the saliency of the climate issue as well as the saliency of the effectiveness of the NBS in addressing that issue (Beery, 2018; Derkzen et al. 2017). A lack of awareness on these two topics causes a significant barrier to the implementation of green roofs (Adriaanse, 2019; Wilkinson & Reed, 2009; Zakeri & Mahdiyar, 2020). Education (Bovaird et al. 2014; Voorberg et al. 2015, as mentioned in Mees, 2019), direct experience with a climate issue (Baptiste et al. 2015; Beery 2018; Bos & Brown, 2015; Clar & Steurer, 2021), and direct experience with an NBS that was adopted by someone else (Brown et al. 2016) all increase the salience of an NBS and the issue it addresses. The findings of this study fall in line with these expectations from the literature, for the most part. First of all, this study underlines previous findings that education plays a part in the extent to which participants have an increased awareness (Bovaird et al. 2014). Next, members of the Zandweerd initiative do show this awareness of the climate adaptation benefits that green roofs

contribute and the necessity to tackle the adaptation challenge. Some members show less awareness of the adaptation benefits, yet in those cases they still participated for the aesthetic benefits of the green roof. Non-members, as discussed, are not as aware of the green roof adaptation benefits and tend to focus on the climate mitigation challenge instead and how green roofs can or cannot help to address that. A portion of the non-member group however, does acknowledge the adaptation value of green roofs. Similarly, van den Born (2020) found awareness of the green roof benefits among non-members too. The results of this study further align with those by van den Born (2020) in that even though the awareness of the benefits may be there for part of the non-members, most non-members only have a low appreciation for the overall benefits of green roofs. Whereas members followed an adaptation narrative regarding these benefits and concluded that 'every little bit helps', non-members more often looked at it from a mitigation perspective and concluded that 'it is too little to help' in this study. They were often assessing the benefits and the urgency of green roof adoption based on its contribution to reducing *climate change* rather than reducing *the local effects of climate change.*

A so called 'mitigation-adaptation gap' has been identified by previous literature as well, which denotes that "citizens seem to *either* adopt climate change mitigation (environmental) *or* adaptation (risk reduction) thinking and values" (Brink & Wamsler, 2019, p. 1350). This dichotomous relationship between adaptation and mitigation thinking is a well-known problem when it comes to climate change action and finance on a larger scale (Abadie et al. 2012; Biesbroek et al. 2009), yet arguably deserves more attention when it comes to encouraging citizens to participate in local climate adaptation. Raising awareness amongst citizens about the urgency to adapt to a changing climate, specifically in the urban settings of developed countries, is called for in the literature too (Lenzholzer et al. 2020a; Tvinnereim et al. 2017). Doing so may require tailor-made strategies that address the specific needs of different groups on local levels (Lenzholzer et al. 2020b). Inspiration for such a tailor-made strategy may be found in a recent study regarding local 'narratives of change' that may increase citizen participation in adaptation action through connecting with "people's daily experience of climate risks and climate resilience" (Marschütz et al. 2020). Moreover, media campaigns, education and highlighting good practice projects can help increase awareness of urban climate adaptation methods (Lenzholzer et al. 2020). Another highly relevant inspiration source is the example set by Phadke and colleagues (2015). Their approach may help in including the most vulnerable (and often times most disengaged) citizens in climate adaptation action – i.e. lower income communities and communities of color. They were able to include those most vulnerable voices by making the adaptation issues personal for them, and through building trust and social capital within the community (Phadke et al. 2015). A similar approach was offered as a successful example in the expert session of this study, highlighting the importance of a personal approach in which trust and social capital is build first.

Group identification

The relevance of this condition as identified by recent studies (Broska, 2021; Sloot et al. 2019) is underscored by the results of this study. Yet, the weight of the importance of this condition did not match the weight of the importance of the *peer pressure, sense of own responsibility* and *objective capacity* conditions in the Zandweerd case. Sloot and colleagues (2019) for example found community motives to be a stronger predictor of a renewable energy community initiative than monetary or environmental motives. The results of this study do not show that *group identification* is of higher importance for green roof initiative membership, when compared to *expected return of investment* or *environmental values* for example. However,

when strictly comparing the result on the statement 'The costs that I could save by participating in this initiative were a motivating factor to participate' with the results of each *group identification* condition, the latter were all scored higher than the monetary statement. Again, the results do fall in line with previous literature, in that they show that those who experience less social cohesion within the neighborhood are also less likely to be a member of the green roof initiative in Zandweerd.

The results of this study do not match the results from the study by van den Born (2020) however, in which the role of *group identification* was not deemed to be influential at all in three green roof initiatives. It could be that this condition therefore may be context specific and may depend on the social cohesion level within a neighborhood. Yet it is also possible that social desirability may have played a role in the lower assessment of importance of *group identification* for those three cases, as mentioned in the theory chapter. As for most *group identification* statements in the study by van den Born (2020), the members of the initiatives find them of higher importance than do the non-members. Socially desirable answers are thought to be less prevalent in this study due to the improved operationalization of the condition statements, and may therefore present a more accurate picture.

Literature on the role of social identity in promoting pro-environmental behavior in a broader sense, furthermore shows that *group identification* with a behaviorally relevant reference group and *group membership of an environmental group* does successfully increase such behavior (Udall et al. 2020). An important nuance to add perhaps, is that the effectiveness of an initiative in fostering pro-environmental behavior in a larger group, is related to the extent to which a pro-environmental initiative is perceived as originating bottom-up (i.e. initiated by fellow neighborhood residents) rather than top-down (i.e. initiated by the state, local government or an NGO for example). If the initiative is perceived to have originated bottom-up however, it may have the following effect: "seeing regular group members forming a pro-environmental initiative themselves, suggests that people like you find pro-environmental behavior important (strengthening pro-environmental group norms) and can actively shape aspects of this group, strengthening identification too" (Jans, 2021). This also shows how the *group identification* and *peer pressure* conditions are interlinked, and how the factor of trust as mentioned in the expert session can have an influence on participation through these conditions.

As mentioned in the theory chapter, social cohesion is underlying to the extent to which group identification takes place within a neighborhood. Making use of the *group identification* condition to encourage membership of a neighborhood initiative, may therefore be limited to those people within the neighborhood that experience that social cohesion. In order to increase the group of people to be reached this way, social cohesion may need to be fostered, in a way that establishes trust, reduces social inequality, unequal distribution of resources and takes cultural diversity into account (Scheifer & van der Noll, 2016). In that sense, the personal approach towards engaging residents of a neighborhood is a fitting suggestion when it comes to increasing *group identification* as well. The fact that this study found a trend that may suggest a possible relationship between in person communication with the neighborhood team and a more strongly experienced *group identification*, further suggests the effectiveness of such a personal approach in which personal contact is made. Personal communication with neighbors / peers could perhaps also be helpful in showing that the initiative was formed bottom-up.

Objective capacity

Current literature finds that the suitability of the roof (Sun & Hall, 2016) and income, education level, gender and profession can be barriers for participation in an NBS initiative (Barnhill &

Smardon, 2012; Lieberherr & Green, 2017; Beery, 2018; Turner et al. 2016). This study did not see any difference in objective capacity based on gender or profession. Therefore the education level, income level and suitability of the roof together formed the basis for this condition. As mentioned previously, especially residents' lower income levels co-existed with a more negative evaluation of the other MCO conditions. As was the case in the study by van den Born (2020), this study indeed showed that the suitability of the roof and limited financial means were barriers to participating in the green roof initiative, despite offered subsidy. A new finding of this study however, is that the *objective capacity* condition was one of the most influential conditions of the MCO framework in this Zandweerd case. Though new, it may not be a surprising finding, as there logically is an objective boundary that may keep residents from participating, even if they would be interested in doing so and score high on most other MCO conditions.

Additionally, this study proposes the addition of another factor to the *objective capacity* condition of the MCO framework. Namely, timing should be taken into account. This factor showed to be both a motivator for members and a barrier for none members. Besides, psychology studies have found that environmentally friendly behavior change is more likely to occur during 'windows of opportunity' that arise during life changes. Life changes 'may force people to renegotiate ways of doing things, create a need for information to make the new choices, and a mind-set of being 'in the mood for change'' (Verplanken & Roy, 2016). In the case of adopting a green roof, a house renovation for example can be such a life change that opens people up to the idea of doing something different and add a green roof to their plans. In practice, this factor is sometimes already being taken into account, as new-build districts often include climate adaptation and mitigation measures by default. Attention should be paid however to include the most vulnerable communities when using the element of timing to encourage residents to make their living environmental more climate adaptive. Often communities with a lower income in the Netherlands for example, have less opportunity to experience these life changes: they are less likely to move to a new place, or (being able to) renovate their house (in terms of ownership) (van Ham & Clark, 2009).

Subjective capacity

NBS and coproduction literature have identified that the following factors play a role in leading to participation: feeling capable of participating in the climate service (Baptiste et al. 2015; Sinasac, 2017; van Valkengoed & Steg, 2019), feeling like they will be effective in delivering a climate service through their participation (Bovaird et al. 2014), and feeling like the collective action thanks to the initiative will be effective in delivering a climate service (van den Born, 2020). This study supports these expectations as members showed a higher belief in their capacity than did non-members, and non-members had a lower expectation of their own and the collective outcome efficacy. These findings are also fully in line with those by van den Born (2020). Van den Born (2020) moreover found that the *subjective capacity* condition was not one of the stronger predictors compared to the other MCO conditions. Similarly, the *subjective capacity* condition was not found to be a necessary condition in this study either.

This latter finding could be somewhat surprising as environmental psychology research has indicated that perceived self-efficacy and outcome efficacy (which together form the *subjective capacity* condition) most strongly motivate climate change adaptation behavior, compared to eleven other factors (van Valkengoed & Steg, 2019). Among the other motivating factors were trust in the government, knowledge, responsibility and injunctive and descriptive norms for example. Context specificity could account for this difference in importance of the

subjective capacity condition. Nonetheless, *subjective capacity* is still counted as a relevant and sufficient motivator for green roof initiative membership.

Peer pressure

Peer pressure, also known as the influence of the social norm, is identified in the literature to influence participation in NBS community initiatives (Dogmusoz, 2019; Sinasac, 2017; Zhang, Fukuda & Lui, 2019). Moreover, in the absence of strong environmental values, peer pressure was found to be a highly influential factor in motivating participation in pro-environmental community initiatives (Broska, 2021). This study fully supports this finding as *peer pressure* is a condition that necessarily should be present (in combination with *objective capacity* and *sense of own responsibility*) in order to lead to membership of the Zandweerd green roof initiative. Thereby this condition carries more weight in terms of importance compared to most other MCO conditions. If and how the importance of the *peer pressure* condition translates to other contexts and cases is to be discovered.

This finding is in stark contrast to that of van den Born (2020) however, who found that *peer pressure* had no influence at all in the three green roof initiatives that were the focus of that study. Van den Born (2020) suggested that this might have to do with the individual setting in which the adoption of a green roof takes place. However, the act of applying for a subsidy together, the neighborhood information meetings and the collective outcome efficacy arguably do give the adoption of a green roof via a community initiative a collective element. Moreover, a social norm may just as well apply to individual actions as it does to collective actions. For example, a person is less likely to litter the public environment if they perceive that the social norm is to not litter (Keizer & Schultz, 2018). A more likely explanation thus becomes, that this contrast in findings is due to the difference in operationalization of the *peer pressure* statements. The results from van den Born (2020) could be due to a social desirability bias, whereas this current study made an effort to avoid socially desirable answers for this condition and may thus be a more accurate representation of the members' and non-members' motivations.

Placing this finding in the broader debate about promoting pro-environmental behavior, an important aspect of this condition is identified. Namely, that the visibility of (social) norms can increase the extent to which a resident will act in line with the norm, rather than with another (hedonic or monetary) gain goal (Steg et al. 2014). Being made aware of, or seeing that others do the right thing and perform a pro-environmental behavior, has been found to promote similar pro-environmental behaviors in those that are observing (Keizer, Lindenberg & Steg, 2013; Reno, Cialdini, Kallgren, 1993). Accordingly, the perception that others are engaging in climate adaptation behaviors has been shown to motivate adaptation behavior in an individual as well (van Valkengoed & Steg, 2019). Yet, crucially, residents are only effected by the social norms (*peer pressure*) that they perceive from the group that they identify themselves with. As mentioned in the literature: "when normative information is provided about an out-group, it exerts little (if any) influence on behavior" (Keizer & Schultz, 2018, p. 184). This once again shows that there is a strong relationship between the condition of *group identification* and *peer pressure*, and the low experienced social cohesion with the Zandweerd neighborhood may explain why non-members did not feel positive *peer pressure* from the neighborhood initiative. If the *peer pressure* for that group is to be increased, the social norm of taking action for climate adaptation should thus be linked to a group that those residents identify themselves with. Relating back to the mentioned effect in the *group identification* condition of "seeing regular group members forming a pro-environmental initiative themselves, suggests that people like

you find pro-environmental behavior important […]" (Jans, 2021), a suggestion comes to mind. Increasing the diversity of a neighborhood team by focusing on recruiting individuals that can represent the most vulnerable groups within the neighborhood may help to increase identification with that team among these groups and therefore the peer pressure to participate, as well as help the team to better take into account the needs of these most vulnerable groups. An example of such a successful approach was mentioned in the expert session result chapter.

Sense of own responsibility

Literature finds that those who feel it is the sole responsibility of governmental or other actors to address climate issues, are less likely to participate in an initiative that targets climate issues (Butler & Pidgeon, 2011; Mees, 2019). Those who have an increased understanding of how they personally contribute to the environmental problem however, seem to be more motivated to take action against the problem (Brown et al. 2016), sometimes out of guilt (Asah & Blahna, 2012). This study again validates past findings, as both members and non-members agree there is a shared responsibility, yet non-members conclude that other parties with larger responsibilities should act first. Moreover, both members and non-members, seemed almost equally aware of how humanity negatively impacts the environment, yet non-members often do not find that green roofs are a good example of taking their responsibility to contribute to a better climate. This relates to the *perceived salience* condition in that people may not find that a green roof is an effective measure with a large enough impact. And it relates to the notion that some non-members disagree with the idea of having to take responsibility at all, which is evident from the qualitative results of this study.

Interestingly, this *sense of own responsibility* condition was a necessary condition that has to be present (in combination with *peer pressure* and *objective capacity*) in order to lead to a positive outcome for green roof initiative membership in Zandweerd. Van den Born (2020) did find the *sense of own responsibility* condition to be relevant as well. Yet, in that study it was also found that participants evaluated their own responsibility separately from the responsibility of the government. It may be that this is contextual difference between the different case studies, or it could be a recent development in thinking following recent developments in increased accountability regarding the negative impact of governments and major polluters (see for example the recent legal victory of Urgenda against the Dutch state (urgenda.nl/en), and the legal victory of climate activist major polluter Shell (Harrabin, 2021, May 26).

It seems that this attribution of responsibility by non-members is rooted in a place of blame: 'those that have the largest stake in causing climate change effects, should also be those to carry the weight in addressing these negative effects'. This is a legitimate point of view, yet this narrative can put the individual in a vulnerable position when this results in missed opportunities to create a more resilient and healthy living environment for them personally. Moreover, during the expert session, a practitioner noted that most residents are not aware of the extent to which they can actually be held responsible for any damage to their property due to climate change effects. Regardless of the broader debate about who should take responsibility and carry the weight in local climate adaptation action (see for example Mees et al. 2019 and Uittenbroek et al. 2019), citizens will be exposed to the effects of the changing climate sooner rather than later (IPCC, 2021). Thus, increasing citizens' *sense of own responsibility* is a wise step to take in order to encourage them to take matters into their own hand and make use of collective climate adaptation initiatives. Interestingly, previously mentioned personal strategies to increase social cohesion may be promising in increasing this *sense of own responsibility* as

well. Namely, social cohesion research indicates that an essential dimension of experiencing social cohesion, is having an orientation towards the common good. With that orientation come feelings of responsibility for that common good for your community (Scheifer & van der Noll, 2016).

Environmental values

Environmental values serve as a person's guiding principles through life, and the literature thus identifies them as strong predictors of pro-environmental behavior (Asilsoy & Oktay, 2018; de Groot & Thogersen, 2018; Lim, 2018; Steg & Vlek, 2009; Steg et al. 2014), among which the participation in pro-environmental community initiatives (Broska, 2021; Lewis, Home & Kizos, 2018; Sloot et al. 2019; Turner et al. 2016). The results of this study do show that this condition is relevant for explaining green roof membership in Zandweerd, even though both members and non-members generally seem to care for the environment to a certain degree.

While the residents of Zandweerd exhibited relatively high environmental values overall, this study shows that this does not necessarily lead to the same (intensity of) behavior, and that mitigation measures take priority over adaptation measures for some. This is in line with the findings by van den Born (2020), who found that both members and non-members exhibit relatively high environmental values too despite that non-members choose not to participate in a green roof initiative. This could have to do with the fact that non-members in this study often referred to their other past or current pro-environmental behaviors to justify that they already do what they can and do not have to do more. Such a phenomenon is know in the literature as a negative spill-over effect, meaning that "when people perform an initial moral behavior, they feel released from moral constraints and are less motivated to act when given an opportunity to perform a subsequent moral behavior" (Truelove et al. 2021, p. 2). Members of this study seemed to experience positive spill-over instead, possibly resulting from "a desire for consistency across behaviours or because pro-environmental behaviours prime environmental concern" (Maki et al. 2019, p. 307).

The current debate regarding pro-environmental behavior spill-over effects and when they occur is still in a developing state, yet initial results indicate that a reduced sense of guilt may increase the chances of negative spill-over, whereas an increased pro-environmental self-identity may increase the chances of positive spill-over (Truelove et al. 2021). This self-identity refers to the phenomenon when someone sees themselves as a person who acts in a way that environmentally friendly, and this is indeed found to mediate the effect of environmental values on accompanying behavior (van der Werff et al. 2013; Wang et al. 2021). Linking a pro-environmental identity to the group that an individual identifies themselves with (i.e. creating a pro-environmental group identity) may have an influence on the extent to which someone self-identifies as an environmentally friendly person (Wang et al. 2021). This shows the interconnectedness of the *environmental values* condition with the *group identification* and *peer pressure* conditions.

8.2 Climate inequity, 'community' initiatives, and including the most vulnerable

During the data collection in the field and the data analysis I noticed a difference between non-members with higher income averages and those with lower income averages. On average, those with a lower income, score lower on each MCO condition compared to higher income non-members, showing a low to non-existing drive to participate in a climate adaptive community initiative. The importance to reach this group however is very relevant as lower income groups (which often include minority groups as well (Kehler & Birchall, 2021) are

assessed to be among the groups that are most vulnerable to climate change impacts. Namely, they are often more exposed to negative effects of climate change compared to higher income groups, while having limited or non-existing access to the resources necessary to adapt (Islam & Winkel, 2017; Kehler & Birchall, 2021). Addressing climate inequity was not a direct aim of this study, yet it does relate to stimulating membership of green roof initiatives in a highly meaningful way.

By failing to reach those with a lower income, adaptation measures are unequally distributed, leading to an increasing inequity in the sense that people that are unable to invest in adaptation are left more vulnerable to climate change impacts (Mees et al. 2019; Uittenbroek et al. 2019). As mentioned by one of the participants of this study, the subsidies go to those that could have afforded a green roof without a subsidy, and more importantly that were already planning to adopt a green roof by themselves in the near future. This way, residents that may be more vulnerable to climate change effects due to a lower income, do not benefit from the institutional support that is available for climate adaptation. Policy efforts that support climate adaptation initiatives should be adjusted in order to make sure that this support reaches the most vulnerable within a community. As mentioned these vulnerable groups include minority groups that face barriers to institutional / social support as well due to structural racism or language barriers for example Kehler & Birchall, 2021). This reflection further spurs the debate on framing neighborhood initiatives as 'community' initiatives. When organizing these climate adaptive initiatives within a neighborhood, or discussing its' effectiveness in reaching climate adaptation targets, the community framing may further result in minimizing the voices of those with less (social) power within that neighborhood. The 'community' framing may be misleading as it hides the diversity of social networks, different worldviews, perceptions and economic well-being within the neighborhood (Titz, Cannon & Krüger, 2018).

Researchers, policy makers, intermediary organizations and neighborhood teams, should continue to search for ways to reach particularly the most vulnerable demographic in order to prevent further climate and health inequality. Based on the discussion of the results of this study, some perspective is offered in the conclusion chapter below for how to better reach and include the most vulnerable communities.

8.3 Implications of the application of the MCO framework

This study is a testament to the strength of the MCO framework in explaining membership and non-membership of a green roof community initiative. The application of the Qualitative Comparative Analysis to the MCO framework further adds to this strength by providing a valid method to asses which conditions carry extra weight in this explanation. The specific MCO framework of this current study as adjusted to green roof initiative membership in this study, reveals and explains what drives citizens in their decision to (not) participate in a green roof initiative specifically. This study's finding that a positive presence of all eight individual conditions is sufficient to lead to initiative membership, confirms the assumption underlying to the framework that a certain motivation, (feelings of) capacity, and ownership are needed to join an environmentally friendly initiative (Mees, 2019).

In the broader scope of co-production, NBS, and behavioral psychology literature, the framework may not encompass all relevant influencing factors. For example, the influences of trust and social cohesion are not explicitly measured by the framework. Still, the framework is a useful tool due to its context-specificity. Initiators, (local) policy makers and other relevant organizations may benefit from this framework as it provides context specific information about which (combinations) of conditions that their efforts should be aimed at when encouraging

citizens to participate in a climate adaptation initiative. This provides them with the information they need to increase their potential in encouraging uptake of climate adaptation measures.

Moreover, the framework leads to both quantitative and qualitative results by the design, and is therefore also a useful tool for a more in depth analyses about what drives citizens to participate in a variety of pro-environmental community initiatives. The improved operationalization in this study seemed to be successful in reducing a social desirability bias in participants' responses to the *peer pressure* and *group identification* conditions. It is therefore advised that future application of the MCO framework follow this new operationalization in interviewing residents about these conditions. Lastly, this study also altered the operationalization of the statements for non-members (compared to a previous master thesis study on the MCO framework by van den Born (2020)), in order to increase their comparability with the statements for the members.

8.4 Limitations of this study design

Several limitations need to be taken into account in the interpretation of the results of this study. First and foremost, the scale of this study was small and the number of participants was limited. Even though this number was found sufficient for QIA and QCA analysis, it does limit the study's ability to identify relevant patterns in the responses of participants. For example, the QCA reflects and analyses all existing patterns that exist within the sample and makes inferences from that information. A larger sample size may include more patterns and may lead to more relevant pathways of MCO conditions. Evidently, due to this low sample size and accompanying consequences for the analysis, the generalizability of this study is limited. Still, the results of this study do show to be in line with previous research, and were validated by expert practitioners in their recognizability across cases. Taking these two steps helped to minimize the negative effect of the small sample size on the generalizability of the results. Evidently, while the findings regarding which condition carry the most weight in terms of importance can be context dependent, the overall narrative about the relevance of the MCO conditions that arises from the results of this study can be applicable to other climate adaptive initiatives.

Another limitation of this study that originated in the data collection phase, was the challenge to arrange in-depth interviews with non-members of the green roof initiative. Due to this difficulty, the choice was made to question non-members via a questionnaire on paper instead of an interview the phone. This resulted in a lack of depth in the answers from non-members, especially when compared to the answers of members. Due to this lack of depth, certain nuances regarding their motivation, capacity and ownership may be missed-out on in this study. This negative effect on the interpretability of the non-member responses are compensated for a bit by the fact that the number of non-member participants was twice as much as the number of member participants. Moreover, the data triangulation method that was used in this study did increase the interpretability of non-member responses by analyzing and comparing both their qualitative and quantitative responses to the questionnaire by analyzing mean scores, a QIA analysis and a QCA analysis. Still, future applications of and research about the MCO framework should try to avoid this limitation by finding creative ways to have more in-depth conversations with non-members.

Lastly, the exploratory nature of the personal communication analysis limits the conclusions that can be drawn regarding a potential relationship between personal communication and the MCO framework. This means that the results regarding this potential effect remain inconclusive despite its suggested effect in the literature.

9. Conclusion

Climate adaptation community initiatives play an important role in increasing the uptake of adaptation measures by citizens, such as the installation of green roofs. Yet, as promising as these initiatives are, they are not reaching their potential as they often only reach a select number of people within a neighborhood. Previous research has identified individual conditions that drive citizens to participate in environmental community initiatives in general, and green roof community initiatives more specifically. This study fills some knowledge gaps that were left open by these previous studies. Namely, a more in-depth analysis of the MCO framework was done with a different methodology that enabled the investigation of causal relationships between the MCO conditions and initiative membership, and a comparison between conditions in terms of weight of importance. On top of that, the operationalization of two individual conditions (*group identification* and *peer pressure*) was improved to address contradicting findings and the possibly influential role of personal communication on enhancing the MCO conditions was explored. The main focus of this study was to provide an answer to the research question: *which (combinations of) individual conditions are most important for people to join a green roof community initiative?* The answer to this question is based on the results and discussion of a multi-method analysis of interviews with both members and non-members of a green roof initiative in the Dutch city of Deventer.

9.1 Answer to the main research question

First of all, this study found that all MCO conditions were relevant for explaining green roof initiative membership. The most reliable configuration of MCO conditions to lead to green roof initiative membership in this study, was the combination of all conditions together. This means that when a resident has a positive stance on all MCO conditions, it is likely that this person becomes a member of the green roof initiative when invited. Within this group of MCO conditions, the *peer pressure*, *objective capacity*, and *sense of own responsibility* are core conditions, in other words, these are the most important conditions for people to join a green roof community initiative. This means that at least the combination of these three conditions must be present in order for someone to become a member of a green roof initiative. So, even if residents are positive about all other individual conditions, if they are negative about either the *peer pressure*, *objective capacity*, or *sense of own responsibility* condition regarding the initiative in question, it is not likely that this person joins the initiative.

As mentioned, in interpreting these findings it is important to keep in mind that these three core conditions may be context specific and could be less important in another setting. Furthermore, considering the small sample size of this study the generalizability of this result is limited. All the same, reactions from practitioners in the field do suggest that the relevance and applicability of these three conditions does hold in different settings. For now, it can thus be concluded that it is wise to take the following aspects into special consideration when encouraging citizens to participate in a green roof initiative: (1) citizens will need to have (access to) the required skills, competencies, information and knowledge, and resources to install a green roof, (2) citizens will have to feel like participating in such an initiative is part of the social norm of the group that they identify themselves with, and (3) they need to believe that they are responsible for addressing the issues caused by climate change. Several recommendations follow from this answer to the research question for organizers, institutions and governmental bodies, who aim to facilitate the development of climate adaptive community

initiatives on how to increase the initiatives' potential. These recommendations are provided in section 9.3 below. First interesting recommendations for future research are provided.

9.2 Recommendations for future research

Generally, future research that investigates this topic, yet includes a larger sample size and a different initiative context is encouraged. This would be relevant for assessing the broader applicability of the findings of this study and therefore would help to scale up efforts that encourage citizens to participate in climate adaptation initiatives in a broader range of contexts.

Other than that, in the discussion of the results of this study it becomes clear that a highly relevant research gap relates to the question of how the most vulnerable groups can be reached and included in climate adaptation initiatives. This study suggest a possible important role for personal communication, *group identification* and *peer pressure* to play in increasing the engagement of specifically these groups in climate adaptive community initiatives. Yet this suggested role needs further research to test the validity of this suggestion. These results do provide an interesting incentive for future research to look into the added benefits that personal communication might bring more generally (on top of text communication like flyers, e-mails, newspapers and social media posts) to motivating citizens to participate in green roof initiatives. Seeing that the exploratory results suggest that those that had personal communication with someone in their social circle or with a neighborhood team member also had a more positive stance on the MCO conditions. Again, further research is needed to assess the validity of that suggestion.

Something that was mentioned during the expert session that was outside the scope of this study but that may be relevant path to take for future research, is the inclusion of housing corporations / landlords into community initiatives to take adaptation measures for their tenants. The current housing market in the Netherlands is such that being a house owner increasingly becomes out of reach for those with lower incomes. This increases this group's dependency on housing corporations / landlords, therefore it would be relevant to assess the needs and adaptation possibilities for vulnerable groups that have this specific dependency.

9.3 Recommendations for practice

Last but not least, several lessons can be taken from this study to inform practitioners that wish to increase the uptake of climate adaptation measures through facilitating / supporting / organizing community initiatives. These practical recommendations are thus relevant for policy makers, initiative organizers, intermediary organizations such as Buurkracht, municipalities, provinces and waterboards. In the following paragraphs the strategies thought to be most influential based on the most important results of this study are provided.

First of all, it is recommended to use the *peer pressure* condition in designing policy interventions or recruitment strategies to encourage climate adaptation initiative membership. In doing so it has to be taken into account that residents are only effected by the social norms (*peer pressure*) that they perceive from the group that they identify themselves with. Thus communication has to be perceived to be about their peer group, or has to be coming directly from their peer group. Policy interventions can help to increase a positive adaption-action social norm, such as communication campaigns, as long as these interventions are tailored to the culture of the specific group (i.e. the target group can identify themselves with the 'we' that is being communicated about) and as long as the pro-environmental stance is perceived to be initiated from the bottom-up.

Another recommendation is to increase the visibility of good practices that peers are

already taking. For example, the neighborhood team of Zandweerd may take the opportunity to showcase climate adaptation actions of peers, by making the newly adopted green roofs visible for other residents through drone footage. In doing so, they can take that opportunity to address other MCO conditions as well, for example they could raise awareness for the adaptation benefits of green roofs and their urgency, thereby increasing the *perceived salience* as well.

If applying a strategy to increase this *peer pressure* condition to target the most climate-vulnerable groups specifically, another recommendation is to use a personal communication strategy in which in-group members of the vulnerable group go into the neighborhood and take stock of any specific needs that this group has, before addressing this groups' climate adaptation needs. This recommendation also stands when attempting to increase the condition of *sense of own responsibility*. Such a personal strategy can increase social cohesion within the neighborhood and thereby increase feelings of responsibility for what is best for the community. On top of these recommendations, other policy instruments may still be needed that increase the institutional support of low income groups when it comes to climate adaption finance, to increase their *objective capacity*. Do note that this is a recommendation *on top* of the other two, as *peer pressure* and *sense of own responsibility* do need to be present in a minimum sense in order to encourage someone to participate.

To conclude this study, a quote from a commentary by Pelling and Garschagen (2019, p. 328) seems fitting for the recommendations that follow from the conclusions of this study: "most of all, we must listen to the voices of impoverished people to realize the aim of the SDGs – to 'leave no one behind'". Doing so is not only effective in growing towards a more socially just society. This study shows that it also a much needed step that can work to increase the uptake of climate adaptation measures among citizens, thereby creating a more environmentally accountable society as well.

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Appendix A1: the complete questionnaire as was used as an interview guide for the telephone interviews with members of the Zandweerd green roof initiative. It includes the informed consent on the front page.

Universiteit Utrecht

Beste bewoner van Zandweerd,

Hartelijk dank voor uw deelname aan mijn afstudeeronderzoek naar het groene daken initiatief in Zandweerd.

Het doel van mijn onderzoek is om inzicht te krijgen in beweegredenen van bewoners om wel of juist niet mee te doen aan het groene daken initiatief in Zandweerd. Uw antwoorden op deze vragenlijst zullen bijdragen aan een overzicht van de belangrijkste motivatiefactoren, aan verdere ontwikkeling van de wetenschappelijke literatuur, en aan beleidsaanbevelingen om vergroening te stimuleren.

Uw deelname

- ✓ Het invullen van de vragenlijst duurt ongeveer 15-20 minuten.
- ✓ Deelname aan dit onderzoek is volledig vrijwillig. U ben niet verplicht antwoord te geven op de vragen, en u kunt uw deelname op elk moment stoppen.
- ✓ Uw antwoorden worden anoniem verwerkt in het onderzoek en zullen niet naar u terug te herleiden zijn.

Ik vertrouw dat ik u hiermee voldoende heb geïnformeerd en wens u succes met het invullen van de vragenlijst!
Voor vragen/opmerkingen kunt u altijd bij mij terecht.

Vriendelijke groeten,

Lineke Hiemstra
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MSc student Duurzame Ontwikkeling – Faculteit Geowetenschappen

De vragenlijst start op de volgende bladzijde

Universiteit Utrecht

1. Hoe bent u bekend geraakt met het initiatief?

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2. Hoe ziet het contact eruit dat u met het duurzaamheidsteam heeft gehad?

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3. Wat was uw motivatie om mee te doen aan het groene daken initiatief?

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4. Hoe ziet u de balans tussen de investering die het kost, en de voordelen die het oplevert om groene daken aan te schaffen via het initiatief?

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5. In hoeverre bent u het met de volgende uitspraken eens?

De voordelen die groende daken opleveren wegen op tegen wat je erin investeerd (qua tijd en geld).

☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Universiteit Utrecht

Het sociale aspect van deelname aan dit initiatief was een motiverende factor om deel te nemen.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

De kosten die ik zou kunnen besparen door deel te nemen aan dit initiatief waren een motiverende factor om deel te nemen.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

De milieuvriendelijkheid van het initiatief was een motiverende factor om deel te nemen.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Ik vind het niet erg om te betalen voor een groen dak omdat het persoonlijke voordelen oplevert.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Ik vind het niet erg om te betalen voor een groen dak omdat het voordelen voor de buurt oplevert.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

6. In hoeverre heeft u het gevoel dat groene daken helpen bij het aanpakken van de gevolgen van klimaatverandering?

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7. In hoeverre bent u het met de volgende uitspraken eens?

Ik ben goed op de hoogte van de gevolgen van klimaatverandering in stedelijke gebieden.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Groende daken helpen bij het tegengaan van klimaatverandering.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Lokale verkoeling is een belangrijke functie van groene daken.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Water vasthouden is een belangrijke functie van groene daken.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Bijdragen aan de biodiversiteit is een belangrijke functie van groene daken.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Universiteit Utrecht

Isoleren is een belangrijke functie van groene daken.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Ik woon graag in een groene omgeving.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Groene daken dragen effectief bij aan het oplossen van de gevolgen van klimaatverandering.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Ik maak me zorgen over toekomstige gevolgen van klimaatverandering in mijn buurt.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Ik heb al gevolgen van klimaatverandering gezien in mijn buurt.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

We hebben in deze buurt vaker last van de gevolgen van klimaatverandering.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Groene daken leveren persoonlijke voordelen op.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Groene daken leveren voordelen op voor mijn buurt.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

8. In hoeverre ervaart u in het algemeen een gevoel van sociale samenhang of gemeenschap in de Zandweerd buurt?

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9. In hoeverre bent u het met de volgende uitspraken eens?

Ik heb het gevoel dat Zandweerd een hechte buurt is.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Ik onderneem graag dingen samen met mijn buren.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Ik leer mijn buren graag beter kennen.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Universiteit Utrecht

Het is voor mij belangrijk om een goede buur te zijn.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

10. In hoeverre was uw dak al geschikt voor een groen dak?

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11. In hoeverre had u toegang tot de benodigde middelen om een groen dak te installeren?

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12. In hoeverre bent u het met de volgende uitspraken eens?

Ik heb de financiële middelen om een groen dak te (laten) installeren.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Ik heb voldoende kennis en informatie over het (laten) installeren van het groene dak.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Ik heb de tijd en kennis die nodig is voor het (laten) onderhouden van het groene dak.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Dit groene daken initiatief stelt mij beter in staat om een groen dak te (laten) installeren, dan wanneer ik dit alleen zou ondernemen.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Mijn groene dak gaat bijdragen aan het verminderen van de gevolgen van klimaatverandering in mijn directe omgeving.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Mijn groene dak gaat bijdragen aan een beter klimaat.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Samen gaan de groene daken van zandweerd bijdragen aan het verminderen van de gevolgen van klimaatverandering in de directe omgeving.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Samen gaan de groene daken van zandweerd bijdragen aan een beter klimaat.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Universiteit Utrecht

13. In hoeverre heeft u het gevoel dat uw buurtgenoten bereid zijn om mee te doen aan een groene daken initiatief?

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14. In hoeverre bent u het met de volgende uitspraken eens?

Ik hecht waarde aan de mening van mensen in mijn omgeving (buren, familie, vrienden).

☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Ik heb het gevoel dat er van mij verwacht wordt (van buren, familie, vrienden) dat ik wel mee zou doen aan een groene daken initiatief.

☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Ik heb het gevoel dat mijn buurtgenoten het groene daken initiatief ondersteunen.

☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

15. In hoeverre heeft u het gevoel verantwoordelijk te zijn om een bijdrage te leveren aan een beter klimaat?

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16. In hoeverre bent u het met de volgende uitspraken eens?

De verantwoordelijkheid om (de gevolgen van) klimaatverandering aan te pakken ligt bij de overheid.

☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Het (laten) installeren van een groen dak is een voorbeeld van het nemen van je verantwoordelijkheid om een bijdrage te leveren aan een beter klimaat.

☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Ik ben me bewust van de negatieve impact van de mens op het klimaat.

☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Universiteit Utrecht

Ik neem een groen dak om de negatieve impact op het klimaat van mij en mijn medemens (deels) te compenseren.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Ik voel me schuldig over mijn potentiële negatieve impact op het klimaat.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Het (laten) installeren van een groen dak laat me beter voelen over mijn impact op het klimaat.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

17. In hoeverre vindt u het uw morele plicht om een bijdrage te leveren aan het aanpakken van klimaatverandering en de gevolgen daarvan?

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18. In hoeverre bent u het met de volgende uitspraken eens?

Ik heb aanpassingen gemaakt in mijn dagelijks leven om mijn impact op het klimaat te verminderen.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Ik vind het belangrijk om mijn omgeving te vergroenen.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Ik voel de noodzaak en het verlangen om het klimaat te verbeteren.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Klimaatverandering is een probleem.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

De ernst van klimaatverandering wordt overdreven door de wetenschap en/of de media.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Universiteit Utrecht

Algemene vragen

Wat is de samenstelling van uw huishouden?	O Eenpersoonshuishouden met kinderen O Eenpersoonshuishouden zonder kinderen O Meerpersoonshuishouden met kinderen O Meerpersoonshuishouden zonderen kinderen 0 Anders
Wat is uw behaalde onderwijsniveau?	O Basisonderwijs O Vmbo, havo-, vwo-onderbouw, mbo1 O Have, vwo, mbo 2-4 O Hbo-, wo-bachelor O Hbo-, wo-master O Doctor, PhD
Wat is uw huidige beroep?	.....
Wat is ongeveer het inkomen van uw huishouden per maand?	o 0-500 euro o 500-1000 euro o 1000-2000 euro o 2000-3000 euro o 3000-4000 euro o 4000-5000 euro o 5000-7500 euro o 7500-10.000 euro o >10.000 euro
Hoe identificeert u zich?	O Man O Vrouw O Beide O Geen van beide
Wat is uw leeftijd?	O <18 O 18-25 O 26-35 O 36-45 O 46-55 O 56-65 O 66-75 O > 75

Hartelijk dank voor uw deelname!
Heeft u nog vragen/opmerkingen? Zet het hieronder neer.

.....

Wilt u de onderzoeksresultaten ontvangen? Stuur mij een mailtje! 😊

Appendix A2: the complete questionnaire as was distributed door to door to non-members of the Zandweerd green roof initiative. It includes the informed consent on the front page.

Universiteit Utrecht

Beste bewoner van Zandweerd,

Hartelijk dank voor uw deelname aan mijn afstudeeronderzoek naar het groene daken initiatief in Zandweerd.

Het doel van mijn onderzoek is om inzicht te krijgen in beweegredenen van bewoners om wel of juist niet mee te doen aan het groene daken initiatief in Zandweerd. Uw antwoorden op deze vragenlijst zullen bijdragen aan een overzicht van de belangrijkste motivatiefactoren, aan verdere ontwikkeling van de wetenschappelijke literatuur, en aan beleidsaanbevelingen aangaande vergroening.

Uw deelname

- ✓ Het invullen van de vragenlijst duurt ongeveer 15-20 minuten.
- ✓ Deelname aan dit onderzoek is volledig vrijwillig. U ben niet verplicht antwoord te geven op de vragen, en u kunt uw deelname op elk moment stoppen.
- ✓ Uw antwoorden worden anoniem verwerkt in het onderzoek en zullen niet naar u terug te herleiden zijn.

Ik vertrouw dat ik u hiermee voldoende heb geïnformeerd en wens u succes met het invullen van de vragenlijst!
Voor vragen/opmerkingen kunt u altijd bij mij terecht.

Vriendelijke groeten,

Lineke Hiemstra
l.hiemstra@students.uu.nl
+31629038542

MSc student Duurzame Ontwikkeling – Faculteit Geowetenschappen

De vragenlijst start op de volgende bladzijde

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1. Hoe bent u bekend geraakt met het groene daken initiatief?

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2. Heeft u contact gehad met het duurzaamheidsteam Zandweerd? Zo ja, hoe zag dat contact eruit?

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3. Wat was uw reden om niet mee te doen aan het groene daken initiatief?

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4. Hoe ziet u de balans tussen de investering die het kost, en de voordelen die het oplevert om groene daken aan te schaffen via het initiatief?

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5. In hoeverre bent u het met de volgende uitspraken eens?

De voordelen die groende daken opleveren wegen op tegen wat je erin investeert (qua tijd en geld).

☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Universiteit Utrecht

Het sociale aspect van deelname aan dit initiatief zou een motiverende factor zijn om deel te nemen.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

De kosten die ik zou kunnen besparen door deel te nemen aan dit initiatief zouden een motiverende factor zijn om deel te nemen.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

De milieuvriendelijkheid van het initiatief zou een motiverende factor zijn om deel te nemen.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Ik zou het niet erg vinden om te betalen voor een groen dak omdat het persoonlijke voordelen oplevert.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Ik zou het niet erg vinden om te betalen voor een groen dak omdat het voordelen voor de buurt oplevert.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

6. In hoeverre heeft u het gevoel dat groene daken helpen bij het aanpakken van de gevolgen van klimaatverandering?

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7. In hoeverre bent u het met de volgende uitspraken eens?

Ik ben goed op de hoogte van de gevolgen van klimaatverandering in stedelijke gebieden.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Groende daken helpen bij het tegengaan van klimaatverandering.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Lokale verkoeling is een belangrijke functie van groene daken.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Water vasthouden is een belangrijke functie van groene daken.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Bijdragen aan de biodiversiteit is een belangrijke functie van groene daken.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Universiteit Utrecht

Isoleren is een belangrijke functie van groene daken.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Ik woon graag in een groene omgeving.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Groene daken dragen effectief bij aan het oplossen van de gevolgen van klimaatverandering.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Ik maak me zorgen over toekomstige gevolgen van klimaatverandering in mijn buurt.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Ik heb al gevolgen van klimaatverandering gezien in mijn buurt.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

We hebben in deze buurt vaker last van de gevolgen van klimaatverandering.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Groene daken leveren persoonlijke voordelen op.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Groene daken leveren voordelen op voor mijn buurt.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

8. In hoeverre ervaart u in het algemeen een gevoel van sociale samenhang of gemeenschap in de Zandweerd buurt?

.....

.....

.....

.....

9. In hoeverre bent u het met de volgende uitspraken eens?

Ik heb het gevoel dat Zandweerd een hechte buurt is.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Ik onderneem graag dingen samen met mijn buren.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Ik leer mijn buren graag beter kennen.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Universiteit Utrecht

Het is voor mij belangrijk om een goede buur te zijn.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

10. In hoeverre zou uw dak geschikt zijn voor een groen dak?

.....

.....

11. In hoeverre heeft u toegang tot de benodigde middelen om een groen dak te installeren?

.....

.....

.....

.....

12. In hoeverre bent u het met de volgende uitspraken eens?

Ik heb de financiële middelen om een groen dak te (laten) installeren.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Ik heb voldoende kennis en informatie over het (laten) installeren van het groene dak.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Ik heb de tijd en kennis die nodig zou zijn voor het (laten) onderhouden van het groene dak.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Dit groene daken initiatief zou mij beter in staat stellen om een groen dak te (laten) installeren, dan wanneer ik dit alleen zou ondernemen.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Als ik een groen dak zou installeren, dan draagt dat bij aan het verminderen van de gevolgen van klimaatverandering in mijn directe omgeving.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Als is een groen dak zou installeren, dan draagt dat bij aan een beter klimaat
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Samen dragen de groene daken van Zandweerd bij aan het verminderen van de gevolgen van klimaatverandering in de directe omgeving.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Universiteit Utrecht

Samen dragen de groene daken van Zandweerd bij aan een beter klimaat.

☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

13. In hoeverre heeft u het gevoel dat uw buurtgenoten bereid zijn om mee te doen aan een groene daken initiatief?

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14. In hoeverre bent u het met de volgende uitspraken eens?

Ik hecht waarde aan de mening van mensen in mijn omgeving (buren, familie, vrienden).

☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Ik heb het gevoel dat er van mij verwacht wordt (van buren, familie, vrienden) dat ik wel mee zou doen aan een groene daken initiatief.

☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Ik heb het gevoel dat mijn buurtgenoten het groene daken initiatief ondersteunen.

☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

15. In hoeverre heeft u het gevoel verantwoordelijk te zijn om een bijdrage te leveren aan een beter klimaat?

.....

.....

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.....

16. In hoeverre bent u het met de volgende uitspraken eens?

De verantwoordelijkheid om (de gevolgen van) klimaatverandering aan te pakken ligt bij de overheid.

☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Het (laten) installeren van een groen dak is een voorbeeld van het nemen van je verantwoordelijkheid om een bijdrage te leveren aan een beter klimaat.

☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Universiteit Utrecht

Ik ben me bewust van de negatieve impact van de mens op het klimaat.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Als ik een groen dak zou installeren, dan zou ik dat doen om de negatieve impact op het klimaat van mij en mijn medemens (deels) te compenseren.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Ik voel me schuldig over mijn potentiële negatieve impact op het klimaat.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Als ik een groen dak zou installeren dan zou dit me beter laten voelen over mijn impact op het klimaat.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

17. In hoeverre vindt u het uw morele plicht om een bijdrage te leveren aan het aanpakken van klimaatverandering en de gevolgen daarvan?

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18. In hoeverre bent u het met de volgende uitspraken eens?

Ik heb aanpassingen gemaakt in mijn dagelijks leven om mijn impact op het klimaat te verminderen.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Ik vind het belangrijk om mijn omgeving te vergroenen.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Ik voel de noodzaak en het verlangen om het klimaat te verbeteren.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Klimaatverandering is een probleem.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

De ernst van klimaatverandering wordt overdreven door de wetenschap en/of de media.
☐ Volledig oneens ☐ Oneens ☐ Neutraal ☐ Eens ☐ Volledig eens

Universiteit Utrecht

Algemene vragen

Wat is de samenstelling van uw huishouden?	O Eenpersoonshuishouden met kinderen O Eenpersoonshuishouden zonder kinderen O Meerpersoonshuishouden met kinderen O Meerpersoonshuishouden zonderen kinderen 0 Anders
Wat is uw behaalde onderwijsniveau?	O Basisonderwijs O Vmbo, havo-, vwo-onderbouw, mbo1 O Have, vwo, mbo 2-4 O Hbo-, wo-bachelor O Hbo-, wo-master O Doctor, PhD
Wat is uw huidige beroep?	.....
Wat is ongeveer het inkomen van uw huishouden per maand?	o 0-500 euro o 500-1000 euro o 1000-2000 euro o 2000-3000 euro o 3000 4000 euro o 4000-5000 euro o 5000-7500 euro o 7500-10.000 euro o >10.000 euro
Hoe identificeert u zich?	O Man O Vrouw O Beide O Geen van beide
Wat is uw leeftijd?	O <18 O 18-25 O 26-35 O 36-45 O 46-55 O 56-65 O 66-75 O > 75

Hartelijk dank voor uw deelname!
Heeft u nog vragen/opmerkingen? Zet het hieronder neer.

.....

Wilt u de onderzoeksresultaten ontvangen? Stuur mij een mailtje! 😊

Appendix B: Average score per statement per condition for non-members and members. Only the statements of the members are displayed. For the exact statements presented to non-members, see appendix A2. The statements are translated from Dutch to English, and statements with a '*' are reversed scored.

	Non-member			**Member**		
Statements return of investment	*N*	Mean	SD	*N*	Mean	SD
Green roofs yield more benefits in comparison to the requires investment (of time and money)	30	**3.3**	0.88	15	**4.47**	0.74
The social aspect of participating in this initiative was a motivating factor for me to participate	29	**2.8**	0.85	15	**3.60**	1.1
Monetary savings by participating in this initiative were a motivating factor for me to participate	29	**3.27**	1.02	15	**3.33**	1.5
Environmental benefits were a motivating factor for me to participate	30	**3.87**	0.97	15	**4.67**	0.49
I do not mind paying for a green roof because it yields personal benefits	30	**3.33**	0.84	15	**4.27**	0.59
I do not mind paying for a green roof because it yields benefits for the neighborhood	30	**2.93**	0.91	15	**4**	0.85
	Non-member			Member		
Statements perceived salience	*N*	Mean	SD	*N*	Mean	SD
I am aware of climate change problems in urban areas	30	**3.57**	0.9	15	**4.27**	0.59
Green roofs contribute to climate change mitigation	29	**3.41**	0.95	15	**4.53**	0.52
Local cooling is an important effect of green roofs	29	**3.76**	0.87	15	**4.47**	0.64
Water retention is an important effect of green roofs	29	**3.72**	0.75	15	**4.47**	0.74
Contributing to biodiversity is an important effect of green roofs	29	**3.90**	0.67	15	**4.67**	0.62
Insulation is an important effect of green roofs	30	**3.67**	0.6	15	**4.33**	0.82
I like to live in a green environment	30	**4.33**	0.55	15	**4.73**	0.46
Green roofs are effective in contributing to solving climate change problems	30	**3.27**	1.02	15	**4.33**	0.62
I am worried about future climate change problems in my neighborhood	30	**3.37**	0.89	15	**3.87**	0.92
I have already noticed effects of climate change in my neighborhood	29	**2.72**	0.88	15	**3.27**	0.96
In this neighborhood, we are more often affected by climate change effects	30	**2.63**	0.67	15	**3.07**	0.88
Green roofs yield personal benefits	30	**3.37**	0.89	15	**4.27**	0.88
Green roofs yield benefits for my neighborhood	29	**3.45**	0.83	15	**4.20**	0.76
	Non-member			Member		
Statements group identification	*N*	Mean	SD	*N*	Mean	SD
I feel that Zandweerd is a tight-knit community	30	**3.23**	0.73	15	**3.47**	0.92
I like to do things together with my neighbors	29	**2.83**	0.89	15	**3.87**	0.83
I enjoy getting to know my neighbors better	29	**3.31**	0.81	15	**4.13**	0.83
For me, it is important to be a good neighbor	29	**4.03**	0.57	15	**4.6**	0.51

	Non-member			Member		
Statements subjective capacity	*N*	Mean	SD	*N*	Mean	SD
I have sufficient financial resources to install a green roof	30	**3.13**	1.01	15	**4.6**	0.51
I have adequate knowledge and information about the installation of a green roof	30	**2.77**	0.94	15	**4.47**	0.52
I have the time and knowledge needed for the long-term maintenance of the green roof	30	**2.87**	0.9	15	**4.40**	0.51
Due to this green roof initiative, I am more capable in installing a green roof, compared to if I had to do it by myself	29	**3.41**	0.95	15	**4.67**	0.62
My green roof will contribute to reducing the effects of climate change in the direct vicinity.	30	**3.33**	0.92	15	**4.33**	0.72
My green roof will contribute to a better climate	30	**3.33**	0.88	15	**4.47**	0.64
Together the green roofs of Zandweerd will contribute to reducing the effects of climate change in the direct vicinity.	30	**3.48**	0.95	15	**4.53**	0.52
Together, green roofs will contribute to a better climate	30	**3.27**	0.91	15	**4.6**	0.51

	Non-member			Member		
Statements peer pressure	*N*	Mean	SD	*N*	Mean	SD
I value the opinion of others in my environment (neighbors, family, friends)	30	**3.2**	0.85	15	**3.53**	0.99
I feel that others would have expected me to participate in a green roof initiative	30	**2.13**	0.82	15	**3.13**	1.3
I have a feeling that neighbors support this green roof initiative.	30	**2.80**	0.85	15	**3.80**	0.94

	Non-member			Member		
Statements sense of own responsibility	*N*	Mean	SD	*N*	Mean	SD
* The government has the sole responsibility to undertake action against (the effects of) climate change.	30	**2.47**	0.97	15	**2.53**	0.99
Installing a green roof is an example of taking your own responsibility for a better climate	30	**3.43**	0.9	15	**4.33**	0.62
I am aware of the negative impact of humans on the environment	30	**4.03**	0.85	15	**4.27**	1.1
I am installing a green roof to (partially) compensate my and humanity's negative impact on the environment	30	**3.13**	0.94	15	**4**	0.76
I feel guilty about my potential negative impact on the environment.	30	**2.43**	0.9	15	**3.1**	0.88
Installing a green roof makes me feel better about my impact on the environment	29	**2.83**	1.11	15	**4.13**	0.74

	Non-member			Member		
Statements environmental values	*N*	Mean	SD	*N*	Mean	SD
I have made adjustments in my daily life to reduce my impact on the environment	30	**3.67**	0.8	15	**4.27**	0.59

I find it important to create more green and nature in my environment	30	**3.80**	0.81	15	**4.73**	0.46
I feel the need and want to improve the environment	30	**3.47**	0.94	15	**4.4**	0.51
Climate change is a problem	30	**4.23**	0.97	15	**4.6**	0.51
* The gravity of climate change is exaggerated by science and / or the media	30	**3.63**	1.1	15	**4.27**	1.1

Appendix C1: The invitation pamphlet send by email to members of the initiative to invite them to participate in this study.

BESTE BEWONER,

Ik ben opzoek naar respondenten voor een kort interview

Het onderzoek

Voor mijn afstudeeronderzoek aan de universiteit van Utrecht doe ik onderzoek naar het groene daken buurtinitiatief van Zandweerd.

Ik ben benieuwd naar de beweegredenen van bewoners om wel of niet mee te doen en een groendak te (laten) installeren.

De interviews

Ik zou u graag interviewen, ook als u heeft besloten geen groendak aan te schaffen.

- De interviews duren maximaal 30 minuten.
- De interviews worden online georganiseerd.
- Het onderzoek loopt tot augustus / begin september.
- Ik pas me graag aan uw agenda aan!

De resultaten

Uw interview draagt bij aan een overzicht van de belangrijkste motivatiefactoren, aan verdere ontwikkeling van de wetenschappelijke literatuur en aan beleidsaanbevelingen om vergroening te stimuleren.

Ik hoop dat u hier net zo enthousiast tegenover staat als ik!

Mag ik u benaderen voor een interview?
Laat dan via de link contactgegevens achter:

https://forms.gle/aCJgc3JbXup3sSbB9

Universiteit Utrecht

Of stuur me een berichtje

Naam: Lineke Hiemstra
Email: l.hiemstra@students.uu.nl
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Appendix C2: The invitation pamphlet that was posted on several social media pages of neighborhood associations in Zandweerd to invite residents to participate in my study.