

Co-Creating Socially Inclusive Urban Nature-Based Solutions:

Towards a framework for socially inclusive co-creation processes



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SUMMARY

The use of nature-based solutions (NBS) for urban resilience is gaining prominence in both academic research and the urban planning domain. NBS can be characterized for their action-oriented approach to addressing problems, and the proclaimed co-benefits NBS can provide for the environment, society, and economy. However, empirical research shows that the consideration for social benefits is often lacking in urban NBS design and implementation processes, specifically lacking consideration for issues of equity and social inclusion. As a result, research shows that urban NBS can cause socially exclusive effects by underrepresenting the interests and experiences of marginalized and vulnerable groups in the local area, potentially causing green gentrification and physical displacement of predominantly low-income households. This problem is partly caused due to the lack of a framework for socially inclusive design processes of urban NBS. As a potential means to fill this gap, a creation process which centres around the engagement of citizens during the entire process of developing local solutions may hold the answer to achieving socially inclusive urban NBS. However, literature on co-creation shows that there is an implementation gap between the intended diverse representation of stakeholders as well as deeper levels of participation through a co-creation process, and the challenges of meeting these goals in practice, also in part due to the lack of a framework for co-creation that incorporate issues of social inclusivity.

With this problem framing, the objective of this study is to develop a novel framework for socially inclusive co-creation for urban NBS. To develop the framework, a multi-methods research approach was used by developing, applying and validating the framework. First, a literature-based framework was developed building off on relevant bodies of literature, including environmental justice and citizen participation. A funnel-down approach was used to conceptualize and operationalize the framework indicators for a socially inclusive co-creation process for urban NBS. To test the literature-based framework, a comparative case study was conducted on the EU-funded CLEVER Cities project, which focuses on co-creating socially inclusive urban NBS with citizens. This empirical confrontation led to adjustments in the framework, as well as inductively derived new indicators and conditions required for a co-creation process to be socially inclusive. This confrontation led to the development of the empirically-confronted framework. Lastly, this empirically-confronted framework was validated through a validation workshop with academic experts. The workshop led to further refinements of the framework to enhance the consistency and future usability, and the development of the validated framework.

The research shows that guiding principles are needed for the entire co-creation process, as well as for each individual co-creation stage. Additionally, the extent to which a co-creation process can be socially inclusive depends on required inputs for citizen engagement and inputs for the implementation of NBS. Overall, the empirical confrontation and the validation of the framework highlight the importance of collectively defining the local problems experienced by citizens as the starting point of the co-creation process. Moreover, the study highlights the importance ensuring the accessibility of the process for diverse social groups, and considering implications for social trade-offs potentially caused by the implementation of the NBS early on with citizens. The validated framework is a starting point to help practitioners develop future urban NBS design processes that revolve around issues of social inclusivity through the use of a co-creation process. Finally, it contributes to a socially sustainable transition.

Key words: co-creation, social inclusion, urban NBS, framework, citizen engagement

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CHAPTER 1. INTRODUCTION

1.1 Problem description

With the onset of current and predicted climate change impacts, cities will need to find innovative ways to deal with pressures such as extreme heat, drought, and extreme precipitation (Revi et al., 2015). As a response to these pressures, an emergence of research and experimentation with urban climate adaptation measures has taken surge (Geneletti & Zardo, 2016). Within the practice of urban climate adaptation, prominence has been placed on the use of nature-based solutions (NBS). The term NBS is used as a broad stroke over multiple practices that involve the use and inclusion of nature for mitigation and adaptation purposes (Pauleit et al., 2017). NBS is understood as an umbrella term for practices such as green infrastructure (GI) and ecosystem-based adaptations (EbA) (Pauleit et al., 2017). Introduced by the International Union for Conservation of Nature (IUCN) to address climate mitigation and biodiversity goals, NBS are thus defined as “actions to address societal challenges through the protection, sustainable management and restoration of ecosystems, benefiting both biodiversity and human well-being” (IUCN, 2020). Within the urban environment, NBS have been shown to reduce extreme heat through natural cooling effects of green spaces, and reducing flooding through natural processes of water infiltration (Emilsson & Sang, 2017).

The uptake of NBS within cities has been facilitated by international programs such as 100 Resilient Cities in which cities are provided support to implement NBS through toolkits and guidelines (Chadsey & Grenfell, 2018). The excitement and promise of NBS to ameliorate climate stresses in cities has been promoted by the European Commission (EC) Horizon 2020 Programme through funding several research initiatives using NBS in front-runner cities. The EC defines NBS as “solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience” (EC, 2020). As seen from the definitions of NBS, one of the reasons for the strong promotion of NBS in cities is due to the proclaimed co-benefits that can be provided.

Within the literature on NBS, there is wide consensus that these greening projects can address multiple issues simultaneously, namely, environmental, economic and social issues (European Commission, 2020; Faivre et al., 2017; Kabisch, Frantzeskaki, Pauleit, Naumann, Davis, et al., 2016). Hence the reason they are emphasized as being ‘solutions’, fit for numerous problems. For instance, NBS have been said to address societal issues such as reducing poverty and enhancing cohesion and provide economic benefits through cost-effectiveness and stimulating green business (Raymond et al., 2017). However, scholars have pointed out that the co-benefits of NBS are often proclaimed as a justification for their implementation, but that in practice the social dimension of urban NBS tends to remain vague and overlooked, and the evidence of social impacts through urban NBS is limited (Haase, 2017; Haase et al., 2017).

On examinations of urban NBS, scholars have criticized the missing consideration for issues of social inclusion and justice (Rutt & Gulsrud, 2016; Tozer et al., 2020). Urban NBS are frequently implemented without considerations for social trade-offs, leading to uneven distributions of costs and benefits (Chu et al., 2017). Social exclusion caused by urban NBS can take shape when the desires for economic benefits are placed above considerations for social cohesion which in turn causes the value of an area to rise, thereby creating a situation where marginalized groups can no longer afford to live in the area, and are forced to leave (Kotsila et al., 2021). Moreover, the implementation of NBS can attract investment and cause

changes in the character and culture of the neighbourhood, a phenomenon labelled as ‘green gentrification’ (Dooling, 2009). Processes of green gentrification take place due to a lack of consideration for the socio-economic or socio-spatial differences within cities (Haase, 2017; Anguelovski et al., 2019). From a distributive justice lens, NBS currently do not take sufficient account for the urban socio-economic inequalities, and thus threaten to create or enhance already existing socio-economic inequalities through a process of socio-spatial exclusion (Tozer et al., 2020). Next to concerns for distributive justice, questions on procedural and recognitional justice are brought to the front. In other words, who has a seat at the decision-making table, whose interests are represented, and which perspectives are eventually included in the final design and decisions regarding the implementation of urban NBS? Scholars point to the need for inclusive participation and representation in urban NBS as a means to include the diversity of needs and perspectives of the local community into the design, thereby tailoring the NBS to the local context and thereby avoiding the effects of social exclusion through urban greening (Dushkova & Haase, 2020). Puskas, Abunnasr and Naalbandian (2021) add on to this point by stating that deeper levels of citizen participation in the creation of urban NBS with emphasis on social learning and representing the diversity of the local community can avoid urban NBS projects from being captured by the neoliberal agenda which causes the aforementioned social exclusionary effects.

While most of the literature on urban NBS currently focuses on the associated co-benefits, few papers emphasize the negative effects of urban NBS, and even fewer pay attention to the need for setting up socially inclusive design processes. This overall lack of knowledge on how to set up socially inclusive design processes for urban NBS creates an implementation gap between the intended co-benefits of NBS and the lack of or unevenly distributed social benefits of urban NBS (Puskas, Abunnasr and Naalbandian, 2021). Thus there remains the question on how to set up socially inclusive processes for urban NBS which incorporates deeper levels of citizen participation. Our attention can be turned to co-creation, an innovative governance process which aims to collectively solve local problems through the collaboration of different actors (Lund, 2018). Co-creation processes, in which citizens are given an elevated decision-making role together with other stakeholders, have been claimed as a governance innovation that can incorporate the needs of the local context, and promote an inclusive design process (Basnou et al., 2020). Thus, co-creation is a promising approach to developing socially inclusive design processes for urban NBS.

While co-creation processes can use public participation as a means to promote socially inclusive solutions by collectively solving local problems, practitioners struggle with putting the potential of a socially inclusive co-creation process into practice (Leino & Puumala, 2020). This points to the importance of the form and level of public participation in the co-creation process, as this can either limit or enhance social inclusivity. Participation cannot simply be used as a means to gain legitimacy or resources from citizens, but must take on a normative approach to achieve inclusivity (Ferilli et al., 2016; Uittenbroek et al., 2019b). Overall, scholars are searching for innovative governance approaches to develop inclusive urban NBS, and while co-creation process may hold the answer, an evaluative framework on socially inclusive co-creation processes is missing in the literature, and thus limits the knowledge on how to use co-creation as a means to develop socially inclusive NBS.

1.2 Research objective and questions

The research objective of this paper is to contribute to insights into how to develop and implement socially inclusive urban NBS through a co-creation process by developing a novel

evaluative framework. A multitude of European projects are developing urban NBS through co-creative processes (such as RECONNECT, URBAN GreenUP, GROW GREEN), however these projects seem to focus on the inclusivity of various stakeholder and sectors rather than on the social inclusivity of citizens. From these projects CLEVER Cities, a European funded project, stands out as it aims to use co-creation process to develop social inclusive urban NBS, which is tested by the Front Runner (FR) cities of the project (CLEVER Cities, n.d.). Therefore the CLEVER Cities project carried out by the FR cities, specifically Hamburg and Milan, provides a unique opportunity to test the evaluative framework. Moreover, due to the novelty of developing the evaluative framework, the framework will be validated by experts. Overall this thesis aims to set the first steps towards a novel framework for socially inclusive urban NBS through co-creation, and is driven by the following research question:

How can principles of social inclusion be woven into a co-creation process for urban nature-based solutions?

The following sub-questions will create the guidance needed to answer the main research question:

SQ1: Which characteristics and principles of socially inclusive urban nature-based solutions can be derived from the literature on urban nature-based solutions and inclusive urban green space?

SQ2: Which characteristics and principles for socially inclusive nature-based solutions can be derived from the literature on co-creation, and how can these integrate with the findings of SQ1 to develop a literature-based evaluation framework?

SQ3: To what extent do the front-runner cities of the CLEVER Cities project (Hamburg and Milan) meet the indicators of the evaluative framework, and how does this confrontation lead to new adjustments in the framework?

SQ4: How do experts on co-creation governance and urban nature-based solutions view the framework and its application, how do these views contribute to the validity of the framework and lead to new adjustments?

SQ5: What insights can be learned from the creation and the application of the framework for socially inclusive urban NBS governance practices?

1.3 Scientific and societal relevance

This research holds both scientific and societal relevance as it contributes to a broader understanding of socially inclusive processes for urban NBS and by using a co-creation process this research provides practitioners with the tools for enhancing the social inclusivity of urban NBS projects. Firstly, this research contributes to the scientific literature on urban NBS and green gentrification by providing a potential avenue to avoid the social exclusionary effects of urban NBS, such as physical displacement due to price increases, or by overlooking the interests of marginalized and vulnerable groups in the area (Anguelovski et al., 2019). As urban NBS are not inherently socially inclusive and considering that the literature currently misses a framework to ensure the social inclusivity of NBS (Haase, 2017), this research adds to the literature by creating a novel evaluative framework combining the principles of social inclusivity with a co-creation process this research provides new insights through a structured

overview of the elements needed for a socially inclusive design process of urban NBS. Moreover, the evaluative framework also contributes to the literature on co-creation by enhancing the elements of social inclusivity within a co-creation process, an aspect that is currently overlooked in the literature (Leino & Puumala, 2020).

Furthermore, this research holds societal relevance as the developed framework can be used as a tool to help practitioners implement urban NBS which adhere to principles of social inclusivity. Therefore, the framework contributes to enhancing the equitable distribution of social benefits from urban NBS by clearly delineating a co-creation process which can be followed by practitioners in the future. This research helps to fill the implementation gap faced by urban planners and practitioners who intend to conduct socially inclusive urban planning approaches, but fail to meet the goals in practice (Ferilli, et al., 2016; Puskas, Abunnasr & Naalbandian, 2021). Overall, this research helps to ensure that future implementations of urban NBS which are needed to reduce climate vulnerabilities in cities, will provide socially inclusive benefits and contribute to a sustainable and just transition.

1.4 Research Framework

To achieve the research objective of developing a framework for socially inclusive co-creation for urban NBS, the following steps shown in Figure 1 will be taken. Firstly, a literature review on urban NBS, environmental justice, and citizen participation is conducted as a backdrop to further conceptualize socially inclusive urban NBS, and co-creation processes. These conceptualizations point towards specific principles of socially inclusive urban NBS and socially inclusive co-creation. Finally these principles lead to specific indicators in the evaluation framework, and therewith answering SQ1 and SQ2 (see Figure 1). After the literature-based framework has been developed, the framework is applied to the case study of the CLEVER Cities project. The empirical confrontation of the case study leads to adjustments in the framework, and the development of the empirically-confronted framework, therewith answering SQ3. This is followed by a validation workshop with academic experts on urban NBS and co-creation, and further adjustments of the framework leading to the validated framework, answering SQ4. Lastly, to answer SQ5, the validated framework and its implications for scholars of urban NBS and co-creation, as well as for practitioners is presented.

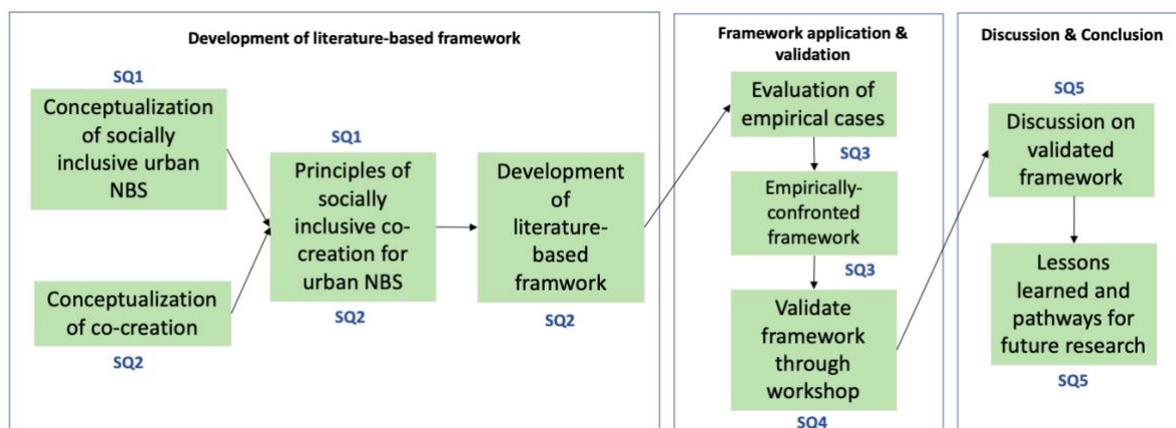


Figure 1. Research framework.

The remaining chapters are structured as follows. Chapter 2 provides the conceptualization socially inclusive urban NBS and co-creation, which leads to corresponding principles, and guides towards the literature-based framework. Chapter 3 presents the research methodology

used within this thesis. Chapter 4 presents the case descriptions of the CLEVER Cities project, and descriptions of the two cities taking part of the project, namely, Hamburg and Milan. In Chapter 5, the Hamburg and Milan case will be evaluated using the literature-based framework. The empirical confrontation leads to adjustments in the framework, and inductively derived indicators and conditions for a socially inclusive co-creation process found within the case study will be presented. Chapter 5 ends with the presentation of the empirically-confronted framework. In Chapter 6, the empirically-confronted framework is validated through a workshop with academic experts, leading to further adjustments and the validated framework. Chapter 7 presents a reflection on the findings, the theoretical implications and recommendations for practitioners, as well as a reflection on the research approach. Lastly, Chapter 8 presents a conclusion to the research question, and avenues for further research.

CHAPTER 2. THEORETICAL AND CONCEPTUAL BACKGROUND

Due to the complexity of creating a novel framework, a funnel down approach is used to research the literature-based evaluation framework. This is done by first drawing upon relevant bodies of literature in section 2.1, namely urban nature-based solutions (NBS), environmental justice and citizen participation. These help to contextualize the conceptualizations of socially inclusive urban NBS and co-creation in sections 2.2. and 2.3 respectively. Next, principles associated with each concept will be delineated based on a personal categorization in section 2.4. Finally, the funnel down approach will end the literature-based framework in section 2.5 and sets the first step in the direction of a novel framework for socially inclusive co-creation for urban NBS.

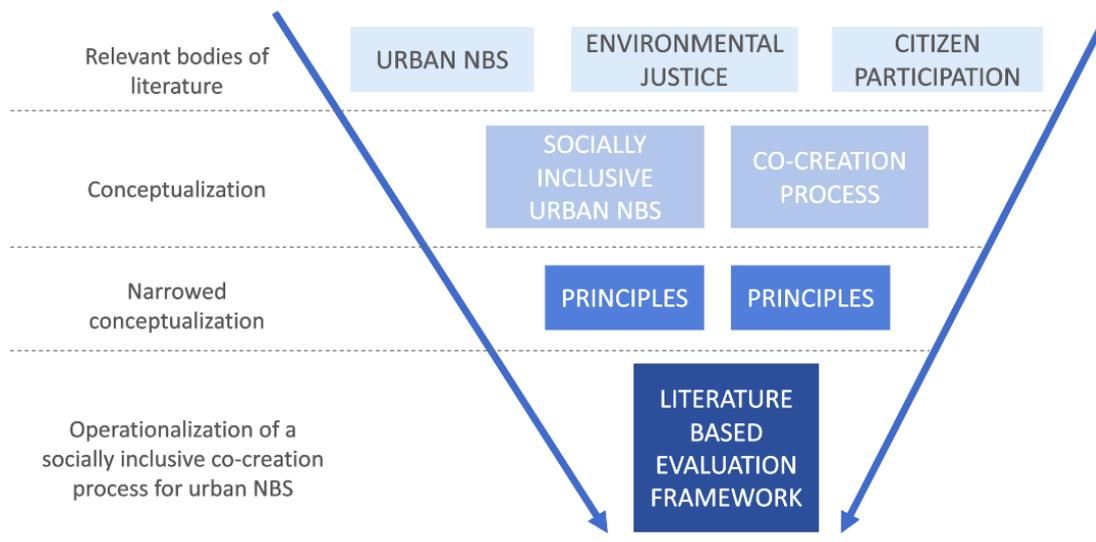


Figure 2. Funnel down approach used for the theoretical and conceptual framework.

2.1 Relevant bodies of literature

2.1.1 Urban nature-based solutions (NBS)

Nature-based solutions (NBS) are being seen as an integral component for sustainable transitions, they are defined by the European Commission as “solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental and economic benefits and help build resilience” (EC, 2020). Additionally the definition adds that “such solutions bring more, and more diverse, nature and natural features and processes into cities, landscape and seascape, through locally adapted resource-efficient and systemic interventions” (EC, 2020). The definition and scope of NBS is broad, and can therefore include various forms and scales of NBS ranging from large grey-green infrastructural projects such as storm water management structures, to small scale gardening projects (Pauleit et al., 2017). The term NBS implies through its reference to ‘solutions’ a strong problem-solving approach, but the application of NBS in planning practices is still under-developed (Pauleit et al., 2017). Especially in the urban domain NBS are being seen as solutions to climate change induced urban challenges such as urban heat stress, or flooding. Therefore, NBS are becoming largely intertwined into urban planning and policy based on the proclaimed co-benefits which NBS can provide, including, environmental benefits, economic growth, and social benefits such as improved well-being and social cohesion (Raymond et al., 2017; Haase et al., 2017). However,

empirical research has shown that the proclaimed social benefits of urban NBS can be questioned (Dushkova & Haase, 2020; Chu, Anguelovski & Roberts, 2017; Anguelovski et al., 2019).

The debate on the social impact of urban NBS is largely centred around the lack of normativity towards environmental justice and inclusivity through the implementation of NBS (Haase et al., 2017; Shi et al., 2016, Dushkova & Haase, 2020). Research has shown that green spaces in lower-class neighbourhoods have consistently been under maintained, of lower quality and smaller compared to more affluent neighbourhoods (Anguelovski et al., 2019). This disparity between neighbourhoods points to the distributive and socio-spatial justice of green spaces often based on race, income and gender discrimination (Dushkova & Haase, 2020). Although the implementation of NBS could be used to redress these inequalities, research has shown that strong socio-economic interests and urban power inequalities are frequently guiding the implementation of urban NBS (Dushkova & Haase, 2020; Chu, Anguelovski & Roberts, 2017).

Nevertheless, there are opportunities to enhance the social equity and justice within urban NBS plans. For instance, by first scoping out the local problems faced by citizens, the implementation can better address the social challenges (Raymond et al., 2017). This requires a participatory decision-making approach together with the diversity of local citizens, to create a locally developed solution, something which is still often missing (Dushkova & Haase, 2020, Raymond et al., 2017). A local participatory process will allow the social and cultural needs of citizens by connecting to local knowledge, and thereby shaping the NBS into a solution that will be used and inclusive (Dorst et al., 2019). Moreover, the placement of the NBS in areas lacking access to quality green space or environmental benefits can attempt to redress the inequalities. However, if the improvement of environmental qualities in an area is not controlled, this may lead to an increase of property values and create an exclusive effect (Raymond et al., 2017). This is because a thorough examination of the scale and trade-offs of urban NBS, regarding the winners and losers, is still often lacking (Frantzeskaki, 2019; Haase et al., 2017). Thereby urban NBS are a double-edged sword, on the one hand exacerbating social and environmental inequalities, but on the other hand, if NBS are designed with a narrative for environmental justice and social inclusion they have the potential to design truly socially beneficial solutions.

2.1.2 Environmental justice

The concept of environmental justice is built upon three foundational pillars of justice, namely, just distributions, just procedures, and just recognition (Schlosberg, 1999). Firstly, just distribution relates to the equitable or otherwise inequitable distribution of environmental risks and benefits (Schlosberg, 1999). In other words, which social groups benefit from climate adaptation interventions, and which groups are deprived of these benefits since they are spatially bound to live near environmental risks or climate-vulnerable areas. The distribution of environmental risks and climate vulnerabilities is disproportionately distributed to marginalized groups, often based on race, ethnicity, and income (Anguelovski et al., 2019). To ensure just distribution as an outcome, a process of redistribution is needed to rectify spatial inequalities and to deliver environmental benefits to groups who have been excluded (Castán Broto & Westman, 2019).

Secondly, procedural justice relates to the idea of legitimate inputs. This notion of justice raises questions around who is participating in the process, and by contrast, who is excluded from participating? Procedural justice is therefore an important prerequisite for achieving just

distributions (Schlosberg, 1999). Emphasis should be placed on the idea that equitable participation is needed but is not satisfactory, it must be complemented with equitable deliberation where all voices can be heard and represented (Castán Broto & Westman, 2019).

Thirdly, just recognition relates to the concept of political recognition of marginalized groups excluded from political processes (Schlosberg, 1999; Schlosberg et al., 2017). Recognizing the needs and interests of excluded groups requires attention to the structural power dimensions that prevent excluded groups from self-determination (Castán Broto & Westman, 2019). Without recognition of the most vulnerable groups in society, procedures and outcomes will continue to exclude marginalized groups and enhance inequalities (Castán Broto & Westman, 2019). Bulkeley (2014) states that recognition is intrinsically connected to all pillars of justice and that procedural and distributive justice must be viewed in tandem with each other. This highlights the interdependency of all three pillars of justice, and denotes that achieving justice requires all three pillars simultaneously.

Within these three pillars of environmental justice, scholars point to the importance of acknowledging social power structures that prevent social inclusivity in regards to environmental benefits, specifically urban climate adaptation measures in this case (Bulkeley, 2021; Castán Broto & Westman, 2019; Chu et al., 2017; van der Jagt et al., 2021; Woroniecki et al., 2020). Exclusion in all pillars of environmental justice is rooted in urban power inequalities which privilege better off groups at the expense of marginalized groups (Chu et al., 2017). Power can be understood as having the resources and position within political and social institutions to voice interests and set agendas. This points to the barriers faced by local groups or citizens who often do not have the capacity needed to be represented within social institutions or who cannot voice their interests regarding environmental protection measures (Schlosberg, 2012). As such, acknowledging existing social power imbalances, and empowering marginalized groups becomes a fundamental element overarching all three pillars of justice.

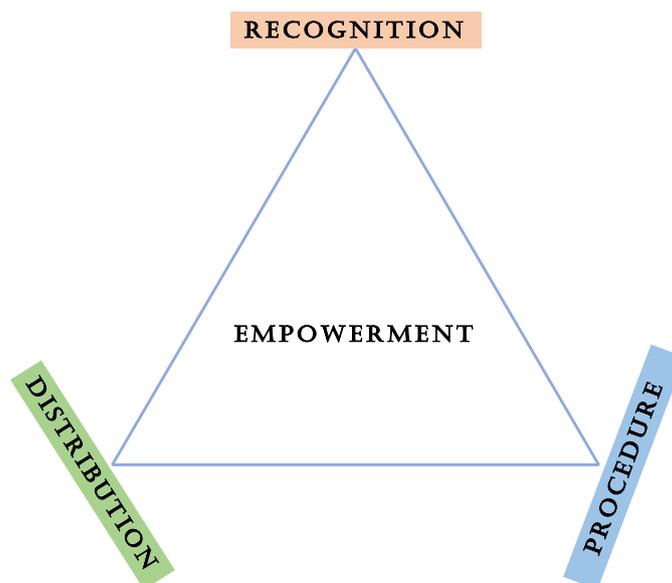


Figure 3. Visual representation of the linkages between the pillars of environmental justice, and the relation with empowerment. (Author)

A representation of the interlinkages between the pillars of environmental justice and the notion of empowerment can be seen in Figure 3. The three pillars of environmental justice, in the

foreground of social power structures, set the stage for an evaluative and normative approach for socially inclusive urban NBS, which will be used to conceptualize socially inclusive urban NBS (see section 2.2).

2.1.3 Citizen participation

The need for citizen participation in urban climate adaptation planning is widely recognized (Wamsler et al., 2020; Uittenbroek et al., 2019b; Puskas, Abunnasr & Naabbandian, 2021). Public participation in urban climate adaptation planning, specifically NBS, is important for its ability to incorporate local knowledge into the design and maintenance. Moreover, citizen participation is important for the acceptance or support from the public regarding the NBS, as well as the promotion of social learning between citizens and local officials (Uittenbroek et al., 2019b). However, depending on the design of the participation process, the degree of citizen representation and influence over decision-making can be limited or encouraging.

Citizen participation can be understood through various typologies concerning the levels of citizen participation as well as the rationales for employing such a process. Regarding the levels of participation, the most well-known typology of citizen participation comes from Arnstein's ladder of participation (1969). Arnstein depicts the various levels of citizen participation as a ladder, with low to high levels of citizen participation based on the power citizens have to make decisions in the planning process. The highest level of citizen participation is citizen control, followed by delegated power, and partnership. These three levels of citizen participation are considered the three degrees of citizen power (Arnstein, 1969). The preceding lower levels such as placation, consultation or informing are considered degrees of tokenism where citizens have no real power to influence decision-making. Luyet et al. (2012) has made a similar typology for the levels of citizen participation within environmental projects, namely levels of information, consultation, collaboration, co-decision, and empowerment. In both Arnstein (1969) and Luyet et al.'s (2012) typologies, citizen empowerment is the highest level of citizen participation where power to make decision is delegated to the stakeholders.

Not can citizen participation be understood through the levels of influence citizens truly have, but also by the rationale for employing such a process in the first place. Uittenbroek et al. (2019b) have distinguished three rationales for public participation. The first being a normative rationale, focused on enhancing citizens' ability to influence decisions, social learning and empowering marginalized groups. The second rationale is substantive, meaning that public participation is used for collecting local information and knowledge. Lastly, public participation can be used with an instrumental rationale, implying that the focus is placed on generating legitimacy or resolving conflicts (Uittenbroek et al., 2019b). These rationales link back to the levels of citizen participation, with a normative rationale promoting higher levels of citizen power for decision-making. Uittenbroek et al. (2019b) also point to the importance of *who*, *when* and *how* public participation involves citizens, and the implications for diversity and citizens' influence in decision-making. Considering *who*, efforts should be placed on ensuring that those who are not able to raise their voices can be heard in a participation process (Ferilli, Sacco & Blessi, 2016). As Uittenbroek et al. (2019b) state, the goals should be a complete representation of interests. To do so, a participation process needs to be redesigned to redress power and capability imbalances to allow marginalized groups to be included (Ferilli, Sacco & Blessi, 2016). Next, the importance of *when* citizens can take part in a planning process has repercussions for the influence citizens can hold. The later citizens join a process, the less influence for decision-making is available, instead citizen should be involved from the beginning when setting goals (Uittenbroek et al., 2019b). Regarding the *how*, a deliberative

process is claimed to give the most room for citizen influence due to the ability for citizens to share experiences and engage in discussion (Uittenbroek et al., 2019b; Geczi, 2017).

Overall, citizen participation processes can either be used to gain legitimacy for a pre-defined planning process, or can be a genuine attempt to engage citizens in the planning process by giving them influence over decision-making (Ferilli, Sacco & Blessi, 2016). To achieve the latter, stakeholders need to address the *who*, *when* and *how* of a participation process to ensure that the diversity of the community is represented, and citizens have influence in the decision-making process.

2.2 Conceptualizing Socially Inclusive Urban Nature-Based Solutions

Before delineating the principles and indicators for socially inclusive urban NBS in the framework, it is necessary to first conceptualize the term for a better understanding of how the concept will be applied throughout this thesis. This conceptualization is necessary to answer SQ1 as shown in the research framework, Figure 1. As mentioned in the previous section 2.1, socially inclusive urban NBS is supported by the bodies of literature on environmental justice. Although the notion of social inclusivity is implied within the pillars of environmental justice, the concept itself needs further clarification. This section first conceptualizes the concept of social inclusion from a socio-political perspective, and then conceptualizes the term in the context of urban nature-based solutions.

2.2.1 Social inclusion

Social inclusion as explained by Collins (2003) states that while the concept and its implications remain vague, it is clear that “social inclusion is an aim or principle of justice” (pg. 22). The lack of a clear definition of social inclusion and thus a lack of understanding on how to operationalize the concept becomes a challenge when the concept is used in practice (Collins, 2003; Oxoby, 2009; Mirzoev et al., 2021). However, there is a common understanding of the general underlying meanings of social inclusion. Most often social inclusion can be understood by comparing it to its counter definition, social exclusion (Kazmierczak & James, 2007; Kohon, 2018; Oxoby, 2009). Social exclusion is defined as “a complex and multi-dimensional process [revolving around] the lack or denial of resources, rights, goods and services, and the inability to participate in the normal relationships and activities available to the majority of people in society, whether in economic, social, cultural, or political arenas. It affects both the quality of life of individuals and the equity and cohesion of society as a whole” (Levitas et al., 2007, pg. 9 as cited in Kohon, 2008). This definition highlights the lack of an individual’s access to common rights and resources due to barriers preventing access to social institutions (Oxoby, 2009). The definition indicates that an individual’s inability to participate and benefit from social institutions affects their quality of life and has a greater impact on social cohesion within society. Following this understanding of social exclusion, social inclusion can be seen as a process and goal focused on eliminating structures that prevent individuals or groups from accessing and benefiting from social institutions.

2.2.2 Social inclusion vs. equal treatment

To further explain the process and goal of social inclusion as redressing the structures that prevent individuals from accessing and benefiting from social institutions, Collins (2003) makes a distinction between the equal treatment principle and social inclusion. Although the principle of equal treatment of individuals may seem fair at first, Collins (2003) argues that a

straightforward equal treatment principle will only continue to disadvantage marginalized groups since they do not have the capabilities that are needed to have equal opportunities (Collins, 2003). Therefore, we must move away from a strict principle of equal treatment for all, and move towards a process redressing unequal distribution of resources and opportunities. In other words, social inclusion deviates away from equal treatment and gives preferential treatment to groups who have fewer opportunities and resources. Collins (2003) makes the point that the process of reaching social inclusion should focus on the goal for a socially inclusive outcome, which cannot happen if the process does not work to redress inequalities. Scholars mention that socially inclusive measures and outcomes need to focus on disadvantaged or marginalized groups however there are no robust means for determining which groups are disadvantaged (Collins, 2003; Kohon, 2018; Anguelovski, Connolly & Brand, 2018). The identification of disadvantaged groups is in part based on the local context and the objective of social inclusion in that context (Collins, 2003). However, some groups are structurally discriminated against, such as ethnic minority groups or immigrants, people with disabilities and women, who should serve as the exception. Following these understandings of social inclusion, the concept can be defined as “the process of improving the terms of participation in society for social groups that experience disadvantage, through enhancing opportunities, access to resources, voice, and respect for rights on which individuals and groups take part in society” (Mirzoev et al., 2021). This definition and understanding of social inclusion will be further conceptualized in the context of urban NBS.

2.2.3 Social inclusion in the context of urban NBS

With the concept of social inclusion defined, the concept can be applied to the context of urban NBS. The implementation of NBS in urban areas can be seen as a double-edged sword, on the one hand contributing to the social cohesion and social inclusivity of the community, while on the other hand if the implementation does not take into account the pillars of social justice and existing inequalities, the NBS can contribute to socially exclusive urban development through processes of displacement or unbalanced urban upgrading (Haase, 2017; Kazmierczak & James, 2007). The potential for NBS to promote socially inclusive urban development ultimately depends on the willingness of urban decision-makers and planners to implement ideas of justice and social inclusion into planning agendas (Haase, 2017). Socially inclusive urban development can be described as “a development considering the needs and wants of all groups of urban inhabitants as well as the different capabilities, capacities and constraints of people to benefit from goods and not to suffer from burdens” (Haase, 2017, pg. 223). Meanwhile, widespread attention for the use of NBS in urban development initiatives has been increasing among local authorities and urban planners, however, Anguelovski, Connolly & Brand (2018) warn for the urban greening orthodoxy which exacerbates inequalities. The urban greening orthodoxy includes the assumptions that urban NBS will provide economic, environmental and social benefits, thereby creating an often technocratic implementation approach that fails to acknowledge existing social vulnerabilities and side-steps meaningful participation with citizens through dialogue-centred approaches, potentially leading to processes of social and physical displacement as a result of increase in value prices of buildings near the urban greenery (Anguelovski, Connolly & Brand, 2018).

Despite the dangers of urban NBS potentially exacerbating social inequalities, scholars have researched elements of socially inclusive urban NBS that can be taken into account when designing and implementing urban greening projects (Haase, 2017; Rutt & Gulsrud, 2016; Kohon, 2018; de Kleyn, Mumaw & Corney, 2020). The decision-making and implementation procedures for urban NBS should be socially centred, with attention to inclusivity in the process

by incorporating citizen participation (Rutt & Gulsrud, 2016). Additionally, the focus should be placed on the quality of the participation and inclusion of citizens throughout the process to ensure that citizens can express their deeper level needs, interests and experiences regarding green space in their local neighbourhood (Rutt & Gulsrud, 2016). In other words, the process cannot simply be democratic but should allow for deliberation with citizens. Moreover, decision-making around urban NBS cannot disregard existing socio-spatial inequalities of different social groups regarding access to quality green spaces. Furthermore, project leaders often decide which stakeholders and participants should get a seat at the table, thereby implicitly excluding people based on preconceived ideas of which stakeholders are relevant for the development of NBS (Mirzoev, et al., 2021).

In terms of socially inclusive participation and engagement of citizens, a key aspect of an urban NBS project is to make participation accessible. Accessibility is displayed in the awareness for different cultures, and tailoring engagement processes according to cultural differences (Kohon, 2018). Awareness of different cultures is necessary since not all social groups or individuals will feel able or welcomed to join an open invitation for participating in a local neighbourhood project. This is related to the point of Collins (2003), namely that an equal treatment approach without considering the barriers individuals face will implicitly exclude social groups and individuals from participating. Therefore targeted outreach to specific social groups based on cultural differences is needed to make engagement accessible and to foster a better sense of belonging for diverse groups (Kohon, 2013). Furthermore, accessibility is demonstrated by the form of communication used by project leaders with citizens. Citizens can feel discouraged to participate if the processes use technical terms such as biodiversity are used without explanation, however, citizens can understand complex terms and concepts if explained through everyday familiar language (de Kleyn, Mumaw & Corney, 2020). On a deeper level, communication with citizens should centre around their experiences and conceptions of nature for a more responsive and inclusive means of developing urban NBS (de Kleyn, Mumaw & Corney, 2020).

2.2.4 Socially inclusive urban NBS connections with environmental justice pillars

In regards to the design of urban NBS, the scale of the NBS interventions should be appropriate for achieving both environmental and social benefits, while avoiding attracting large investments. That is to say that the NBS needs to be large enough to address climate change threats while staying small enough to appropriately address local social issues (Shi et al., 2016). Additionally, the NBS needs to be designed with consideration for both intended and unintended long-term effects (Mirzoev et al., 2021). Since the interventions are placed in a dynamic urban context, NBS can trigger unintended exclusionary effects such as green gentrification (Anguelovski et al., 2019). In other words, socially inclusive NBS needs to take into account the scale of the intervention in terms of spatial scale effects, and time scale effects.

Turning back to the environmental justice framework, Van der Jagt, Kiss, Hirose & Takahashi (2021) and Toxopeus et al. (2020) have used the three dimensions of justice to evaluate the politics of nature-based solutions in the city. In the context of urban NBS, distributional justice refers to the provision of inclusive access to the benefits of urban NBS in the short- and long-term, focusing on social groups who have previously been excluded from these benefits. Procedural justice entails the removal of barriers for inclusive participation and representation of the community, again stressing the importance of including and representing social groups who are often excluded from these processes. Moreover, an inclusive procedure requires knowledge brokerage between participants to include the needs and interests of the local

community. Lastly, just recognition entails that NBS are designed in a manner that is inclusive to racial, ethnic, gender, age, and disabled contextual demands (van der Jagt et al., 2021).

Additionally, using the justice pillars in pursuit of inclusive urban NBS, scholars have mentioned the importance of reflexive engagement through discourse with a diverse set of stakeholders through a collaborative and horizontal engagement and deliberation process (Castán Broto & Westman, 2019; Schlosberg & Collins, 2014; van der Jagt et al., 2021). Collaborative partnerships create a space to define a common goal between stakeholders by drawing in various forms of knowledge, including local experiences. Thereby co-creation as a collaborative and engaging process with emphasis on the role of citizens holds potential as a means to achieve socially inclusive urban NBS design and implementation.

2.3 Conceptualizing the co-creation processes

To delineate the principles and indicators of the co-creation processes needed to answer SQ2, it is first important to conceptualize what is meant with co-creation and the co-creation process (SQ2).

2.3.1 Origins of the co-creation concept

The term ‘co-creation’ has gained significant attention in the public sector being promoted as a tool to be used for the creation of fairer, sustainable and socially centred cities (Leino & Puumala, 2020). Yet, despite the increasing trend of public actors picking up co-creation as an approach, the definition and process of ‘co-creation’ remain loosely defined (Ramaswamy & Ozcan, 2018). The term ‘co-creation’ stems from the private sector indicating a practice in which the users of a service or product may take over a certain function within the production process. End-users participating in the process add value to the creation of the service by incorporating their shared experiences in the design (Voorberg et al., 2015). Thus co-creation strays away from traditional design processes in which products or services are designed for the user. Instead, co-creation turns towards a process in which products and services are designed with end-users. The concept of ‘co-creation’ has been brought over from the private sector into the public sector, where the end-users are citizens. In the public sector, co-creation is driven by a need for social innovation to address societal needs (Leino & Puumala, 2020; Voorberg et al., 2015). Social innovation points to the need for cross-collaboration between public, private and civil society actors to collectively find innovative solutions for societal problems (Nyseth et al., 2019). Thus, co-creation in the social sector focuses on joint problem and solution finding together with citizens as key participants. Scholars emphasize that the goal of co-creation is to collectively define problems and find solutions through a cooperative design process emphasizing the valuable role of citizens’ input to address societal problems and develop innovative solutions (DeLosRíos-White et al., 2020; Basnou et al., 2020).

2.3.2 Co-creation vs. co-production

The concept of co-creation is closely linked to that of co-production of knowledge, as both require the integration of diverse knowledge through collaborative and engaging processes for the development of a collective output (Voorberg et al., 2015). The concept of co-production is important to understand co-creation due to the overarching similarities. As such co-production is an “iterative and collaborative processes involving diverse types of expertise, knowledge and actors to produce context-specific knowledge” (Norström et al, 2020, pg. 2). These definitions show the importance of ensuring a diversity of actors and knowledge to

promote collective learning between stakeholders. The process of diverse actors sharing and learning from each other to reach a joint solution is iterative, implying that the process is not linear but involves multiple feedback rounds to get to the outcome. Despite the use of the term co-production to understand co-creation, a clear distinction of the terms is marked by the emphasis co-creation places on creating a collective value together with the actors, whereas co-production focuses on achieving a pre-defined output (Voorberg et al., 2015). To develop a socially valued outcome, a diverse mapping of stakeholders is needed with a focus on the expertise that citizens can bring in the process (Norström et al., DeLosRíos-White et al., 2020, Basnou et al., 2020). Moreover, in a co-creation process, all actors have a focus on maximization of the creation of public value through the diversity in resources and capabilities that stakeholders can bring in the collaborative process (Torfing et al., 2019).

2.3.3 Roles in the co-creation process

The co-creation process is an engaging process that can integrate a diverse range of knowledge from actors to address local needs. This context-specific element is crucial to develop sustainable transitions that take into account the local context (Norström et al., 2020; Webb et al., 2018). The actors in the co-creation process often include public administrators, industry, academia and civil society, also known as the quadruple-helix (Foth, 2017; Leino & Puumala, 2020). This configuration of actors highlights the transdisciplinary nature of the co-creation process. However, this cross-disciplinary nature of co-creation requires the actors involved to take on new horizontal roles, an essential element of the co-creation process which is often a barrier to the potential to develop social value (Torfing et al., 2019). Leino and Puumala (2020) highlight that the capacity for innovation within a co-creation process depends on the ability of stakeholders to accept and take on a fundamental change in their role, and position in relation to other stakeholders throughout the co-creation process. This restructuring of roles requires a shift in the perceptions stakeholders hold over their roles as participants (Torfing et al., 2019).

Regarding the role of citizens in the co-creation process, authors claim that it is important to involve citizens throughout the entire process to ensure they can contribute to the shaping of the problem and solutions (Leino & Puumala, 2020). However, although it may be easier for public or private stakeholders to take on a role in the co-creation process, citizens often face more barriers. Namely, the characteristics of individual citizens will largely determine if they participate in a co-creation process. These characteristics include their skills, level of education and intrinsic values, but also their sense of ownership and sense of their ability to take on a role in the co-creation process (Voorberg et al., 2015). To overcome this challenge, those organizing the co-creation process hold the responsibility for lowering the threshold for citizens to take on a participating role (Voorberg et al., 2015).

2.3.4 Social learning and openness

A key component of a co-creation process is the openness towards a diversity of stakeholders and knowledge, and how this knowledge is shared and incorporated to develop a socially valued solution. Webb et al. (2018) point to the importance of establishing an open and inclusive process from the beginning of the co-creation. This early openness is crucial for allowing a broad framing of the knowledge to be incorporated throughout the co-creation. By creating a broad framing of the process early on, there is more room for flexibility in the diversity of knowledge and types of experiences that can be integrated. Moreover, setting the openness of the process will facilitate enhanced reflexivity and iterative thinking throughout the co-creation process (Webb et al. 2018). Likewise, Torfing et al. (2019) state that co-creation

processes solicit a shift from a focus on throughput legitimacy towards input and output legitimacy. Rather than focusing on the process of integrating various knowledge and expertise, the focus should be on allowing a broader scope for types of knowledge in the first place to give citizens a larger voice on the outputs of the co-creation process. Moreover, a stronger emphasis on input legitimacy enhances the opportunity for citizens to actively take part in shaping local solutions (Torfing et al., 2019).

Besides opening up the input of the co-creation process, deliberation throughout the process is needed to facilitate shared ownership with a broader group, and to create consensus regarding the form the co-creation process will take on (Peurari et al., 2018). The process should be open to a wider scope of collaboration between the participants to achieve a shared vision on the output and the process itself. Moreover, the techniques used within the co-creation process should promote continuous and iterative social learning between the participants. Iterative social learning is a key element for understanding participants expressions of knowledge and personal experiences needed for the creation of a shared vision to work towards (Basnou et al., 2020). The co-creation dynamics can stimulate social learning around participants place-based knowledge and social structures that will lead to a process of creating a solution that is better in tune with integrated societal demands with the solution (Basnou et al., 2020). In addition, Ramaswamy and Ozcan (2018) stress that the social value of a co-creation process is not only determined by the output, but more importantly through the interactions within the process that shape how the output is created, and how the value of the solution is defined.

2.3.5 Socially inclusive co-creation and empowerment

The previous sections illustrate the various elements of co-creation that can enhance citizen participation, and open the process to promote inclusivity of knowledge, stakeholders and social learning in the creation of valued solutions. Co-creation processes can be socially inclusive and empower citizens in the creation of local solutions, however, this depends on specific components of a co-creation process that either enhance or limit the social inclusivity (Torfing et al., 2019). For a co-creation process to be socially inclusive, participation and empowerment of citizens in a co-creation process can neither be seen as an incentive nor a means to legitimize a process (Leino & Puumala, 2020; Peurari et al., 2018). Rather, participation and empowerment are fundamental goals of a socially inclusive co-creation process, to which the entire process is planned accordingly. This needs to be done by operationalizing the co-creation process according to the citizens' capacities and understanding of their participation in the development of a solution (Leino & Puumala, 2020).

Moreover, a socially inclusive co-creation process must address and re-organize power relations that exist between stakeholders to ensure power imbalances do not skew the process and exclude the participation of certain individuals or forms of knowledge which comparatively hold less influence (Leino & Puumala, 2020; Basnou et al., 2020). Power struggles between stakeholders can influence the direction and boundaries of a co-creation process, thereby limiting the potential for openness for a diversity of knowledge, and iterative social learning in the hopes to create a socially valued output (Norström et al., 2020; Basnou et al., 2020). To overcome the exclusionary effect of limited knowledge weaving due to power discrepancies, there must be a capacity to adapt the communication and knowledge to be understood by all participants, especially citizens (Basnou et al., 2020). Additionally, the inclusion of diverse citizens in a co-creation process requires the role of mediators to appropriately engage citizens according to their capacities and cultural values (Leino & Puumala, 2020). Lastly, Toxopeus et al. (2020) make the point that although open participation

of stakeholders and citizens is needed for representative diversity, this may have exclusionary effects since an open process may articulate the voices of those more represented. Again, this stresses the importance of tailoring the co-creation process to the specific capabilities of citizens to redress imbalances.

2.3.6 Co-creation process framework

The co-creation process is conceptualized through an iteration of steps, and although specific steps in the process are debated among scholars, there is consensus on three main stages within the co-creation process (Leino & Puumala, 2020; Raymond et al., 2017; Toxopeus et al., 2020; Lupp et al., 2021). The first stage is the identification of local problems and relevant stakeholders focused on end-users or people who would receive the most benefits of the solution. In the first stage, an in-depth analysis of participants' needs sets the basis for the co-creation process (Lupp et al., 2021). The second stage is the design and testing of the solution through participatory and deliberative processes. Once a solution has been designed, the final stage is the implementation of the solution, and subsequent evaluations through a monitoring process.

Although the three stages set a general outline of a co-creation process, DeLosRíos-White et al. (2020) have attempted to create a detailed co-creation framework by mapping out the life cycle of a co-creation process for urban NBS. Their framework indicates the iterative stages and sub-stages of a co-creation endeavour. The conceptualization of the co-creation process can be seen in Figure 4. The co-creation stages are built upon a systemic thinking approach, with a participatory and user-centred focus, thereby capturing the focus on the engagement of citizens and learning together with them to design NBS with most social value. Moreover, the co-creation process includes a co-management stage which adds an additional long-term timeframe to the co-creation process which is often missing in most other co-creation descriptions (DeLosRíos-White et al., 2020). Research in academic literature on co-creation process frameworks for urban NBS projects with a user-centred focus, has shown that the framework by DeLosRíos-White et al. (2020) is the most comprehensive and suited framework to date. Therefore, the co-creation process framework will be used as the backbone of the evaluation framework (see section 2.5).

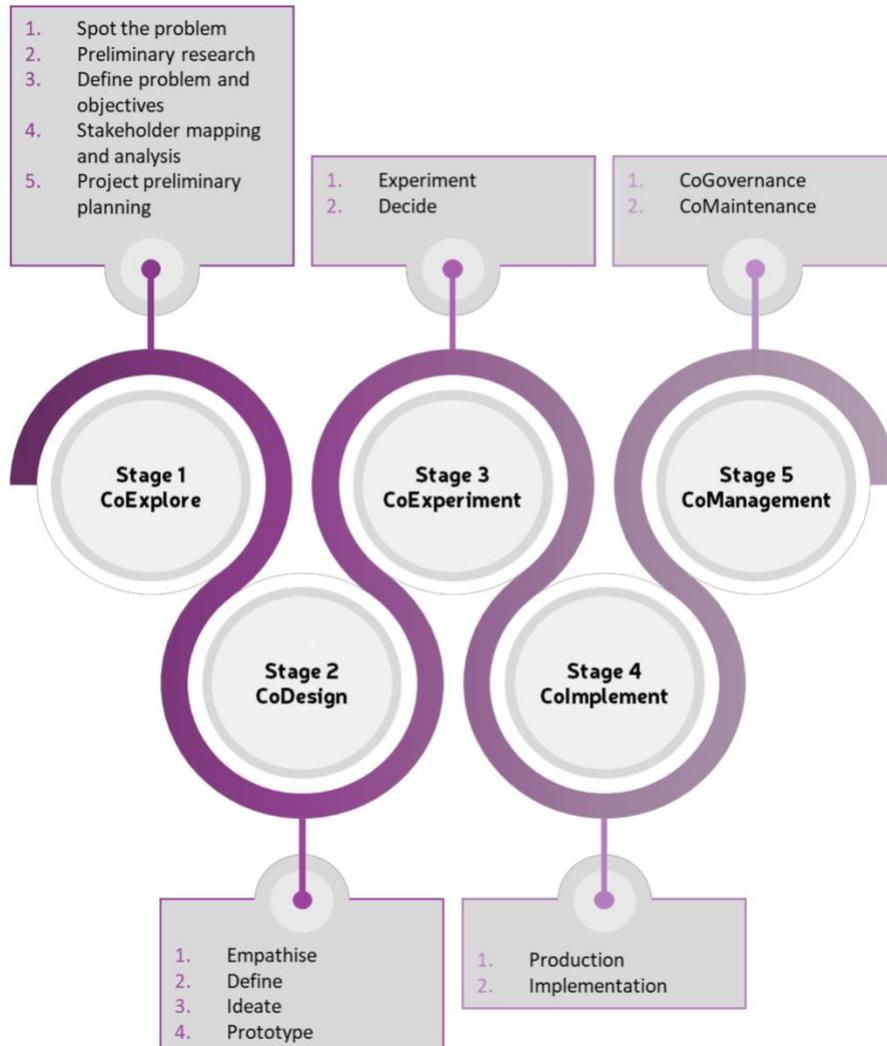


Figure 4. Stages and sub-stages of the co-creation process (DeLosRíos-White et al., 2020)

As shown in Figure 4, the co-creation process starts with the co-explore stage, with sub-stages including spotting the problem, stakeholder mapping and setting a preliminary project planning. The co-explore stage is important for collecting the information that will guide the co-creation process (DeLosRíos-White et al., 2020). Therefore it is important that this stage is open towards various forms of local information and local stakeholders, citizens, to start the process with an inclusive frame. The second stage, co-design, is a stage where the problems and solutions are better defined together with stakeholders by empathizing with their needs and wishes, combined with a deeper analysis of concerns and struggles that may exist (DeLosRíos-White et al., 2020). The design ideas of the NBS from this stage constantly receives feedback from the co-experiment stage (stage 3). The third stage centres around evaluating the ideas from the co-design stage and feeding back into the second stage as many times as needed until a most desirable solution has been co-designed. The fourth stage, co-implement involves the production and implementation of the NBS, while managing the budget and finance of the NBS (DeLosRíos-White et al., 2020). The final stage, co-management, comprises of creating a governance structure in line with the new roles of local authorities and citizens, as well as ensuring that the NBS can be maintained over a long-term by drawing on stakeholders' sense of ownership towards the solution.

As mentioned, this co-creation structure of the stages will create the backbone of the evaluation framework, although the sub-stages will not be used to delineate sub-stages in the evaluation framework they are used to shape an understanding of the co-creation process stages.

2.4 Principles of socially inclusive co-creation for urban NBS

The following section will identify the principles of socially inclusive urban NBS and socially inclusive co-creation respectively, guided by the previous conceptualizations in sections 2.2 and 2.3. These principles have been delineated through a personal categorization based on the literature, since existing principles for both concepts currently does not exist in literature. These principles will guide the identification of specific indicators for social inclusivity in a co-creation process that will be brought together in section 2.5 to build the evaluative framework. Table 1 presents an overview of the principles for socially inclusive urban NBS and socially inclusive co-creation which will be described in the following sections.

Table 1. List of identified principles for socially inclusive urban NBS and co-creation.

Category	Principle
Socially inclusive urban NBS	Planners acknowledge socio-economic and socio-spatial inequalities
	Social inclusivity as the starting point for designing NBS
	Diversity of citizens and their knowlegde is represented
	NBS are designed for inclusive effects at different scales
	Non-profit and sustainable financing of the NBS
	Accessibility in the decision-making process of the NBS
Socially inclusive co-creation	Co-creation organizers facilitate a flexible and open process
	Sufficient reflexive and social learning takes place
	Diverse stakeholder mapping
	Citizens take on active roles in the co-creation process
	The co-creation process strives towards empowering citizens
	Co-creation participants set colletive goals
	Power imablances are addressed by the co-creation oragnizers

These principles are my own categorization based on readings of the literature, and will be used as input for the evaluation framework, organized according to the stages of the co-creation process from the framework of DeLosRíos-White et al. (2020) (Figure 4).

2.4.1 Principles of socially inclusive urban NBS

With stages of the co-creation process (Figure 2) forming the base of the evaluative framework, together with the conceptualization of socially inclusive urban NBS in section 2.2, it becomes possible to identify principles for socially inclusive urban NBS. These principles will be drawn from the literature on social inclusivity within urban NBS, urban climate adaptation planning, urban GI, and urban green space (Haase et al., 2017; Rutt & Gulsrud, 2016; Shi et al., 2016; Tozer et al., 2020). NBS can promote inclusivity within the city, but can also lead to exclusionary effects due to how they are designed, planned and executed (Tozer et al., 2020). The literature identifies recommendations and requirements for achieving a socially inclusive process and outcome of urban NBS. These recommendations are scattered across the literature and will be aggregated and categorized in light of the environmental justice lens and stages of

the co-creation process to indicate principles needed for inclusive urban NBS to answer SQ1. Subsequently, these principles will feed into the evaluative framework.

Planners acknowledge socio-economic and socio-spatial inequalities

Referring back to notions of distributional justice and recognition, scholars point to the need to recognize and redress socio-economic and socio-spatial inequalities within the city when planning to implement NBS (Bulkeley et al., 2014; Rutt & Gulsrud, 2016; Shi et al., 2016; Tozer et al., 2020). Exclusionary effects of NBS result from inadequate recognition of spatial injustices regarding access to benefits of NBS, and quality of the NBS. Lack of access to and quality of urban green spaces is correlated with low socio-economic characteristics of residential areas (Rutt & Gulsrud, 2016). Failing to acknowledge existing socio-economic and socio-spatial inequalities regarding access to urban greenery benefits can further exacerbate inequalities and lead to spatial polarization (Tozer et al., 2020). Therefore, a principle for inclusive urban NBS is to acknowledge distributional inequalities and ensure that disadvantaged groups will benefit from the implementation of NBS (Haase, 2017; Bulkeley et al., 2014).

Social inclusivity as the starting point for designing NBS

The first principle that stands out in the literature is the importance of integrating ideas of social justice and inclusion at the beginning of the design process for urban regeneration through NBS (Haase, 2017). It seems crucial for inclusivity to be a starting point for designing urban NBS as this determines how the process will continue to be framed and planned. Woroniecki (2020), highlights the importance of the initial framing of NBS by highlighting that framing how a NBS is valued and for which purposes it should be used affects which actors are seen as important, and which knowledge is seen as legitimate. Research shows that NBS which have been framed through a materialist or infrastructural perspective prioritize scientific knowledge in the co-production process, and thereby exclude forms of local knowledge from communities (Shi et al., 2016; Woroniecki et al., 2020). Therefore, to make urban NBS socially inclusive, the initiation of the project must be framed through goals for social inclusion. This is done by critically engaging in questions of how nature can benefit those who are most vulnerable, to recognize their needs and interests and therewith develop NBS that includes diverse needs and values of nature by local communities (Bulkeley et al., 2014; Schlosberg et al., 2017; Tozer et al., 2020). Moreover, this implies that actors wishing to design an urban NBS are aware of the negative social impacts associated with NBS and aim to redress the negative impacts.

Diversity of citizens and their knowledge is represented

Complementary to acknowledging spatial inequalities in the city, fostering social inclusion through urban NBS calls for the inclusion of a diversity of people participating in the design, implementation, and evaluation stages (Rutt & Gulsrud, 2016). The disregard of different needs and demands by the community, especially disadvantaged groups in the community, will lead to extended forms of exclusion (Toxopeus et al., 2020). The inclusion of diverse communities and communities who are often excluded, in the development of NBS allows for a tailored creation of NBS which incorporates the local interests and structures of the social context (Tozer et al., 2020; Shi et al., 2016). Moreover, the diversity in citizen representation needs to be complemented by the incorporation of diverse forms of knowledge. This diversity of knowledge extends beyond people's needs to include people's experience and understanding of their place, as well as their values for nature (de Kleyen et al., 2020). Thereby, the third

condition is to include local community participants, especially disadvantaged groups, to promote a diversity of local knowledge in the creation of urban NBS.

NBS are designed for inclusive effects at different scales

Furthermore, creating inclusive urban NBS requires careful consideration of both short-term and long-term effects (Shi et al., 2016; Tozer et al., 2020). Processes that favour short-term interests over long-term effects can lead to displacement and exclusion of social groups (Shi et al., 2016). Thus, developing inclusive urban NBS is a balancing act between addressing current forms of exclusion while being cautionary for potential future forms of exclusion (Schlosberg et al., 2017). To balance the effects in both short and long-term spatial scales requires a systems thinking approach to identify how trade-offs can be avoided or minimized (Haase, 2017). These trade-offs occur between the potential co-benefits of NBS, namely, social, environmental and social costs. Bulkeley (2021) adds on that potential trade-offs in the creation of NBS need to be clearly communicated with participants to ensure transparency in how costs and benefits are being weighed out, and how these will affect different social groups.

Non-profit driven and sustainable financing of the NBS

A common feature of urban NBS that have posed a barrier to inclusive outcomes concerns the structure in which such projects are financed (Bulkeley, 2021; Chu et al., 2017; Toxopeus et al., 2020). Kabisch (2016) gives caution to the broader “growth obsession barrier” that influences the financing of urban NBS to be profit-oriented (pg. 39). Private actors are often needed in urban NBS projects as they can fulfil the need for resources to implement such projects, however, oftentimes private actors selectively choose to finance projects or parts of projects that are profitable (Toxopeus et al., 2020). As a result, private funding of urban NBS can drive up the costs of the area causing forms of green gentrification and driving forms of spatial inequality for those who cannot afford to live in the area (Anguelovski et al., 2019; Toxopeus, et al., 2020). Thus, a condition to the creation is to develop a financial structure that is not dependent on profitability or market value capture, yet which allows for sustainable financial support.

Accessibility in the decision-making process of NBS

In order to ensure that the NBS can be inclusive towards diverse social groups, the process for creating NBS should be accessible for citizens. Procedural accessibility is especially important for the involvement of marginalized groups since they often face barriers to participate in decision-making processes (Shi et al., 2016). Therefore, procedural accessibility entails the removal of barriers for citizen to take part the in the process for creating NBS, by setting low thresholds for participation with a focus on marginalized groups. To do so, the specific engagement activities with citizens should be tailored according to the physical, emotional and cultural needs of diverse social groups to ensure participation is appropriate and thereby accessible (Kohon, 2018). Lastly, the accessibility of the process is shaped by the language used by organizers of an NBS project. Communication should be clear and understandable for citizens, for instance through the use of everyday terminology, or through the use of mediators who can better clarify the message of the project to citizens in a familiar language or style of communication (de Kleyn, Mumaw & Corney, 2020, Basnou et al., 2020; Leino & Puumala, 2020).

2.4.2 Principles of a socially inclusive co-creation process

To fulfil the conditions of an inclusive urban NBS, a co-creation process provides the opportunity to create a space for inclusive debate and the production of knowledge that can empower citizens (Basnou et al., 2020). Although in practice there are also barriers that need to be addressed for achieving collective value creation that highlights the needs of citizens, especially marginalized groups (Turnhout et al., 2020). Thus, to support a design and implementation process of inclusive urban NBS, principles for an inclusive co-creation process need to be delineated (SQ2). These barriers and requirements for an inclusive co-creation process have been drawn from the literature on co-creation, co-production and hybrid forms of governance in the context of inclusivity and NBS (Basnou et al., 2020; Leino & Puumala, 2020; Norström et al., 2020; Toxopeus et al., 2020). The following principles have been categorized based on my readings of the literature, as there is no existing framework on principles for socially inclusive co-creation.

Co-creation organizers facilitate a flexible and open process

The first condition is for the co-creation process to be flexible and open regarding the diversity of participants, and openness for diverse forms of knowledge. A pluralist and flexible approach towards the actors and their knowledge in a co-creation process will enrich the understanding of the problems in the local context in a holistic manner (Norström et al., 2020). For the co-creation process to be flexible and open to different actors and forms of knowledge, stakeholder mapping needs to be broad and unrestrictive (Basnou et al., 2020). This will allow the openness of different disciplines and different experiences to guide the creation of the NBS (Kabisch, Frantzeskaki, Pauleit, Naumann, Artmann, et al., 2016). Moreover, for co-creation to be flexible and open, the complex terminology needs to be configured into language that can be understood by a wide audience, thereby making participation more accessible (Basnou et al., 2020; Kabisch, Frantzeskaki, Pauleit, Naumann, Artmann, et al., 2016). Furthermore, in the context of co-creation for urban NBS, the conceptualization of an NBS must also be flexible, meaning that the conceptualization should also be flexible to be able to incorporate citizens' diverse perceptions of nature (Basnou et al., 2020).

Sufficient reflexive social and learning takes place

Next to the openness of the actors and knowledge, the process must also take on a reflexive approach to stimulate collective learning and successful integration of the different knowledge (Basnou et al., 2020). Often scientific knowledge dominates the decision-making and halts the ability to integrate a diversity of knowledge (Toxopeus et al., 2020). For a process to integrate a diversity of knowledge, the co-creation process needs to operate through frequent iterations between steps to allow for ongoing learning and reflection between participants to capture the needs of the community throughout the process (DeLosRíos-White et al., 2020; Norström et al., 2020). This reflexivity can be supported by the use of indicators, monitoring and evaluation throughout the process (Webb et al., 2018).

Diverse stakeholder mapping

A diverse mapping of local stakeholders is important for facilitating a socially inclusive co-creation process because it allows for an incorporation of varied perceptions to shape the process and outcome. Co-creation processes are often limited in their ability to address local problems when stakeholder mapping is too narrow (Basnou et al., 2020). This often occurs

because organizers map and analyse stakeholders based on a certain socio-economic perspective, or based on the organizers' own ideas and expectations about which groups would be relevant to include in the process (Basnou et al., 2020). DeLosRíos-White et al. (2020) claim that a diverse stakeholder mapping in a co-creation process will increase the benefits and value of the solution because of the incorporation of different views within the process. Therefore, mapping of local stakeholders, specifically citizens, should include a diversity of social groups, with a focus on local marginalized groups so that the co-creation process will include their interests for the solution to hold benefit for them.

Citizens take on active roles in the co-creation process

To allow for inclusive knowledge integration and collective learning, the roles of the actors in the co-creation process need to follow along with the logic of horizontal governance. This entails that citizens should take on an active role in the co-creation process, by co-implementing, co-designing, and co-initiating the process (Lund, 2018). To allow citizens to take on these active roles, public administrators need to step down from their usual role and take on a collaborative role that will enable citizens to engage in the co-creation process (Foth, 2017). Moreover, to allow citizens to hold an active role in the co-creation process from beginning to end, participation in the co-creation process needs to be operationalized according to citizens' expectations of their participation (Leino & Puumala, 2020). Additionally, Puskas, Abunnasr & Naalbandian (2021) mention that the type of engagement tools used to involve citizens in the co-creation process has implications for their ability to hold influence over the decision-making process. Thus, tools for citizen engagement should allow citizens to express their deeper level concerns and interests, ideally through a deliberative process, which allows them to influence decision-making.

The co-creation process strives towards empowering citizens

This principles picks up from the main points of citizen participation mention in section 2.1.3. Participation of diverse actors, and especially that of local communities, is needed for an inclusive co-creation process. Yet, participation in co-creation processes is often seen as a tool to enhance the legitimacy of the process and outcome (Leino & Puumala, 2020). This in turn limits the engagement of citizens in the process and limits the degree to which their needs and interests can be incorporated. Instead, the form of participation with citizens needs to be operationalized together with the citizens in a way that fits the citizens' expectations and understandings of their impact through participation (Leino & Puumala, 2020). Moreover, due to the transdisciplinary and collaborative nature of co-creation, public actors can no longer safeguard the democratic process to ensure that citizens are well represented (Toxopeus et al., 2020). Therefore, there must be mechanisms in place that can monitor and facilitate the meaningful engagement of citizens (Toxopeus et al., 2020).

Co-creation participants set collective goals

Co-creation processes tend to be oriented towards reaching efficient and effective outcomes, at the cost of inclusive and legitimate inputs and outputs (Lund, 2018; Voorberg et al., 2015). To avoid this trade-off for inclusive legitimacy, the goals and success criteria for the co-creation process and its output should be agreed upon by all participants, including citizens (Norström et al., 2020). Participants should be involved in setting milestones for the project, and these should be monitored throughout the co-creation process (Norström et al., 2020).

Power imbalances are addressed by co-creation organizers

Lastly, similar to the overarching perspective or power imbalances over urban NBS as addressed in section 2.1, the co-creation process must be wary of uneven power relations (Leino & Puumala, 2020). The co-creation process can be dominated by strong stakeholders pulling the process to align with their interests which will label the knowledge of other actors as not legitimate (Turnhout et al., 2020). This often occurs when scientific expertise is prioritized, or elite actors manage to control the process (Turnhout et al., 2020). Moreover, power structures can also influence which actors can participate in the first place, by requiring certain resources to participate (Toxopeus et al., 2020). Therefore, the examination of power imbalances needs to be woven into the previously mentioned principles for inclusive co-creation.

These principles, together with the principles of socially inclusive urban NBS in section 2.4.1 will be used to guide the indicators in the evaluative framework as shown in Figure 5.

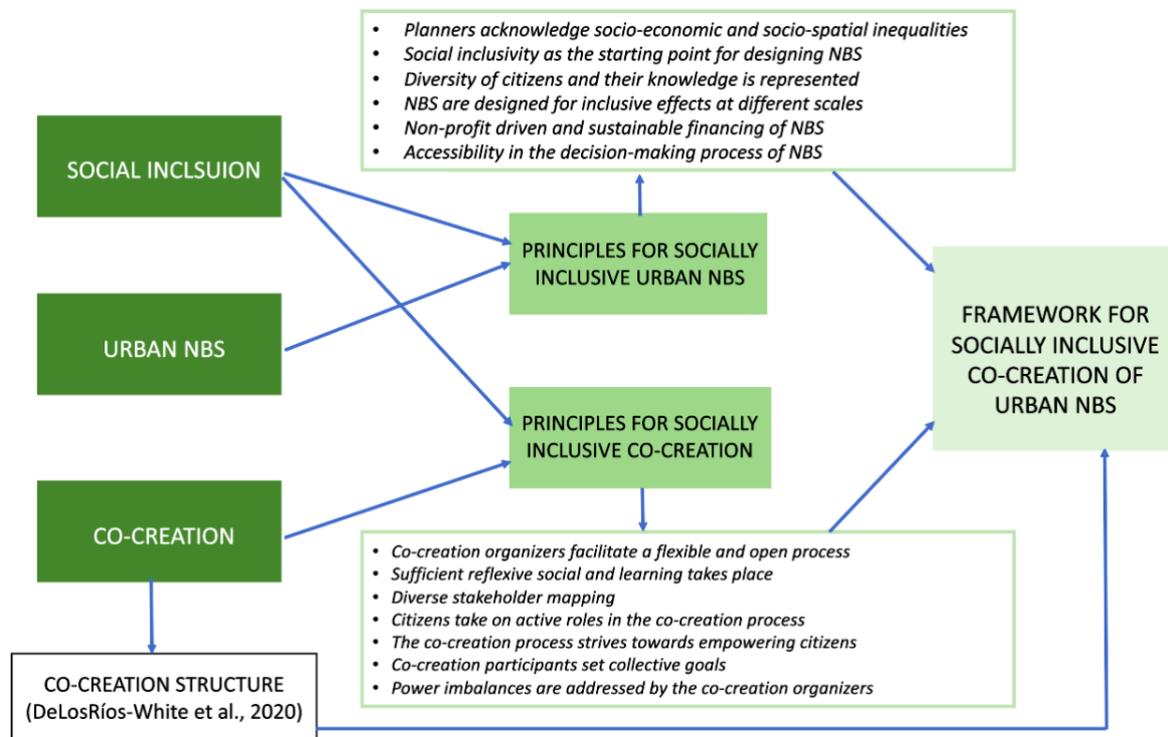


Figure 5. Conceptual framework.

2.5 Towards a framework for socially inclusive co-creation of urban NBS

Using the stages of the co-creation process structure by DeLosRíos-White et al. (2020) for the evaluation framework (see Figure 4) combined with the principles for socially inclusive urban NBS, and socially inclusive co-creation process, it becomes possible to develop the first version of the framework (see Table 2), otherwise known as the literature-based framework. The indicators in the framework have been derived directly from the principles in sections 2.4.1 and 2.4.2 and have also been adapted from the principles, as the associated principle for each indicator is shown in Table 2. The placement of the indicators with the co-creation stages is a personal categorization inspired by the previous conceptualizations as there is no framework for socially inclusive co-creation to reference from.

Table 2. Socially Inclusive Co-Creation for Urban NBS Evaluation Framework.

Co-creation Stage	Indicator	Description	Source	Associated principle (sections 2.4.1 & 2.4.2)
Co-explore	The NBS is framed through a goal of social inclusion	The choice of NBS is framed to promote social inclusion through the process and the result and provide value for the local community, especially for disadvantaged communities	Haase, 2017; Schlosberg et al., 2017; Tozer et al., 2020	Social inclusivity as the starting point for designing NBS (2.4.1)
	The local problems and the use of NBS as a solution are defined together with citizens	The local problem to be addressed by the project is collectively defined with local citizens, and how the NBS will act as a solution to the problem is also collectively decided together with local citizens	DeLosRíos-White et al., 2020	Diversity of citizens and their knowledge is represented (2.4.1) The co-creation process strives towards empowering citizens (2.4.2)
	Organizers acknowledge socio-economic and socio-spatial inequalities regarding access to quality urban greenery	The location for the NBS is planned to redress socio-spatial inequalities and acknowledged socio-economic inequalities of neighbourhoods in terms of their disadvantages in obtaining benefits from urban natural elements and local climate adaptation measures	Bulkeley et al., 2014, Rutt & Gulsrud, 2016; Shi et al, 2016; Tozer et al., 2020	Planners acknowledge socio-economic and socio-spatial inequalities (2.4.1)
	Organizers identify/map diverse local community groups as stakeholders	Stakeholder mapping for relevant actors in the co-creation process includes a diversity of local citizens as end-users of the NBS, and organizing actors actively put in the effort to engage and represent marginalized community members as stakeholders	Geczi, 2007; Lupp et al., 2021	Diversity of citizens and their knowledge is represented (2.4.1) & Diverse stakeholder mapping (2.4.1)
	Citizens and organizers set goals for the NBS together	The goals and success criteria for the NBS are set by all actors, including local citizens, before designing the NBS, this will guide the next stages, steps and evaluation of the co-creation process	Norström et al., 2020	Co-creation participants set collective goals (2.4.2)
	Organizers engage marginalized and vulnerable groups appropriately	Facilitating actors engage different social groups according to their needs and values and actively put in the effort to engage marginalized groups in the community and use culturally appropriate means to engage these groups	Kohon, 2018	Accessibility in the decision-making process of the NBS (2.4.1) Power imbalances are addressed by the co-creation organizers (2.4.2)

Table 2. Socially Inclusive Co-Creation for Urban NBS Evaluation Framework (continued).

	Citizens and organizers collectively operationalize the co-creation process	The terms of participation for the co-creation process are set together with citizens according to their needs and capabilities to take part in the co-creation process	Leino & Puumala, 2020	The co-creation process strives towards empowering citizens (2.4.2)
Co-design	Diverse local citizens are represented	There is an active effort to achieve participation and representation of the diversity of the community, especially disadvantaged groups during the co-design of the NBS	Rutt & Gulsrud, 2016; Shi et al., 2016	Diversity of citizens and their knowledge is represented (2.4.1)
	Organizers facilitate a process open and flexible to the needs and values of citizens	Openness for different forms of knowledge, values of nature, the inclusion of local needs, interests, experiences and preferences are incorporated in the co-design process of the NBS	Kabisch et al., 2016	Co-creation organizers facilitate a flexible and open process (2.4.2)
	The NBS is designed for both short- and long-term inclusive effects	There is an active effort to balance short-term goals for social inclusion with long-term inclusivity, considering potential negative long-term effects such as gentrification and exclusive effects	Schlosberg et al., 2017; Shi et al., 2016; Tozer et al., 2020	NBS are designed for inclusive effects at different scales (2.4.1)
	Organizers use accessible communication with citizens	Facilitating actors use terminology that is understandable to all citizens, different approaches to communicate steps in the co-design process are tailored for different community groups, possibly through the use of a mediator	de Kleyn, Mumaw & Corney, 2020; Leino & Puumala, 2020	Accessibility in the decision-making process of the NBS (2.4.1)
	Citizen engagement tools are accessible to diverse social groups	The tools used in the co-design stage allow citizens to express their needs and wishes for the design of the NBS and are accessible and appropriate for the groups using them	Puskas, Abunnasr & Naalbandian, 2021	Accessibility in the decision-making process of the NBS (2.4.1) The co-creation process strives towards empowering citizens (2.4.2)
	Organizers facilitate a transparent decision-making process	Clear communication of decisions and trade-offs regarding the NBS takes place	Basnou et al., 2020; Kabisch et al., 2016; Bulkeley, 2021	The co-creation process strives towards empowering citizens (2.4.2) Co-creation participants set collective goals (2.4.2)

Table 2. Socially Inclusive Co-Creation for Urban NBS Evaluation Framework (continued).

Co-experiment	Reflexive social learning takes place	Frequent iterations for evaluation and reflection on the NBS by all actors feedback into the co-design stage, the process is reflexive, citizens learn from each other and organizing actors learn about citizen needs which feed back into the co-design stage	Basnou et al., 2020	Diversity of citizens and their knowledge is represented (2.4.1) Sufficient reflexive and social learning takes place (2.4.2)
	Indicators set collectively with citizens are used for final evaluations of the NBS design	Collectively set indicators for evaluation are set by all participants and are used for the final design of the NBS	Webb et al., 2018; Rutt & Gulsrud, 2016	Co-creation participants set collective goals (2.4.2)
Co-implement	There is non-profit oriented financing of the NBS	Financial support that is not based upon market value capture or stakeholders with a profit-making agenda is used to implement and maintain the NBS which does not create an increase in price for the local citizens	Toxopeus et al., 2020; Bulkeley, 2021, Mirzoev et al., 2021	Non-profit driven and sustainable financing of the NBS (2.4.2)
	Citizens can take on active roles as co-implementers	Citizens can be involved in the co-implementation of the urban NBS in a manner that adheres to their wants and capabilities	Lund, 2018	Citizens take on active roles in the co-creation process (2.4.2)
Co-management	Citizens are appropriately involved in the management of the NBS	Citizens continue to hold an ongoing role in the management of the NBS according to their capabilities	Tozer, 2020; Kabisch et al., 2016	Accessibility in the decision-making process of NBS (2.4.1) Citizens take on active roles in the co-creation process (2.4.2)
	Organizers provide a structure for continued citizen-based evaluations of the NBS	Continued evaluation of the NBS by all local citizens based on experiences with the NBS is organized through a collective governance structure and can feed back can be used to adapt the NBS	Webb et al., 2018	NBS designed for inclusive effects at different scales (2.4.1) Sufficient reflexive and social learning takes place (2.4.2)

Table 2 indicates the required indicators for an inclusive urban NBS at each stage of the co-creation process. As mentioned in the conceptualization of inclusive NBS, and the principles for inclusive co-creation, a critical view of power imbalances is embedded within each of the stages of the framework. A visualization of Table 2, the literature-based framework, can be seen in section 2.5.1, see Figure 6. This literature-based framework will be applied to the case study in Chapter 5 for empirical confrontation.

2.5.1 Literature-based framework

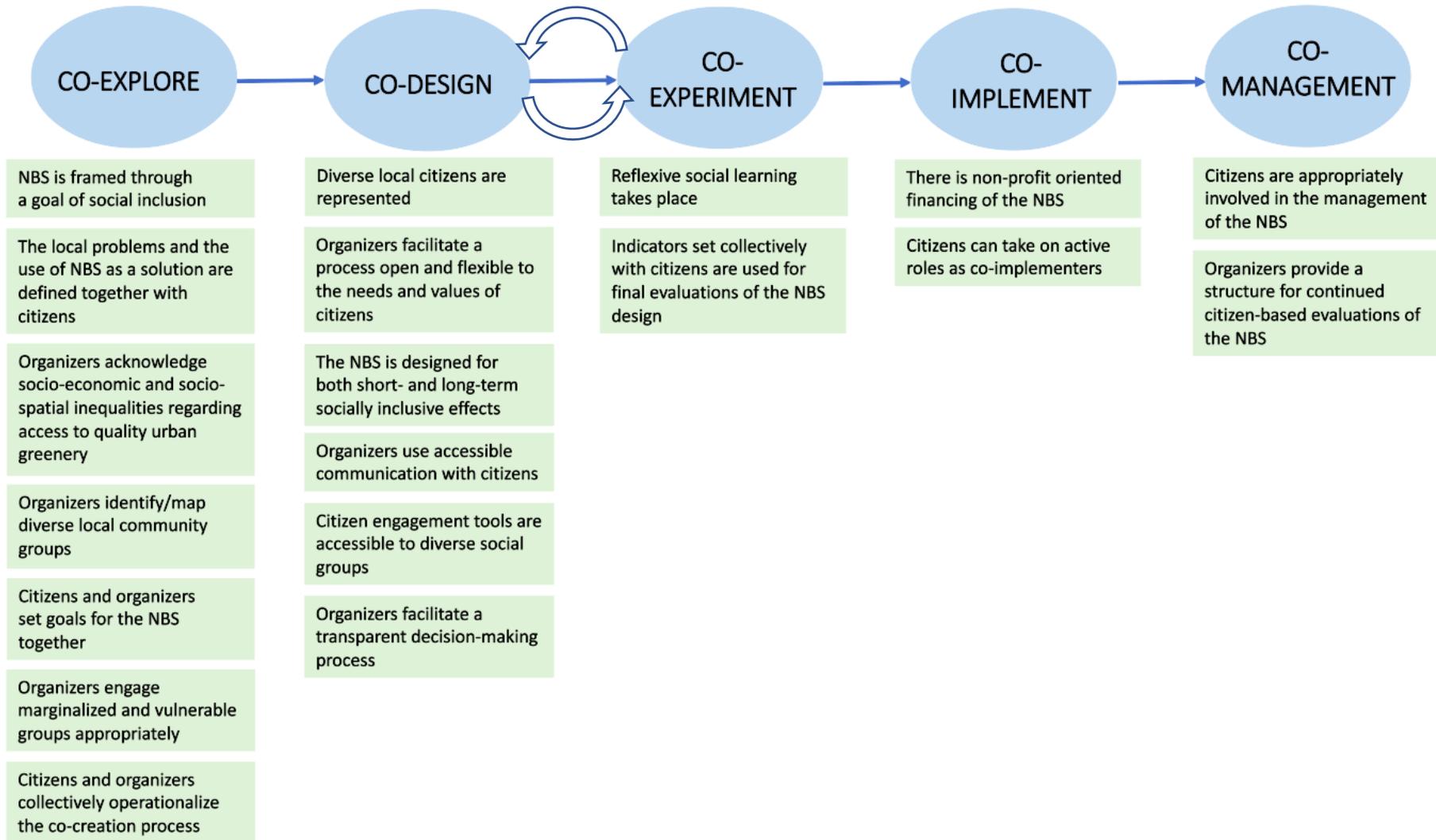


Figure 6. Literature-based evaluative framework for socially inclusive co-creation for urban NBS.

CHAPTER 3. METHODOLOGY

This chapter will describe the step-wise research strategy used for the development of the framework (see section 3.1), the data collection that was carried out to build the framework (see section 3.2), and lastly the data analysis that was conducted to derive results from the data and support the empirical grounding of the framework (see section 3.3)

3.1 Research Strategy

The research strategy used to answer the main research question took on a qualitative mixed-methods approach due to the complexity involved in designing a new framework without a predecessor. The literature-based evaluative framework (see section 2.5.1) was the take-off point for a step-wise process of editing and adjusting the framework through a multi-layered approach. To answer SQ3 (see Figure 1) the literature-based framework was first applied using a comparative case study analysis to evaluate the extent to which current NBS projects that aim to develop socially valued solutions adhere to principles of social inclusivity within the co-creation process. The application of the framework through a comparative case study analysis led to adjustments in the literature-based framework as well as the addition of inductively derived indicators and conditions through the empirical confrontation. The comparative case study approach led to a new version of the framework, namely, the empirically-confronted framework. Next, to answer SQ4 (see Figure 1), the validity of the empirically-confronted framework was tested through a validation workshop with academics in the field of urban NBS and co-creation. The participants of the workshop gave critical remarks on the framework, and suggested further adjustments which were used to reconfigure and improve the framework, and thereby led to the version of the validated framework. The two stages of the research strategy, the empirical confrontation and the validation will be explained further in sections 3.1.1 and 3.1.2 respectively.

3.1.1 Comparative Case Study

The cases selected for the comparative case study analysis are cities part of the European research action project called CLEVER Cities, abbreviated from the full title, Co-designing Locally tailored Ecological solutions for Value added, socially inclusivE Regeneration in Cities (<https://clevercities.eu>). The project is funded by the European Horizon 2020 program from 2018 to 2023, and thus is currently still ongoing (CLEVER Cities, n.d.). This European research action project was selected based on the project's aim to use a co-creation approach and engage local citizens to address urban challenges with nature-based solutions that are socially inclusive. The CLEVER Cities project is therefore directly relevant for this thesis as it combines the two concepts that are used to build the literature-based framework, and thereby provides an appropriate case to apply the framework to for evaluation, and draw lessons from to support the development of the framework. The research project is composed of nine participating cities who use a co-creation guide, developed by the CLEVER Cities project, to co-create local urban NBS with citizens. Out of these nine cities, three are front-runner (FR) cities which are implementing the co-creation process and act as demonstrators for the learning experience to draw lessons for the follower cities of the CLEVER Cities project. The two front-runner (FR) cities, Hamburg and Milan, have been selected for the comparative case study analysis.

As the front runner cities are currently undergoing the co-creation process with local citizens to develop socially inclusive urban NBS, these cities provided a unique opportunity to apply the framework and evaluate the projects on their degree of their inclusiveness throughout the co-creation process and secondly, to draw lessons from their co-creation process to build onto the evaluative framework. Further in-depth descriptions of the CLEVER Cities project and the Hamburg and Milan FR cities are provided in Chapter 4. Lastly, although it was initially planned to also conduct an in-depth analysis of the third FR city, London, this was not possible due to the limited number of interviews. Nevertheless the insights from the London project are still valuable and are thus used in the discussion of this thesis.

3.1.2 Validation Workshop

After the comparative case study analysis of the FR cities, the subsequent adjusting of the framework and development of lessons learned regarding the co-creation process of socially inclusive urban NBS, a validation workshop was conducted with academic experts in the field of urban NBS and co-creation to validate the empirically-confronted framework (SQ4). The expert workshop served as a tool to ensure external validity of the empirically-confronted framework by critically reflecting on the indicators and newly found elements within the framework. Moreover the validation workshop served to address the future applicability of the framework. The results of the validation workshop have been used to re-adjust the empirically-confronted framework, and has led to the development of the validated framework.

3.2 Data Collection

3.2.2 Case study

To collect data on the co-creation process thus far in the FR cities Hamburg and Milan, beside a review of the CLEVER Cities project reports, 13 semi-structured interviews have been conducted to develop a holistic overview of the process in each city. Semi-structured interviews with project partners in the FR cities was chosen as a data collection method because of the in-depth information that could be gathered on the process for each co-creation stage in Hamburg and Milan. It is important to note that the projects are currently ongoing and thus data for the co-experiment, co-implement and co-management stages have been collected based upon the planned activities. Therefore the data for these mentioned stages is speculative, considering that the processes may adapt in the future. The in-depth interviews were an appropriate method to collect the experiences of the process and results thus far. The interviews provided data needed to evaluate the cases against the literature-based framework because they allowed for a complete and extensive description of the project and the co-creation process.

In Hamburg, six project partners specific to the Hamburg CLEVER Cities project have been interviewed. In Milan seven interviews have been conducted with project partners of the Milan CLEVER Cities project. A conscious selection of project partners was made to represent different sectors involved in the project. This varied the representation of different perspectives towards the project to limit the bias of the interviews, and develop a holistic overview of the co-creation process. A list of the interviewees, the sector they represent, and their involvement in the CLEVER Cities project can be seen in Table 3. As mentioned previously, an in-depth case study of the FR city London was not possible, however, one interview was conducted with a London project partner and the insights of the interview are used for the discussion.

Table 3. Overview of interviewees.

CLEVER Cities Case	Interviewee Code	Sector description	Role in CLEVER cities project
Hamburg	H1	Public sector	CLEVER Cities project coordinator for Hamburg
	H2	Research/Academia	Scientific guidance for local partners
	H3	Public sector	Support the development of NBS and upscaling
	H4	Public sector	Coordinator of the CLEVER Cities project
	H5	Private sector	Citizen engagement
	H6	Private sector	Citizen engagement
Milan	M1	Private sector	Citizen engagement and impact monitoring
	M2	Private sector	Construction of green roofs, impact monitoring
	M3	Private sector	Construction of green roofs, impact monitoring
	M4	Private sector	Citizen engagement
	M5	Public sector	Coordination of the CLEVER Milan project
	M6	Research/Academia	Co-creation guide development
	M7	Research/Academia	Co-creation guide development
London	L1	Private Sector	Citizen engagement

The semi-structured interview questions were developed according to the literature-based framework (see Appendix A for the interview guide). Guiding questions were created for each stage of the co-creation process to open the discussion. These were followed-up by specific sub-questions centred around the stage-specific indicators. The sub-questions were asked to gain better clarity of the specific activities and results of the co-creation process and to understand the extent to which the process adhered to principles of social inclusivity. The interviews lasted between 1 to 1.5 hours, and were recorded and transcribed.

To ensure the research interviews adhere to principles of research ethics, the privacy of the interviewees will be safeguarded by remaining anonymous and using interviewee codes (see Table 3). Additionally, they have been asked to sign a form of consent which informs the interviewee of the manner in which their data will be handled, and which states that interviewees can always opt out of the interview (see Appendix B for the interview consent form).

3.2.3 Validation Workshop

A scoping of academics working on topics of urban nature based solutions, co-creation and citizen participation was conducted by searching for authors of academic articles focused on the aforementioned topics. E-mail invitations were sent out to the initially scoped academics (approximately 18 scholars), and resulted in a final configuration of six participants for the workshop (see Table 4 for the overview of participants). The validation workshop was conducted in two separate sessions with three participants in each workshop and were held on

an online meeting platform. To facilitate interaction and collaboration between participants the workshop made use of a digital ‘whiteboard’. The guide the participants’ reflections and remarks on the framework the workshops were structured into four parts. The workshop began with a brief introduction of the aim and research question of the thesis, the concepts used to build the framework, the application of the framework to the Hamburg and Milan cases and the subsequent adjustments of the literature-based framework into the empirically-confronted framework. Next, through the use of the interactive online ‘whiteboard’ the participants were asked to reflect on the use of the co-creation structure by DeLosRíos-White et al. (2020) as the backbone for the framework. In the third part of the workshop, participants were asked to reflect on the elements within the framework through the use of guiding questions, such as the extent of consistency or repetitiveness of the indicators, or missing elements, and pathways to strengthen the framework. Lastly, the workshop ended by asking participants to reflect on their opinion of the usefulness and future applicability of the framework. The workshops were recorded and transcribed, and notes were taken on the main points brought up by participants.

To safeguard the research ethics, participants were asked to sign an informed consent form stating the purpose of the workshop and how their data would be handled (see Appendix C for the validation workshop consent form). Moreover, the participants were asked if they wished to stay anonymous in the thesis to respect their privacy, however none of the participants wished to do so.

Table 4. Overview of validation workshop participants.

Participant	Code	Affiliated research institute	Fields of study
Prof. dr. N. Frantzeskaki	W1	Swinburne University of Technology	Sustainability transitions and governance, urban and regional planning, NBS
M.Sc. G. Silvestri	W2	The Dutch Research Institute for Transition (DRIFT)	Sustainability transitions, stakeholder engagement strategies
Dr. ir. D. Hegger	W3	Utrecht University, Copernicus Institute for Sustainable Development	Citizen-based initiatives, science-policy interface, knowledge co-creation
Dr. APN van der Jagt	W4	Wageningen University and Research	NBS mainstreaming and co-creation, urban governance of nature
M.Sc A. Schmidt	W5	Helmholtz Centre for Environmental Research	Participatory urban governance, cooperative urban development, urban (environmental) justice
Dr. D. Dushkova	W6	Helmholtz Centre for Environmental Research	NBS for environmental and societal challenges, urban transformations

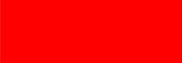
3.3 Data Analysis

3.3.1 Analysis and evaluation of the cases

The interview transcripts were coded through NVivo using both a deductive and inductive coding approach. Deductive coding was conducted by analysing the interview transcripts for information according to each indicator of the literature-based framework. Inductive coding was carried out by identifying new indicators for the framework that were not previously addressed in the literature-based framework. Additionally, inductive coding was used to indicate relevant conditions interviewees mentioned are needed for a co-creation process to reach deeper levels of citizen participation, and ultimately strive towards principles of social inclusivity. Unlike indicators which organizers are able to carry out and thus hold influence over extent to which the co-creation process meets the indicator, conditions are larger contextual factors that influence the possibility for a co-creation process to be socially inclusive and which organizers have limited influence over.

Once the interviews were coded, the deductively derived codes for each case, based on the indicators of the literature-based framework, were analysed and evaluated according to a 5 point scale. The scale was inspired by the Likert-type scoring system developed by Koop et al. (2017) used to assess levels of governance capacity for water challenges. The 5-tier scoring scale starts from a very limited scoring (- -) to a very encouraging scoring (+ +) as shown in Table 5. The scoring is based on the extent to which the co-creation process meets the description of an indicator (see Table 5). Since the indicators and their complementary descriptions are sensitizing concepts not definitive concepts, meaning that the indicators are not strictly specified but guide the research towards further delineation (Bowen, 2006), an accurate evaluation of the co-creation processes in Hamburg and Mila against the indicators was done to the best of my ability.

Table 5. Scoring scale.

Scoring	Justification	Colour
Very encouraging (+ +)	The case strongly meets the full description of the indicator	
Encouraging (+)	The case meets the description of the indicator	
Indifferent (0)	The case is neutral towards meeting the description of the indicator	
Limited (-)	The case barely meets the description of the indicator	
Very limited (- -)	The case does not meet the description of the indicator at all	

The evaluation of the cases using the indicators of the literature-based framework, besides giving insights into the extent to which the cases adhere to the indicators for a socially inclusive co-creation process also provided empirical confrontation of the applicability of the indicators. This together with the inductively derived new indicators and conditions were used to make adjustments to the framework and develop the empirically-confronted framework.

3.3.2 Analysis of the validation workshop

The transcripts of the validation workshops together with the notes on the key points made by the participants were analysed according to the main suggestions and comments. The feedback was divided into three categories, namely, the co-creation structure used as the backbone of the framework, the specific indicators and conditions of the framework, and the future applicability of the framework. These comments were used to make necessary adjustments and further reconceptualization of the framework which led to the version of the validated framework.

CHAPTER 4. CASE DESCRIPTIONS

This chapter will provide a descriptive overview of the structure of the ongoing EU CLEVER Cities project, the main aims of the project, and the co-creation guide used by the cities (see section 4.1), followed by a comparison of the CLEVER Cities co-creation guide and the literature-based framework (see section 4.1.2). Next, an in-depth description of the front-runner cities Hamburg and Milan will be provided (see section 4.2 and 4.3 respectively). The case descriptions of Hamburg and Milan will give an overview of the demographics, urban development and relevant climate policies among other descriptions, as well as an in-depth description of the NBS projects being implemented.

4.1 CLEVER Cities Project

The CLEVER Cities project is a European Innovation Action (IA) project supported through the EU Horizon 2020 program. Horizon 2020 is a financial instrument of the European Union aimed at funding projects that will secure Europe's global competitiveness. The core aim of the funding program is to support research and innovation projects that will lead Europe towards technological, sustainable and inclusive growth. The CLEVER Cities receives 14.214 million Euros funding from Horizon 2020 for the duration of the project, which runs from 2018 to 2023 (European Commission, 2021). The CLEVER Cities project is funded as an IA (innovation action) project, thereby receiving a funding rate of 70 per cent by the EU. An IA project is described as a project which includes “activities directly aiming at producing plans and arrangements or designs for new, altered or improved products, processes or services. For this purpose they may include prototyping, testing, demonstrating, piloting, large-scale product validation and market replication” (European Commission, n.d.). This also highlights the aim of the CLEVER project to test and demonstrate a collaborative governance process for designing and implementing urban NBS through a co-creation approach, with the ultimate goal to produce socially inclusive NBS for sustainable urban regeneration.

The CLEVER Cities project is a collaborative effort between nine cities, eight in Europe and one in South America, that will focus on implementing urban NBS innovations to demonstrate best practices. This is being done by using the partner cities Hamburg, London and Milan as the front-runner (FR) cities to share the lessons learned of their processes and outcomes with the remaining six fellow cities (see the locations of the FR and follower cities in Figure 7). In total there are 34 partners listed as beneficiaries of the CLEVER cities project, ranging from regional non-profit networks to national and local public sector actors, private sector actors, and research institutions of the various participating countries, which demonstrates the large-scale of this project.



Figure 7. Locations of the Front Runner (FR) cities in blue; Hamburg, London and Milan. Locations of the Follower cities in orange.(Author).

The CLEVER Cities project evolves around the use of NBS as a means to address key urban challenges in the cities and use a co-creation approach to develop locally valued urban regeneration (European Commission, 2021). The project deliverable report lists four key urban regeneration challenges to be improved; human health and well-being, sustainable economic prosperity, social cohesion and environmental justice, and citizen security (Davis et al., 2018). Moreover, the project aims to establish urban NBS through an inclusive and participatory manner by connecting a diversity of stakeholders from different sectors and levels of operation through partnerships. These diverse partnerships are needed to develop tailor-made approaches which can tend to the needs of the local context, and thus create socially inclusive NBS. Central is the use of a co-creation guide which each city can use flexibly to facilitate an inclusive, and place-based process and outcome when designing urban NBS. Co-creation in the project takes place both at the transversal level between stakeholders of the city projects, but also at the local level where citizens play an important role in co-designing the NBS.

Following the structure of EU Horizon 2020 projects, the CLEVER Cities project will be guided by the work packages that need to be fulfilled and delivered throughout the project. Work packages (WP) guide activities within the project and sets outcomes for the activities. In total there are 9 WPs defined for the CLEVER project, with different project partners taking the lead for each WP. The WPs highlight the aims and goals of the CLEVER project and are stated as follow:

- WP1: Designing the CLEVER NBS Knowledge Framework*
- WP2: Co-Creating CLEVER Cities for urban regeneration*
- WP3: CLEVER Fellows – Taking the lead in transferring and customizing NBS*
- WP4: Assessing NBS impact through the CLEVER Monitor*
- WP5: CLEVER Solutions – From Innovations to Market*
- WP6: Enabling global NBS leaders*
- WP7: Sharing the CLEVER Cities story*
- WP8: Coordinating CLEVER Cities Project Management*
- WP9: Ethics requirements*

As the WPs show, the CLEVER project follows a guided plan starting with collecting knowledge on NBS (WP1), creating a co-creation guide for the cities to follow (WP2), using the framework to develop place-based and socially inclusive urban NBS (WP3), assessing the impacts of the NBS (WP4), scaling up the pilot projects into marketable solutions (WP5), and finally disseminating the findings to support the uptake of NBS internationally (WP6). Hamburg is taking the lead in coordinating the project management between the partner cities as well as ensuring ethics requirement for the entire duration of the project (WP8 and WP9). The WPs show the importance of the FR cities in demonstrating best practices for co-creating urban NBS, and highlights the focus the project places on scaling-up the NBS practices as well as disseminating the best practices on an international stage.

In the context of the CLEVER Cities project, the overarching aim is to use NBS for sustainable urban regeneration. Urban regeneration, as described in the CLEVER project, “encompasses the idea of improving, reorganizing, and upgrading an undesirable urban context (as opposed to the planning of new urbanization)” (Davis et al., 2018, p. 56). Examples given by the project of areas appropriate for urban regeneration include abandoned or neglected spaces, both built areas or natural sites, places with environmental challenges such as a lack of green spaces or a lack of resilience to climate change, or areas that face social and economic challenges such as low social health and wellbeing, social inequalities, and high crime rates. These examples point to the triple-bottom-line approach that the project uses in their understanding of goals for urban regeneration, in other words “people, business, and place” (Davis et al., 2018, p. 56). The focus on impacts in the social dimension include increased and secured income, participation in local decision making, social cohesion and quality of life. Improvements in the business dimension include economic competitiveness, local business development and job creation, whereas the place dimension focuses on improved infrastructure, resilient environment, and greater appeal of the place to attract people and business (Davis et al., 2018, p. 56).

The focus on generating beneficial impacts in the different domains highlights the projects’ aim to create co-benefits through urban regeneration with NBS. The necessity to ensure co-benefits and synergies is describe by the project as a ‘sustainable urban regeneration’ approach. Moreover the CLEVER Cities project claims to stand out from other urban regeneration projects based on the use of positive environmental impacts as the starting point rather than the outcome of urban regeneration. The project states that it leans on the “great promise of NBS to provide benefits for people, business and place [and serves] to help overcome the potentially negative impacts of urban regeneration more broadly (e.g. small dwellings, lack of affordability, shortage of green space, risks to respiratory health and increased crime)” (Davis et al., 2018, p. 58). The project outlines a general sketch of challenges to be addressed and co-benefits to be pursued, however, the exact delineation of the challenges and benefits differs between the cities. As each city is contextualized by different challenges, needs, and values, the precise challenges and co-benefits to be pursued will be adapted to the local context of each city.

Moreover, the FR cities, Hamburg, London and Milan, will each have three different NBS interventions developed through local action labs called CLEVER Action Labs (CAL), which take the shape of Urban Living Labs (ULLs). Each CAL uses a specific NBS to address slightly different challenges is tailored to the local context and citizens involved in the CAL. Moreover, each city is supported by a city-wide configuration of stakeholders, also known by the project as an Urban Innovation Partnership (UIP) who help organize the co-creation process. Each CAL can also be supported by a more specific configuration of stakeholders, a local UIP, who

have an interest in supporting the realization of a specific NBS. Figure 8 demonstrates the interconnections of the (local) UIPs and the CALs.

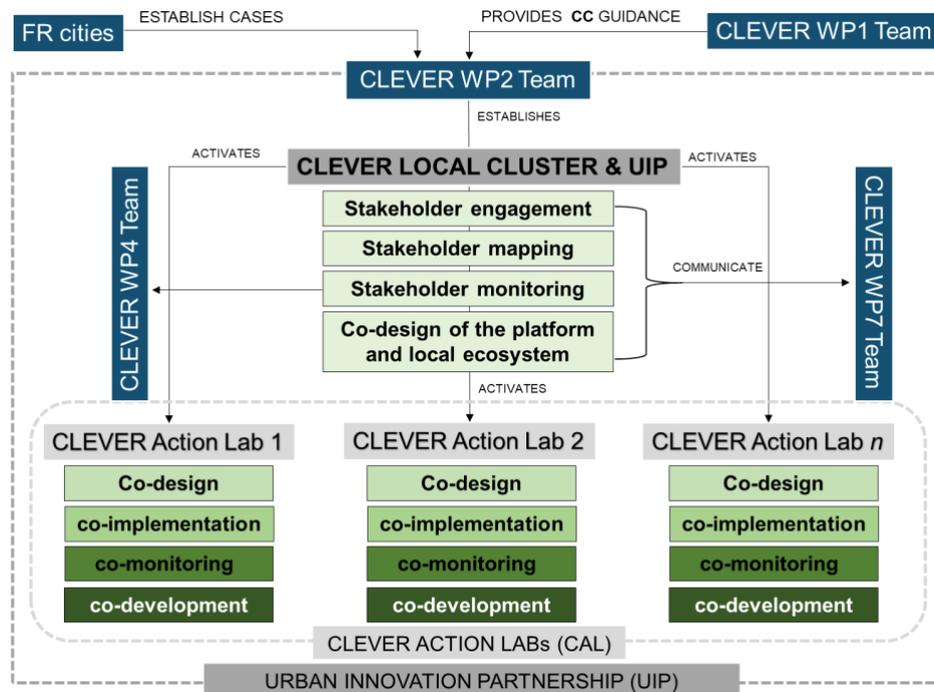


Figure 8. Representation of the CLEVER Project co-creation stages and steps distinguished between the UIP level and CAL level. (Morello et al., 2018).

Each CAL and specific NBS intervention for the FR cities will be explained in greater detail in the following sections.

Additional to the use of NBS as a means of generating socially inclusive urban regeneration projects, the CLEVER Cities project aims to advance the theoretical and applied knowledge base on socially inclusive urban generation by developing a co-creation methodology (explained in detail in the next section). Co-creation in the CLEVER Cities project is understood as “a collaborative approach to engagement which allows stakeholders to collectively design and build more inclusive and sustainable mechanisms for change” (Morello et al., 2018, p. 93). Following this definition, stakeholder mapping and stakeholder engagement are critical features of the co-creation process. Not only do suitable and diverse stakeholders need to be selected for the regeneration projects, but they must also be able to engage with one another to collectively design the local NBS. Stakeholder mapping and engagement in the co-creation process is thus fundamental to an inclusive process and outcome. These stakeholders range from public actors, private actors, NGOs, local service providers, research institutes, and most critically, citizens. Thus, the co-creation guide helps cities to engage a diverse range of stakeholders in the collective design, implementation and monitoring of the NBS.

The co-creation methodology developed in the project is founded upon an extensive literature review on co-creation. Based upon the literature, a co-creation guide has been created and tailored to the specific aims and structure of the CLEVER Cities project. The guide sets out the stages, steps and potential tools that will help cities to facilitate a co-creation process. This co-creation guide is intended to be used flexibly by the cities and adapted to the local context of each city (Morello & Mahmoud, 2018). To make the co-creation guide flexible, the structure includes fundamental steps, recommended steps and optional steps throughout the stages.

Alongside the steps and actions, the co-creation guide also provides toolkits that can be used according to the needs and context of the cities. The co-creation guide developed by the CLEVER Cities project differs from the co-creation structure by DeLosRíos-White et al. (2020) used in this thesis for the literature-based framework because of the project’s implementation orientation compared to the framework’s evaluative perspective. The similarities and differences between the CLEVER Cities co-creation guide, and literature-based framework will be discussed in more detail in the following section.

CLEVER Cities co-creation guide

The co-creation guide is divided into six phases; 1) establishing the UIP, 2) co-creation planning, 3) co-design of solutions, 4) co-implementation, 5) co-monitoring, 6) co-development as shown in Figure 9. The co-creation process starts with the establishment of an Urban Innovation Partnership (UIP). As mentioned before, the project defines the UIPs as a “city-wide or district-focused informal alliance of local and city authorities, community (groups), businesses, academics to promote the NBS for regeneration or urban transformation, facilitate and drive the cocreation process” (Morello et al., 2018, p. 90). A UIP is a partnership between local partners who have a high interest in the realization of a place-based NBS, or who have the capabilities relevant for the fulfilment of the NBS. Each UIP supports either one CAL or multiple CALS.

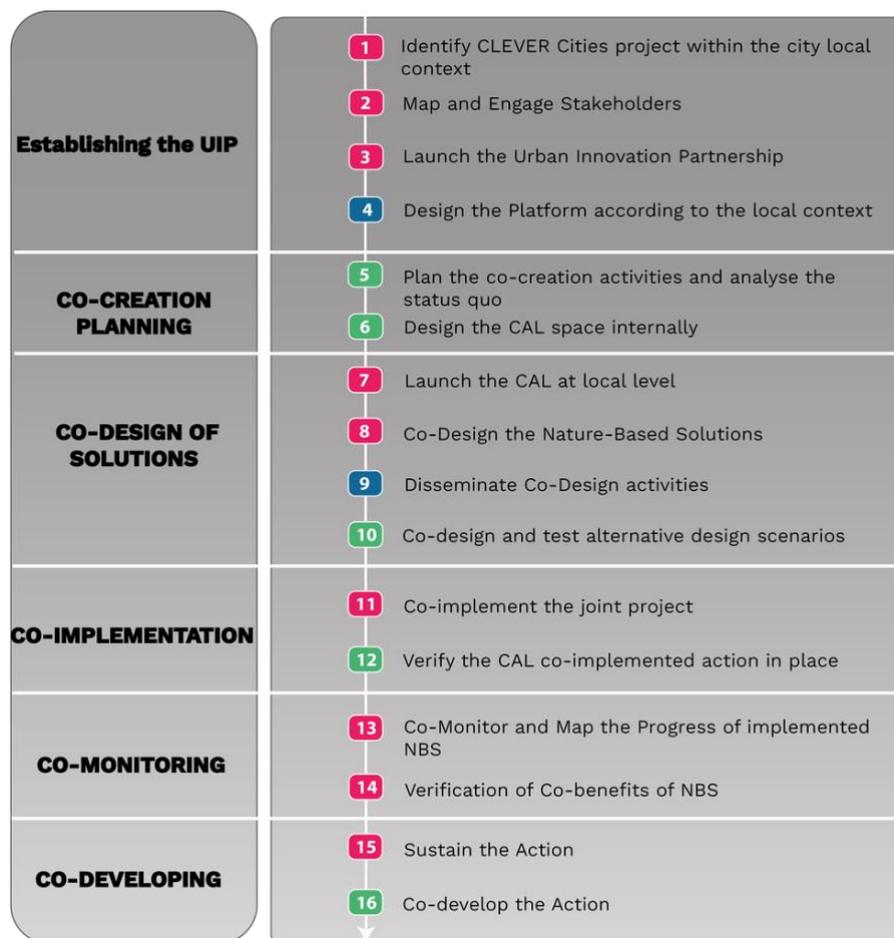


Figure 9. The phases and correlating steps and actions of the co-creation guide. Red boxes are fundamental steps, green boxes are recommended steps and blue boxes are optional steps. (Mahmoud, n.d.)

The phases and corresponding steps of the CLEVER Cities co-creation guide (Morello, Mahmoud & Gulyurtlu, 208) will be described, however, it is important to keep in mind that the projects are still ongoing and therefore have not yet started the co-implementation phase.

Phase 1: Establishing the UIP

Step one of phase one begins with identifying and framing the CLEVER Cities project within existing projects and strategies at the local level. This is used to find synergies between the project aims and action plans with current local plans which may support the projects. The first step also involves the agreement on the mission, objectives and values of the CLEVER project between FR city partners. Lastly, step 1 involves FR city partners defining the general outline of the CALS including the timeline, aims, procedural steps, and organization.

The second step is to map and engage the stakeholders that will make up the Urban Innovation Partnership (UIP) for one or multiple CALs. This step involves several actions starting with the identification of potential stakeholders in the area of the CAL who should be involved in the NBS. This broad list of potential stakeholders is followed by an analysis of the needs and interests of each stakeholder regarding the NBS. Consequently, the stakeholders are mapped on a two-dimensions grid based on their interest and influence. This mapping will determine which stakeholders will be prioritized and how they will be engaged in the UIP, and which stakeholders will be engaged in the CALs. The final actions are to determine by which methods stakeholders will be engaged to ensure that engagement is accessible and appropriate for each stakeholder's needs.

Once the stakeholders for the UIPs and CALs have been identified and engaged, step 3 is to launch the UIP. The main objectives of the UIP launch are to increase the visibility of the project to the public and to attract more stakeholders to be involved in the NBS projects. The launch should be a publicly announced and communicated event in the city to widely spread the visibility of the project.

The final step in phase one is to design the platform according to the local context. This is an optional step intended to facilitate a city-wide platform between city administrators and the CLEVER Cities partnership. Depending on the willingness and resources from the city administration, a local platform to collaborate and disseminate the NBS can be established. Creating a local platform between city administrators and the CLEVER partners can potentially help mainstream NBS and co-creation at the city-wide level.

Phase 3: Co-creation planning

After completing phase one by having established the UIPs for the corresponding CALs, the project can enter the next phase of the co-design activities per CAL. This also marks a shift from the UIP city-wide level to the localized CAL-specific level. Step five asks to define the co-design kick-off and analyse the status quo, a highly recommended step for cities to follow. Since this phase begins a year after the CLEVER project has started, this step is designed to reconfigure any new developments about the local context of the CALs, and align information and roles between the CAL partners. Moreover, this step is intended to recollect any opportunities and threats existing at the site of the NBS through a SWOT analysis.

The second optional step in the co-creation planning phase is to design the CAL space internally. In this step, the CAL partners should make a realistic plan for the activities of the NBS, to ensure that the co-design activities will lead to a realistic design for implementation. Moreover, the partners should describe the expected level of participation from the

stakeholders since some NBS projects are limited to the level of engagement possible. The step aims to set the boundaries for the levels of participation by locals in the co-creation phases and the scope of the flexibility of the NBS.

Phase 4: Co-design of solutions

The seventh step is a fundamental step for all cities, namely, to launch the CAL at the local level. To communicate the aim of the project to the local citizens and to engage citizens in the co-creation process for the NBS, the cities will launch a public event either at the city level or at the level of the CAL. The main purpose of this step is to communicate to the local residents about the project while also attracting locals to join the project.

The core activity of the project takes shape during step 8, co-design the NBS. Depending on the design of the NBS for each CAL, the duration of the co-design activities can take up to two years. The objectives of this step are to create a shared NBS through the participation of local citizens in each CAL. Moreover, the goal of the co-design step is to raise awareness to the local citizens of the co-benefits of NBS in terms of their social, environmental and economic benefits, and stimulate an overall engagement of citizens with nature. The first activity for the co-design step is to reconfigure the focus of the CALs through the input of the citizens. Inputs from the citizens may redirect the values, outcomes, and success criteria of the CALs, and thus need to be incorporated into the design of the co-design activities, co-implementation and co-monitoring. Once the citizens' input has been incorporated into the CAL pathway, activities for co-designing the NBS can begin. Using different tools, virtual or in-person, the needs and wishes for the design of the NBS by the locals are captured to come to a collective design of the NBS. These inputs for the design are held within the boundaries of what is technically and financially possible, thus, carefully explaining these boundaries to the locals is a crucial aspect to keep expectations realistic. With the locals' inputs for the design of the NBS, technical experts are brought in to realize the plans of the designs which are again brought to the locals for an evaluation. This evaluation will lead to a final design of the NBS. This step will be carried out in multiple workshops and meeting with locals and experts, and the progress of these sessions should contribute to the indicators for the monitoring phase.

The ninth step is to disseminate co-design activities. This is a recommended step to open up the progress of the co-design process of the CAL to the wider public. The publicity can take place either through an online platform allowing for e-participation or through an open event. These events can be fruitful for reaching a wider audience gathering more input from locals who were not able to attend workshops.

The last recommended step of the co-design phase is to co-design and test alternative design scenarios. To finalize the NBS design it is strongly recommended for the technical experts of the CAL to create a realistic visual representation of the proposed NBS design to be shown to the CAL local participants. This is meant to clarify and resolve any last issues with the design, and to make sure the design meets the needs of the participants before implementation. With the final approval of the visual design, the co-design phases are rounded off.

Phase 4: Co-implementation

The eleventh step, marking the first action in the implementation phase, is to co-implement the joint project. With the final design of the NBS, this step involves finding local partners who will be able to carry out the construction of the NBS as well as finding local partners who can finance the solutions. The financial partners would ideally be committed to supporting a long-term financial scheme of the NBS through co-financing. Stakeholders and citizens should be

involved in the implementation of the NBS to ensure that there is agreement on the realization of the design.

The twelfth recommended step is to verify the CAL co-implemented action in place. Once the NBS is in place there is an opportunity for citizens and stakeholders to give feedback on the construction process for potential feedback and corresponding adjustments to the NBS. The physical construction of the NBS might lead to the interest and involvement of different stakeholders who see a chance to contribute. Completing this step should also lead to the finalization and secured co-implementation partnerships with stakeholders and locals.

Phase 5: Co-monitoring

After the NBS have been implemented, the project turns its focus to monitoring and management of the NBS which includes two fundamental steps. The thirteenth step is to co-monitor and map the progress of implemented NBS. Spanning over several months, this step aims to find innovative schemes to co-monitor the NBS in place together with locals and stakeholders. Moreover, this step gives the room to find co-management structures that can engage locals in managing parts of the NBS, considering that the degree of involvement is appropriate for the type of NBS and CAL. The co-monitoring is divided into pre- and post-greening stages, in other words monitoring before and after the NBS implementation.

The fourteenth step is the verification of co-benefits which have been delineated at the co-design phase. This step is carried out by the CAL partners using the previously designed Key Performance Indicators (KPI) based on the results of the co-designing process. To measure and evaluate the KPIs, surveys and online tools can be used.

Phase 6: Co-development

The final phase of the co-creation guide includes the step, sustain the action. Overall the aim is to reflect on what have been successes and failures during the co-creation process of each CAL to generate lessons learned. These lessons should facilitate the replicability of the co-created NBS for future up-scaling of the solution.

To last step of the co-creation guide, is the recommended step to co-develop the action. As the CALs and corresponding co-created NBS are pilot projects, the aim is to diffuse the successful projects further at the city level, or even at the European level and further.

4.1.1 Comparison of the literature-based framework and the CLEVER Cities co-creation guide

As can be seen, the co-creation phases that are used in the CLEVER Cities project differ slightly from the stages used in the literature-based evaluation framework in this thesis from (see section 2.5.1). These differences are in part because the CLEVER co-creation guide has been designed for practical implementation, whereas the evaluation framework uses a more generalized understanding of co-creation. The main differences are due to the pre-defined boundaries and agreements of the CLEVER Cities project through the grant agreement from the EU Horizon 2020 funding program. Thus, the first stage in the CLEVER co-creation guide already has some delineations for what activities will be taking place in each city through the CALs. In contrast, the first stage in the literature-based evaluative framework begins with open possibilities for the definition of the local problems and solution.

Moreover, the evaluative framework distinguishes between a co-design and co-experiment stage, whereas in the CLEVER co-creation guide this stage can be seen as part of the co-design phase. Lastly, after the co-implementation stage, the evaluative framework follows with the co-management stage which involves sustaining a co-governance and co-management model for the NBS. In the CLEVER guide, a co-monitoring phase is implemented after the co-implementation to measure and analyse the effects of the NBS concerning previously set indicators. Although monitoring is not part of the co-creation framework from DeLosRíos-White et al. (2020), evaluation of the NBS has been included as an indicator in the literature-based evaluation framework within the co-management stage. The main similarities and differences between the co-creation stages of the literature-based framework and the CLEVER Cities guide can be seen in Table 6. It should be emphasized that is not an evaluation of the CLEVER Cities guide, but rather to show a comparison of the co-creation structures.

Table 6. Comparison of co-creation stages between literature-based evaluation framework and CLEVER Cities co-creation guide.

Evaluative Framework (EV)	CLEVER Cities Co-creation guide (CC)	Similarities	Differences
Co-explore	Establishing the UIP	Stakeholder mapping and analysis, clarification of stakeholder roles, definition of objectives	EV begins with defining the local problem whereas the local problem in CC has been set in the grant agreement, CC focuses on spreading the visibility of the project
	Co-creation planning		
Co-design	Co-design of solutions	Citizens can define their needs and preferences for the NBS, needs are prioritized, prototypes of the NBS are made based on citizen input	EV has a distinguished co-experiment stage whereas in CC this is incorporated in the co-design phase as a recommended step
Co-experiment			
Co-implement	Co-implement	Construction of the NBS by technical experts and co-implementation with citizens	CC also focuses on finding an innovative co-financing structure with partners
Co-management	Co-monitor	N/A	CC includes a monitoring stage to validate the co-benefits of the NBS and social benefits according to KPIs, EV sets out a stage to sustain the NBS through co-governance and co-maintenance structures, CC focuses on potential replication of the NBS for scaling up
	Co-development		

The steps of the CLEVER co-creation guide are intended to guide the co-creation process for each city and within each CAL. As the guide should be able to adapt to each local context, the guidance is to be taken flexibly for each city and CAL. Depending on the focus of each CAL the tools and activities per co-creation stage and step may differ. Additionally, the type of NBS and the focus of each CAL guide determines the level of local participation that will be possible during the co-creation process. Therefore the CALs may have different goals for the degree of local participation. Moreover, the co-design phases for each city largely began at the time of the Covid-19 outbreak. This caused many disruptions to the original co-design plans and has caused delays in the process. Nonetheless, the cities were able to continue through innovative and flexible solutions despite social distancing measures, albeit these new plans considerably limited the level of local participation and engagement that was hoped for. The next sections will describe the specific co-creation cases for each FR city.

4.2 Case description of Hamburg, Germany

Hamburg, officially known as the Free and Hanseatic City of Hamburg, is the second-largest city in the country with a population of over 1.84 million. It is one of the 16 federal states of the Federal Republic of Germany, located in the North of the country as seen in Figure 10. Moreover, Hamburg is located on the River Elbe connected to the North Sea, which also hosts the Port of Hamburg. The port is the third-largest in Europe and is the main industry in the area. The CLEVER Cities interventions take place in the neighbourhood Neugraben-Fischbek in the Harburg district, South-West from the city centre, the location can be seen in Figure 10.

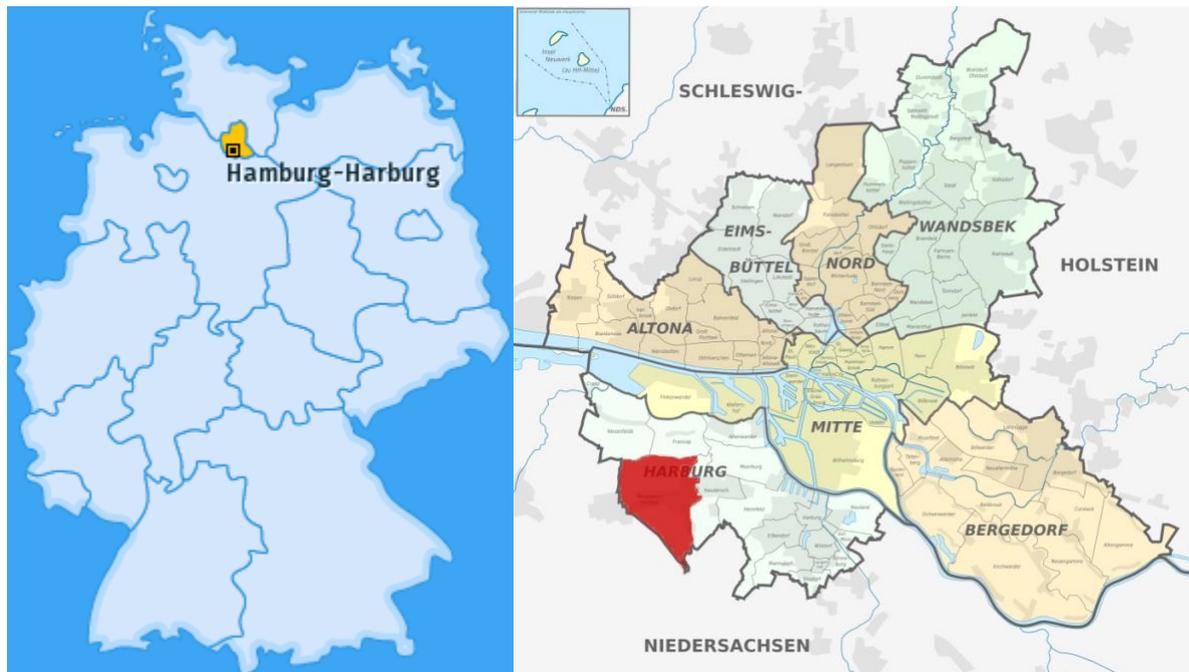


Figure 10. Left shows the location of city-state Hamburg within Germany. Right shows the location of Neugraben-Fischbek neighbourhood within the Harburg district in Hamburg marked in red. (PLZ Suche, n.d.; WikimediaCommons, n.d.)

4.2.1 Governance structure of Germany

Hamburg is both a city and a municipality without a distinction between these administrative levels meaning that the city-wide government is organized at the state-level through the Hamburg State Parliament. This is contrary to territorial states whose governance is hierarchy subdivided, as shown in Figure 11. The city-state Hamburg government is divided into the legislative, executive and judicial branch. The Hamburg State Parliament is the legislature of Hamburg with the responsibilities of law creation, amendment and ratification. The executive powers of the Hamburg government lie with the Senate comprising of senators of the different ministries. Furthermore, Hamburg is divided into seven districts each with its own local parliament, also called district offices, to take the lead over matters of local importance for each district (Hamburg, n.d.).

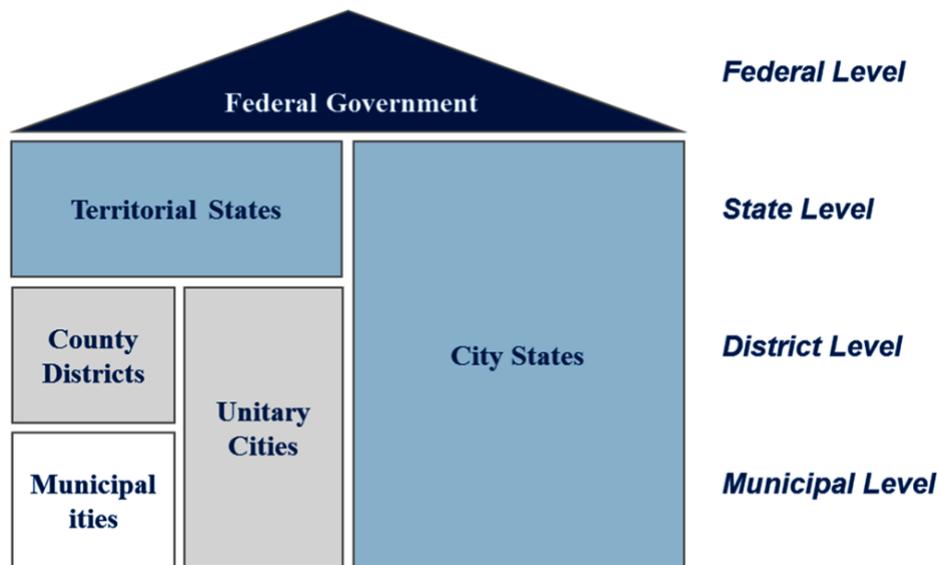


Figure 11. Representation of the German federal system. (OECD, 2019)

4.2.2 Demographics of Neugraben-Fischbek

The population in Neugraben-Fischbek currently accounts for 30.690 people, with the district size being 22.5km². Out of the total population of the district in the year 2018, 20.1 per cent of the population is aged 18 and younger, and 19,9 per cent of the population is aged 65 and older (Statistisches Amt für Hamburg und Schleswig-Holstein, 2018). Statistics from 2016 show that approximately 14.6 per cent of the population is aged between 18 and 20 years, 18.8 percent is aged between 30 and 45, and 26.5 percent is aged between 45-65 (Statistisches Amt für Hamburg und Schleswig-Holstein, 2016). In 2018 18.0 percent of the population were foreigners and 47.1 percent of the population have a migration background (Statistisches Amt für Hamburg und Schleswig-Holstein, 2018). There is also an asylum seekers accommodation organized by the German Red Cross (DRK) to provide housing and support for the duration of their asylum procedure. In regards to the social structure in the neighbourhood, in the age group from 15 to 65 year old's there is an unemployment rate of 6.6 percent. 13.7 percent of the population is receiving unemployment benefits (SGB II) which includes a monthly allowance to cover living expenses, adequate housing and health care Statistisches Amt für Hamburg und Schleswig-Holstein, 2018). Figure 12 shows some photos of the inner area of the neighbourhood.



Figure 12. Photos of the inner area of Neugraben-Fischbek. (Bellin, C. n.d.-a, n.d.-b, n.d.-c; Perras, 2018)

4.2.3 Urban development in Hamburg

Neugraben-Fischbek is expected to see an increase in the population, with a predicted increase of approximately 10,000 new residents by the year 2025 (Freie und Hansestadt Hamburg, n.d.-b). In line with this predicted population growth, the district is working on an urban expansion plan to create more housing and facilities to accommodate the future population. These development plans were brought from the Harburg district council and the Senate has approved three locations in the neighbourhood for expansion. The expansion predominantly includes new housing but also news commercial and public areas. These development plans are part of the Integrated Urban District Development (RISE) framework program, which was initiated in 2017 and will last until 2026 (steg Hamburg mbH, 2018). While developing the neighbourhood in the expectance of new inhabitants, the program focuses on ensuring that there will be an integration of the newly built areas and existing areas to prevent any social and spatial polarization in the neighbourhood. In short, the program aims to counter any negative effects from urban development by reacting to any structural deficits between different areas in the neighbourhood. The activities of the program have involved several public participation events and discussions with the local citizens as input for the development plans. Thus, a culture of public participation in local development plans has already been established in the area. The local development plans in Neugraben-Fischbek is nested under a larger state plan to accommodate for a growing population by building 10,000 apartments each year with 30 percent being dedicated to social housing subsidized by the state (steg Hamburg mbH, 2018).

4.2.4 Climate and environmental policies in Hamburg

In regards to environmental and climate policy, Hamburg is very active in this domain and has considerable future developmental plans for climate adaptation and mitigation. The Ministry for Environment, Climate, Energy and Agriculture are key actors in this domain. In 2011, Hamburg was nominated for the title Green Capital by the European Commission. Hamburg has set goals to reduce carbon emissions by 80 percent by 2050 and halve carbon emissions compared to 1990 levels by 2030. In addition, Hamburg has a strong focus on adapting to and protecting from flooding and stormwater surges. The Rain InfraStructure Adaptation (RISA) plan has been implemented to promote the development of a water resilient city which will promote guidance to administrators, experts and property owners (Freie und Hansestadt Hamburg, n.d.-a). The city is undergoing a transition into a sustainable energy system which includes upgrading public buildings to be energy efficient, focusing on energy efficiency, introducing smart grids and promoting renewable energy sources. Concerning urban greenery, Hamburg is implementing the Hamburg Green Roof Strategy, making Hamburg the first city to implement such a comprehensive strategy. Hamburg has some city parks but has a host of natural areas in the periphery of the city. The Senate has made plans to protect and enhance and maintain the existing green spaces to promote biodiversity and to secure the city's 'natural capital' (Freie und Hansestadt Hamburg, 2016). Additionally, the urgent goal to develop housing for the expected increase in population comes with the risk of losing natural areas through intensive land use. The Senate has agreed to implement a real estate tax which puts a tax on new development projects and direct the revenue to a 'Nature Conservation and Landscape Management' fund (Freie und Hansestadt Hamburg, n.d.-a). Within these programs for urban development and environmental protection, there is room for citizen participation, predominantly at the neighbourhood level.

4.2.5 CLEVER Cities Project Aim for Hamburg

Turning to the CLEVER Cities project in Hamburg, the ongoing urban development expansion and risk of polarization between existing and new areas in Neugraben-Fischbek is the main motivation for realizing the CLEVER Cities project in this district. Thus, the aim and idea of the CLEVER project in Neugraben-Fischbek are to use NBS as a means to regenerate the existing peri-urban areas and foster a better cohesion between different community groups through the co-creation process of these NBS. In other words, with the backdrop of the ongoing urban expansion in the area, the NBS is seen as a means that can both provide social, environmental and economic benefits while enabling different communities to interact with each other in the hopes that these NBS can foster better relations between different social groups in the neighbourhood. The urban regeneration challenges set by the CLEVER project are also matters of concern, since they are likely to be aggravated by the ongoing urban development, and thus the hope lies in addressing these challenges through NBS. Specific to Neugraben-Fischbek, the challenge for human health and well-being is the 1 to 5 percent higher morbidity compared to the Hamburg average and has been labelled as a hot spot for social stress. Regarding economic prosperity, the group of the population that is unemployed and those receiving social welfare benefits are of concern to the city. The challenge for social cohesion and economic justice is the differentiated social structure that exists in Neugraben-Fischbek, namely that 60 percent of the population are foreigners of having a migration background from Russia, Poland, Kazakhstan and Turkey. Moreover, the refugees arriving in the asylum seeker accommodation need access and support to German courses, integration programs, and education programs. Lastly, the challenge for citizen security deals with the perception and feelings areas being unsafe due to the layout of some roads, and lack of lighting

(Davis et al., 2018). Looking at the dispersion of green space in Hamburg and specifically Neugraben-Fischbek it becomes clear that the district is not in any deficit of green space as it is wedged between two nature reserves, the Naturschutzgebiet Moorgürtel and the Fischbeker Heide, as shown in Figure 13.

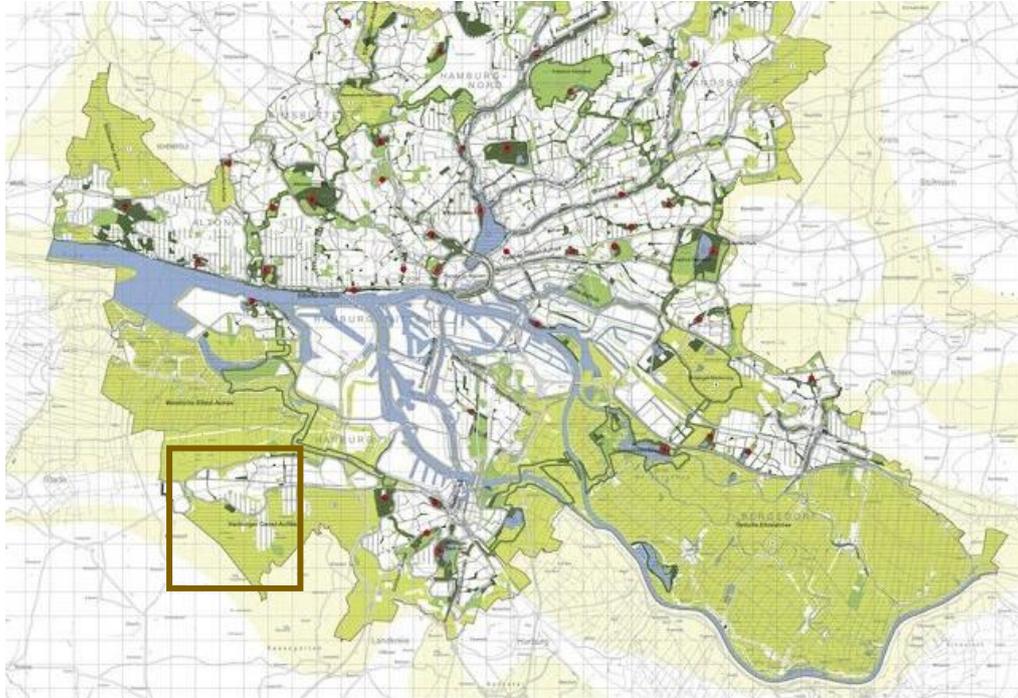


Figure 13. Map of green spaces in Hamburg, with an approximate outline of Neugraben-Fischbek. (Lavars, 2014)

4.2.6 Hamburg CLEVER Action Labs – NBS Interventions

Following the structure of the CLEVER Cities project for the front runner cities, the project in Neugraben-Fischbek consists of three CALs. The first CAL is called the ‘Green Corridor’ and intended to be designed as a green corridor that will connect and weave together the following NBS interventions. The corridor will consist of small-scale place-based interventions to enhance the biodiversity in the area, such as planting different plant species. Plans for the corridor focus on promoting the story and image of CLEVER. Additional to these spot-like interventions, a water retention bike path will be designed along the corridor. The bike path will be a means to address the challenge of water flooding in the area. The location of the corridor and the following interventions can be seen in Figure 14.

The second CAL is focused on creating green roofs and facades. The green roofs and facades will be implemented on buildings along the corridor, to contribute to water retention, biodiversity and insulation of the building. Moreover, the green roofs can contribute to more green space for recreation for the building dwellers. Lastly, CAL 3 focuses on implementing NBS in schoolyards in the area. Three schoolyards in Neugraben-Fischbek will be undergoing renovation, and thus the project aims to use this opportunity to design multifunctional green spaces in the schoolyards together with the pupils and parents. In addition, this CAL also focuses on the educational component and raising awareness for environmental issues and NBS through the school teaching program. During the early participation events together with the local citizens, the need to incorporate the refugee accommodation was brought up. This led to the incorporation of activities at the DRK asylum seekers accommodation. In the garden of the

accommodation, raised garden beds were implemented as well as picnic tables and a naturally inspired painting on one of the containers (Cantergiani et al., 2019). Although the co-creation process with the DRK garden is a sub-project of CAL 1, it will be referred to as an independent project within this research.

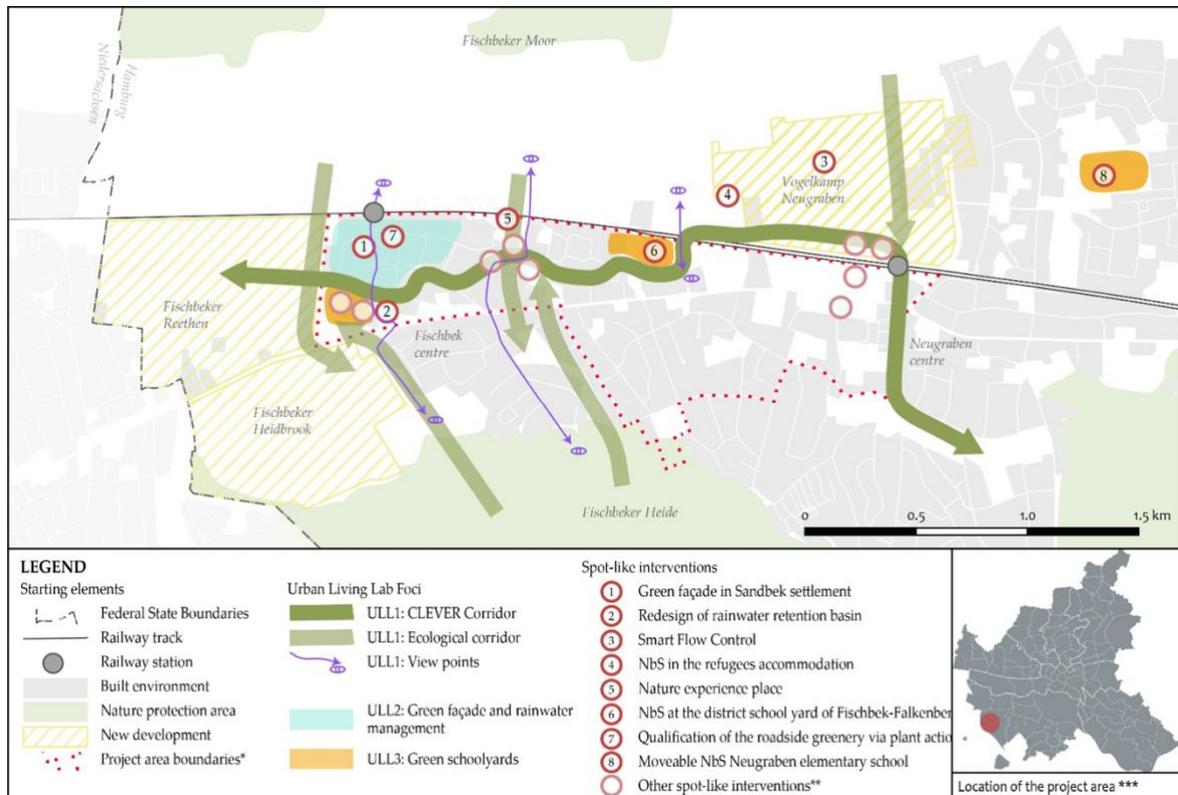


Figure 14. Plan of the NBS interventions in Neugraben-Fischbek, the spots are the school yards and interventions along the corridor, nodes are areas along the corridor connecting multiple interventions (Arlati, Rödl, Kanjaria-Christian & Knieling, 2021).

The CLEVER project in Neugraben-Fischbek took on a spot-like intervention approach, meaning that many of the CALs consist of multiple smaller projects contained within them or as it is called by the project coordinators, a stepping-stone approach. This approach entails that multiple small scale projects are going on where citizens can easily get involved, but also causes that the analysis of the project area in Neugraben-Fischbek could not go into such detail of each small scale intervention. As each intervention and sub-project within the CALs had their own methods for engagement and tools for interaction, the results section will focus on the analysis at a broader level by evaluating the project at large and by looking at each CAL, the corridor (CAL 1), the green roofs and facades (CAL 2), the schoolyards (CAL 3), and the DRK gardens. An overview of the CALS and the corresponding NBS and main activities is provided in Table 7.

Table 7. Description of Clever Action Labs in Hamburg.

CAL	Description	Main Activities
1 Corridor	Small scale greening interventions along a route through the neighbourhood connecting to the other CALs with a focus on telling the story of CLEVER	ToC workshop, DIPAS (digital participation tool)
2 Green roof and facade	Green roofs and facades on selected buildings in combination with the existing Hamburg green roof strategy aiming to create biodiverse hotspots	ToC workshop with building owners, surveys
3 Schoolyard	Three local schools will design NBS interventions, such as gardens, in their schoolyards together with students and teachers, focusing on an educational objective	ToC workshop with school teachers, garden design activity with pupils
DRK Garden	Building spaces to recreate in the refugee accommodation centre, wooden islands to sit, high garden beds, and nature-inspired painting on the container	Toc workshop, interactive building sessions with refugees

4.2.7 Transversal Stakeholder Configuration in Hamburg

Each specific project within the Neugraben-Fischbek project area has its own collection of collaborating stakeholders and local partners. However, the public sector, academic sector, private sector, and civil society held a crucial role in the co-creation of all CALs. The public sector is responsible for the administration of all projects, involving legal procedures, financial agreements and third-party contracting for the projects. In other words, the role of the public sector in the co-creation of the projects takes on a coordinating function, ensuring that participation and collaboration are occurring in the projects either with citizens or contracting stakeholders. Additionally, the public sector is involved in scaling up the NBS strategies learned from the CLEVER Cities project at the federal level. The primary role of the academic sector is to guide the local stakeholders through the provision of scientific information, which has contributed to the creation of the co-creation guide and the KPIs for the monitoring of the project. The representation of the private sector in the project is very diverse, ranging from landscape architects to gardeners, to housing associations. However, the most crucial private sector actor for the co-creation of the initiatives with citizens is an urban development company. This actor was mainly responsible for the outreach and engagement with citizens in the area. Lastly, the civil society in the project is represented by the local residents, NGOs, teachers and students from the local school, and local organizations (Arlati, Rödl, Kanjaria-Christian & Knieling, 2021).

4.2.8 Main activities and progress of Hamburg CALs

The CLEVER Cities project in Hamburg started with a large-scale public kick-off event in 2018 to raise attention for the project's aims and objectives, as well as setting the basis for the following co-creation process. The kick-off event attracted approximately 130 people from the neighbourhood, including local citizens and a representative from both the public and private sector. During the kick-off event, participants could walk around tables with the proposed CALs and leave comments through discussions with the project partners, by leaving notes, and

by using the online participation tool known as DIPAS. The DIPAS tool allows citizens to leave comments on a virtual map of the project area to locate their comments and ideas for the NBS interventions. The kick-off event was the starting point for the co-creation process in Hamburg.

With the comments of the participants, and interest demonstrated by participants towards specific CALs, the project partners identified relevant stakeholders for each NBS intervention. With the configuration of stakeholders for the individual CALs through the kick-off event and additional stakeholder mapping, the UIPs for the CALs were set. The UIPs collaborate throughout the co-creation process in different formats, including workshops, meetings and jour fixes depending on the specific NBS intervention. Most importantly, the UIPs were involved in a Theory of Change (ToC) workshop to identify long-, medium- and short-term goals for the individual CALs based on visions for the NBS. The ToC was the basis for the co-creation process and is used as a basis for the monitoring indicators. However, citizen involvement was not limited to these local UIPs. Citizens could participate in the co-creation process through the online digital participation tool, DIPAS, and through ongoing engagement activities in the neighbourhood (Arlati, Rödl, Kanjaria-Christian & Knieling, 2021). The current state of the CALs according to the CLEVER Cities co-creation guide can be seen in Table 8.

Table 8. The current progress of CALs in Hamburg according to the CLEVER Cities co-creation guide.

CAL	Co-Creation Progress in Hamburg					
	UIP Establishment	Co-Design	Pre Co-Monitoring	Co-Implementation	Post-Co-Monitoring	Co-Development
1, Corridor						
2, Green roof/façade						
3, Schoolyard						
DRK garden						

4.3 Case description of Milan, Italy

Milan is the second most populated city in Italy, with a population of 1.4 million living in the city of 181 kilometres squared, and 3.26 million in the greater metropolitan city of Milan. The city is located in the Northern Lombardy region, within the province of Milan as shown in Figure 15.



Figure 15. Left shows the location of Milan province in the Lombardy region, right shows the boroughs of the city of Milan. (Enchanting Italy, n.d.; Wikimedia, n.d.)

Geographically, the province of Milan is located near the foothills of the Alps, and South of the great lakes. Milan is a buzzing economic hub, known for its business and financial commerce, tourism, and cultural sector. The province can be further broken down into nine administrative boroughs with the historic city centre of Milan marked as borough 1, see Figure 15. Furthermore, each borough has distinct smaller districts. The intricate layers already hint at the complexity of the administrative hierarchies within Italian urban planning.

4.3.1 Governance structure of Italy

The hierarchy in urban planning in Italy can be divided into four layers, namely, the central government, the regional government, the provincial government and the local government. At the top of the hierarchy, the central government sets the national urban planning law which creates guidelines and general objectives, while also providing detailed planning instruments to Municipalities. The regional government has competencies through the regional planning laws and conducts regional landscape plans. The provincial government does not have legislative powers over urban planning, yet can use the province territorial and province urban planning instrument. Likewise, at the local government level, there are no legislative powers however, the general urban plans set at the state level are legally binding for municipalities. Planning instruments at the local level include the urban general plan for urban and building regulations (Covilatti, Usai & Bonfiglioli, 2013). These intricate layers of public administration in urban planning cause problems through the excessive bureaucratization and complexities due to overlapping competencies between the administrative layers (Covilatti, Usai & Bonfiglioli, 2013). The CLEVER Cities project area is located in the Giambellino- Lorenteggio district in the sixth borough of Milan, as shown in Figure 16.



Figure 17. Photos of the Giambellino-Lorenteggio district. (Giannattasio, 2017; La Scuola Dei Quartierie, n.d.; Wikimedia, n.d.; Natale, 2019)

4.3.3 Urban development in Milan

A large urban regeneration program is being implemented in the Giambellino-Lorenteggio district by the Municipality of Milan following plans from the Lombardy region. The redevelopment plans include the creation of more walking space for pedestrians on the main roads together with more trees and greenery along the road, as well as providing more public spaces. This includes plans to make a 27,000 square meters park, which is part of the CLEVER Cities project. Additionally, the plan will be complemented by the regeneration of buildings, requiring some buildings to be demolished and families relocated for the reconstruction of the buildings. Moreover, underground works in the area will strengthen the district heating. Overall, the regeneration program for the Giambellino-Lorenteggio district aims to make the area greener and more attractive, and better connected to other districts. The redevelopment program is currently being implemented with plans for the revalidation of buildings in 2025 (Commune di Milano, n.d.-b). These plans for the development of Milan are supported by the Milan 2030 master plan, set by the City Council of Milan, aiming to transform the peripheral districts of Milan into a green, alive and resilient city, and better connected to the centre. The master plan includes an enhanced integrated mobility system with emphasis on public transport, job opportunities and quality public spaces created from abandoned spaces among other starting points (Commune di Milano, n.d.-a)

4.3.4 Climate and environmental policies in Milan

Relevant climate policies for Milan include the Italian National Adaptation Strategy to Climate Change (NAS) which was adopted in 2015, to promote climate adaptation planning at the national, regional and local administrative levels. In addition to the NAS, the Italian Directorate-General for Climate and Energy has drafted the Italian National Adaptation Plan

for Climate Change (NAP) to provide the tools and institutional guidance for integrating climate change adaptation within spatial and sectoral planning at the national and local level. At the regional level, the Lombardy Region Adaptation Strategy (RAS) is a methodology focused on mainstreaming adaptation planning into cross-sectoral policies. The RAS outlines climate scenarios and impacts for various sectors with potential adaptation measures based on a soft, grey and green typology (Cetara, Pregolato, Denti & Lombardy Foundation for the Environment, 2019). Zooming into the Milan metropolitan area, the main challenges to address are hydrological risks caused by pluvial flooding, reduced soil supply, pollution and lack of water resources, heat waves, and the overconsumption of non-renewable energy sources. To address these challenges, the Milan Metropolitan Territorial Plan is a general planning tool that specifies an action strategy for the entire territory. The plan aims to increase the resilience and adaptability of Milan by improving the integration of adaptation policies within territorial planning (Life Metro Adapt, 2020). Moreover, at the Municipal level of Milan attention is placed on increasing the quantity and quality of green infrastructure within the city (Commune di Milano, 2020).

4.3.5 CLEVER Cities project aim for Milan

Turning to the overarching goals and aims for the CLEVER Cities project in Milan, the main goals for the project are to reduce air and noise pollution and enhance biodiversity in the city. These goals are placed in the frame of a larger urban regeneration program taking place in the Giambellino-Lorenteggio district to rehabilitate the area. The overarching aim is to use the CLEVER Cities projects as a testing ground for urban regeneration in Milan through the use of NBS. The NBS projects will be a means for the city to develop innovative solutions that promote citizen participation and climate change adaptation. Moreover, the projects are used to raise awareness about the implementation of NBS to increase the uptake of such intervention in Milan. The Milan CLEVER Cities projects also aim to address the four urban regeneration challenges specific to the project intervention area. The interviewees have mentioned the specific goal to provide environmental and social benefits to the citizens living in the district as a means to improve their well-being, considering the large social vulnerabilities of the local population. In regards to the challenge for human health and well-being, Milan is trying to address the high noise pollution and effects of the urban heat island effect, as well as the vulnerable conditions of human wellbeing for residents living in proximity to the railway infrastructure that runs through the entire project site. Regarding the second challenge for sustainable economic prosperity, Milan focuses on reduced costs through the green roof stormwater management approach. Additionally, the railway infrastructure creates social and economic segregation between districts and has caused a depreciation of housing along the railway lines. Furthermore, regarding the challenge of social cohesion and environmental justice, residents in Milan faces a poor sense of place and a lack of social cohesion within the community. Lastly, concerning the urban challenge of citizen security Milan faces high crime in abandoned areas around the rail yards, and a history of crime in an abandoned park. This causes many residents to feel unsafe in their neighbourhood (Davis et al., 2018).

Looking at the dispersion of green spaces in Milan and specifically within the Giambellino-Lorenteggio district, it is clear that there is a lack of green space due to the compact urban fabric of the city, especially in the district as it is located out of the city centre and before the periphery of the city where more green space can be found, see Figure 18. Additionally, the quality of the green spaces in the district is generally derelict and abandoned.

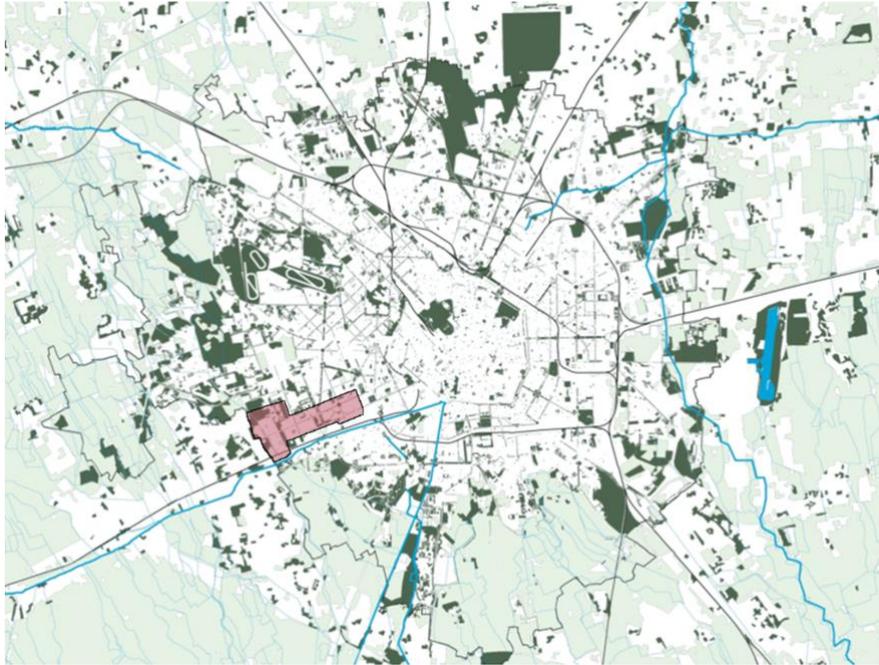


Figure 18. Dispersion of green spaces in Milan, the Giambellino-Lorenteggio district is outlined. (Puerari, Concilio, Longo, & Rizzo, 2013)

4.3.6 Milan CLEVER Action Labs – NBS Interventions

The three Clever Action Labs in Milan are spaced over a wider project area compared to the CALs in Hamburg. The first CAL is focused on the implementation of green roofs and walls on various buildings around the Giambellino-Lorenteggio district and also stretching into other districts, thus the scope of CAL 1 is city-wide. The specific implementations of the green walls and roofs include a green wall on a public building on a popular street in the Giambellino district. Another intervention includes a green roof project on a social housing building that connects four rooftops, with plans to make an edible garden and green walls for the residents to enjoy and cultivate. The last intervention takes place on another social housing building, with plans to create both a common green roof for the entire building and dedicated green roofs for specific vulnerable communities living in the building. CAL 2 is focused on the regeneration of an abandoned and derelict park in the Giambellino neighbourhood, otherwise known as park Giambellino 129. The park was already been included in the Municipal-led regeneration program in Giambellino-Lorenteggio. The goals for the park are to create a multifunctional green space that will involve natural elements for enhancing local biodiversity, rain-water runoff, and a harvesting area for a shared kitchen. The third CAL aims to implement NBS for the Tibaldi train station, located just within zone 5, to create a noise and pollution barrier. The specific implementations include green walls, soil remediation and planted trees, as well as public space (Cantergiani et al., 2019). An overview of the CALs can be seen in Figure 19.

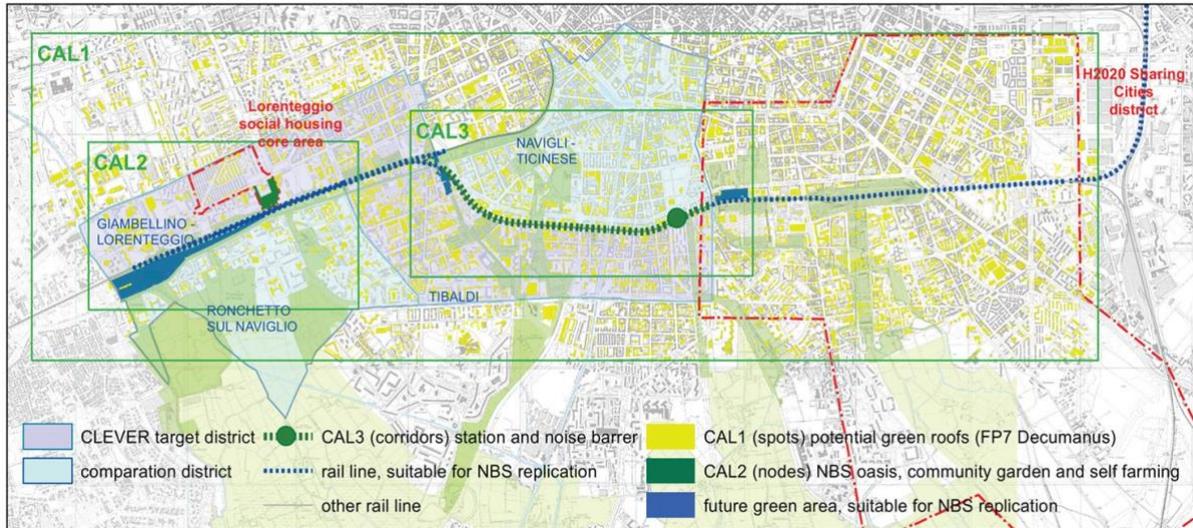


Figure 19. Milan CLEVER Cities project site, with located CALs. (Cantergiani et al., 2019)

An overview of the CALs with corresponding NBS description and main activities is provided in Table 9.

Table 9. Description of Clever Action Labs in Milan.

CAL	Description	Main Activities
1 Green roofs and walls	Green walls and roofs to provide environmental microclimate benefits, and create a space for locals to recreate and engage with nature; one green wall on a public building, and two intensive green roofs on social housing buildings	ToC workshop with main stakeholders, online meetings with residents
2 Park, Giambellino 129	Revitalization of an abandoned park focusing on the enhancement of biodiversity and education of environmental benefits	ToC workshop with main stakeholders, envisioning activities with citizens
3 Tibaldi train station	Creation of noise and pollution barriers through green walls and trees, revitalization of the train station	Online public survey sent out to citizens

In contrast with the CALs in Hamburg which have multiple projects within each CAL and the overall CLEVER project, space is centred in one local area, the CALs in Milan are more dispersed at a city-wide level and are designated to the one specific project, namely the green roofs and walls, the park and the train station. The analysis of the CLEVER Cities case in Milan will have an overarching evaluation but can focus in more detail on each specific CAL as these are more defined compared to the CALs in Hamburg.



Figure 20. Participants meeting at the Giambellino 129 park, CAL 2. (CLEVER Milano, n.d.)

4.3.7 Transversal Stakeholder Configuration in Milan

For each CAL, a specific configuration of stakeholders was created to support the co-creation process and the overall facilitation of the NBS. However, the stakeholder establishment for the overall CLEVER Cities project includes actors from the public and private sector, academia and civil society. The public sector is responsible for the management of the entire Milan CLEVER Cities project, involving the contracting of stakeholders. The private sector is responsible for the design and implementation of the green infrastructure, as well as citizen engagement and monitoring of the NBS. The academic sector is involved in the monitoring and creation of the co-creation guidance, as well as providing scientific information to support the development of the NBS throughout the co-creation process. Lastly, civil society is represented by social organizations both helping to engage citizens and participating themselves, and citizens taking part in the co-creation process.

4.2.8 Main activities and progress of Milan CALs

The initial set-up of the co-creation process in Milan took a different form compared to the establishment of the co-creation process in Hamburg. In Hamburg, the co-creation process started with a large kick-off event allowing citizens to participate in shaping the contents within the CALs from the beginning which also set the basis for the local UIP formations. Whereas in Milan citizens could only participate starting from the co-design phase. However, CAL 1 is an exception since the co-creation process started with a public call for residents of buildings and professionals to take part in the green roof and wall interventions. Residents of buildings, or building owners could apply their building for the green roof or wall intervention. The applicants for the public call resulted in both participants interested in receiving the green roof or wall, and professionals who would support the realization of the intervention. This configuration led to the establishment of the local UIPs for each individual green roof or wall project, and the basis of the needs for each intervention. Following the UIP set-up in CAL 1, each intervention consisted of four meetings throughout the co-design phase, which include the residents, the professionals, and project partners.

In CAL 2, and CAL 3, the UIP configuration and delineation of the general contents of the NBS interventions was decided without citizen participation. Stakeholder mapping was conducted primarily by the public sector involved in the CLEVER Cities project and focused on professionals and stakeholders. After the configuration of the UIPs for CAL 2 and 3 through the stakeholder mapping process, citizens were able to give their inputs in the co-design of the NBS through engagement activities, in the case of CAL 2, and an online survey in the case of CAL 3. The current state of the CALs according to the CLEVER Cities co-creation guide can be seen in Table 10.

Table 10. The current progress of CALs in Milan according to the CLEVER Cities co-creation guide.

CAL	Co-Creation Progress in Milan					
	UIP Establishment	Co-Design	Pre Co-Monitoring	Co-Implementation	Post-Co-Monitoring	Co-Development
1, Green roof/façade						
2, Giambellino 129 park						
3, Tibaldi train station						

CHAPTER 5. RESULTS PART I: EMPIRICAL CONFRONTATION

This chapter firstly presents the results from the case evaluations of Hamburg and Milan against the literature-based framework in section 5.1 and 5.2 respectively. For each case evaluation the results are divided per co-creation stage of the literature-based framework. The individual case evaluations are followed by a comparison of the case evaluations in section 5.3, which leads to adjustments in the literature-based framework 5.3.1. Next, the inductively derived indicators through the comparative case study analysis is presented in section 5.4, proceeded by the inductively derived conditions presented in section 5.5. Lastly, this chapter ends by putting together all the findings of the previously mentioned sections and leads to the empirically-confronted framework in section 5.6. An overview of the layers in this empirical confrontation chapter can be seen in Figure 21.

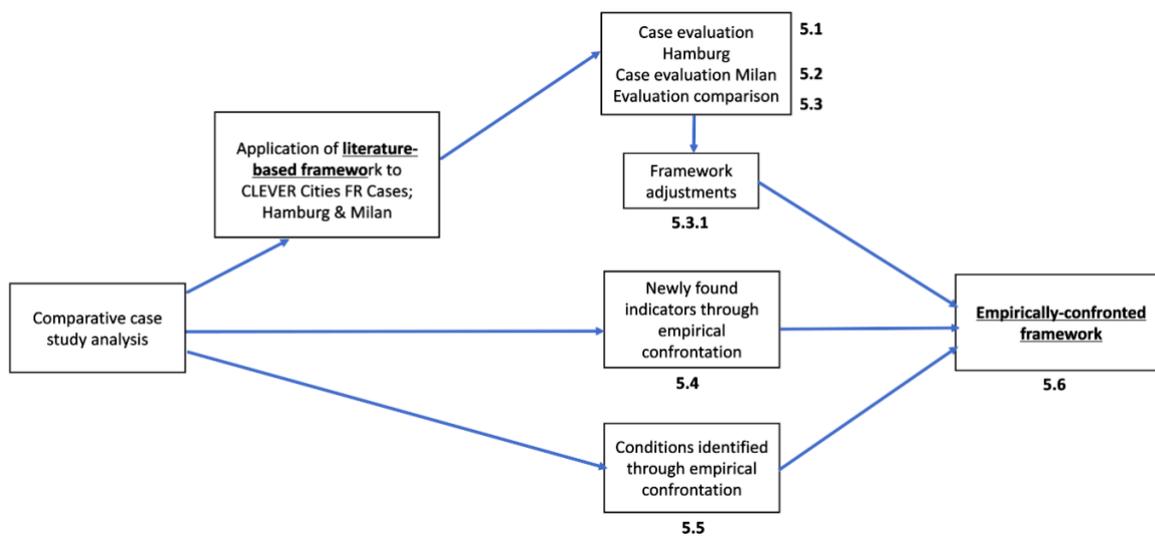


Figure 21. Visual representation of results chapter outline (development process of the framework) with corresponding chapter sections.

5.1 Evaluation of Neugraben-Fischbek, Hamburg

5.1.1 Co-Explore

An overview of the scores for the co-explore stage in the Hamburg co-creation process can be seen in Table 11. The scoring for each indicator is presented and justified in the following sections.

Table 11. Overview of co-explore stage results for Hamburg.

Hamburg Results		
Co-Creation Stage	Indicator	Score
Co-Explore	The NBS is framed through a goal of social inclusion	(+)
	The local problems and the use of NBS as a solution are defined together with citizens	(-)

(Table 11 continued on page 68)

Organizers acknowledge socio-economic and socio-spatial inequalities regarding access to quality urban greenery	(-)
Organizers map/identify diverse local community groups as stakeholders	(+)
Citizens and organizers set goals for the NBS together	(+)
Organizers engage marginalized and vulnerable groups appropriately	(++)
Citizens and organizers collectively operationalize the co-creation process	(+)

The NBS is framed through a goal of social inclusion (+)

The main concern for the NBS in Hamburg is centred around the involvement and empowerment of local citizens in the collaborative design of the NBS, however there is a lack of focus on specifically empowering marginalized social groups through the co-creation process, therefore this indicator scores a (+).

The co-creation guide is seen as an approach that will give room for citizens to take on an elevated role in the co-creation process and giving them the ability to contribute to the shaping of their neighbourhood. Although there are different levels of citizen participation depending on the type of NBS, interviewees state that the ultimate goal is to empower citizens by giving them influence decision-making process in the shaping of the NBS, as illustrated by the following interviewee:

“The goal is to empower citizens [and] involve them in the shaping of [their] neighbourhood. And also what we expect out of this process is also to enhance their sense of belonging and a sense of ownership of what they co-design [and] co-produce.” (H2, Research/Academia)

As illustrated by the quote, the goal of including citizens in the co-creation of the NBS is to empower citizens by having the ability to shape their neighbourhood through the NBS and therewith give them a sense of ownership over the outcome of the co-creation process. The goal is thus to involve citizens in the co-creation process to give them a sense of ownership and responsibility of the co-created NBS with the aim that the sense of inclusion and ownership will be sustained after the NBS has been implemented. Moreover, interviewees stress the importance of involving local citizens throughout the entire co-creation process, not only at the end once the decisions have already been made:

“The co-creation brings the participation to the utmost level, meaning not coming to ask x y, z actor what they think later on in different planning stages, but we’re taking them on board from the very beginning, from idea level on[wards].” (H1, Public sector)

Moreover, specific to the challenges faced in Neugraben-Fischbek, the current fragmentation of neighbourhoods and the expected increase in fragmentation due to new developments in the area, the idea behind co-creating urban NBS with citizens is to establish a practice and output

that can bring different groups of people together. The citizens living in the area range from wealthy people living in large single houses, to middle class, and lower class people living in social housing apartments, as well refugees living in accommodation centres. This point for integration through the co-creation process for urban NBS is explained by the following interviewee:

“[Neugraben-Fischbek] is a quarter which is very fragmented. And it is a neighbourhood that is subject to major changes right now because there are three development areas around Neugraben-Fischbek, they are just built up right now. And [...] within 10 years or so they will have like 25,000 additional inhabitants, which are not at all connected to the ones that are already living there. So the question is, you have an area that is already quite fragmented, and now you like build on top a lot of really, really major developments, larger areas around that. Perhaps it's a good idea to do something that brings those people together.” (H4, Public sector)

Overall, the vision of social inclusion concerning the NBS in Hamburg is to use a co-creation process that will empower citizens by being involving them in the co-creation decisions for the NBS. The aim is to give people a sense of ownership over their neighbourhood, while at the same time creating a process that can bring people together. While there is an overall focus to improve areas dealing with urban challenges through NBS, there was no specific focus on using the NBS interventions or co-creation process to specifically benefit and uplift the representation of marginalized or excluded groups in Neugraben-Fischbek.

The local problems and the use of NBS as a solution are defined together with citizens (0)

Although citizens were able to contribute to the development of the contents within the CLEVER Action Labs (CAL), the CALs with corresponding NBS interventions were already largely pre-determined and thus limited the scope for which citizens can share the problems they would like addressed as well as the use of NBS as the solution to their problems, therefore a neutral score (0) is given.

The CLEVER project did not give room for citizen contribution when defining the local problems in the area. The outline of problems in Neugraben-Fischbek was already broadly defined in the grant agreement labelled as the urban regeneration challenges, those being human health and well-being, sustainable economic prosperity, social cohesion and environmental justice, and citizen security. The proposal also set forth the initial objectives of the CALs in Neugraben-Fischbek, and thereby limited the scope for citizens to contribute to the definition of the local problems the CALs will address. With the urban challenges and CAL interventions largely pre-determined in the proposal phase, the objectives of the CALs are quite detached from the local problems that are prioritized by local citizens. For example, the problem of fragmentation although prioritized by the organizers of the CLEVER Cities project does not seem to be shared by local citizens as the following interviewee explains:

“We already [have] so many different nationalities in our district. Actually, most of the people didn't say that was or could be a big problem. Mostly they focused on [...] security, is the area secure, can we send our children outside to play or how is the school situation, [how] many people are coming to live in Neugraben-Fischbek, [how] many new buildings will be built? And so what happens with the kindergarten, with the schools, with [the] medical situation, with technical

infrastructure, busses and underground and so on. So that's actually what the people are worried about.” (H5, Private sector)

The quote shows that citizens do not prioritize social fragmentation as a local problem, and neither do they mention greenery and urban nature as a priority. Additionally, it seems that the use of NBS as a solution to address the problems defined by the project seems rather undefined. The interviewees mention that NBS are needed to address unwanted negative impacts from urban development, and are important to secure social, economic and environmental benefits through for instance reduced energy costs for buildings with green roofs, raising awareness about nature and improving the living environment. Yet, the specific link between the NBS interventions and the benefits they claim to provide are unclear to the organizers:

“That's what we have always discussed, how nature-based solution can actually help the people here who are living here. I can't, I don't have an answer actually, to that question. Maybe at the end of the project, we will have an answer. So we always are thinking what actually is NBS? So what is a nature-based solution? It's, of course, we have an idea, but all the social indicators are also important as well.” (H5, Private sector)

Although the main problems and initial plans for the CALs had been set previous to the involvement of citizens, the project partners in Hamburg organized a large kick-off event in the neighbourhood open for all citizens to take part. The kick-off event allowed citizens to bring their input and feedback on the proposed plans for the CALs by speaking with the project partners and through an online participation tool which allows citizens to place their comments on a map of the project area. The feedback of citizens' needs and interests for the project during this event led to changes in the formatting of the CALs. For instance, one proposed CAL was removed as citizens' feedback showed there was no interest in it, and the DRK refugee accommodation garden project was included due to citizens' demand. In this public event, citizens were able to contribute to the shaping of the NBS as a solution to the projects' pre-defined problems. The project did not allow citizens to collectively define the problems to be addressed but made room for adjustments in the CALs and collective shaping of the NBS as a 'solution'.

Organizers acknowledge socio-economic and socio-spatial inequalities regarding access to quality urban greenery (-)

This indicator scores (-) because the decision for Neugraben-Fischbek as the location of the CLEVER Cities project was not based on a socio-spatial analysis looking at discrepancies in citizens' access to green space, however the projects' goal to use NBS as a means to redress social fragmentation in the neighbourhood demonstrates that the case somewhat meets the description of the indicator (-) instead of not meeting the description at all (- -).

Neugraben-Fischbek is already a very green neighbourhood as it lies in the outskirts of the city centre located in-between two nature reserves. Thus the choice of this neighbourhood to implement the CLEVER Cities project which aims to enhance the area through benefits of urban NBS seemed a bit odd for some project partners, as is explained by the following interviewee:

“Because first of all the area here in Neugraben Fischbek is quite green. So, we are not in the city centre. So as my boss first asked me if I would like to do this

CLEVER project and I looked into the papers, I said, huh [these] questions and NBS nature-based solutions for Neugraben-Fischbek does that really make sense? Because we have got so many [...] green spaces here within the district. And close to the district, we have forest we have fields and everything.” (H5, Private sector)

Thus the motivation for implementing the CLEVER project in the neighbourhood of Neugraben-Fischbek was not based on an effort to redress spatial inequalities of green space benefits. The choice for the location was instead partially based on the capacity of the local administrators to take on such an intensive project, since the initially proposed location was turned down due to a lack of local administrative capacity. In Neugraben-Fischbek, the aim of the NBS is centred on the issue of social fragmentation as was stated by the project partners. As there are different social groups with varying degrees of economic and social stability in the area, the NBS aims to break down barriers between these groups to facilitate interaction. Yet, the placement of NBS is not specifically aimed at redressing inequalities within the neighbourhood. It was through the demands from citizens during participation events which brought attention to include and provide NBS benefits for the refugee accommodation centre in the neighbourhood.

The choice for the specific locations of the NBS interventions was partly based on existing ongoing projects in the area that the CLEVER project could connect with. As an example, Hamburg has an ongoing green roof program which is also active in the neighbourhood. Thus the CLEVER project focused on enhancing the biodiversity of the existing green roofs instead of creating and spreading out new green roofs. Additionally, the school yards in the area were already making plans for re-construction and thus the CLEVER project built on these existing developments as well. It should be noted that linking the CLEVER project into ongoing developments was part of the conditions of the overall project, however, it has restricted the necessary analysis of where NBS benefits are needed most by specific groups of people. Overall the placement of the NBS was not based on redressing inequalities, but on available capacity. Although one interviewee mentioned that because the project area is small, the specific location is not as significant since the NBS will provide benefits for most of the area. Nonetheless, it shows that the specific locations were not chosen to address social or environmental vulnerabilities. One interviewee describes that the choice of placement of the NBS interventions was not planned based on societal needs but environmental needs:

“If we thought of putting a special nature-based solution at a special place to answer the needs of this specific group? No. I would rather say if a specific user group or if a specific part of the society expressed the need or specific people expressed a need, but we did not [think] of one user group needs something so we let's put an NBS somewhere. There were, for example, there was a house for elderly people and which was very close to a huge road with large amounts of traffic. So we thought to place a green wall as a noise barrier in front of [the house] next to the street. But we did not think of it because there was the because of the elderly people, but because of the street.” (H3, Public sector)

The location of the overall CLEVER project in Neugraben-Fischbek was thus chosen based on the capacity of the local administrators to support such a co-creation project and not necessarily based on redressing inequalities. Similarly, the specific locations of the three NBS interventions were not chosen to redress local socio-spatial inequalities or disparities in benefits from NBS, although it was due to citizens' demands that an NBS is being implemented in the refugee accommodation and thereby takes into account social vulnerabilities.

Organizers identify/map diverse local community groups as stakeholders (+)

Stakeholder mapping of citizens and social groups in the area was broad and active efforts were made to represent the diversity of the community, although there was no specific identification of marginalized or vulnerable groups, thereby the Hamburg project scores (+) for this indicator.

Before starting the co-creation process, an overview of the different social groups and communities of the area was made by one of the project partners who has been working in the local area for many years. Based on this overview, the project partners approached diverse social group representatives to be involved in the project and help to reach out to the members of the community they represent. The mapped out social groups and communities include faith organizations, youth organizations, schools and the elderly.

“Before we've started with the projects, and with the co-creation process, we looked, who was living here in the district, where are the problems or where are the challenges? And who is working here with the people? So maybe the teachers or some institutions, churches, the mosques, and so we got in contact with them.”
(H5, Private sector)

Thus the stakeholder mapping process involved an analysis of the different social groups present in the area and identifying representatives of such groups. This scoping and mapping of different social groups was based on the intuition and experience of the project partner, instead of using a methodology to map and represent the social diversity of the area. Moreover, the interviewees mentioned that there was no specific identification of vulnerable or marginalized groups in the area, as shown previously that the refugee accommodation centre was initially not included by project partners, however as an interviewee pointed out this was based on the challenge of including a fluctuating group of people throughout the project.

Furthermore, the broad stakeholder mapping in Hamburg was not necessarily restricted to citizens who would receive direct benefits of the NBS interventions, instead project partners looked at the whole neighbourhood as end-users of the interventions. As one interviewee mentioned that they consider the end-users of the green wall to also include the pedestrians passing by, not only those living in the building of the green wall. Therefore the co-creation process was open to all citizens. However the direct involvement of participants in project meetings or workshops was limited to citizens with the required resources and capacity and with a direct relation with the NBS.

“But wherever we were inviting in terms of directly inviting, only involving, from our point of view, where were the actors that were bringing the resources, bringing the knowledge bringing, or getting the direct impact, and getting the direct [...] experience [...] with regards to those measures.” (H1, Public sector)

This shows that stakeholder mapping of citizens was conscious of representing the diversity of the community, but that direct involvement of citizens through deeper levels of participation was based on citizens' direct impact by the NBS intervention or their ability to contribute by having the right resources or skills. Moreover, the involvement of citizens is determined by their capacity and willingness to participate in the project, as the following interviewee points out:

“It's not that we try to reach out to every group that has been defined in the in the course of the project. But we try more to see which group is actually active, which is actually really wanting to involve themselves or where do we have multipliers that, that really reach out to the people that we want to reach that we can't address directly? So from that point of view, there was a conscious process, but it was not that we said, okay, we need that many people from that kind of group and that many people from that kind of group and this project is only for that kind of group. We didn't decide upon that like this, but more like, okay, where's the chance was the window of opportunity to reach out to certain people.” (H6, Private sector)

Overall, the initial broad stakeholder mapping was based on the experience and the connections of the project partner who has been active in the area for some years. Mapping the diversity of social groups and marginalized groups in the area was based on the intuition and social networks of this experienced project partner. In this way this partner was crucial in the representation of diverse social groups in the area in the project, although there was no specific method of ensuring that a diverse representation was reached. Furthermore, citizens' direct involvement in the project was based on their knowledge or resources, or being directly linked to the placement of the intervention, thereby excluding citizens without these resources to hold deeper levels of influence in the decision-making. However, it should also be noted that citizens' direct engagement in the project is also based upon their own motivation and willingness to take part in the project.

Citizens and organizers set goals for the NBS together (+)

Citizens were able to take part in setting the goals for the NBS through their input when defining the contents of the CALs in the public event and by taking part in the smaller ToC workshops which were used to define the long-term goals of the NBS. As not all social groups were represented in the Theory of Change workshops, this indicators scores a (+).

The ability for citizens to take part in setting defined goals for the NBS interventions took place during the ToC workshops. The ToC workshops took place after the public kick-off event where the specific contents and shaping of the CALs occurred. With the collectively defined CALs during the public event, for each CAL a small group of citizens together with project partners carried out a ToC workshop to delineate the goals and visions for the each CAL and corresponding NBS intervention. The ToC workshop gave room for participating citizens to express their wishes for the NBS, long term visions and goals. Once these were in place, together with the project partners the goals were back-traced into a pathway for how to reach these goals by delineating concrete outcomes of the NSB. The pathway includes specific methods or tools that need to be used in order to reach the outcomes and goals.

The outcome of the ToC workshops for each individual CAL was also the basis for the social monitoring Key Performance Indicators (KPI) that are being used to monitor the outcome and impacts of the NBS. The monitoring is required by the CLEVER project, but does not feed-back into the co-creation process. Nonetheless, the KPIs were created based on the goals and feedback of citizens who participation in the ToC. Moreover, due to the dynamic nature of the project, these KPIs are also changing to adapt to new developments.

“The KPIs were the outcome of the question of how do we organise those projects. And the selection was quite individual let's say, and I was surprised that within those kind of like three or four hours, how we had like such an immense structure

and sound outcome from just this [ToC] workshop. And this still is the basis for the KPI selection that we have. It has been modified, of course, because also the projects are dynamic. But it has really helped to have like some sort of, how do you say some foundation coming from the people that really work on the topics that really bring the ideas, be volunteers, be teachers, you name it, we've had quite an interesting mixture of people being participating in this process. I was not even thinking about this methodology to be that powerful. And long term, effective, let's say.” (H6, Private sector)

Although the general goal setting of the NBS within the CALs gave room to citizens, it is unclear which citizens were represented within these ToC workshops as they were small and intense working groups that required specific capacities and skills. In CAL 3, the school yards, it is clear that the teachers and parents participated in the workshop, but it is unclear which citizens were represented in the CAL 1, the corridor, ToC workshop. Moreover, in CAL 2, the green roofs, citizens were not involved in the ToC workshop, instead the building owner participated in setting the goals.

Besides the ToC workshop which set the specific goals, pathways and the basis for the KPIs of each CAL, an online participation tool was open for three weeks to allow citizens to continue defining the contents of the CALs. In this way citizens who were not part of the ToC workshop were able to indirectly contribute to setting the goals of the NBS. Moreover, interviewees noticed that citizens were not interested in setting specific KPIs for the NBS, instead the main interest for citizens is in being involved in designing and producing the output of the NBS, in other words the ‘doing’ not the detailed planning.

Organizers engage marginalized and vulnerable groups appropriately (++)

Active efforts by the project partners were made to engage hard to reach groups through means that were tailored to the needs of the groups by investing time and resources to ensure the groups could participate in the process. Therefore the indicators scores (++).

The kick-off event tried to open up participation for groups that usually have a hard time raising their voice, in the case of Neugraben-Fischbek a focus was placed on the refugees, youngsters and the elderly. The experienced project partner was again a key success factor in engaging hard to reach groups as they have the networks and experience in stakeholder engagement in the local area. The interviewees mentioned that the engagement of different social groups, especially marginalized or hard to reach groups, required specific engagement methods tailored to their needs as can be shown by the process of engaging youngsters. Project organizers used fun and engaging activities that were not necessarily directly related to the NBS project, as a method to gain their interest. One of these activities was designing a cargo bike, called the CLEVER mobile, together with youngsters in the area which was used as a boundary object to have youngsters indirectly engage in the CLEVER project.

“Then the young people, maybe age[d] between 14 and 20, 21, it's possible to reach them, but it's not very easy. So the fun factor needs to be quite high. So and of course they think what's the benefit that we get if we do things. What we did with the young people was together with some students [design] our clever mobilel [...] and that worked quite good” (H5, Private sector)

For the elderly and disabled, the project partners made sure that participation in the project did not have any physical barriers to join. Project partners went to the locations of these groups to make engagement easier. Reaching out to representatives of associations or community groups was also an important factor when engaging harder to reach groups as they can act as a mediator between the citizens and the project and thereby make participation and engagement accessible to the needs of the citizens.

Moreover, for the engagement of the asylum seekers in the refugee accommodation, it was necessary to use translators and interpreters for making engagement accessible to the people. The project partners also placed attention on working together with the refugee accommodation manager, and visiting the site often. These efforts were necessary to tailor the engagement process with the needs and interests of the refugees, although as interviewees have mentioned that this was a resource and time intensive process:

“This was a really long and I will say a lot of resource[s] [and] consuming effort to really involve [the refugees] because we had to communicate with them [in different] languages. So we also had interpreters, that were translating what we were doing, and planning” (H2, Research/Academia)

As the response of the interviewee shows, the involvement of the refugees in the project required a large investment of time and resources from the project partners. Overall, the engagement methods for different social groups, especially the harder to reach groups, were specifically tailored to their needs to ensure that engagement was accessible and appropriate for these groups.

Citizens and organizers collectively operationalize the co-creation process (+)

This indicator scores (+) based on the efforts made to ensure that citizen participation was made accessible by consulting with citizens to ensure engagement activities are fit to the availabilities and needs of social groups. For instance, the project partners spoke with the representatives of social groups and associations to make sure that the interactive workshops were planned at an appropriate and accessible time, and were organized in a safe and comfortable location (H5). Additionally the creation of the CLEVER mobile together with youngsters was created according to their interests, and was therefore able to get more active engagement and input from youngsters than originally planned. However, it is not entirely clear how the participation of citizens in the corridor project, CAL 1, was organized.

5.1.2 Co-Design

An overview of the scores for the co-design stage in the Hamburg co-creation process can be seen in Table 12 (see next page). The scoring for each indicator is presented and justified in the following sections.

Table 12. Overview of co-design stage results for Hamburg.

Hamburg Results		
Co-Creation Stage	Indicator	Score
Co-Design	Diverse local citizens are represented	(+)
	Organizers facilitate a process open and flexible to the needs and values of citizens	(+)
	The NBS is designed for both short- and long term socially inclusive effects	(-)
	Organizers use accessible communication with citizens	(++)
	Citizen engagement tools are accessible to diverse social groups	(+)
	Organizers facilitate a transparent decision-making process	(+)

Diverse local citizens are represented (+)

Based on the efforts of the project partners to represent the community by approaching various social group representatives throughout the co-design process, and the cultural sensitivities project partners encountered regarding the monitoring of participating citizens which limited the evaluation of the extent to which there was a diversity representation, this indicators scores (+).

The project partners stated that a diversity of local social group representatives were approached and engaged in the co-design process to represent the interests of their community groups. These representatives are called ‘multipliers’ by the project partners since they can multiply the number of citizens being represented in the co-design process without having to directly include large numbers of citizens in the process. However, there was no monitoring of the diversity of the citizens participating the co-design events. This lack of evaluating the representativeness of the participants is due to several factors. One being that observing the identities of citizens can be felt as discriminating, and contradictory to the project partners’ aims of creating an open atmosphere to encourage the interaction between different citizens. This sentiment is described by an interviewee in the following quote:

“So we actually, we don't make a [checklist]. We are dealing with everyone who lives here in this area. So we don't ask them where do you come from, actually, [our CLEVER colleagues in London] they wanted us to ask in our questionnaires, where do you come from? And I said, no, I don't want to ask that because for me, it's not important. [In] Neugraben-Fischbek [there are] so many nationalities and that's good. And even when the refugees came a few years ago, for my opinion, it was a good thing for the community here and for the district. Lots of not only Germans, but other nationalities, they came together and they were very sympathetic, and they thought what can we do to help these people and so it was actually a good situation and not a bad situation.” (H5, Private sector)

The interviewee shows that checking the different identities and backgrounds of the participants can feel discriminating, especially when monitoring if non-natives are joining in the project. While this sentiment is understandably culturally sensitive especially considering the history in Germany, lack of monitoring participating citizens can potentially create an unawareness of the true diversity that is being portrayed in the co-design project activities. Although, contrary to this statement, another interviewee who was not involved in citizen engagement mentioned that there was some form of checking the diversity of the participating citizens, though this was through informal observations of the group. Additionally, the same interviewee mentioned that despite the informal observations of the different citizens taking part they are unsure if the project was able to react on any imbalances in the representation of different groups throughout the co-design process.

Another reason for the lack of evaluating the diversity of citizens participating is that it can take away from the efforts project partners put in to engage the citizens in the activities. During the co-design stage the project partners are focused on ensuring the activities are running well and that citizens are encouraged to give their inputs. Asking and monitoring the diversity in these co-design activities can become a barrier when trying to facilitate informal and approachable engagement activities. Moreover, another barrier to monitoring the representativeness of the community is the restrictions created by online engagement tools and privacy concerns. Due to online data privacy measures it is difficult to collect personal data about those participating through the online tools.

Overall, the creation of an open, inviting and inclusive atmosphere throughout co-design process had a higher priority than formal evaluations of the diversity of citizens. Nevertheless, the social group representatives and associations were key in engaging different groups throughout the co-design process, and the various tailored engagement methods enabled different social groups to take part in the co-design activities.

Organizers facilitate a process open and flexible to the needs and values of citizens (+)

Based on the different approaches used to get input from citizens incorporated into the project, and the flexibility of project partners to find ways in making the ideas of citizens fit the project, but the limited openness for input specifically from the tenants of the green roof residential building gives this indicator an overall score of (+).

The process and methods for the co-design of the CALs in Hamburg were very dynamic and flexible as the process moved together with and built upon the ongoing inputs from the citizens. Project organizers made room for participating citizens to express their wishes and needs for the NBS which are taken into account through an iterative process as citizens can always give input to the project through an e-mail or passing by the local office of one of the project partners.

To facilitate the openness of the inputs from citizens, the project partners organized various methods, including the online participation tool which allows citizens to leave their comments of what they would like from the project on a virtual map of the area. Additionally the workshops were used for more in-depth engagement and gave more room for citizens to express what they feel about the projects. As part of facilitating an open process, the project partners were strongly focused on incorporating citizens' input into the project even if the ideas did not fit the label of 'nature based solutions'. In this sense the project partners understand the

importance of being open to citizens' inputs and being flexible in finding ways to incorporate the input into the design of the NBS so as not to discourage citizens' efforts.

“And we didn't want to disappoint the people that have brought their ideas, or that like certain ideas and wanted to participate. And we would have had to say but sorry, this is not a nature-based solution itself, so we can't work on it. So we thought, no, this is part of it. We need to negotiate about how it makes sense, and how we can link it in a good manner with the overall idea.” (H6, Private sector)

For instance, in the case of the DRK garden, one of the ideas that was proposed by the refugees was to create a painted mural with flowers and plants on a container wall. Despite the idea not strictly being a 'nature based solution' in the sense of providing environmental benefits, the project partners included the idea to encourage the efforts made, and to create a solution that directly addresses what the people want. The flexibility in the co-design should give the possibility for citizens to provide inputs that are not strictly filtered by the definition of an NBS, but should be used and adapted to fit the project.

The openness and flexibility in the type of inputs that could be given range from locals leaving a comment when passing by the local office or sending an e-mail about a new idea or opinion about a specific CAL, to youngsters making drawings about their ideas for the new design of the green school yard. Additionally, citizens' input regarding their sense of safety in the area was registered through an app, and citizens were able to choose the specific plants or flowers they would like in the interventions. With the different methods used to collect citizen input, the workshops seemed to provide the most openness for different ideas since it is easier to have an open deliberation without restrictions in the type of feedback that is possible. However it should be noted that in the case of CAL 2 the openness for the tenants' input was quite limited due to the fact that the owner is representing their interests. This also potentially caused the lack of engagement of the tenants regarding responses to surveys and questionnaires about the green roof on their building.

The NBS is designed for both short- and long-term socially inclusive effects (-)

In Neugraben-Fischbek, the NBS are designed to provide a means to bring different social groups together with a long-term goal of reducing the social fragmentation of the area. However, the uncertainties of long-term exclusionary effects based on potential exclusion of citizens who were not involved in the co-design, and the imbalance of the scale of the NBS with the larger goal to address social cohesion within the community gives this indicator a neutral score (0).

The NBS seem to be designed with a short-term goal of providing an opportunity for different groups of citizens to collaborate together through the co-design activities and give them a chance to take part in shaping their neighbourhood. While the long-term goal seems to be focused on the sustained interaction between the citizens and the NBS. This can be seen in the case of refugees taking care of the raised garden beds in the DRK garden or young students and teachers taking care of the school yard. However, this long-term engagement of citizen with the NBS is limited in CAL 2, the green roofs, due to the lack of active maintenance that is needed, and thereby does not provide citizens room to build a sense of ownership or attachment with the NBS. Furthermore, it seems unclear how the NBS can in the future attract different groups of citizens who did not take part in the co-creation process during the CLEVER project. Moreover, since CAL 2, the green roofs, and CAL 3, the school yard are designed for a specific user group, only that specific user group can benefit from the NBS. The green

corridor in CAL 1 could potentially attract more citizens to enjoy and learn about the nature planted along the corridor.

Regarding potential exclusionary effects through processes of value or price increase in the area caused by the NBS, the interviewees seem not to be concerned due to the small scale of the NBS. In other words, the NBS interventions are of too small scale to start a process of gentrification in the area. Moreover it is assumed by the interviewees that the benefits of the NBS will spread to the whole neighbourhood since the NBS are spread around the neighbourhood in a spot-like intervention, yet are small enough to prevent price increases. However, these are assumptions made by the project partners, and it is still the challenge to understand how to correctly measure these impacts caused by the NBS.

Additionally, long-term goals for the NBS were set through the ToC workshops, in combination with the projects aim to address broadly defined urban regeneration challenges:

“The starting point [for the long-term goals was] through the theory of change workshop, in my opinion, and I think it laid ground definitely and linked to the long term goal of afterwards binding with monitoring and evaluating phases, what it brings in terms of not only inclusivity, but in terms of all these four, urban regeneration challenges, what we have in the CLEVER cities project.” (H1, Public sector)

The long-term goals are thus developed partially together with citizen’s needs, and the overall larger urban challenges of citizen security, economic prosperity, social cohesion and environmental justice and health and well-being as set by the CLEVER project. Overall the short-term goals are to use the co-creation process and the NBS to provide means for social interaction, however, it is unclear how these small scale NBS can address larger urban challenges, and contribute to the problem of social fragmentation stated as the problem in Neugraben-Fischbek.

Organizers use accessible communication with citizens (++)

Overall, the project partners showed an active effort to create a sense of informality and approachability with their choice of wording and accessible communication with citizens, thereby giving this indicator a score of (++).

The role of mediators was key for the process to help create an accessible form of communication with the citizens in the different CALs. The project partner with experience in stakeholder engagement in the area was able to mediate the project with citizens in a manner that was appropriate and accessible to them. For instance, the ability for locals to pass by the partner’s office in the neighborhood created an easy contact point for citizens to share information. Additionally, the creation of the cargo bike, CLEVER mobile, was not only an engaging activity to involve youngsters but could be used as a boundary object to talk about the project in an informal manner.

Besides the experienced project partner being an important mediator, the translators used to speak with the refugees, and the social group representatives were central to communicate the project goals or activities in an understandable fashion. Representatives were able to speak about the project in a way that is appropriate for citizens of a social group, and could easily

spread information about the project to a much wider audience. An interviewee spoke about the importance of the representatives, also called ‘multipliers’:

“With basically each and every group, or each and every project needed a specific way of communication, a specific way of approaching the people especially the multipliers, I'm not sure if this is the right term, or multiplier, that's how we call it a lot of times. So this are the gatekeepers, or the ones that really reach out to the people because they have some higher rank, let's say they have more responsibility, they're well seen in the network.” (H6, Private sector)

Additional to the role of mediators facilitating accessible communication, the use of understandable terminology also seemed to be important for speaking with citizens in Neugraben-Fischbek. Using terminology that is understandable by citizens instead of technical terminology used internally by the project partners, including the term NBS, was needed to create a more tangible form of communication that does not discourage citizens from participating:

“We [made the CLEVER mobile] with an institution which is working together with young people, we call it a Jugendzentrum [a youth center]. And most of them are not very high educated and we put them together with the students [from the university], and that's when I said, we need to find the same language and the same words, not that the young people feel ashamed, or if the students are talking in the spatial planner language. And that was [really] a challenge but it worked.” (H5, Public sector)

Visual tools were also used as a method to communicate plans for the project without using complicated terminology. For instance a large carpet with the map of the area was used to help explain the plans, as well as visuals of the potential NBS designs. These visuals were not only useful to explain the project to citizens, but allowed them to then better express their wishes and in return contribute to the design process.

Most of the general communication about the CLEVER project was either done through the municipality, through online social media, or the e-mail channels of the experienced project partner. Overall, the form of communication was quite widespread and accessible, tailored to the specific needs of each social group, however a main barrier in making the communication accessible was to break down the formality that can often exist in projects organized with local authorities and academia.

Citizen engagement tools are accessible to diverse social groups (+)

The project in Neugraben-Fischbek used a variety of tools to make citizens’ contributions to the NBS design accessible, namely, through the small workshops, the online participation tool, and spontaneous contributions when passing the local office in the neighbourhood. However, the digital divide caused by the use of online tools gives this indicator a score of (+).

As mentioned in the previous indicator, various tools were used to make involvement in the project more accessible in the project as the tools were tailored to the different needs and capabilities of the social groups. The interactive sessions and workshops gave room for citizens to express their wishes, and be able to give a broader range of information and personal experiences. Workshops are tools that stimulate a space for deliberation between participants

and can thereby help project partners incorporate citizens' wishes into the design of the NBS. In the case of the school yards, the school students participated in workshops where the project partners let the students lead (H5). In CAL 1, the green corridor, workshops were also held together with citizens to determine the natural elements to be used to create the nature experience. In the DRK gardens, workshops were held with the refugees to create an understanding of what was wanted and needed from the people. Only in CAL 2, the green roofs, the tenants were not present in the workshop as they were represented by the building owner. Therefore in CAL 2, the citizens were not given enough tools to express their wishes as they have only been consulted in the project.

Besides the workshops, surveys have been handed out to citizens asking about detailed elements of the NBS, such as the type of plants or flowers to be planted. These surveys give citizens the possibility to take part in planning details of the NBS, but are limited in the influence citizens can hold over the decision-making. Moreover, the online participation tool (DIPAS) was used to collect citizen feedback and input on the NBS of the different CALs. The online tool was only meant to be used for the opening event but due to the Covid-19 pandemic the online tool was adapted to supplement for other planned citizen engagement activities. The DIPAS tool allows citizens to pinpoint their comments or concerns on the area map, and leave comments, ideas or suggestions for the CALs:

“So we had in Hamburg we had the DIPAS, tool which is practically digital table in this case is a digital one, the digital table were for citizen participation. This was actually present during the first up event and people could use the these tables to leave comments on, and also place based, which was the geo-reference, that geo referenced map of the area. And people could leave comments on, concerning topics that are like social topics, natural related topics and so on.” (H2, Research/Academia)

Regarding the ability for citizens to express their wishes, the DIPAS tool was very useful in allowing citizens to visually locate any concerns or ideas for the NBS through direct place-based input of citizens. However, the DIPAS tool limits the level of participation that can be reached and creates a digital divide of citizens who can or cannot use digital tools. These online tools particularly excluded elderly citizens. To adapt to this digital divide, project partners handed out flyers to the elderly for their input. Additionally, the use of the CLEVER mobile helped youngsters to connect with the project and leave comments about what they would like for the NBS. Moreover, trips with citizens and refugees to the NBS sites helped citizens express and formulate their wishes.

Organizers facilitate a transparent decision-making process (+)

Based on the efforts made to manage the expectations of the citizens regarding the feasibility of their inputs, and the efforts made by project partners to balance keeping citizens informed while preventing a participation fatigue, this indicator scores (+).

Overall the project partners demonstrated that they used different communication tools to give updates and information about the developments within the NBS projects. The main tool to communicate the developments of the project was done through online tools, however, to accommodate for the digital divide the project partners made sure to give updates on the progression of the project through leaflets or brochures, and importantly through the social group representatives.

A key element in ensuring transparency with the citizens was to manage the expectations of citizens by clearly outlining the boundaries in which the interventions can take place, either financial or technical boundaries, or by safeguarding that the NBS interventions serve a purpose for the CLEVER project. It was important for the project partners to be clear with citizens about the extent to which their inputs could be realized, and if their inputs fit in within the boundaries of the CLEVER project. Moreover, an interviewee pointed out that expectation management is needed to make clear that the CLEVER interventions are a small addition to the development of the neighbourhood and will generate a large transformative impact for the area:

“But you somehow it's really important to have this expectation management just to make clear for people, okay, what is it what we are talking about here? What will be the result? What are the chances, but what are also the limitations? CLEVER is just a little part, a little piece of what's happening here and we tried to contribute to the overall development of the neighbourhood, but we will just be able to deliver some incentives and some additional push for some of those things that are happening here. But we will not like redevelop the whole neighbourhood. And so this is really important to be honest about this to people. And so I'm absolutely sure that a lot of things that people brought into the process, were not part of the interventions.” (H4, Public sector)

Regarding the flow of information from the project partners to the citizens throughout the duration of the project, there seems to be some discrepancy in the interviewees' statements. As some interviewees mentioned that citizens were kept up to date on developments of the interventions, some interviewees felt that there was a lack of communication due to the absence of a local newsletter, since this responsibility was not taken up by any of the project partners.

“I guess [citizens] who joined [...] the first event might wonder what happened to CLEVER in the meanwhile, because we have no newsletter within CLEVER cities, local Hamburg. Because no one saw the responsibility the [necessity] to do so. But I think to activate people, it's very important to regularly just feed the people with some kind of information just to let them know the project is still alive. And or just to show up somewhere. Having a website is also important but you have to interlink this website somehow somewhere.” (H3, Public sector)

The reason for the interviewees' statement that there is a lack of regular updates being sent to the citizens is due to the fact that doing so may also cause participation fatigue. As other interviewees from Hamburg have mentioned that it is challenging to keep the locals updated and engaged during the time lags of the interventions. In other words, sending updates of the project while no progress in the NBS interventions has taken place can discourage people from staying engaged. There is thus a challenge to balance on the one hand that citizens feel included in the updates of the project, while on the other hand being careful not to create a participation fatigue with constant updates and no progress.

“I mean, this is participation paradox. And one of the ways to solve that is to keep people interested and involved over a long time, not to contact and contact them again, and again and again and sometimes they don't even know what's coming out of [their efforts] and then you end up with this participation fatigue, where people say ah come on, get lost, I'm not invested anymore, because last time I was involved there, and nothing came out of it, and so on and so on.” (H4, Public sector)

There was not much information about how the project partners deal with communicating larger trade-offs, but instead how partners clarify to citizens what is possible within the boundaries of the CLEVER project.

5.1.3 Co-Experiment

An overview of the scores for the co-experiment stage in the Hamburg co-creation process can be seen in Table 13. The scoring for each indicator is presented and justified in the following sections.

Table 13. Overview of co-experiment stage results for Hamburg.

Hamburg Results		
Co-Creation Stage	Indicator	Score
Co-Experiment	Reflexive social learning takes place	(+)
	Indicators set collectively with citizens are used for final evaluations of the NBS	(0)

Reflexive social learning takes place (+)

In the process of co-designing the NBS interventions, the project partners actively reflected on the inputs of citizens for the design of the NBS interventions and considered the accessibility of the activities for citizens, although there was no reflexivity based on the experiences of citizens in the co-design process to adapt the process itself, thereby giving this indicator a score of (+).

The learning process is seen as a core element within the CLEVER co-creation guide, and in fact learning from citizens was mentioned as a key characteristic of the co-creation approach. This element of social learning between citizens and project partners is necessary in order to design interventions that capture the citizens' needs and wishes (H2). Through all the moments in which citizens could provide their inputs for the design of the interventions, the project was very dynamic in the sense that the projects were always adapting to the local needs:

“Since the planning part was built to allow much flexibility. Of course, problems were always on the corner. But we had always to modify, to adapt to the local condition of [...] each process at the end. [...]. But it's a part of the game so to adapt all the time, to the needs, to specific needs.” (H2, Research/Academia)

Moreover, besides the reflexive evaluations of the needs and wishes of the locals for the NBS interventions, interviewees also mentioned the reflexivity that was needed to ensure that the citizens have the capacity for the co-creation process so as not to overburden. The social learning in Hamburg shows that both the citizens needs and capacities were considered and constantly fed-back into the design of the NBS.

“[The different levels of co-creation are] different circles, iterative learning circles [which overlap and]makes it super interesting and super, I think fruitful at the same time. Sometimes challenging, lengthy as well, because, obviously, with so

many part-projects, of course, you have this wide spectrum of actors and processes and... what are the goals? What are the capacities in order not to overburden the other side as well? And we always talk about this co-creation.. but is the cocreation to the extent wished as well? Or are there capacities from the other side for co-creating? That's a challenge, which are continuously analysed.” (H1, Public sector)

Despite the reflexivity in the inputs for the design and the capacity of locals in the co-creation process, one interviewee mentioned that a weakness of the project is the lack of feedback from citizens about how they experience the co-creation process itself:

“What I would like to know better or more, is actually a feedback from the people. So what was the benefit? What did they like? Or what was good? What was not so good? Actually, we are doing the projects and workshops and we do things and then we are gone.” (H5, Private sector)

This statement by the interviewee demonstrates that project partners are unaware of how the locals experience to co-design process. This limits the projects' ability to react on the citizens' experiences by adapting the process to be better tailored to their needs. Moreover, since the participation of citizens is always changing as different people join the events, it is difficult to learn if locals feel that the co-creation process and NBS interventions have been adapted to their needs. Although this fluctuation of citizens in the project events can also show that different people are joining in the project, it is difficult to follow-up on citizens' sense of progression in the project. Finally, the CLEVER project requires that FR cities conduct social monitoring of the NBS, at two different stages in the project. One before the implementation of the NBS intervention and one after the implementation. This monitoring is not used to feedback into the co-design stage, however doing so could allow for better reflexivity in the project regarding social aspects which are not specifically asked in the co-design activities.

Indicators set collectively with citizens are used for final evaluations of the NBS design (0)

Evaluations of the NBS design together with the citizens are not done through collectively set indicators, but are conducted through continuous feedback throughout the co-design process, with some cases of specific activities for a final evaluation. However, due to some uncertainties about the final evaluation process in specific CALs, and the breadth of citizen participation in this evaluation process this indicator scores neutral (0).

Although the social monitoring KPIs were in some cases set together with citizens they are not used for an evaluation of the final design of the NBS but instead used by the CLEVER project to monitor the overall impact of the NBS. In fact the process for the final evaluations of the NBS designs are tailored to the specific CALs. In the case of the green corridor, citizens can use the online participation tool to vote for their favourite designs. In the case of the school yards project, the school children were able to take on a role as jury together with the project partners and university students to pick the best designs for the NBS (H2). It is unclear how the final evaluations of the green roofs will be facilitated or how the evaluations for the DRK gardens were facilitated. However, the case shows that there is not one moment in which there is a collective evaluation of the final design. Instead the process towards reaching the final design seems to involve constant evaluations with citizens throughout the co-design phase.

5.1.4 Co-Implement

An overview of the scores for the co-implement stage in the Hamburg co-creation process can be seen in Table 14. The scoring for each indicator is presented and justified in the following sections.

Table 14. Overview of co-implement stage results for Hamburg.

Hamburg Results		
Co-Creation Stage	Indicator	Score
Co-Implement	There is non-profit oriented financing of the NBS	(0)
	Citizens can take on active roles as co-implementers	(+)

There is non-profit oriented financing of the NBS (0)

In the case of the NBS interventions in Hamburg, the projects will be co-financed in both the implementation and maintenance of the NBS. However, due to the uncertainties of the motivations behind sponsors investing in the NBS, especially in the case of the green roofs, and the price effects of the NBS finance for citizens, this indicator scores neutral (0).

The implementation of the NBS are predominantly implemented using the CLEVER funds provided by the EU Horizon 2020 program, in combination with local forms of co-finance. The CLEVER funds are used to both implement technical aspects of the NBS but also to provide consultancy for those who are implementing and own the NBS. Thus in the case of the green roofs, CAL 2, the CLEVER funds are used to support the consultations and implementation of the green roof, supported by co-finance with the building owner and the Hamburg green roof subsidy program. In the case of the green corridor, CAL 1, the implementation will be completely financed by CLEVER funds, whereas the maintenance will be financed by the municipality with voluntary maintenance from the citizens. The school yards are also implemented largely by CLEVER funds, with a symbolic financial contribution by school parents. As for the DRK garden in the refugee accommodation, this will be financed by a real estate office, a subsidiary of the state.

In the short-term, the NBS solutions seem to be financed in a manner that does not require a return on investment, or that places the cost of the NBS interventions on the citizens. However, in the case of the green roofs, and interviewee mentioned that despite the social housing buildings being owned by the state, the addition of the green roof can be included in the costs of refurbishing the building, meaning that tenants may be obliged to financially contribute to the maintenance of the green roof.

Furthermore, the motivations for local actors in Neugraben-Fischbek to ask for the NBS implementation is often driven by the motivation of these actors to increase the value of their building or area. The discussions with the interviewees mention that focus is placed on increasing social value, and that NBS can in fact reduce costs for example through improved insulation.

“A rental house with a lot of people living there. And here we have, for example, a lot of those houses in the area are owned by the [a housing company]. And this is

a good thing because this is an old company, but this company is owned by the city of Hamburg, so this is more or less state housing. So if you put green roofs on their roofs, and so to say, increase the value of those houses you can more or less argue you increase societal value and you will probably not increase rents because [you] also could save money through improved insulation, for example. So I would say, this is not the big problem here. We are thought about other effects.” (H4, Public sector)

Despite the standpoints of the interviewees that an increase in value can be considered social benefits, there is no mechanism in place to ensure that the NBS will not contribute to financial value and drive up prices. Another interviewee stated that it is difficult to attribute impacts of green gentrification to the NBS interventions as they are woven into larger development programs which are more likely to cause price fluctuations. Moreover, the interviewees argue that the small scale of the NBS interventions cannot cause a price spike in the area. Overall, an interviewee mentions that the social culture in Hamburg is cautious about gentrification, and that this was not a concern by the citizens in Neugraben-Fischbek.

Citizens can take on active roles as co-implementers (+)

The project partners plans to have citizens included in the co-implementation process as an engaging activity to help citizens build a sense of ownership over the NBS and interact with other citizens, although, the technicalities of the green roofs do not allow for citizen participation in the co-implementation stage. For these reasons this indicator scores (+).

As part of helping citizens to feel ownership over the NBS they contributed to, an important feature of the co-creation process is for citizens to be involved in the co-implementation of the NBS. The implementation activities are planned to give citizens a direct sense of contribution and ownership over the NBS with the idea that this feeling will last after the CLEVER project is completed. Moreover, the implementation of the NBS together with citizens is important for stimulating interaction between the different groups of citizens. An interviewee also mentioned that citizens are mostly looking forward to the implementation activities since the citizens want ‘to do’ and not only contribute through surveys. The projects in the DRK garden have already been implemented and resulted in positive feedback:

“So when we had the projects in the refugee camps, we made raised beds and had these [wooden] islands where they can sit on and we [made drawings of nature], [the refugees] did [it] together with us and some actors here from this area. And all these projects were quite good and the people who took, who made it were quite happy and they said, they had a lot of fun and it was good to do something together with the neighbours.” (H5, Private sector)

For the green corridor, the school yards, and the DRK gardens, the NBS have been or will be implemented together with the citizens. Citizen contributions is possible in these projects since the implementation of the NBS does not require any technical skills, they are easy and safe projects to implement with citizens. However, in the case of the green roofs, citizens will not be able to contribute since experienced professionals with technical skills are required for the implementation. This may have consequences for the resident’s feeling of attachment towards the NBS, and as an interviewee stated, lack of citizen involvement in the implementation will probably translate into a lack of feelings of attachment and ownership towards the green roofs (H3).

5.1.5 Co-Management

An overview of the scores for the co-management stage in the Hamburg co-creation process can be seen in Table 15. The scoring for each indicator is presented and justified in the following sections.

Table 15. Overview of co-management stage results for Hamburg.

Hamburg Results		
Co-Creation Stage	Indicator	Score
Co-Management	Citizens are appropriately involved in the management of the NBS	(+)
	Organizers provide a structure for continued citizen-based evaluations of the NBS	(0)

Citizens are appropriately involved in the management of the NBS (+)

Citizen involvement in the long-term management of the NBS differs per NBS case, as there is less ability for citizens to be engaged in the management of the green corridor since the public space is owned by the municipality, whereas the school children, parents and teachers are able to be involved in the management of the school yard NBS since they have ownership of the space. Moreover, the responsibilities for citizens in managing the NBS are decided through consultations. Although in the case of CAL 2, the responsibility of the tenants to contribute to the maintenance of the green roof can be decided by the building owner without consultation. For these reasons, this indicator scores (+).

As mentioned previously, in combination with giving citizens a sense of ownership through their inputs in the design and their involvement in the implementation of the NBS, it is hoped that this feeling of ownership will translate into citizens' willingness to help the long-term maintenance of the NBS. Although citizens are encouraged to be involved in the long-term maintenance of the NBS interventions, the structure for allowing them to do so depends on the actual ownership of the NBS:

“The [...] maintenance depends on the type of intervention and the place where the intervention is and the ownership. So we can imagine so for instance [concerning] the school interventions the management would be done on the shoulder of the of the teachers and the school, but for instance [concerning] the interventions in public spaces for instance, this is a bit difficult for us to expect the citizens will take care of that.” (H2, Research/Academia)

The statement shows that the question of ownership and existing governing structures will largely determine how citizens will stay involved in the maintenance and management of the NBS. For instance, in the case of the school yards there is already an existing structure which allows teachers to manage the activities in the school grounds. This existing structure makes it easier for teachers and students to stay involved in the NBS, as well as the fact that they have ownership over the school yard. In the case of the green corridor, the main task of managing the NBS will fall on the municipality as they hold ownership. In the DRK gardens, similar to the school yards, there is already an existing structure in place making it easier to facilitate a for refugees to be supported in the long-term maintenance of the vegetable gardens. In contrast,

the NBS in the corridor are designed for residents to enjoy and learn about nature, but not necessarily to take care of as the corridor is owned by the municipality and therefore maintenance by citizens will be limited. Moreover, in CAL 2, although tenants have had limited involvement and interest in the green roofs on their building, they may be expected by the building owner to contribute to the maintenance. This would be in conflict with appropriately engaging the tenants in the long-term management of the NBS.

In terms of ensuring the roles of citizens in the management of the NBS are not overburdening, an interviewee mentioned that it is necessary to discuss with citizens during the co-design stage about how and to what extent they want to be involved in the management, a term they call 'god-parenting'. In other words, which responsibilities do the citizens want to take on in the management of the NBS. This needs to be done through an open and honest conversation about how the NBS needs to be maintained and which responsibilities and capabilities are needed to do so.

“Having very conscious discussions, even in the start with the start-up projects, definitely. And taking them seriously, that's very important. We just had this discussion with god-parenting the elements of the guiding system. And we have so many people there that have already had their experiences with those kind of projects, and they had good experiences or bad experiences or both. And so it's very important to listen to them what they say about our idea of god-parenting to bring it to the table.” (H6, Private sector)

By speaking with the locals early on about how they envision themselves taking care of the NBS, the project partners can create a realistic scenario about how to arrange continued maintenance and provides understanding about where to spread the responsibilities for maintenance that do not overburden citizens. As an example, the project organizers envisioned that students will be 'ambassadors' of the school yard NBS, but were quickly confronted by the school teachers stating that this is an unrealistic role. This confrontation helped to project partners to ensure that maintenance roles for the school garden are in consideration of the motivation and willingness of the school students, and thereby places appropriate responsibility. Lastly, as the CALs in Neugraben-Fischbek are linked into the larger urban development and integration project, RISE, there is some form of security that the citizens and local partners can continue to be supported in the maintenance of the NBS.

Organizers provide a structure for continued citizen-based evaluations of the NBS (0)

Continued evaluations of the NBS will be organized by the CLEVER project partners based on the KPIs based on the overall urban challenges, with a time-frame of 5 years after the project. However, it is unclear how citizens will be able to give feedback on the NBS outside of the organized monitoring by the project, and how this feedback can be used to adjust the NBS, therefore this indicator is given a score of (0).

At the moment it seems that future evaluations of the projects will be organized by the CLEVER project partners based on the KPI monitoring structure, yet it is unclear how this will be organized after the project ends. The CLEVER project requires that monitoring data needs to be delivered five years after the project, but project partners currently do not know how to arrange this (H4). Monitoring conducted by project partners will give an overall assessment of the impacts of the NBS in regards to the urban regeneration challenges.

Interviewees have mentioned several tools that will enable citizens to continue giving feedback on their experiences with the NBS after the project ends. For instance, the online participation tool, DIPAS, is a tool that is regularly used by the municipality for other purposes and thus citizen feedback could be obtained by the municipality. However, it is unsure how this feedback could be structured and reacted upon. Overall, evaluations of the social impact of the NBS currently seem to be in the hands of the project partners, yet it is unclear how citizens will be able to give feedback which can be used to make necessary adaptations of the NBS after the project ends.

5.2 Evaluation of Giambellino-Lorentiggo (Zone 6), Milan

5.1.1 Co-Explore

An overview of the scores for the co-explore stage in the Milan co-creation process can be seen in Table 16. The scoring for each indicator is presented and justified in the following sections.

Table 16. Overview of co-explore stage results for Milan.

Hamburg Results		
Co-Creation Stage	Indicator	Score
Co-Explore	The NBS is framed through a goal of social inclusion	(+)
	The local problems and the use of NBS as a solution are defined together with citizens	(-)
	Organizers acknowledge socio-economic and socio-spatial inequalities regarding access to quality urban greenery	(+)
	Organizers map/identify local community groups as stakeholders	(+)
	Citizens and organizers set goals for the NBS together	(0)
	Organizers engage marginalized and vulnerable groups appropriately	(+)
	Citizens and organizers collectively operationalize the co-creation process	(+)

The NBS is framed through a goal of social inclusion (+)

The overall framing for the NBS is promoted with the idea to provide both environmental and social benefits through NBS interventions for citizens in an area who can otherwise not access these benefits due to socio-economic disadvantages, yet within this area there is no focus on providing the benefits of the NBS specifically to marginalized or vulnerable groups. For these reasons this indicator scores a (+).

In Milan the NBS are largely seen as a way of making citizens of the Giambellino-Lorentiggo area feel like they are seen and heard by providing them with both environmental and social benefits associated with the NBS. As one interviewee put it, the citizens of Giambellino-

Lorentiggo feel forgotten by the municipality due to the lack of general maintenance in the area, and the NBS interventions are a way to let the residents of the district know that the city is taking care of them (M3).

Specifically in the case of the green roofs, CAL 1, respondents say that the use of the NBS in regards to social inclusion is to give citizens a space where they can feel connected to and enjoy the benefits of nature, who otherwise would not have access to green spaces, or who lack a sense of place in the area. Thus a criteria for the green roofs is that they have to be useable by the residents of the building, or that the green walls need to be in a visible street. The NBS are thus framed by the project partners as a the giving back to underprivileged and vulnerable residents:

“And after that you can have of course, a lot of let's call them not just ownership sense, but also the sense of being a part of something that works, being part of a community and knowing that this community is giving something back to them. Point is that usually they are forgotten, now they are not forgotten.” (M3, Private sector)

For CAL 2, the park, in addition to providing benefits to the community, the NBS is framed as a means to connect people with nature in their local environments. For this, the park had to be designed with natural features that can engage citizen and work to improve their relation and experience with nature by create an inviting space where citizens can interact with one another.

“We would like to design something that helps biodiversity, but also people to improve their relationship with nature. So, if I give you a bird garden a butterfly garden an orchard, I can help you to see, to recognise and to stay very near with the nature.” (M4, Private sector)

In CAL 3, the framing of social inclusivity is to involve citizens in the design of the train station as these types of projects are often conducted without citizen input and the use of natural elements such as trees and greenery for the renovation of the station is seen to create a safer space where locals can come to interact. Although, more focus seems to be placed on the technical innovations of the NBS rather than deeper levels of participation with citizens.

The local problems and the use of NBS as a solution are defined together with citizens (-)

Overall there is an absence of citizen involvement during the definition of the local problems in the area, as this was pre-determined by the CLEVER cities project proposal and thereby already set boundaries in which citizens could only add on their needs but could not contribute to the definition of the local problems. This has created a discrepancy between what the project partners believe are the problems and how the NBS can be used as a solutions, against what the actual concerns of citizens in the area are. Therefore this indicator scores (-).

In line with the CLEVER project proposal, the overall challenges to be addressed in Giambellino-Lorenteggio are defined by the urban challenges. The definition of the local problems took place separate from citizen participation, as citizens were predominantly involved only during the co-design phase. Moreover, the definition of the CALs had been set in the grant proposal, but unlike the Hamburg case, there was no open event for citizens to contribute in defining the contents of the CALs. In contrast, the delineation of citizens' needs took place in the co-design phase within the boundaries of the pre-set CAL objectives.

The interviewees' perspectives of the main problems in the area are focused on the pollution in the city and lack of green spaces, and therefore the solutions are mainly focused on redressing pollution and heat stress through NBS, and improving the microclimate for the residents (M2). Moreover, the Giambellino-Lorenteggio area is seen as an area with less financially stable households and with a history of criminal activities. Overall the area seems to have less attention and maintenance, as an interviewee stated that one of the social housing buildings is in awful condition (M3, M4). In the case of CAL 1, the social housing buildings house many financially insecure groups with health issues, and therefore the project uses the NBS as a means to provide these groups with accessible green spaces to redress inequalities. Moreover, the area by the park, CAL 2, has a lot of different social groups who do not interact with each other, and thus the idea of the park would be to give a means and space for people of different social groups to interact with one another (M1).

However, as one interviewee mentioned the citizens prioritize larger structural problems rather than small greenery interventions. And thus the problems being addressed by the project are not in line with the concerns of citizens.

“But, as I said, sometimes they have bigger problems to address. So it's not so easy to have a real impact from my point of view with this project, because there are more structural issues or even historical issues [to deal with in the area]. I don't know [much about] the other places but historically Giambellino was a very [...] difficult neighborhood in the 80s, they had a lot of problems also with organised crime. So, I think that the problem is bigger than us.” (M1, Private sector)

“It's sometimes it's not so easy [to talk about citizens' concerns], because, for example, in those social housing [...] buildings, it's not so easy to go and talk about green roofs and people say, 'okay but I don't have heating in my home'. So sometimes they have bigger concerns than the ones we can address or discuss with them because it's a more structural problem for some of them.” (M1, Private sector)

Overall, in the case of Milan, the problems were not collectively delineated together with citizens. Only in CAL 1, the candidates that applied for the green roofs had to delineate their reasonings for asking for a green roof, and in that sense shaped the general problems they would like to address with green roofs. However, this delineation of 'problems' already takes place within the set boundaries of using green roofs as a 'solution'. This absence of citizen involvement in the delineation of the local problems shows that citizens can feel disconnected to the project if they have more structural concerns.

Organizers acknowledge socio-economic and socio-spatial inequalities regarding access to quality urban greenery (+)

Project partners have chosen the Giambellino-Lorenteggio area specifically based on the socio-spatial inequalities that can be felt in the area, specifically also through the lack of green spaces. The overall location was based on the disadvantages faced in the area, but the specific CAL interventions were not placed intentionally to redress local forms of socio-spatial inequalities, thereby giving this indicator a score of (+).

The choice of placing the NBS interventions in the district of Giambellino-Lorenteggio was primarily due to the fact that the district is located in the South of Milan which faces many inequalities compared to other areas of Milan. These disadvantages are expressed in terms of

socio-economic disadvantages, and also spatial inequalities due a lack of green space or lack in quality of green spaces as is the case with the abandoned Giambellino 129 park in CAL 2. Due to the vulnerabilities faced in the South of Milan the Giambellino-Lorentiggo area was chosen as the intervention site for the NBS.

“In CAL 1, also CAL 2 and 3, if you see the physical configuration of [...] where we would like to develop our projects, our three laboratories, it's South of Milan. There CAL two Giambellino, the park, and the park there itself, all that area there it's inhabited by people that really are very vulnerable [...] financially but also [socially] in terms of education, work, perhaps also ethnically. It's not, let's say a segregated area, but that it's really inhabited mostly by vulnerable people. So that's why it was chosen that area there.” (M2, Private sector)

Interviewees mentioned that the choice to upgrade the Giambellino 129 park was based on its derelict state and the presence of disadvantaged groups living around the park. Therefore, this choice was made to give people with social and economic vulnerabilities a chance to enjoy greenery near their homes. However the specific locations of the buildings for green roofs and walls in CAL 1 and the choice of the train station in CAL 3 were not based on a more specific analysis or mapping of inequalities in terms of green space disparities or groups of people who face barriers preventing them from the benefits of NBS. Instead, in the case of the green roofs the public call was open to everyone and the final choice of where to implement the green roofs was based on the ability of the applicants to contribute in the co-creation process and be available for the monitoring conducted by the project (M2). In the case of the green wall on the public agency's building, although it can provide microclimate benefits to the local surroundings, the use of the green wall is mainly focused on promoting a green image for the agency.

Organizers identify/map diverse local community groups as stakeholders (+)

Stakeholder-mapping of citizens in the Milan NBS projects generally shows an effort to represent the diversity of the community by approaching specific social groups in the area of the NBS interventions. Although, there was no systematic approach used to represent the diversity of the citizens, and CAL 3 lacks a process that maps out diverse social groups in the area to be included, this indicator scores (+).

The process for mapping the end-users in the community is dependent on the specific NBS project. In the case of the green roofs project, the overall process of selecting the buildings that would receive the green roofs was conducted through an open public call. The buildings were selected on both technical criteria related to the implementation of the green roof, and criteria that will allow the building to ask for the government subsidy. Moreover, the selection of the buildings was made based on the building residents' ability to contribute to the monitoring of the NBS. Within each of the buildings that will receive green roofs the stakeholder mapping included the various communities living in the building, and representatives of the building's floors. The representatives were used to map the different groups living in the building to be engaged in the co-creation process.

Interviewees mentioned that diverse groups of citizens were mapped and engaged in the NBS interventions as in the case of CAL 1 and CAL2, yet there was no specific methodology used to ensure the diversity of the community is represented. In the case of CAL 2, different community groups were approached by a social organization working on engagement activities

in the local area. This organization had a list of citizen stakeholder groups from their own network. Thus, the social organization, using their networks and channels were able to map out various social associations in the area near the park, and thereby try to reach a diverse representation of the local community. Furthermore, in CAL 3, the train station, as the only activity for citizen involvement was a survey sent out through the municipality there is was no targeting of diverse social groups and no indication yet of which citizens are answering the survey.

Besides mapping citizens, the stakeholder mapping also consisted of a reaching various stakeholders that could support the implementation, financing and long-term stability of the intervention but were not selected on a criteria to represent a diversity of the community. This selection is based on the capacity of stakeholders to contribute to the realization of the NBS projects.

Citizens and organizers set goals for the NBS together (0)

There was no citizen engagement in the formulation of the overarching goals for each NBS intervention, instead citizens gave their input by contributing to the output of the NBS within the projects' pre-defined outcome goals for the CALs, thereby giving this indicator a neutral score of (0).

As the citizens were generally not involved in the co-explore phase but enter in the co-design phase, the general goals for the NBS interventions through the CALS were proposed in the grant agreement and through the UIP partnership formation which includes stakeholders and professionals required for the realization of the NBS. However, within the boundaries of the pre-defined CALS, citizens could say their needs for the interventions which would set the basic requirements of the interventions.

“We had another meeting just with the candidates, the owners, [during the stakeholder engagement stage], precisely to again do all the presentation of the project, but also to know their needs, their desires. And also their reasons why they applied for a co-funding, why they are interested in building green roofs and walls.” (M2, Private sector)

The overall goals were not set together with the citizens as these have already been put into place by the CLEVER project outlines, but the citizens needs and wishes for the CALs were used to set more specific output goals for each NBS project. In the case of the green roofs this took place during the selection of the buildings, and in the park this took place in the co-design stage. As for the train station, citizens were not able to contribute to the process of setting overarching goals instead their input was guided through surveys to choose which natural items they preferred for the station.

Regarding the social monitoring KPIs, these have been set according to the urban regeneration challenges through a theory of change workshop (ToC) with the project partners but not with citizens as was the case in Hamburg. Although, the KPIs are being refined and modified to the needs and priorities of the local residents for each NBS project (M7). Thus indirectly citizens are able to influence to the criteria for the outcomes of the NBS. Although it should be mentioned that citizens are not particularly interested in contributing to the setting of NBS outcome criteria, but more importantly they are interested in the creation of physical NBS outputs that the co-creation process will deliver (M4).

Organizers engage marginalized and vulnerable groups appropriately (+)

Overall, there was an active effort to reach marginalized or vulnerable groups in the areas of the NBS projects with the exception of the train station project. Within CAL 1 and CAL 2, the green roofs and the park, marginalized social groups were approached to learn about their needs in relation to the NBS interventions. In the case of the green roofs this was done by having conversations with different communities living in the building, but it is unclear how this process went for CAL 2. Overall this indicator scores (+).

The engagement of hard to reach and marginalized groups in the process varies depending on the NBS project, considering the location of the NBS and the citizens' sense of ownership with the place of intervention. In the case of the green roofs in CAL 1, marginalized groups were already living in small communities in the social housing buildings. Overall the social housing building houses financially vulnerable people, but there are also smaller sub-communities of around 10 to 20 people dealing with health issues and stigmatization, such as an HIV community, and elderly group with mobility issues and a group with psychiatric problems.

“So [in the social housing building], you also have some close communities, for example, there's an HIV community, all the communities are around 10 to 20 people, for example, the HIV community usually they don't get out of their community, it's around the second or third floor of the building. And many of them they can't move properly or they have problems moving. And there's an old people community and a psychiatric community. All of them all of these three will have its own roof, its own green roof. So there the green roof is giving them not just a sense of, okay we are in contact with nature we have a nicer place to stay, but also I can take care about this, this is also healthy and this is also a sort of healing approach to the green.” (M3, Private sector)

Since these vulnerable communities have existing strong internal bonds and are established within the building, it was possible for the project partners to speak with these communities and listen to their concerns and needs regarding the green roofs.

In CAL 2 an effort was made to reach a diversity of groups in the area including young people, elderly, foreigners or migrants, and Roma people, although challenges were faced when trying to reach Roma people or non-natives due to the language barriers or perhaps a lack of connection to the area, and park more specifically. The engagement of these groups for the park project was the responsibility of the social organization that works with different social associations in the local area. The interviewees mentioned that this organization contacted diverse social groups through their existing network and channels. The interviewees themselves working on the park project were unaware of how this engagement process went or who the organization managed to successfully engage.

In CAL 3, the participation of locals was open for all through an online survey, and thus there was no specific targeting or efforts to engage marginalized groups in the co-creation process.

Citizens and organizers collectively operationalization of the co-creation process (+)

This indicator scores (+) for the efforts of project partners in making participation in the co-creation process accessible by asking the availabilities and needs of citizens. However, although this was strongly demonstrated in CAL 1, in CAL 2 the extent of collectively deciding

with citizens how they could participate in the co-creation process is unclear, and in CAL 3 this was not the case.

In the case of the green roofs project, the project partners made sure to give citizens the possibility to say when they would like to meet for the participation in the co-design discussions. This was to ensure that the moments for collaboration are more accessible to the residents with the hopes to include more residents in the discussions.

“Well, in relation to [...] the meetings, we were giving them the possibility to choose the schedule appropriate to their daily activities. So for example, in one of the projects we had our meetings, always from 5pm to 7pm. For example, for us it would be after our work schedule but still, we wanted to make it more suitable to others” (M2, Private sector).

There was an effort by project partners to make participation in the process fit the needs of the citizens, specifically in CAL 1.

5.1.2 Co-Design

An overview of the scores for the co-design stage in the Milan co-creation process can be seen in Table 17. The scoring for each indicator is presented and justified in the following sections.

Table 17. Overview of co-design stage results for Milan.

Milan Results		
Co-Creation Stage	Indicator	Score
Co-Design	Diverse local citizens are represented	(+)
	Organizers facilitate a process open and flexible to the needs and values of citizens	(+)
	The NBS is designed for both short- and long-term socially inclusive effects	(0)
	Organizers use accessible communication with citizens	(+)
	Citizen engagement tools are accessible to diverse social groups	(+)
	Organizers facilitate a transparent decision-making process	(+)

Diverse local citizens are represented (+)

Overall, the efforts of the project partners to engage a diversity of social groups throughout the co-design process by involving representatives of diverse social groups gives this indicator a score of (+).

In the case of Milan, the engagement of social group or association representatives were important in trying to represent the diversity of interests within the local area. For instance, in the case of CAL 1, representatives of community groups in the building were important for

reaching out to these groups and including their wishes in the design of the NBS. Moreover, the representatives of the building's floors were important for representing the various residents of the building, and they were the ones mediating between the project partners and the residents. The representatives handed out the questionnaires to the residents and were thereby able to receive more than 50 percent of responses from the building. In this regard, the community representatives were critical for enhancing the representativeness of citizens in the building.

In the park, the social organization helping the project was responsible for managing the participation and representation of the local community. This organization, through their experience and networks in the local area had a list of the social groups present in the area around the park. The project reached out to representatives of social groups such as a migrant women's organization, or youth association to represent the diversity of the community. An interviewee stated that representatives of the social groups were important in representing a broader range of interests without having to approach numerous individual citizens:

"[The social organization working with the park project] had a list of all stakeholder[s] of the area, local stakeholders, and they invited all the local stakeholders to participate and it was open to local stakeholder, they invited organisations [and] associations. Also some citizen but the co-design activities we're focused in particular on organisations and associations. Citizen participate but they were not targeted, because to have a co-design activity and to ensure that the participants will be representative of the different needs we focused our attention on associations and organizations not [on individual] citizens but citizens could participate if they asked." (M4, Private sector)

Moreover, throughout the co-creation process there was some identification of which social groups should be involved in the design of the NBS. However, it is unclear exactly how this configuration of important social groups to include was made. Moreover, an interviewee shared that the participation of elderly people was important, but that the balance in the representation of different groups was also a concern.

"So there's the involvement of association that worked with disabilities with some residents are elderly people. So we had the opposite problem. We had more for instance, in one case, we had elderly people more than young people involved in the process. So we had to cope with that and make sure that we had the representation of all the residents of the area, but some area we are going to work on is actually an area where the [...] elderly are more than young people." (M5, Public sector)

It is unclear how the representation of participants was being monitored and if and how discrepancies were acted upon throughout the co-creation process. There were also challenges in representing the interests of non-native Italians in the co-design due to the language barrier. Furthermore, in the surveys sent out for the design of the train station there is no clear indication of who is participating due to privacy concerns. The surveys were also not targeted to specific social groups who are often less heard in the community.

Organizers facilitate a process open and flexible to the needs and values of citizens (+)

Taking into account the different levels of flexibility and openness in the co-design of the NBS by including citizens' inputs in the co-design, and the especially encouraging level of openness in CAL 1 and 2 due to their discursive formats and used of diverse local knowledge, this indicator scores a (+).

In CAL 1 and CAL 2 there was room for citizens to set their needs and wishes for the design of the NBS through an interactive process between project partners and citizens which mapped out the wishes of the local residents. The online meetings with the residents of the green roof buildings were very in-depth, and participants were able to speak about their interests for the roof, their needs, and their concerns through an open discussion with the project partners. The main points raised by the residents were put into notes on a digital whiteboard and created an overview of the discussion for the residents to follow. This also allowed the residents to control the points raised in the meeting, to ensure their needs have been heard. Moreover, the designers presented sketches of the proposed green roof plan which the residents were able to make alterations on and send back. This process was very flexible and open in terms of the ability of the residents to put forward their ideas and concerns about the green roof.

“And [during the online meetings] we were preparing the table based on some issues, for example, we would say the functions, what kind of functions this green roof would have, accessibility to whom will be accessible, how will be accessible, and every kind of detail regarding the accessibility, we had the communication, how we want to communicate the project. So we had for each project, we had some customised, let's say issues and then we were discussing, each of the participants would say their word and then we will take the keywords and put in the in the table with stickers.” (M2, Private sector)

The co-design process for the park involved asking the participants about their wants and wishes for the park, explaining the benefits of different types of natural elements they could choose for the park such as plants or bird gardens as well as different furniture such as benches. This process also involved the project partners talking to citizens about how they feel in the area, and listening to more emotive forms of information from the citizens. Not only did the co-design focus on the ecological design of the park, but cultural aspects that locals wished for in their area were also included in the design:

“We [...] CLEVER try to define all the functions and all the NBS that could answer to the needs of these association. So the co-design was made together with them. In fact, in the park, we will find the not only this kind of NBS, but also cultural and spaces to organise events for the community or some others function that could answer to the needs of the stakeholders.” (M4, Private sector)

In comparison, the co-design for CAL 3, the train station, was not necessarily flexible nor open in the sense that citizens could only pick the type of elements they wished from a pre-selected list.

The NBS is designed for both short- and long-term socially inclusive effects (0)

The NBS projects have shown active efforts to engage citizens in the co-creation process to ensure the long-term socially inclusive effects of the NBS, but the uncertainties of exclusionary

effects for citizens who did not take part in the co-creation process combined with a lack of project partners' concern for gentrification gives this indicator a neutral score (0).

The NBS are intended to give citizens living in the less fortunate areas in the South of Milan a space with nature that can help them reconnect with their local area, connect with other residents and enjoy the benefits of the NBS. The interviewees point out that these inclusive effects and the sustainability of the NBS can only be ensured if the residents are engaged in the continued maintenance of the NBS, and thus a lot of efforts are being placed in involving citizens in the co-implementation of the NBS and giving citizens the capacity and knowledge to take care of the NBS and thereby stay connected to the NBS in the long-term. Moreover the interviewees recognize the importance of setting up long-term plans early on to ensure the sustainability of the NBS.

“You need long term plans. So it's not easy to do when you have a short term, not more than five years in European projects, but you can set it up now, in order to have it [following] in the years after this after this project.” (M3, Private sector)

Furthermore, while one interviewee shared concerns about ensuring that the prices for maintenance of the NBS do not fall on the citizens, among the other interviewees there was less consideration for potential price increases or gentrification as a result of the NBS. Additionally, an interviewee mentioned that in a questionnaire handed out to the citizens for social monitoring, the results also showed a lack of concern or perhaps awareness by citizens for price changes in the area.

“I think that gentrification is always a problem because, it is a problem that we have to consider. But it is not the problem now in Giambellino. The challenge is, the most important challenge is something that is not the gentrification. The problem is that people don't trust that a big area, an area big like Giambellino could be saved from the risk of crime, abandoned, to be abandoned, to be dirty.” (M4, Private sector)

Instead, the concerns for the long-term socially inclusive effects of the NBS are focused on establishing a process that will continue to engage citizens with the NBS after the CLEVER project ends. According to the interviewees, this long-term engagement of citizens needs to be facilitated by involving citizens predominantly in the co-design and co-implementation phase to give the citizens a feeling that they are involved and have some ownership over the NBS. The question remains how to make locals who did not take part in the co-creation process feel engaged with the NBS, and avoid exclusion based on participation in the co-creation process during the project.

Organizers use accessible communication with citizens (+)

General communication of the co-creation process for each NBS project was conducted through different channels including the Milan CLEVER website, the municipality, flyers and importantly through the representatives of the social groups participating in the process. Additionally, the project partners made sure to use terminology that could be understood by citizens to make participation more accessible, therefore giving this indicator a score of (+).

In the green roof buildings project, communication was conducted through the representatives who would pass down information and messages personally to the residents by passing the information from door to door or through their messaging chat group.

“And what we noticed that, of course, the representatives will, how can I say, they, they contacted all the people. So when we went there, everyone was informed and we noticed that because while we were talking with them, asking them, there were actually specific question in the questionnaire here that we will ask if you knew the project before the this questionnaire, for example. And they will say yes, yes our representative told us.” (M2, Private sector)

Thus the representatives play an important role of mediating the communication between the project partners and the residents. This is similar in the case of the park, where the social organization used their network channels to communicate with the association representatives.

Furthermore, the communication with different social groups had to be tailored to the abilities of the people. For instance, in the case of the elderly the use of communicating project updates or activities through online mediums created a digital divide. Therefore, the partners went to the elderly residents individually to speak with them and make sure they could better understand what was happening within the project.

“And the residents as I said they are mostly elderly people. And to involve them, it was, we couldn't rely on on social media or anything that is, we had two partners, some partners of the project had to go door to door to submit the questionnaires and explain to them what was the project about what they could take out of the project as results and know, what they could achieve with participating in the project.” (M5, Public sector)

Additionally, the project partners' use of accessible terminology was an important aspect in making sure citizens understood the information, but more importantly to make the citizens feel included in the design process. Terminology such as biodiversity or NBS were often not used as these can create confusion and were seen as unclear terms, instead the partners would use more descriptive words.

“It's very, very important, I will never use words that people can't understand. We don't use NBS nature based solution only a few times we use this term. We spoke about solutions sometimes, green solutions we use sometimes intervention, we use sometimes. I don't remember now, I have to check but I don't remember. But generally, we don't use the terms nature based solution. We, if we use these we have to explain and we have to use only after others words.” (M4, Private sector)

A challenge was the language barrier faced when trying to communicate with non-native speaking citizens. Interviewees noted that overcoming this language barrier would require more resources and efforts, for instance by using translators, however, it is unclear to what extent resources were invested by project partners to overcome this barrier.

Citizen engagement tools are accessible to diverse social groups (+)

The tools used for the co-design within the different CALs was tailored to the specific context, although an overall focus was placed on using tools that could stimulate discussion between

the citizens and project partners. Although the survey for the train station may not have been accessible to all citizens due to the digital divide without alternative options to participate, therefore a score of (+) is given.

The main tools used for designing the green roofs went through online meeting channels to facilitate in-depth discussions with the residents, however the format of conducting the meetings virtually was due to the social restrictions caused by the Covid-19 pandemic. The open meeting format allowed the residents to be free in bringing up topics they felt relevant to address in regards to the design of the NBS. As one interviewee mentioned, one of the residents was concerned that locals from outside the building could enter the rooftop. This concern was brought up and discussed between the project partners and residents together. Thus the meetings created space for deliberation and the possibility for residents to address topics that were important to them.

Despite this, the use of the online meeting tool created a barrier for some people to participate due to the challenges faced by some residents when using technology. This points back to the digital divide as discussed in previous sections, and in the Hamburg case. Although this perhaps limited access to participation for some, since the residents were familiar with one another some residents were able to share their computer with each other. Overall, the use of digital tools for the overall co-creation process of the projects in Milan created a slight inaccessibility for some citizens.

“We had the problem of the digital divide that might have been, you know, in some cases, the problem because we were referring to a target group that was mainly composed by elderly people, but we actually in some cases had the opposite problem that the representation of young people was less than we expected. And the other one is the fact that we might not be able to include also immigrants or non native language speakers. And we will see how we are going to overcome that kind of problem.” (M5, Public sector)

Turning towards to the NBS project in the park, CAL 2, several tools were used to give citizens the room to express their interests and wishes for the park, including play cards which displayed various images of elements that could be implemented in the park, envisioning activities, and a guided empathy map to give participants the ability to express how they feel in the park. The use of visual and interactive tools helped guide citizens to express their thoughts and wishes for the park.

“During these meetings, we use some tools for example, play cards, do you know play cards in a meeting, in the final meeting we will, and I think another important tool that we used the was the walking tour, we went in the area with them with persons involved in the associations involved and in the area we will use some empathy tools, empathy map. [...] And to do these visioning activities, we used also the play cards because we wanted to give them something that can help their imagination. [...] They can choose all these kinds of things and tell us that they desire these kind of furniture for the park”. (M4, Private sector)

The tools used in the green roof projects and the park provided the opportunity for citizens to express their wishes, and broader concerns and feelings regarding the local space and the NBS.

Organizers facilitate a transparent decision-making process (+)

The project partners placed great efforts to make sure citizens are aware of the maintenance implications based on their choices for the NBS, and explaining the financial boundaries in which the NBS can be designed. In the case of CAL 1, there was very strong transparency of the overall co-creation process since the co-design with citizens was more frequent and intensive, yet it is unclear to what extent the co-design process was transparent for the park and the train station interventions. Thus a score of (+) is given.

As the focus was placed on ensuring that the citizens would take some responsibility for the maintenance of the NBS interventions, especially in the case of the green roofs, the project partners made sure that the residents in the buildings were aware of the implications of their choices. Since the NBS design choices determine the maintenance needed for the NBS and would thus have a long-term impact on the residents. Moreover, the financing of the interventions was clearly explained to the tenants to ensure that the feasibility of the interventions was clear.

“I asked you about your intentions I asked you about your dreams I asked you about everything. But I also have to communicate well, what it means in which are the pros and the cons. And not just selling the pros, of course, but making understand that understanding the needs means so trying and looking for the right solution, that gives you the widest quantity of benefits in some way.” (M3, Private sector)

Transparency throughout the process was not only an important issue for ensuring that residents are informed about their choices, but it was also necessary to gain their trust for participating in the project. As one interviewee mentioned that in one instance there was a general hesitation of residents to join the project in the beginning due to the lack of clarity on the CLEVER project and the underlying intentions.

“Perhaps it was the only project that first we had some doubts about the participation and whether we are including all of them, whether they are all informed about the project. So we went there and made sure that more or less everyone is well informed. At least those that were directly impacted from the interventions.” (M2, Private sector)

Decisions were clearly communicated with the residents in CAL 1 as there were frequent meetings. This transparency also stemmed from the residents taking initiative to frequently ask questions, mainly because the residents feel attached to their roof so they are concerned about the details within the process. Whereas this might be less so in the case of the park or the train station. For CAL 2, information was sent to the residents through the social associations and the Milan project website. Moreover, the project partners made sure to explain to citizens the different benefits of the elements that could be implemented in the park.

5.1.3 Co-Experiment

An overview of the scores for the co-experiment stage in the Milan co-creation process can be seen in Table 18 (see next page). The scoring for each indicator is presented and justified in the following sections.

Table 18. Overview of co-experiment stage results for Milan.

Milan Results		
Co-Creation Stage	Indicator	Score
Co-Experiment	Reflexive social learning takes place	(+)
	Indicators set collectively with citizens are used for final evaluations of the NBS	(0)

Reflexive social learning takes place (+)

A score of (+) is given for this indicator because of the iterative nature of the co-design process for the different NBS which continuously built upon the inputs of the citizens, although a lack of reflexivity on the co-creation process itself limits the scoring.

The co-design process of the green roofs was iterative with frequent interactions between project partners and residents about the designs for the green roofs, the needs and wishes of the residents were noted and fed-back into the design plans. This process of reflexive social learning started by first delineating the needs of the residents and communities within the building. These needs set the basic requirements of the green roof design. From there back and forth meetings with the project partners, designers and residents took place to gradually reach a final design. For the design of the park, CAL 2, the activities organized with the citizens were used to create an overarching plan for the park. It is unclear how often these activities took place. For the train station, an online survey was used to pick the natural elements with the most votes. Therefore, comparing the cases, there is a considerable lack of social learning taking place in the design of the station.

Similar to the case in Hamburg, the social monitoring survey was conducted separately from the co-design process. Thus the feedback from the social survey which holds insights on citizens' broader concerns for the area and their sense of belonging, was not included in the co-design of the NBS projects. However, in CAL 1 it was possible to include this survey data into the co-design of the green roofs because the timing of these activities overlapped. Moreover, in the social monitoring survey many quantitative questions were used to collect responses. Although this can allow easier data analysis and comparison it limits the extent to which people can express themselves. One interviewee mentioned that the questions limit the reflections that can be made about social inclusivity in the area:

“I think [the social monitoring] is important because it helps us reach a lot of people. But as I said, sometimes I think that maybe we should ask different questions. So I think that [the social monitoring] will help us to have a general vision, but maybe to have a more clear idea about the situation and about what could be done we should have a more in depth research.” (M1, Private sector)

In general, reflexivity of citizens' needs and wishes for the output of the NBS are well incorporated in the NBS designs but similar to the case in Hamburg there is a lack of reflexivity on the general co-creation process. There was no monitoring of citizens' experiences throughout the co-design process to make necessary adjustments to the process. Overall the focus is placed on the NBS outputs but less so on how citizens perceive and experience the co-creation process.

Indicators set collectively with citizens are used for final evaluations of the NBS design (0)

There were no collectively set indicators for the evaluation of the NBS projects, instead for CAL 1 the evaluation process was gradual throughout the co-design process, but for the park design and the trains station it is unclear if there will be a final evaluation of the designs, thereby giving a neutral score (0).

For CAL 1 the participants could each give their feedback to the designs of the green roofs during the meetings with the project partners and thereby collectively evaluate the final design.

“[The tenants] saw the last design and accepted it, not all of them, we are going to experiment it, with the next one it will be probably by the end of June maybe before, because they are stronger community and if you make a mistake there, you make a mistake for all the next two years of the project. So, you will carry it out for two years so better not to make mistakes now, and probably we will assess it. It's not really an evaluation and take also care that we are also with this survey, we are also listening to what they say, with the social survey with the baseline one.” (M3, Private sector)

Thus, in line with the iterative approach in which the design of the green roof is being made, the evaluations of the design are a constant part of this process. With each new design plan of the green roof the residents can give their feedback, until the co-design period comes to an end. Therefore there is not one moment of evaluation, instead it is woven throughout the entire co-design process.

For the park, the interviewee's concern did not seem to focus in facilitating a collective evaluation of the final NBS design with citizens. Instead, the interviewee mentioned they are confident that the activities and tools used were able to include all the needs of the participants, however, this was stated without any guarantee of the NBS design being representative of citizens inputs and interests. The interviewee mentioned that the focus should instead be placed on ensuring that the locals will be engaged with the co-implementation and co-monitoring of the park:

“They could give some [feedback to the final design], but I think that for Giambellino 129 the problem is not the design because these activities give us the opportunity to have a shared vision of the garden and the park and people think in general that desires and needs are included in in the final design. I think that the problem, not the problem, but the most important thing that we have to focus now is the co-implementation phase and the co-monitoring phase. Because in this kind of area in this kind of neighbourhood the challenges to engage people to manage an area is not so easy if these commitments is not bottom up but top down.” (M4, Private sector)

In the case of the park, citizens have not been involved in the creation of indicators or criteria to be used for a collective evaluation. This relates to the point made by an interviewee that it is not in the locals' interest to take part in setting monitoring criteria, they are predominantly interested in realizing the outputs of the NBS.

5.1.4 Co-Implement

An overview of the scores for the co-implement stage in the Milan co-creation process can be seen in Table 19. The scoring for each indicator is presented and justified in the following sections.

Table 19. Overview of co-implement stage results for Milan.

Milan Results		
Co-Creation Stage	Indicator	Score
Co-Implement	There is non-profit oriented financing of the NBS	(0)
	Citizens can take on active roles as co-implementers	(+)

There is non-profit oriented financing of the NBS (0)

Overall due to the uncertainties behind the motivations of sponsors investing in the NBS interventions with the potential effects thereof, and the possibility of citizens carrying the cost for maintenance in the future, a score of (0) is given.

Similar to the case in Hamburg, the main financing for the implementation of the NBS projects comes from the CLEVER project funding, however forms of co-financing separate from the CLEVER funds were needed for the implementation of the green roofs and train station, and for the maintenance of all the NBS projects. In the case of CAL 1, co-financing or sponsorship is an important feature of the co-creation process in Milan since green roofs are only recently being mainstreamed in the city, and thus innovative forms for financing these projects are still to be tested. The financing for the green roofs is a combination of a 35 percent subsidy from the municipality, the CLEVER funds and funding through external investors. This structure of innovative co-financing should ensure that the residents do not need to cover the cost of the NBS intervention. However, an interviewee shared that the reason for investors to join the co-financing structure is to invest in the value of the building.

“The owner of one of the projects I talked about is a foundation, is a social housing foundation. So they decided, they were convinced to invest on a roof on our green roof, in order to have energy benefits, environmental benefits, social benefits, economic benefits, and so on. And we had to convince them, we didn't do the big action, we just put the occasion and their technician, the person who looks after the maintenance, decided it was a good investment, and also that the building value would be increased.” (M3, Private sector)

Additionally, to cover the cost of maintenance, one of the green roof projects is considering selling the produce from the vegetable garden to a nearby supermarket. The proceeds would be used to contribute to the cost of maintaining the green roof. Although, this indirectly places the responsibility for managing the costs of the maintenance with the residents. Overall it is unclear if the costs for maintenance of the green roofs might be translated to the residents. The project is currently looking for different sponsors that can contribute to the finance, but it seems that sponsors will be interested only if there is a benefits for them. This benefit as shown by the previous quite is often centred on increasing in value of the building, or the promotion of a green image. The co-finance and the motivations for sponsors are still in the workings, although

there should be a greater caution for the potential price increase that could be translated to the residents.

The implementation of CAL 2 is financed primarily by the CLEVER funds and the maintenance will be in the hands of the municipality as it is public ground. CAL 3 is in the hands of the Italian transportation company, which used CLEVER funding but is part of a much larger urban regeneration project financed by the government.

Citizens can take on active roles as co-implementers (+)

The project partners place a strong importance on engaging citizens in the implementation of the NBS interventions based on their willingness and capabilities as a means to promote long-term engagement with the NBS. However, involvement of citizens in the implementation of the NBS in the train station will be limited due to the technical elements and safety precautions. Overall this indicator scores (+).

As mentioned in the previous sections, the involvement of citizens in the implementation of the NBS projects is important for citizens to develop a sense of ownership and responsibility of their local space, and to have this sentiment carry on after the CLEVER project ends. Citizens will be involved in the implementation of the green roof projects and the park project which are appropriate and manageable for citizens to be involved in. Moreover, the involvement of citizens in the implementation is voluntary and based on what the citizens themselves want to take on. In the case of CAL 1 and CAL 2 the involvement of citizens in the implementation of the NBS is possible due to the low threshold of the required implementation activities. In contrast, the involvement of citizens in the implementation of the train station project will not be feasible to the attached technical and safety issues.

A strong focus is placed on engaging people in the NBS implementation activities to make sure that the citizens have the capacity and understanding of how to maintain the interventions, since the idea for the park and the green roofs is to give citizens a sense ownership over the NBS.

“We are trying to engage people in the implementation phase with activities that give them tools and knowledge about how they can manage the area when they will have the area” (M4, Private sector)

Overall the projects have a strong emphasis on engaging citizens in the implementation of the NBS, considering the abilities and willingness of citizens to do so. These implementation activities are focused on giving citizens a sense of ownership over the NBS, but more importantly to give citizens the knowledge on maintaining the NBS.

5.1.5 Co-Management

An overview of the scores for the co-implement stage in the Milan co-creation process can be seen in Table 20 (see next page). The scoring for each indicator is presented and justified in the following sections.

Table 20. Overview of co-management stage results for Milan.

Milan Results		
Co-Creation Stage	Indicator	Score
Co-Management	Citizens are appropriately involved in the management of the NBS	(+)
	Organizers provide a structure for continued citizen-based evaluations of the NBS	(-)

Citizens are appropriately involved in the management of the NBS (+)

The projects show that there is active consideration on how to help citizens stay involved with the NBS in a manner that is appropriate, by for instance supplementing maintenance support through the help of other stakeholders. At the moment it is still unclear how citizens who were not engaged in the co-creation process can be involved in the maintenance of the NBS after the CLEVER project has ended. For these reasons this indicator scores a (+).

Citizens of the green roofs will be engaged in maintaining the NBS, as mentioned before this is also important to continue to the sustainability and engagement of citizens in the interventions after the CLEVER project ends. In the case of the green roofs the building maintenance team will be involved in helping with the management of more technical aspects of the interventions, and will provide support to the citizens. The residents will take up the responsibilities they want to take on, but an interviewee has mentioned that citizens seem keen on being involved with the NBS since they are eager to have their own green space. Moreover, the interviewee mentioned that when the elderly mentioned they will not be able to take care of the NBS, the other residents have offered to take over this responsibility. This also demonstrates the existing connection between the residents in the building which may help the sustainability of the NBS. However, as mentioned previously there are plans to have the residents sell the produce from the vegetable garden to the local store as a way to cover the costs of maintenance. This could become a problem if the residents do not want to continue doing this over time and the maintenance costs are transferred to the residents.

Overall, the project partners need to help the citizens build the competencies and motivations to stay involved with the maintenance of the NBS during the co-design and co-implementation stages. Although, the partners will designate all other responsibilities that cannot or will not be taken up by the citizens to external actors, for instance to the municipality, the building maintenance organization or the building owner.

“[Citizens can be involved] up to a certain level [that] they want to be involved. So we need to find a way of understanding up to a certain point, what has been worked will be done by residents and volunteers, and [the left over responsibilities have to be] give[n] to either a professional or [putting] ourselves in charge as the municipality.” (M5, Public sector)

For the train station, the involvement of citizens for the maintenance is more difficult since the interventions require more technical expertise and there are concerns for safety, however, an interviewee mentioned that some citizens have volunteered to help.

Organizers provide a structure for continued citizen-based evaluations of the NBS (-)

Overall it seems that once the project ends there will be a lack of ability to for citizens to give feedback through an organized channel which could be used to make necessary adaptations to the NBS. Moreover, it is unclear if and how governing structures for the NBS will allow for continued evaluations once the CLEVER project ends. Therefore, this indicator scores a (-).

Evaluations of the NBS outcomes and impacts will be conducted by the project partners five years after the CLEVER project ends. This will be the last organized form of evaluation of the project. These evaluations are based on overall impacts of the NBS according to the social monitoring KPIs. Citizens will be asked to give their feedback on the NBS on topics such as social cohesion, safety, and sense of belonging. Moreover, specifically for the park project an interviewee mentioned that there are plans to involve citizens in monitoring the ecological benefits of the park through a citizen science structure.

However, at the moment there are no plans on how to incorporate citizens' long-term experiences with the NBS for adjustments of the NBS. As one interviewee mentioned, there are currently channels for collecting feedback but there is no systematic approach for collecting the feedback. Thus while the project is ongoing feedback can be collected but it is unclear how this could be used to make adaptations to the NBS. The evaluations conducted by the project partners are used for assessing the impacts of the NBS but at the moment there are no plans on how to incorporate these findings back into the NBS to sustain a loop of improvement.

In order to ensure some form of adaptability however, for the green roofs a key element in the design is that the roofs should be modular and adaptable for the community to make any smaller changes as needed. The residents can make minor modifications, but will need to contact an external actor for major changes which will cost money and further investment.

“The project of a clever green roof or a clever green wall [needs] to be modular, you have to build a place that people can and must manage by themselves, of course, in an ordinary way, for the extraordinary maintenance, everyone needs someone else. But this was what was taught to the designers, to be aware about having a place that has to adapt some way to what's happening to the building to what's happening to the community of course, you have small maintenance and an extraordinary maintenance, the extraordinary maintenance means that all of them have to agree on something changing. And it means that then they will ask someone else to spend some money and so on.” (M3, Private sector)

5.3 Case comparison and reflection on the evaluations

In section 5.3.1 a comparison between the evaluations of Hamburg and Milan will be drawn up co-creation stage with reflections on the relevance of indicators after empirical confrontation of the literature-based framework. Secondly, in section 5.3.2 the insights from the case comparison and reflections on indicators will point to adjustments in the literature-based framework based on the empirical confrontation.

5.3.1 Case evaluation comparison

As Table 21 depicts, both cases overall score encouraging for the majority of the indicators, with the case of Hamburg scoring very encouraging twice. Moreover, the evaluations show that both cases also score limited on predominately the same indicators. These similarities and differences will be described in further detail per co-creation stage.

Table 21. Overview of Case Evaluation Comparison.

Co-Creation Stage	Indicator	Scoring	
		Hamburg	Milan
Co-Explore	The NBS is framed through a goal of social inclusion	(+)	(+)
	The local problems and the use of NBS as a solution are defined together with citizens	(-)	(-)
	Organizers acknowledge socio-economic and socio-spatial inequalities regarding access to quality urban greenery	(-)	(+)
	Organizers identify/map local community groups as stakeholders	(+)	(+)
	Citizen and organizers set goals for the NBS together	(+)	(0)
	Organizers engage marginalized and vulnerable groups appropriately	(++)	(+)
	Citizens and organizers collectively operationalization the co-creation process	(+)	(+)
Co-Design	Diverse local citizens are represented	(+)	(+)
	Organizers facilitate a process open and flexible to the needs and values of citizens	(+)	(+)
	The NBS is designed for both short- and long-term socially inclusive effects	(0)	(0)
	Organizers use accessible communication with citizens	(++)	(+)
	Citizen engagement tools are accessible to diverse social groups	(+)	(+)
	Organizers facilitate a transparent decision-making process	(+)	(+)
Co-Experiment	Reflexive social learning takes place	(+)	(+)
	Indicators set collectively with citizens are used for final evaluations of the NBS design	(0)	(0)
Co-Implement	There is non-profit oriented financing of the NBS	(0)	(0)
	Citizens take on active roles as co-implementers	(+)	(+)

(Table 21 continued on page 109)

Co- Management	Citizens are appropriately involved in the management of NBS	(+)	(+)
	Organizers provide a structure for continued citizen-based evaluations of the NBS	(0)	(-)

Co-explore comparison

For both cases Table 21 shows that the most limited scores (-) occur in the co-creation stage, however these are also complemented by both encouraging (+) and very encouraging evaluations (+). Hamburg and Milan both have limited evaluations for defining the local problems and how NBS can act as a solution together with citizens. This is partly due to the fact that the local problems have been pre-defined in the project proposal through the four urban challenges, and configured into NBS interventions through the CALs. Citizens were able to give input and contribute to the definition of the NBS within the predominantly pre-defined CALs. However, in Hamburg there was more space for citizens to define the contents of the CALs due to the public kick-off event, whereas in Milan citizens were only involved in the co-design stage. As a result, in both cases interviewees noticed that the problem and solution framing around the NBS does not match citizens' concerns. This discrepancy in the framing of the local problem could discourage some citizens from participating since their concerns and priorities are not reflected in the project.

Moreover, there is a discrepancy in the evaluation between Hamburg and Milan for the indicator of acknowledging socio-economic and socio-spatial inequalities in regards to access to urban greenery. In the case of Hamburg, the neighbourhood of Neugraben-Fischbek is surrounded by large nature parks, and the interviewees themselves did not believe that there was a strong need for NBS interventions in the neighbourhood due to the abundant access to greenery. In contrast, in Milan there was a conscious choice to place the NBS interventions in the South of the city due to the lack of urban greenery in the urban fabric and the lower socio-economic stability of people in the area.

There is an encouraging (+) and very encouraging evaluation (+ +) of Milan and Hamburg respectively for the efforts to engage hard to reach or marginalized groups in the local area. In both cases the project partners responsible for the engagement of the citizens used approaches tailored to specific social groups. In the case of Hamburg, project partners actively adapted their engagement approaches to reach out to the youngsters by creating active fun activities and by using translators and translated pieces of information to engage refugees in the co-creation process.

Furthermore, Table 21 shows that both cities have an encouraging evaluation for the collective operationalization of the co-creation process with citizens based on the efforts of the project partners to ensure the timing and location of the co-creation activities match the availabilities and needs of the social groups. Based on the evaluations of this indicator, the cases show that this indicator is relevant throughout the entire co-creation process, and therefore this indicators will be adjusted accordingly in section 5.3.1.

Co-design comparison

The results from the co-design process is overall encouraging for both cases. The co-design stage in Hamburg and Milan both create a flexible and open process that is continuously building upon the inputs of citizens participating in the process, with the exception of the train

station case in Milan which only uses a survey as a means for citizen participation. The cases show a strong focus towards using accessible communication throughout the co-design process, in terms of the terminology used to explain the activities and the NBS project so as not to discourage citizens from participating. Moreover, in both cases, accessible communication about the co-creation processes was facilitated by using the representatives as mediators for communication, as well as through social media and flyers or brochures for those who have troubles accessing these online channels of communication. The cases show that this indicator is relevant throughout the entire process, to make the entire process feel approachable for citizens, therefore this will be adjusted in the framework in section 5.3.2.

Furthermore, Table 21 shows that both cases have an encouraging evaluation for the tools used for citizens to give their inputs throughout the co-design stage, as well as making the co-design stage transparent. In the case of Hamburg the frequent workshops with citizens, and the use of the online participation tool allows citizens to give discursive and detailed input in the co-design phase. In Milan, the online meetings with the residents of the buildings allowed for detailed discussions, and the visualization tools used for the park co-design allowed citizen to express not only their wishes but also deeper emotions connected to the local space. Regarding the transparency of the co-design in Hamburg and Milan, the project partners made sure that the implications of the design choices for the NBS were well explained, and that citizens have an accurate expectation of how their inputs can be incorporated.

Co-experiment comparison

Table 21 shows that Hamburg and Milan have the same evaluations for the indicators in the co-experimentation stage. Due to the iterative process of the co-design stage there is continuous reflexivity taking place throughout the process of co-creating the design of the NBS. The process incorporates the inputs of citizens and is continuously building upon the previous drafts of the design, although this happens to different degrees depending on the CAL. In the case of the green roofs in Milan and the schoolyard in Hamburg, the co-design meetings were more intensive since the same citizens were joining in each session. Whereas in the case of the park in Milan and the green corridor in Hamburg, the degree of social reflexivity may have been less since there is a larger fluctuation of citizens participating in these projects.

Evaluations through collectively set indicators does not properly apply to the cases since the citizens have not been included in setting success criteria, instead citizens are continuously evaluating the designs through their feedback. Moreover, in both cases it was pointed out that citizens are not interested in setting specific criteria for the NBS, instead they are interested in realizing the NBS output. In this sense it is more appropriate for the indicator to include a collective evaluation of the NBS designs with citizens instead of focusing on collectively set indicators for evaluation with citizens, as the cases show that this is not relevant. This adjustment will be made in the framework in section 5.3.2.

Co-implement comparison

Again, Table 21 shows that Hamburg and Milan score the same for the co-implement stage. Citizen engagement in the implementation is encouraging, but uncertainties remain in the financing of the NBS interventions for both cases. Although the co-financing of the projects is necessary in cases where the space is not owned by the municipality and cannot provide sufficient financial support for the NBS interventions, there remain uncertainties as to the motivations behind sponsors' willingness to invest in the NBS. Especially in the cases of the

green roofs in Hamburg and Milan one of the mentioned motivations for investment in the green roofs is based on the perceived increase in value of the building the NBS can provide. It is unclear if and how this increase in value will take shape in the long-term, however a majority of interviewees currently do not seem to be concerned of potential price increases for the tenants.

Co-management comparison

In both cases the involvement of citizens in the long-term maintenance of the NBS have an encouraging evaluation, see Table 21. The responsibilities of citizens for the maintenance of the NBS are designed according to the capacity and willingness of citizen to take on long-term roles. In cases that citizens are not willing to engage in the maintenance of the NBS, the project partners will find external stakeholder to support the maintenance.

Moreover in both cases the structure for long-term evaluations of the project is currently lacking. There are momentarily only plans to conduct evaluations 5 years after the CLEVER Cities project ends. The evaluations of the NBS interventions will be conducted by the project partners to measure the impact of the NBS based on the KPIs for the different urban challenges, with specific social monitoring evaluation. However, it is unclear how citizens will be able to give feedback on adjustments needed for the NBS since there is no systematic way for collecting feedback and it is unclear how this can be structured without the CLEVER Cities project. In the case of Hamburg, all the NBS interventions fall under the broader integrated urban development program which is centred around citizen participation, thus there is some form of security for continued reflections by citizens.

5.3.2 Framework adjustments based on case evaluations and reflections

With the insights on the relevance of the indicators of the literature-based framework after the empirical confrontation through the case evaluations in section 5.3.1, adjustments will be made to the framework according to the insights. An overview of the adjustments to the framework based on the empirical confrontation can be seen in Table 22.

Table 22. Adjustments in the framework based on the case evaluation comparison and reflections.

Indicator	Co-Creation Stage	Adjustment	Justification
Citizens and organizers collectively operationalize the co-creation process	Co-Explore	Applicable to all co-creation stages – transversal indicator	Collective operationalization of citizens' participation in the co-creation process needs to be included in all co-creation stages to ensure citizens can be engaged in the entire process

(Table 22 continued on page 112)

Organizers use accessible communication with citizens	Co-Design	Applicable to all co-creation stages – transversal indicator	The cases demonstrate the importance of using accessible forms of communication with citizens throughout the entire co-creation process, and thus it is an indicator relevant for all co-creation stages
Indicators set collectively with citizens are used for final evaluations of the NBS design	Co-Experiment	Re-operationalized: 'Citizens and organizers collectively evaluate the final NBS design'	The cases show that evaluations are predominantly intertwined with the co-creation process, and citizens do not want to take on roles to create strict indicators instead this is a more natural process

The adjustments to the framework based on empirical confrontation as indicated in Table 21, can be seen visually as the grey boxed in Figure 22.

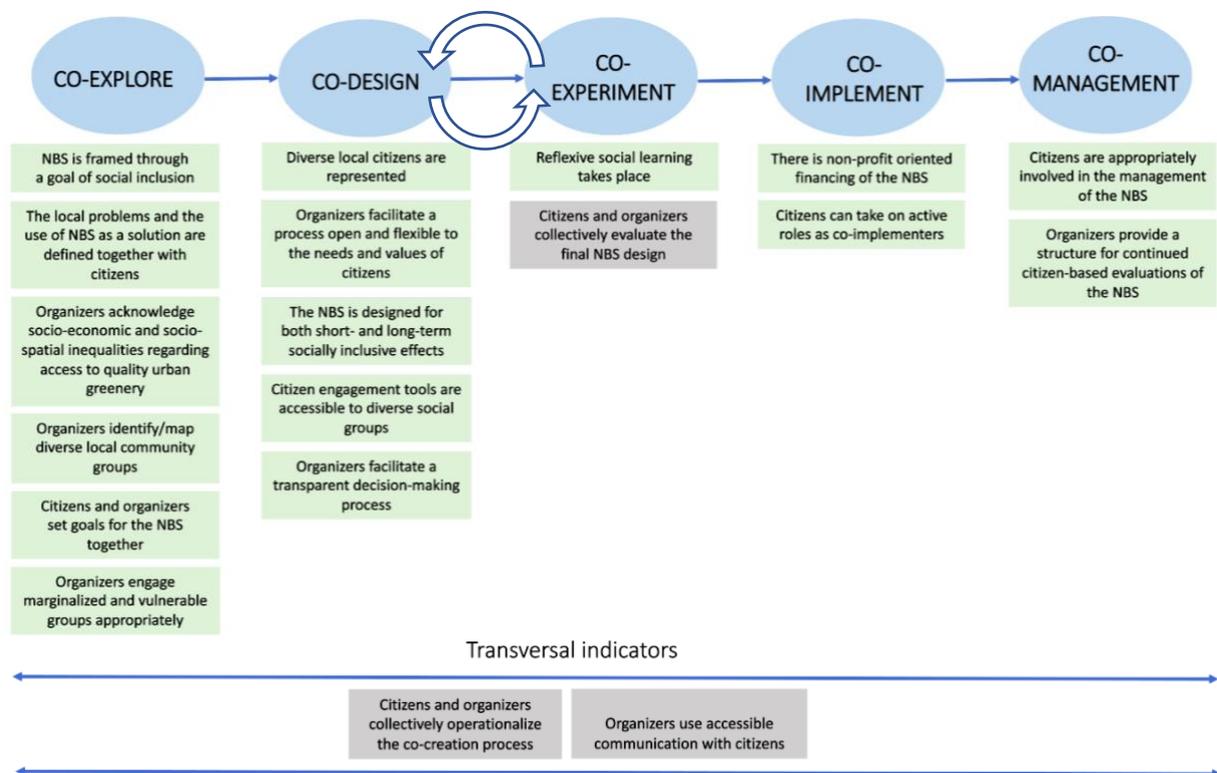


Figure 22. Framework with adjustments based on case comparison and reflection.

5.4 Newly found indicators through empirical confrontation

Besides the evaluations of the co-creation processes in Hamburg and Milan using the framework indicators for social inclusivity, this section will present the inductively derived indicators that are new additions to the framework and are empirically supported by the case studies of Hamburg and Milan. These newly found indicators will be discussed according to the findings in the case studies that support them, and their placement within the framework. Furthermore, unlike the literature-based framework, the newly found indicators are categorized as either transversal indicators, meaning they are applicable to all stages in the co-creation process, or stage-specific indicators, meaning they are applicable to one or more specific co-creation stages. These inductively derived indicators enhance the ability of a co-creation processes to be socially inclusive, and therefore will be added to the framework (see section 5.4.1). An overview of the newly found indicators can be seen in Table 23, and will be discussed in the following sections.

Table 23. New indicators inductively derived through case study.

Indicator	Description	Placement within the co-creation framework	Supporting case study
Organizers identify and recognize marginalized and excluded groups in the area	Before starting the co-design with citizens, organizers conduct a social analysis of the area to map out marginalised or socially excluded groups to ensure the needs of these groups are recognized and incorporated into the design and final outcome of the NBS	Co-explore	Hamburg and Milan
Spaces for co-creation with citizens are accessible	The co-creation process takes place in spaces that are accessible to citizens, the spaces are appropriate and feel comfortable for the target group	Transversal indicator	Hamburg
Organizers engage representatives of diverse social groups	Organizers reach out to the representatives of diverse social groups or communities and engage them throughout the co-creation process	Transversal indicator	Hamburg and Milan

(Table 23 continued on page 114)

Organizers link the NBS intervention into other ongoing programs	The NBS is linked into other ongoing urban projects, policies, or local interventions to ensure that the implementation of the NBS can be supported by external resources (in the form of co-financing, and actors) and an existing governance structure for a long-term period	Co-implement and co-management	Hamburg
Organizers raise awareness of the NBS intervention	Organizers raise awareness about the possibilities for citizens (and other stakeholders) to participate in the NBS project	Transversal indicator	Hamburg and Milan
Citizens' needs are assembled and define the basis for the NBS	Organizers listen to the needs and requirements of citizens and these are used to set the basic framework and boundaries of the NBS design	Co-explore	Milan
Organizers continuously engage citizens throughout the co-creation process	Throughout the co-creation process organizers keep citizens engaged with the NBS project, especially during project delays	Transversal indicator	Milan
Organizers help citizens understand the benefits and maintenance of the NBS	Throughout the co-design phase, organizers help citizens to understand the different functions and benefits of the natural elements that can possibly be incorporated into the design, and citizens are made aware of the required maintenance for these elements	Co-design, co-implement & co-management	Milan
Organizers facilitate reflexive monitoring and evaluation of the co-creation process	Organizers monitor and evaluate the co-creation process against the three environmental justice pillars, and citizens' feedback on their experience of the co-creation process is monitored and evaluated throughout all stages and used to adapt the process as needed	Transversal indicator	Hamburg and Milan

Organizers identify and recognize marginalized and excluded groups in the area

In both cases, there was no systematic guide used to identify who vulnerable groups in each local context are. Instead the CLEVER cities co-creation guide focused on an overall profiling

exercise to map out stakeholders, which for the cities translated into mapping out target groups for the realization of the NBS interventions and the user-groups of these interventions. As a result, there is a shortcoming within the co-creation process of cities not identifying which groups in the area are considered vulnerable or socially excluded in the area (M6). Although the literature-based framework implicitly required organizers of a co-creation process to map and engaged marginalized and vulnerable groups in the area, the cases show that this can easily be overlooked and there for this is required as a separate indicator in the framework.

As one interviewee responsible for citizen engagement in Hamburg mentioned that the term ‘vulnerable groups’ was used in the overall project plan, yet the term remained undefined for the project partners causing the project partners to be unsure how to interpret or identify vulnerable groups in the co-creation process:

“In the grant agreement, there was this term vulnerable groups. And we discussed a lot about it because the question was, what does it mean? What's the definition of a vulnerable group, and especially if you project it onto this spot, on to the district that you're working in.” (H6, Private sector)

As a result, both cases resorted to the general intuition of the project partners in identifying which social groups should receive attention throughout the co-creation process to have their needs and interests incorporated into the NBS. In Hamburg, the organizers responsible for citizen engagement took the lead in approaching and involving marginalized groups in the co-creation process. This project partner was able to do so based on their networks and experiences with citizen engagement in the area. Similarly, in Milan, the social organization with experience of citizen engagement in the local area was crucial for the engagement of marginalized groups in the park project.

“Through the recent project [our organization has been involved in], we already were very much connected in the local networks, about how to target certain groups. It's not that we try to reach out to every group that has been defined in the in the course of the project. But we try more to see which group is actually active, which is actually really wanting to involve themselves or where do we have multipliers that, that really reach out to the people that we want to reach that we can't address directly?” (H6, Private sector)

“In Giambellino [reaching a diversity of social groups] was only through [the social organization], they mainly help[ed] us using their channels, but there wasn't, as far as I know, there wasn't a specific methodology to reach everybody so, I think that it was just using their own programme.” (M1, Private sector)

The statements show that the experiences of these project partners were key in reaching out to vulnerable groups in the area. Additionally, the involvement of vulnerable or marginalized groups depends on the specific boundaries of the intervention. For instance, the green corridor in Hamburg or the park in Milan will have a broader scope of social groups to be included, in contrast with the green roof projects in both cases which limits the scope of potentially vulnerable groups that can be involved.

However, as one interviewee also mentions, the process of engaging various social groups was based on the willingness of groups to involve themselves. Although the willingness of groups and citizens to take part in the co-creation process is also a crucial aspect for their engagement,

by only focusing on those groups who are willing to involve themselves the interests of groups who do not have the capacity to participate will remain underrepresented. Therefore, without identifying which groups in the area are considered vulnerable or marginalized or who often does not participate in the public sphere, the risk that their interests are not recognized or represented in the co-creation process increases. Consequentially, existing inequalities may be exacerbated through the co-creation process if marginalized or vulnerable groups are not specifically indicated beforehand. By clearly understanding who these groups are will enhance the possibility for recognizing their interests in the design, implementation and management of the NBS even if they do not directly participate. This indicator of specifically mapping and indicating vulnerable or marginalized groups in the area should be part of the co-explore stage.

Spaces for co-creation with citizens are accessible

The case in Hamburg shows that making participation in the co-creation process accessible to citizens is strongly determined by the choice of location for these activities. If the space in which the co-creation activities are taking place in do not feel safe or welcomed, citizens will feel discouraged to participate in the co-creation activities. This aspect is not included in the literature-based framework, but the cases show the importance of ensuring the accessibility of the co-creation spaces for to increase citizen participation and representation and is therefore added to the framework.

The project in Hamburg was aware of this issue and were wary of the accessibility of the spaces for the co-creation activities with citizens. The project partner primarily responsible for the engagement of citizens made sure that the spaces for the co-creation activities were appropriate for the target groups. For instance, the ‘CLEVER mobile’ was a boundary object that could be used to engage primarily youngster since the mobile was a fun and inviting tool that could spark the interest of youngsters. Moreover, the project partners made sure to approach youngsters in a park setting to consciously choose a space that youngsters often spend their time (H6). This choice of space also creates a sphere of informality that better suits the interests of youngsters.

Moreover, the interviewees made the point that it is important to make sure the places where the co-creation activities are happening are taking place in a space that participants feel comfortable to go to, this is different for each target group, importance of consulting with the locals or the representatives.

“If we start with a project, we first ask the multiplayers of the institutions, what could be a good time, for example, so if the people are working, or they are not working, or with the refugees, most of them are in German language courses during the day, some of them are already working. And so the time is always very important. So then, of course, is that easy to reach? Or you should look, are they afraid to go there? Maybe it's for the refugees or maybe elderly people, they will never go into a youth centre, because they might be afraid or something so. So you should always think what, and then that you have something they see that they might have a benefit.” (H5, Private sector)

This shows that the choice of location for the co-creation activities needs to be properly matched to the specific social groups. Moreover, one of the project partners has an office in the area that is well-known by the locals through other previous citizen participation projects. The office thus made participation of citizens in the project more accessible by using a well-known

location. The public events to promote the CLEVER cities project in Neugraben-Fischbek took place in a local education and community centre, and during local markets and festivals. Overall, the spaces should create a sphere of informality to make participation more accessible and lower the threshold for citizens to join. Moreover the spaces for co-creation activities should be carefully tailored to specific social groups. This indicator applies to all co-creation stages, and is therefore relevant as a transversal indicator.

Organizers engage representatives of diverse social groups

Although the literature-based framework already includes indicators that touch upon the representation of different social groups throughout the co-creation process to recognize the diversity in the community, both cases show that involvement of social group representatives is crucial in reaching a representative citizen engagement, therefore this indicator is of importance to be added. Since the involvement of individual citizens is time and resource intensive, the representatives were able to easily mediate between a broader group of citizens and the project partners. The representatives have stronger connections with the local communities, and have access to social networks and places that can encourage people to join the project, and their presence can also create a sense of trust towards the project. For these reasons the Hamburg CLEVER partners call these representative ‘multipliers’ as they are able to connect with many local people in the area, and ‘multiply’ the number of citizens that can be represented in the co-creation process.

“So [the representatives are] the gatekeepers, or the ones that really reach out to the people because they have some higher rank, [...] they have more responsibility, they're well seen in the network.” (H6, Private sector)

The interviewees in Milan also mentioned that representatives of social groups were primarily targeted as a means to represent a diversity of the community, since the process of engaging individual citizens would be resource intensive and would likely not be able to result in a similar degree of citizen engagement as can be done through the representatives. Additionally, some citizens preferred to express themselves through their group representative, and in this manner made participation in the process more accessible to some citizens. Moreover, in both cases the representatives were important for mediating the communication between citizens and project partners, as demonstrated by the case in Milan.

“The representatives [...] contacted all the people. So when we went there, everyone was informed and we noticed that because while we were talking with them, asking them [a] specific question in the questionnaire if [the citizens] knew the project before the this questionnaire, for example. And they will say yes, yes our representative told us, [they] informed us.” (M2, Private sector)

Representatives of social groups play an important mediating role in making engagement and communication between project partners and citizens more accessible, and can reach a larger audience to be represented in the co-creation process. Therefore the indicator of engagement of representatives of diverse social groups is relevant for all stages of the co-creation process, and can be categorized as a transversal indicator.

Organizers link the NBS intervention into other ongoing programs

The importance of linking the NBS interventions was shown by the Hamburg case to be important for the finance and the long-term sustainability of the NBS interventions. By linking

the NBS interventions into other ongoing projects, programs or initiatives the NBS interventions can be secured in receiving continued support, even after the CLEVER project ends. This aspect of linking the NBS interventions with ongoing programs is not included in the literature-based framework, however it touches upon an important aspect of ensuring the longevity and but the Hamburg case demonstrates the importance for securing the sustainability of the NBS.

In the case of the NBS interventions in Neugraben-Fischbek, they have been linked with the ongoing RISE project, the state-subsidized integrated urban development program, which is also operating in Neugraben-Fischbek. Furthermore, several of the project partners are also involved in the RISE program and therefore there is more possibility that the NBS interventions from the CLEVER project can be supported through the RISE program. Additionally, the green roofs project in CAL 2 can receive financial support through the Hamburg green roof subsidy program. Linking the NBS interventions to the existing green roofs program has helped to facilitate the realization of the NBS by reducing the cost that the building owners will have to contribute.

“It was really good that we had our partner [responsible for the citizen engagement], because they're working in the area for a lot of years as part of other programmes. It was really, really important for us to piggyback [off of] other programmes to use other processes already in the area happening there, well to get attention, because if we would be just on our own, there wouldn't have been a chance for us to get the attention of the people.” (H4, Public sector)

Overall, linking the NBS intervention with ongoing programs or initiatives is important for securing resources and support for the realization of the interventions by building upon previous knowledge and networks. Moreover, linking the NBS with ongoing long-term programs can secure the maintenance and management of the interventions after the project ends through continued support. For these reasons this indicator is most relevant for the co-implementation and co-management stage.

Organizers raise awareness of the NBS intervention

The literature-based framework underestimates and ignores the importance of raising awareness of the interventions to bring attention of the NBS and to a wider group of citizens in the area as well as informing the possibilities for citizens to collaborate through the co-creation process. Raising awareness of the aims of the NBS projects and the possibilities to join an important features to reach a diversity of both stakeholders and project partners for the realization of the NBS, and reaching a broader scope of citizens to participate and be involved in the co-creation process.

“Really the difficulty is to have a representative selection of people there in your process, it's really [...] you shouldn't underestimate the task to raise awareness for a certain topic.” (H4, Public sector)

In both cases, raising awareness for the NBS interventions and the possibilities to take part in the co-creation process was an important feature in reaching a broad audience. Moreover, interviewees mentioned the importance of raising awareness of the benefits of the NBS, since the engagement of stakeholders and citizens requires competing for their interest as they have other priorities. Thus raising awareness of should show potential participants of the co-creation

process what the benefits and possibilities of the various NBS are. This was one of the priorities in CAL 1 in Milan since green roofs are only recently being implemented on a larger scale.

“[In CAL 1] we have more or less two tasks, two major tasks. One is the awareness raising campaign [...]. So as part of the awareness raising campaign, we had many different interventions that we were doing since 2019 that comprise guided visits, training courses, always related to green roofs and walls, [...] they were made for the citizens, for example, [through] guided tours the citizens could participate, but in particular [these interventions were aimed at] the professionals [meaning] the architects, the engineers, the agronomist, so all the technical experts, all the disciplines, let's say that are very important in the design and construction of green roofs and walls.” (M2, Private sector)

Although it is important to raise awareness on the technical and environmental elements of green roofs, efforts should also be placed in spreading the message about the co-creation process for the NBS, and the important roles citizens play in the overall creation of the NBS. In other words, raising awareness should also signal the values of the

Additionally, raising awareness on the NBS interventions should include the potential social benefits for locals. Citizens should be made aware that they are important for the co-creation process, and that their inputs are important for the overall design of the NBS. Overall there should be emphasis on the goal to create socially inclusive benefits to indicate to citizens that all social groups are welcome to participate, and also to attract stakeholders that will support this goal. This indicator is relevant for all stages in the co-creation process to continuously promote the openness for citizens and stakeholders to participate, and continuously reach out and engage various participants to overcome the fluctuation of participants throughout the co-creation process.

Citizens' needs are assembled and define the basis for the NBS

The current framework includes an indicator for collectively setting goals in the co-explore phase, however the case in Milan shows the importance for using the needs of citizens to set the basic requirements the interventions must adhere to. This also differs from the indicator of collectively defining the local problems and solution which focusses on the experienced problems in the area, this newly found indicator points to specific physical, psychological or cultural needs of citizens that need to be taken into account in the design of the NBS. Although citizens were not involved in the co-explore stage of the co-creation process in Milan, the first activity in the co-design stage in the case of the green roofs and the park was to collect the needs of the participating citizens to demarcate the standards to which the project needs to adhere.

“[In the second green roof project], we have three communities who have very strict needs. For example, people who can't walk, who have to go with [a wheelchair which] can't go everywhere. So you have to pay attention on how and what you put in [the design]. That is [...] a need, but also as something you couldn't [avoid as] part of the project. [...] So your project starts from there, you have a very strong need. [...] So there you have to find a trade-off, you have to compromise [between citizens' needs and desires] But it's easier because when you discuss [with citizens] you understand what it is really something that is needed

and what is something that [is just desired and this] trade-off comes out from the discussion.” (M3, Private sector)

This is an important element in a co-creation process to ensure that all needs are set from the beginning to ensure the NBS can be accessible to different social groups based on the needs and capabilities. Additionally there should be recognition of the needs of marginalized and excluded groups when setting the basic needs to ensure they are represented even if they may not be participating. This indicator is relevant for the co-explore stage.

Organizers continuously engage citizens throughout the co-creation process

The case in Milan demonstrates that the project organizers placed great importance to ensure that citizens feel engaged throughout the entire process, especially during gaps between the engagement activities with locals and the physical results of their inputs through the NBS output. In the case of the park intervention in CAL 2, to deal with the lack of engagement activities due to Covid-19 restrictions and general delays in the process, the project partners have decided to give locals planting kits to stay engaged and informed with the project. This aspect was not included in the literature-based framework, and thus will be explicitly added to ensure the complete engagement of citizens throughout the co-creation process.

“We have prepared and we are launching in the next weeks a little kit with seeds and the information about NBS biodiversity, urban biodiversity and how you can grow plants on your window [on your] roof. And in these kits we also tell something about Giambellino 129, about the park, and we invite people to discover activities and to participate in this process with a QR code that brings you on the web page in the CLEVER website. And we invite them to be informed about all the activities to participate in the management of the area. So we are trying to engage people during all the process. We don't stop the engagement phase in the first phase but we are trying to make the engagement continuous during the process.” (M4)

Moreover, interviewees point to the importance of engaging citizens in all stages of the co-creation process as a means to encourage citizen involvement in the long-term support and maintenance of the NBS interventions once the CLEVER project ends. Especially in a process that is not driven by bottom-up community demands, citizens need to be engaged in all stages to foster a feeling of ownership over the NBS to motivate their long-term engagement with the NBS.

“We have to work on that to motivate them and have them engaged as much as we can, because we need to ensure that those solutions will be maintained, we can guarantee up to a certain point, but after you know, we have to find a way to maintain those solutions. And we are working on that for the commitment of people that will be engaged in the maintenance.” (M5, Public sector)

Therefore, engagement of citizens throughout the co-creation process, especially during project delays, is an important element in keeping citizens motivated about the NBS intervention and to spark a sense of inclusion and ownership with the NBS. Although, in contrast to the Milan project partners keeping citizens engaged for the goal to have them be included in the maintenance of the NBS, the engagement of citizens throughout the process should be facilitated through different activities, tools and discussions to build a sense of place-making,

regardless of their commitments for long-term maintenance. Therefore, this indicator is transversal as it is relevant for all co-creation stages.

Organizers help citizens understand the benefits and maintenance of the NBS

The interviewees of the case in Milan stressed the importance of helping citizens to understand the ecological benefits of NBS for biodiversity and climate adaptation, and social benefits. Moreover, besides informing locals on the benefits of NBS for biodiversity with the aim to educate on the importance of nature and biodiversity, the focus was also placed on informing locals on the maintenance of the NBS in the hopes to secure citizen involvement in the long-term maintenance of the interventions. This aspect is important as the citizens should be aware of the implications of their design choices for the ecological and social benefits of the NBS, as well as the implications for the long-term maintenance of the NBS.

Informing the citizens about the natural elements of the NBS and their benefits, as well as showing how to take care of the NBS can help to spark a sense of empowerment and ownership over the NBS. Therefore, the indicator should be included during the co-design stage to inform citizens on the benefits of the elements they can choose for the NBS and generally to give citizens more ecological knowledge to allow them to notice nature in their environments. Moreover the indicator is relevant for the co-implement and co-management stage as citizens should be informed how to implement the different features of the NBS, for instance planting, and how to take care of these elements. This is not only useful for the long-term engagement of locals with the NBS interventions, but also empowers locals to use the knowledge for their own personal benefit.

Organizers facilitate reflexive monitoring and evaluation of the co-creation process

Although the CLEVER Cities co-creation guide includes social monitoring of the impacts of the NBS through a pre- and post-evaluation, the results of the monitoring are not incorporated back into the co-creation process. Instead the results of the monitoring, specifically social monitoring, are used to evaluate the overall impact of the NBS. This lack of reflexivity towards the co-creation process itself, and citizens' experience of the process was mentioned as a limitation of the co-creation guide which needs to be incorporated in future co-creation processes. Therefore, this element of reflexive monitoring over the entire co-creation process is important for safeguarding the pillars of environmental justice are being considered throughout.

In both Hamburg and Milan there has not been monitoring of the co-creation process itself or citizens experiences with the process (H2). Interviewees mentioned that there were some informal observations of locals that were participating in the co-creation process, however it seems this was done to collect data for the co-monitoring stage instead of being used to react upon. Moreover, an interviewee mentioned that she missed the feedback of the experiences of the participating citizens, as there are no structures for collecting citizen feedback on the activities and overall co-creation process (H5). Rather, project partners should continuously monitor the co-creation process by reflecting if the needs of the community and especially marginalized groups are being represented in the process throughout all stages and make necessary adjustments to align the co-creation process with the goals for social inclusivity. This should be done in tandem with feedback from citizens experiences according to these pillars.

5.4.1 Framework adjustments with newly found indicators

With the descriptions and justifications of the inductively found indicators from section 5.4, these have been added to framework, shown as the addition of the yellow boxes in Figure 23.

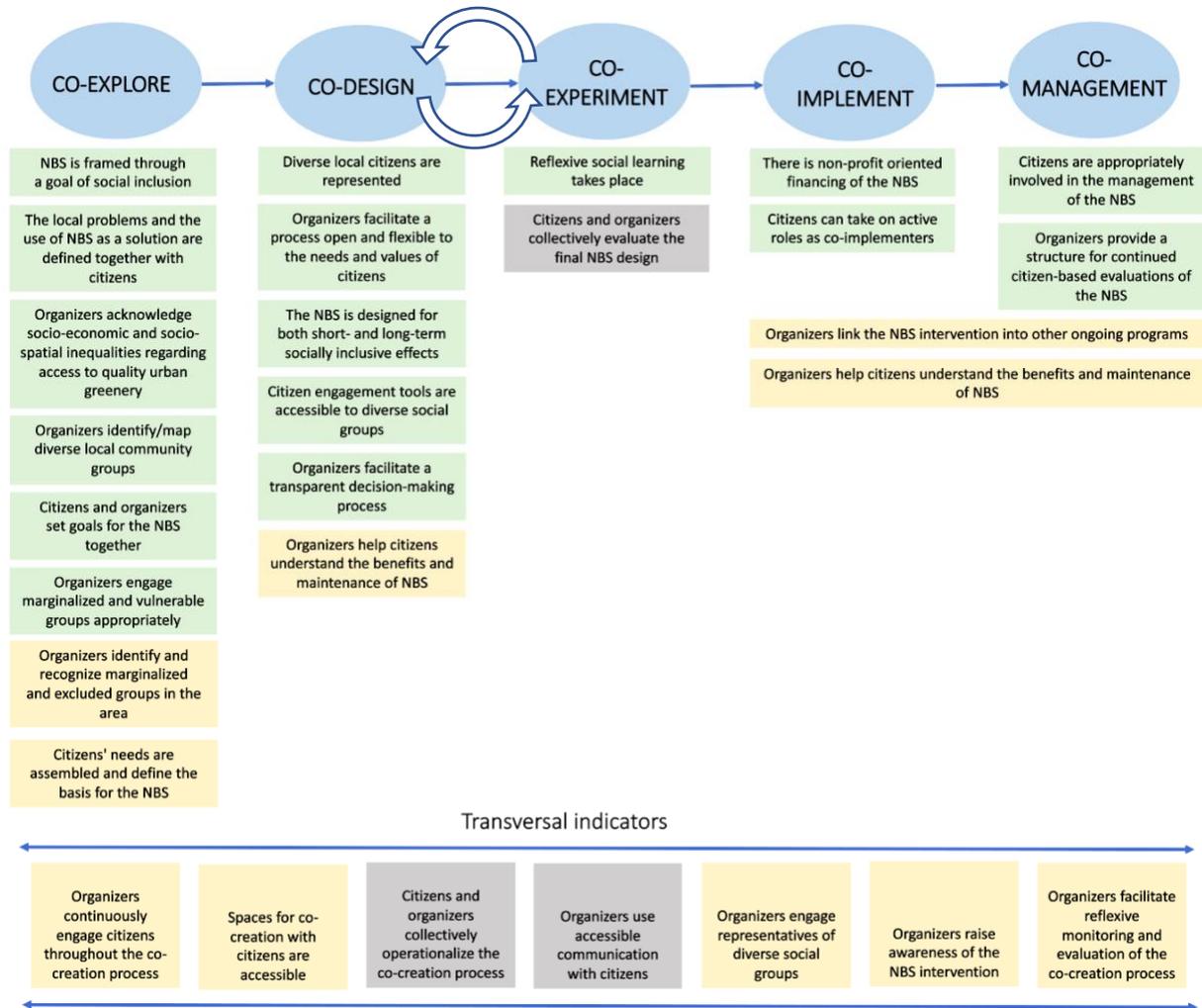


Figure 23. Adjusted framework with newly found indicators.

5.5 Conditions for socially inclusive co-creation derived through empirical confrontation

This section covers the inductively derived conditions needed for a socially inclusive co-creation process which have been mentioned during the interviews with the project partners. The newly found conditions are described through the case study findings, as well as their relevance for the framework. Table 24 presents an overview of the inductively derived conditions, and is followed by descriptions and justifications for each condition. With the incorporation of these inductively derived and empirically supported conditions for socially inclusive co-creation processes, the empirically-confronted framework can be seen in section 5.6 (Figure 24).

Table 24. Conditions for socially inclusive co-creation inductively derived from the case study.

Condition	Description	Supporting case study
Capacity	Both the overall co-creation process as well as organizers, stakeholders and citizens have the capacity to go through a co-creation process, by having the necessary resources, time, and abilities	Hamburg and Milan
Citizens' trust	Citizens trust that the organizers will recognize their needs and incorporate their inputs into the design of the NBS	Hamburg and Milan
Experience in citizen engagement and established local networks	Stakeholders with experience in engaging a diversity of citizens in a co-creation process and who have established networks in the local area are involved in the project	Hamburg and Milan
Adaptability	The co-creation process can adapt to the local context needs and unexpected events while ensuring the co-creation process and NBS outcome remains socially inclusive	Hamburg and Milan
Supportive legal frameworks	Policies and legal frameworks support the realisation of the co-designed NBS	Milan

Capacity

Both cases highlight the importance of capacity as an overarching condition needed to support and facilitate a socially inclusive co-creation process. Many of the decisions made throughout the co-creation process in Hamburg and Milan are based around the question if there is the capacity to do so? The issue of capacity is reflected in the overall capacity of the project at hand, the capacity of the stakeholders to facilitate a co-creation process and the capacity of citizens to participate in a co-creation process.

Regarding the capacity of the overall co-creation process, there must be financial capacity to implement NBS that incorporate the various needs and wishes from citizens, and have financial capacity to secure the long-term sustainability of the NBS. As the co-creation process is

iterative in nature, there should also be the capacity to sustain the co-creation process over a long time frame. Stakeholders, project partners and citizens must have the capacity to participate under long time frames, with frequent discussions and iterations of the plans for the NBS. In the case in Hamburg, the initial location for the project was re-located since the municipal actors did not have the capacity to take on an intensive co-creation process. Furthermore, in the case of CLEVER cities, since the projects are funded by the EU Horizon2020 program, there is a fixed financial capacity and time-line in which the co-creation processes have to take place. Interviewees have mentioned that these financial and time boundaries limits the degree of inclusivity they can promote within the co-creation process.

In terms of the capacity of stakeholders, the cases in Hamburg and Milan show that while initial stakeholder mapping can aim to represent a diversity of the participants, in the end the ability for stakeholders to engage in the co-creation process and take on responsibilities depends on their capacity.

“So when choosing the actors for such workshops, we obviously always think about how to map all the relevant ones: different institutions, locals and [others] is as well onboard in this process who knows all those different actors. We contact them, follow up or show interest, ask for the involvement, and as told, you have to always bear in mind the capacity and the willingness on the other side and work with that as well.” (H1, Public sector)

Specifically the capacity of stakeholders is determined by their ability to invest in an intensive collaborative process, as well as being able to manage and mediate between different interests for the NBS within the boundaries of the overall co-creation project (M3).

Citizens also need to have the capacity to participate in a long-term co-creation process, and be able to invest their time and efforts to the process. More importantly, they should feel that they have the capacity to participate by feeling they have the right knowledge to take part, or without having personal or cultural barriers that may keep citizens from participating. Additionally, in the case of the social housing buildings in Milan, it became apparent that the residents also need to have the capacity to self-organize to make collective decisions when an NBS is implemented in a private space. In one instance, a building that was applying for the green roofs dropped out because the residents could not make collective decisions, even with support from the project partners.

Lastly, a point that has already been touched upon is the long-term capacity of the co-creation process and long-term sustainability of the NBS. Both stakeholders and citizens need to have the capacity to maintain and manage the NBS.

“[The CLEVER project] in Hamburg [has], for example, a lot of such interventions on public property, it's pretty difficult to keep the co-creation scheme going continuously, because after the project ends the maintenance and all the responsibilities stay on the city. So how to organize the co-monitoring or god-parenting from bottom-up... There, again is the question of capacity management when it comes to external actors. I think that co-creation as well comes with responsibilities partly for the other side as well.” (H1, Public sector)

Overall, although the project partners and citizens can to some extent build up the capacity for the co-creation process by investing more resources to help engage citizens in the process, this

is also a structural condition that cannot be influenced by the co-creation process. Thus the capacity of citizens and project partners to fully engaged and collaborative is a pre-condition required to support a socially inclusive co-creation process.

Citizens' trust

In Hamburg and Milan, the interviews have pointed towards the importance of citizens' trust towards the co-creation process and the project partners. The trust of citizens is an overall condition that will determine the participation and engagement of citizens in the co-creation process.

The co-creation process in Neugraben-Fischbek and Milan show that citizens can lack trust towards the co-creation process if they are doubtful that their efforts in the co-process can be reflected in the NBS output. The case studies point to the effect that a lack of trust by citizens towards the project can have on the activation of local citizens to take part in such a co-creation process. If citizens do not trust that these interventions will benefit them, or that their efforts in participating in the project will not be reflected in the outcomes they will not be doubtful to participate in the process.

“Once you build expectations, you have to respect them. So we need to make sure that everything that they chose is going to be implemented that we're going to you know, have those elements inserted in the in the final project.” (M5)

Moreover, the trust of citizens towards to project is also influenced by the role of the project partners. If citizens do not trust that the partners will take into account their inputs, or will not be transparent throughout the process, this can influence their choice to take part in the co-creation process.

“I think it's a lot about trust also, it's a lot about responsibility that you have for doing the job, that what is said, what is brought to you with your certain project, not with the overall CLEVER cities in Hamburg, but with a certain [NBS] project, that you are dealing with it in a responsible way and that people trust you that you will think about it and give some feedback. That you give feedback about, 'I've heard yo'u, that this is an idea we try to incorporate and if we can't, we tried to give you a good reason why we couldn't, the resources, legal, means, whatever it might be.” (H6, Private sector)

Moreover, the lack of in-person collaboration due to the Covid-19 restrictions and the formality of some of the participation tools or methods, such as questionnaires or the inherent sphere of informality that comes with online meetings, can cause citizens to distrust the process. The project partners were able to overcome some of the distrust by physically coming to the social housing buildings to have conversations with the residents to give a face to the project. Thus, the cases show that there are means to build trust between citizens and project partners, however, citizens' trust towards the process can also run much deeper and be influenced by larger structural issues, such as trust in the governmental system. Additionally, one interviewee mentioned that some citizens do not trust that their area can be improved or ridden of crime, since they feel the current conditions are engrained in the area. Thus, trust between the citizens can project partners can be built, but is also an overall condition that needs to exist if citizens are to engage in the co-creation process.

Experience in citizen engagement and established local networks

In both cases the engagement of an actor with experience in citizen engagement in the local area was an important condition that helped the process to represent a diversity of citizens in the co-creation process. In both cases the experienced project partner were able to use their existing networks and reputation to reach out to and engage different social groups. Additionally, for both cases, the other project partners seemed to rely heavily on the experience and established connections of these specific project partners, and were crucial for the co-creation process to be able to include and represent vulnerable groups.

“For one specific CAL the one in Giambellino, which is the area that is south west of Milan, we worked with an association that is very active on their area. So they they know residents very well, they're very active also with people with you know, with disadvantages [...]. So that was actually not necessarily up to us, because we relied on their experience.” (M5, Public sector)

Furthermore, in the case of Hamburg, the local reputation of the experienced partner within the community and their involvement in the co-creation process was able to improve citizens' trust towards the project (H5). In both cases, the social inclusivity within the co-creation process was reliant on their expertise, experience, and established networks in the community for reaching diverse participation. Interviewees also mentioned that the engagement of citizens was made possible by the experienced partner, while the other project partners themselves were not completely aware of how or which citizens were engaged. This demonstrates the importance of involving partners or stakeholders with experience in citizen engagement, but more importantly having a well-established reputation and networks in the community.

Adaptability

Separate to the indicator of reflexivity within the framework, an overall condition for the co-creation process to be socially inclusive is the adaptability of the project to local needs and constraints. The importance of the adaptability of the co-creation process was demonstrated in both Hamburg and Milan. Moreover, adaptability is necessary for the general realization of the project in regards to unexpected disturbances.

Although the CLEVER Cities co-creation guide gives steps and tools that can be used throughout the stages of the co-creation process, each step needs to be adapted and tailored to the local context, and specifically adapted to target groups. Thus the co-creation process in all its stages, and steps needs to be modified to fit local needs.

“[The co-creation guidelines] have been the basis but not necessarily the only basis for our actions. It's more like a guideline that showed us, did we think about this, or are our steps making sense? Is it in order? Those kinds of things were very helpful, but we didn't one by one follow the guidance. [...] We tried to adapt it very much to the local situation and especially to the specifications, let's say of certain groups, the demands of certain groups.” (H6, Private sector)

More specifically the process needs to adapt to both individual needs of citizens, but also to adapt to new means of financing the interventions to insure the inputs can be met. Therefore, adapting requires mediation between diverse needs and interests both from citizens and

stakeholders, while making sure the realization of the NBS is feasible. This entails that the co-creation process must adapt to stakeholders that join and leave the process.

“Sometimes you also have to adjust your process based on what's happening, based on your stakeholders, based on the fact that you discovered a new stakeholder that is important to get in the process. So you have to be a bit adaptable.” (M3, Private sector)

Similarly, the co-creation process must be adaptable to the fluctuation of citizens throughout the co-creation process, to ensure that different social groups can be engaged along the process and their inputs can be managed within the co-creation of the NBS.

The adaptability of the co-creation process was tested by the Covid-19 pandemic which started in early 2020 and placed restrictions on social contact. These restrictions caused many disruptions for the co-creation processes in Neugraben-Fischbek and Milan since the initial engagement activities and tools for citizen participation were centred around in-person interactions. Nevertheless, the projects were able to adapt their activities by incorporating digital participation tools, facilitating smaller group sessions, or creating new activities that can keep citizens engaged with the process despite the lack of interaction.

“[Even with Covid-19 we managed], because for example, for the questionnaire, we went [to the building] and we organised small groups in order to not be so many people in the same room. So we completely adapted to totally another form of working that we didn't imagine from the beginning.” (M2, Private sector)

Therefore, an overall enabling condition to ensure that the co-creation can be socially inclusive is to be adaptive to the local context and specific needs while also being adaptive within the boundaries of the project to find new stakeholder or new solutions that can create the largest benefit by including a diversity of inputs.

Supportive legal frameworks

One enabling condition that stands out from the case in Milan is the overall structure of legal frameworks in which the co-creation process and implementation of NBS takes place. With the green roofs project, the process struggled with the legal frameworks for receiving public funding since the rules on green roof implementation are still new. Therefore the legal frameworks lack clarity on the specific details and criteria of green roofs that can receive funding. The challenge becomes on the one hand incorporating the inputs of citizens in the design of the NBS to ensure the needs and wishes are represented, and on the other hand making sure the design is still eligible for public funding.

“To get the funding you had to meet some criteria. And then it was very challenging to know, really, what kind of interventions because for example, one green roof would use so many, so many accessories also the different kind of systems of the grid of green roofs, so it was very challenging to know, really, at the end, if the public call will give the funding for that kind of specific [elements], because it was just not written before in the in the main law that they have to finance the green roofs. So it was really quite also new for the public officials, that's why it was very challenging.” (M2)

Therefore a supporting legal framework can enhance the opportunities of including a variety of elements in the NBS intervention while still being able to receive public funding, and thereby in return also reducing the cost and the accessibility for buildings to install green roofs.

5.5.1 Adjustments to framework based on inductively derived conditions for socially inclusive co-creation

These previously described and empirically justified conditions enhance the framework by adding elements required for the co-creation process to be socially inclusive and can support the social inclusivity of the NBS outputs. The addition of these conditions can be seen in the following section 5.6 (Figure 24), and therewith presents the empirically-confronted framework.

5.6 New framework based on case study results

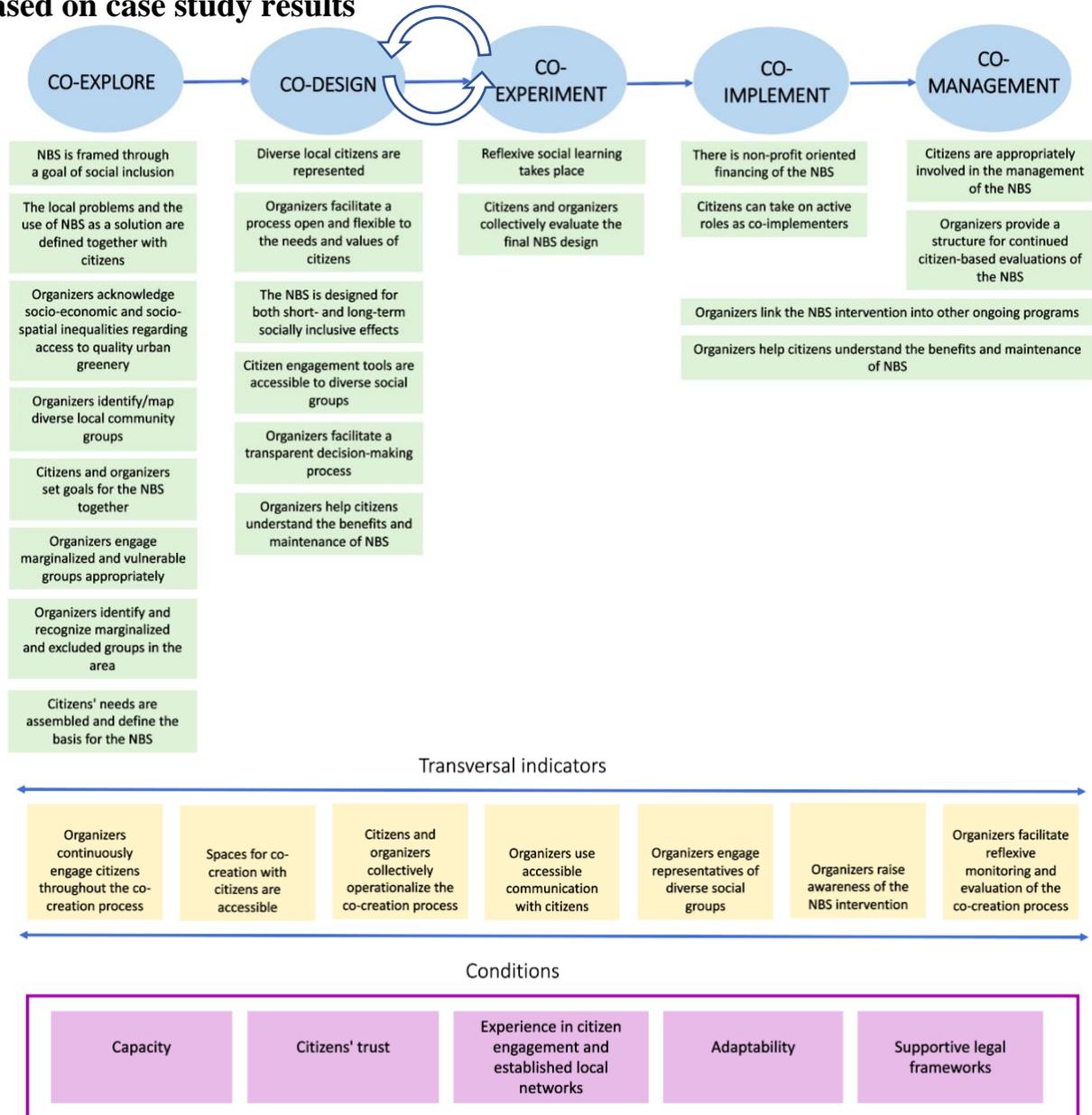


Figure 24. Empirically-confronted framework.

CHAPTER 6: RESULTS PART II: VALIDATION

In this chapter the results of the validation workshop about the state of the empirically-confronted framework (see Figure 24) will be presented in order to answer SQ4. The chapter is divided into two parts. First, a description of the remarks made during the validation workshop is provided in section 6.1. Secondly, the adjustments made to the empirically-confronted framework will be presented in section 6.2. Lastly, the validated framework will be presented in section 6.3.

6.1 Validation workshop results

This section presents the results from the validation workshop divided into three topics, namely, remarks on the use of the co-creation framework from DeLosRíos-White et al. (2020), remarks on the indicators and conditions, and remarks and the future applicability of the framework. An overview of the main comments from the validation workshop can be seen in Table 25, and is followed by descriptions of these comments in the following sections.

Table 25. Overview of validation workshop results.

Framework topic	Main comments from the workshop	Participants supporting the comment
Co-creation structure	The co-creation structure is a planning process throughout out from a co-creation perspective	M1, M2
	The co-creation structure is a starting point, the framework can contribute to the conceptual development of the structure by enhancing elements of co-creation	M1, M2, M4
Indicators and conditions	The framework needs to be made more concise, consistent and simplistic	M1, M2, M4, M5
	Improve the conceptual linkages and clarity of indicators and conditions by creating distinct hierarchies or classifications	M1, M2
Future applicability	Useful tool for urban planners or local authorities, as either an ex-post evaluation framework, or a guiding tool for urban NBS projects	M1, M2
	The framework could also be used for other urban planning contexts besides urban NBS	M1, M2

6.1.1 Remarks on the co-creation structure

During the reflections on the use of the co-creation process framework by DeLosRíos-White et al. (2020) as the backbone for the framework, it was pointed out that the structure is more in line with a planning approach, instead of a co-creation process. The participants highlighted that linear presentation of the stages is more in tune with a planning process, but that the stages are conceptualized through a co-creation perspective (W1, W2). In contrast, a true co-creation approach would be structured in a cyclical manner similar to the policy cycle, and would take into account a broader scope of urban factors such as institutional, infrastructural, financial and perhaps cultural features within the urban domain. Thus, the co-creation structure presents itself as a planning approach thought out from a co-creation perspective (W1). Overall, the participants commented on the fact that the structure is somewhat of a combination between a pragmatic planning approach with elements of co-creation, yet not to the extent that the co-creation represents a process for embedding NBS in a broader level of urban planning. The co-creation structure as it is presented lacks the fundamental elements of co-creation. Therefore the creation of the framework in this thesis can contribute to the conceptual development of the co-creation structure used as the backbone by enhancing the co-creation elements of the overall process and for each stage.

Furthermore, participants have noted that the role of citizens and their engagement within the co-creation process appears quite passive, whereas citizens should be involved in the project with a deeper level of engagement. There should be greater emphasis on citizens being able to share deeper understandings of the problems and challenges they face. Moreover, since the co-creation framework is developed from the perspective of a project planner, the participants state that there is potential for power imbalances between those who are designing the co-creation process and stakeholders participating in the process, especially citizens (W2, W4). The use of guiding principles for each stage of the co-creation process could help to redress this implicit power imbalance to better establish the role of citizens throughout the process. Lastly, it was mentioned that a completely diverse participation of citizens in the co-creation process is challenging if NBS are not considered the solution by citizens as a solution to their problems. This implies that citizens will be difficult to engage in the co-creation process if their priorities do not lie with the provision of nature in the city (W4), as was also demonstrated in the case studies. Instead, to motivate a greater diversity of citizens for joining the co-creation process of NBS a participant suggested to conduct a scoping of existing citizen initiatives in the local area before or in tandem with the co-explore stage to link the NBS interventions with these initiatives (W4). In this manner, there is a greater possibility that citizens who do not prioritize enhancing nature in the city, can still be motivated to indirectly participate in the co-creation process.

6.1.2 Remarks on the framework indicators and conditions

An overall observation that was shared by all participants during the workshop is the intricate length of the framework which can seem overwhelming and daunting for a potential practitioner interested in utilizing the framework as a tool (W1, W2, W4, W5). The structure of the framework with multiple indicators for each stage could discourage its use due to the demanding nature of the numerous indicators. A focus should be placed on making the framework more concise, consistent and simplistic (W1, W4). One suggestion is to ensure that there are no overlapping indicators, since the participants mentioned that some indicators seem repetitive and could therefore be grouped together (W4). For instance, there are several indicators focused on a diverse representation of citizens during the co-creation process.

Instead these individual indicators could be grouped together. Furthermore, the indicators can be made concise by checking that indicators do not measure the same aspect (W1).

Another pathway for simplifying the framework identified during the validation workshop, is to better differentiate the indicators and conditions to create a conceptual linkage of the elements in the framework (W1, W2). One suggestion was to re-conceptualize the indicators as co-creation guiding principles since they are more in tune with principles that should be followed for a co-creation process to be socially inclusive, rather than indicators (W1).

In regards to the conditions of the framework, participants have also mentioned the opportunity for enhanced conceptual clarity by defining in more detail the goal of the conditions. In other words, to describe what the goal for the enabling conditions is, and how the conditions contribute to reaching this goal. This discussion led to the identification of two dimensions within the list of conditions. On the one hand, the conditions of capacity, citizens' trust and experienced actors are relevant for an inclusive co-creation process with a specific focus on the stakeholders and participants. On the other hand, the conditions of adaptability and supportive legal frameworks are more in tune with institutional conditions that are relevant for implementing socially inclusive NBS.

Lastly, participants have pointed out specific indicators or elements that need to be enhanced within the framework. Specifically, it was mentioned that the element of building trust does not seem to stand out from the framework. However, the condition of citizen's trust and other indicators that touch upon similar issues could provide a means to integrate the element of building trust into the framework (W2). Additionally, although the indicator to educate citizens on the benefits of NBS and biodiversity is important, it creates an implication that the involvement and empowerment of citizens is one directional. In other words, it seems to imply that knowledge and skills transfer is only taking place from the project partners to citizens, whereas citizens have valuable local and personal knowledge and expertise which should be used for the co-creation of NBS. Therefore this element of two directional sharing of knowledge should be enhanced throughout the framework.

6.1.3 Remarks on the future applicability of the framework

The workshop participants have stated that the framework could be useful as a tool for both ex-post evaluations on the social inclusivity of co-creation processes, as well as its use for guiding co-creation processes (W1, W2). Due to the pragmatic approach of the framework structure, as mentioned in the previous section, the framework could be used by urban planners looking to implement NBS. Moreover, the framework could be a useful tool for cities and local authorities to learn from as they often encounter challenges when implementing NBS together with citizens. Furthermore, the participants mentioned that although the framework has been developed in the context of urban NBS, the framework could be applied to other urban planning projects.

6.2 Framework adjustments based on validation workshop results

6.2.1 Restructuring conditions as inputs

Using the insights from the validation workshop described in section 2.7.1, the empirically-confronted framework can be analysed through a new logic in order to make the framework more concise, consistent and simplistic. Upon re-consideration, the conditions of the

framework, in fact are more akin to inputs needed for a socially inclusive co-creation process for urban NBS. In other words, the ‘conditions’ are the starting point required for the facilitation of an inclusive NBS, and ultimately affect the degree of social inclusivity that can be reached throughout the co-creation process. Therefore, according to this logic the conditions will be re-conceptualized as inputs. Moreover, the newly conceptualized inputs can be divided into two sub-categories, namely, inputs relevant for the co-creation process and inputs relevant for the inclusive implementation of urban NBS, see Figure 25. Capacity, citizen’s trust and experience in citizen engagement and established local networks are centred around socially inclusive involvement of stakeholders and citizens, whereas adaptability and supportive legal frameworks are linked to implementing the urban NBS in a manner that captures the diverse needs of citizens.

6.2.2 Reconceptualizing indicators as guiding principles

By re-conceptualizing the conditions as inputs, the framework can be reconfigured along the logic of an impact pathway analysis (Alvarez et al., 2010; Douthwaite et al., 2003; Springer-Heinze et al., 2003). An impact pathway analysis looks at the progressive steps that transform a social innovation from inputs to an eventual large-scale social impact. The pathway starts with inputs for the social innovation, followed by the process needed to implement the innovation. This leads to subsequent outputs, and the use of outputs which deliver direct benefits. After some time, these outputs should develop into a larger scale impact for society (Alvarez et al., 2010; Douthwaite et al., 2003). Continuing along this line of logic for restructuring the framework, the stage-specific and transversal indicators are reconceptualized at the overall process needed to reach an impact of a socially inclusive community through urban NBS. Adding on, using the comments from the validation workshop, the indicators are reconceptualized as guiding principles to enhance the holistic nature of a co-creation process within the framework, and the guiding principles are divided into stage-specific guiding principles and general guiding principles for the co-creation process, see Figure 25.

6.2.3 Adjustments made for consistency and simplicity of the framework

Moreover, in the effort to make the framework more consistent, the indicators, from now on referred to as guiding principles were revised for any overlaps. This has led to a reconfiguration of the framework by removing or merging guiding principles, see Figure 25. For instance, the stage-specific guiding principle of socially inclusive framing has been removed since it in fact is encompassed by the entirety of the framework itself since all elements in the framework are framed with the goal of facilitating a socially inclusive co-creation process for urban NBS.

Furthermore, the identification and appropriate engagement of marginalized groups by organizers have been merged with the guiding principle of organizers map/identify diverse local community groups, see Figure 25. Through this new configuration the guiding principle has been slightly re-conceptualized to not only include identifying but also recognizing diverse social groups with an emphasis on marginalized and vulnerable groups. Moreover, this guiding principle, upon recommendation from a workshop participant (W4) will also include the identification of local initiatives, as has been mentioned that linking the NBS to initiatives can reach a broader diversity of citizens and can spark more motivation for citizens to participate. With this, the inductively derived stage-specific guiding principle of linking the NBS into ongoing local programs has been merged together with the guiding principle of identifying local initiatives since these are inherently overlapping.

The stage-specific guiding principle of citizens needs setting the basis of the NBS has been merged with collectively defining the local problem, as this inherently includes citizens' needs. Next, the inductively found principle of helping citizens understand the benefits and maintenance of NBS was merged with the general guiding principle of raising awareness of the NBS, see Figure 24. Lastly, the theme of accessibility was found throughout the framework in both the stage-specific and general guiding principles. Due to the relevance for the entire co-creation process being accessible for citizens, these principles centred around accessibility have been merged into one general guiding principle, see Figure 25.

An overview of the reconfigured descriptions of the framework can be seen in Table 26, and a visual representation of the validated framework can be seen in section 5.8, see Figure 26.

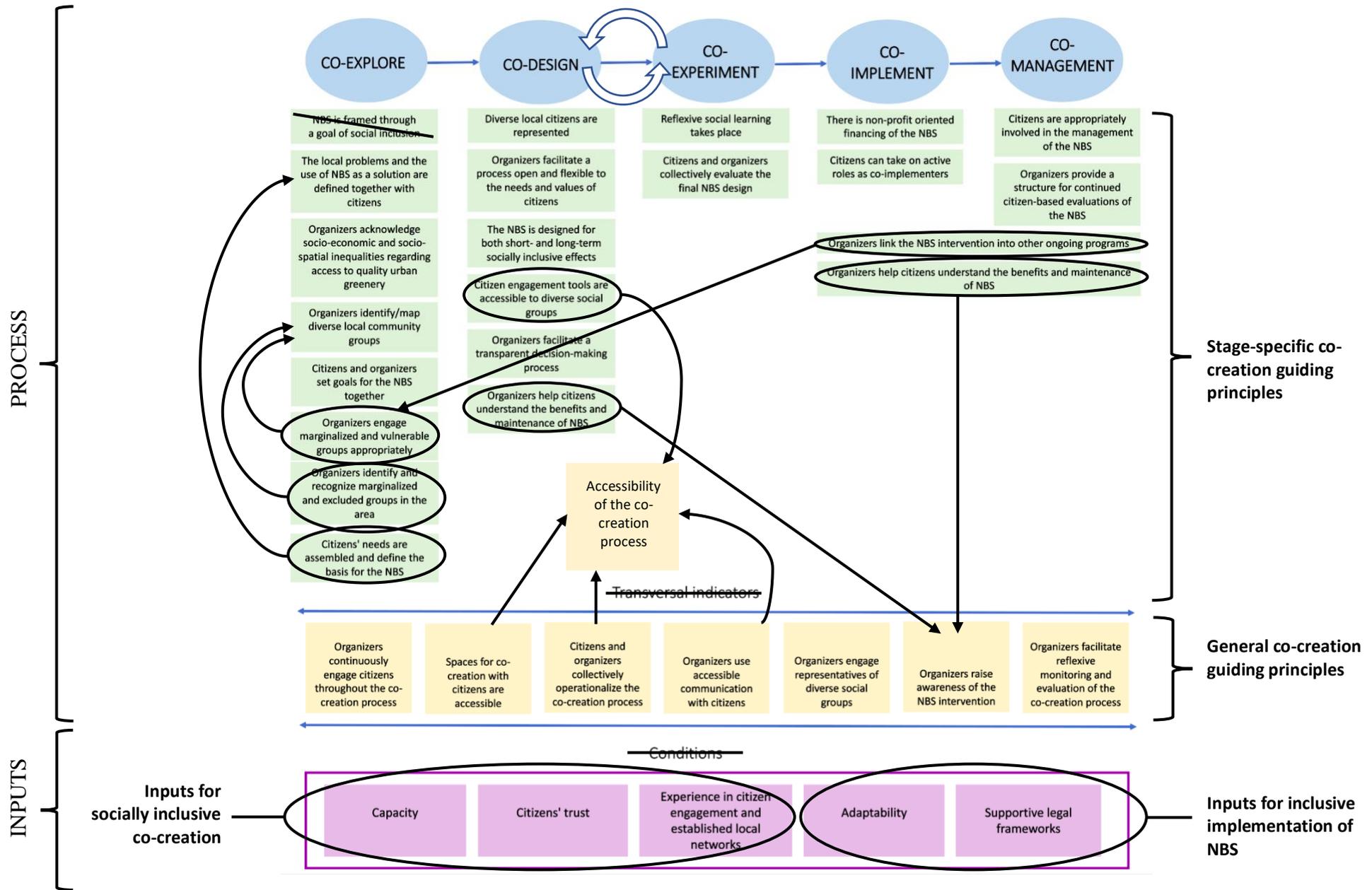


Figure 25. Changes to empirically-confronted framework based on validation workshop results.

Table 26. Validated framework for socially inclusive co-creation for urban NBS.

Category	Sub-category	Title	Description
Inputs	Socially inclusive co-creation process	Capacity	Both the overall co-creation process as well as organizers, stakeholders and citizens have the capacity to go through a co-creation process, by having the necessary resources, time, and abilities
		Citizens' trust	Citizens trust that the organizers partners will recognize their needs and incorporate their inputs into the design of the NBS
		Experience in citizen engagement and established local networks	Stakeholders with experience in engaging a diversity of citizens in a co-creation process and who have established networks in the local area are involved in the project
	Socially inclusive implementation of NBS	Adaptability	The co-creation process can adapt to the local context needs and cunexpected events while ensuring the co-creation process and NBS outcome remains socially inclusive
		Supportive legal frameworks	Policies and legal frameworks support the realisation of the co-designed NBS
Process	General co-creation guiding principles	Organizers facilitate reflexive monitoring and evaluation throughout the co-creation process	Organizers monitor and evaluate the co-creation process against the three environmental justice pillars, and citizens' feedback on their experience of the co-creation process is monitored and evaluated throughout all stages and used to adapt the process as needed
		Organizers make the co-creation process accesible to diverse citizens	Organizers ensure that spaces for co-creation activities with citizens are appropriate and feel safe, the tools and communication used for citizens' inputs are accessible to diverse social groups, and moments for citizen co-creation activities are decided with citizens
		Organizers engage representatives of diverse social groups	Organizers reach out to the representatives of diverse social groups or communities and engage them throughout the co-creation process
		Organizers raise awareness for the NBS intervention and associated benefits	Organizers raise awareness about the benefits of NBS possibilities for citizen participation (and other stakeholders) to influence decision-making
		Organizers continuously engage citizens throught the co-creation process	Throughout the co-creation process organizers keep citizens engaged with the NBS project, espically during moments of project delays

Table 26. Validated framework for socially inclusive co-creation for urban NBS (cont.)

Category	Sub-category	Co-creation stage	Title	Description
Process	Stage-specific co-creation guiding principles	Co-explore	The local problems and the use of NBS as a solution is defined together with citizens	The local problem to be addressed by the project is collectively defined with local citizens, and how the NBS will act as a solution to the problem is also collectively decided together with local citizens taking into account specific needs of social groups for the NBS
			Organizers acknowledge socio-economic and socio-spatial inequalities regarding access to quality urban	The location for the NBS is planned to redress socio-spatial inequalities and acknowledged socio-economic inequalities of neighbourhoods in terms of their disadvantages in obtaining benefits from urban natural elements and local climate adaptation measures
			Organizers recognize and engage diverse local community groups (especially marginalized and vulnerable groups) and local initiatives	Organizers map and identify diverse social groups in the local area, and specifically recognize marginalized and vulnerable groups, as well as identifying local initiatives to be linked with the co-creation process
			Citizens and organizers set goals for the NBS together	The goals and success criteria for the NBS are set by all actors, including local citizens, before designing the NBS, this will guide the next stages, steps and evaluation of the co-creation process
		Co-design	Diverse local citizens are represented	There is an active effort to achieve participation and representation of the diversity of the community, especially disadvantaged groups during the co-design of the NBS
			Organizers facilitate a process open and flexible to the needs and values of citizens	Openness for different forms of knowledge, values of nature, the inclusion of local needs, interests, experiences and preferences are incorporated in the co-design process of the NBS
			The NBS is designed for both short- and long-term inclusive effects	There is an active effort to balance short-term goals for social inclusion with long-term inclusivity, considering potential negative long-term effects such as gentrification and exclusive effects
			Organizers facilitate a transparent decision-making process	Clear communication of decisions and trade-offs regarding the NBS takes place

Table 26. Validated framework for socially inclusive co-creation for urban NBS (cont.)

Category	Sub-category	Co-creation stage	Title	Description
Process	Stage specific co-creation guiding principles	Co-experiment	Reflexive social learning takes place	Frequent iterations for evaluation and reflection on the NBS by all actors feedback into the co-design stage, the process is reflexive, citizens learn from each other and organizing actors learn about citizen needs which feed back into the co-design stage
			Citizens and organizers collectively evaluate the final NBS design	NBS designs are collectively evaluated together with citizens and organizers, in an iterative fashion moving between the co-design and co-experiment stage until a final design is selected
		Co-implement	There is non-profit oriented financing of the NBS	Financial support that is not based upon market value capture or stakeholders with a profit-making agenda is used to implement and maintain the NBS which does not create an increase in price for the local citizens
			Citizens can take on active roles as co-implementers	Citizens can be involved in the co-implementation of the urban NBS in a manner that adheres to their wants and capabilities
		Co-management	Citizens are appropriately involved in the management of the NBS	Citizens continue to hold an ongoing role in the management of the NBS according to their capabilities
			Organizers provide a structure for continued citizen-based evaluations of the NBS	Continued evaluation of the NBS by all local citizens based on experiences with the NBS is organized through a collective governance structure and can feed back can be used to adapt the NBS

With the adjustments made to the empirically-confronted framework based on the validation workshop (see Figure 24), and the reconceptualization of the framework as shown in Table 26, the validated framework which has been adjusted for consistency and conciseness is presented in section 6.3 (see Figure 25).

6.3 Validated framework

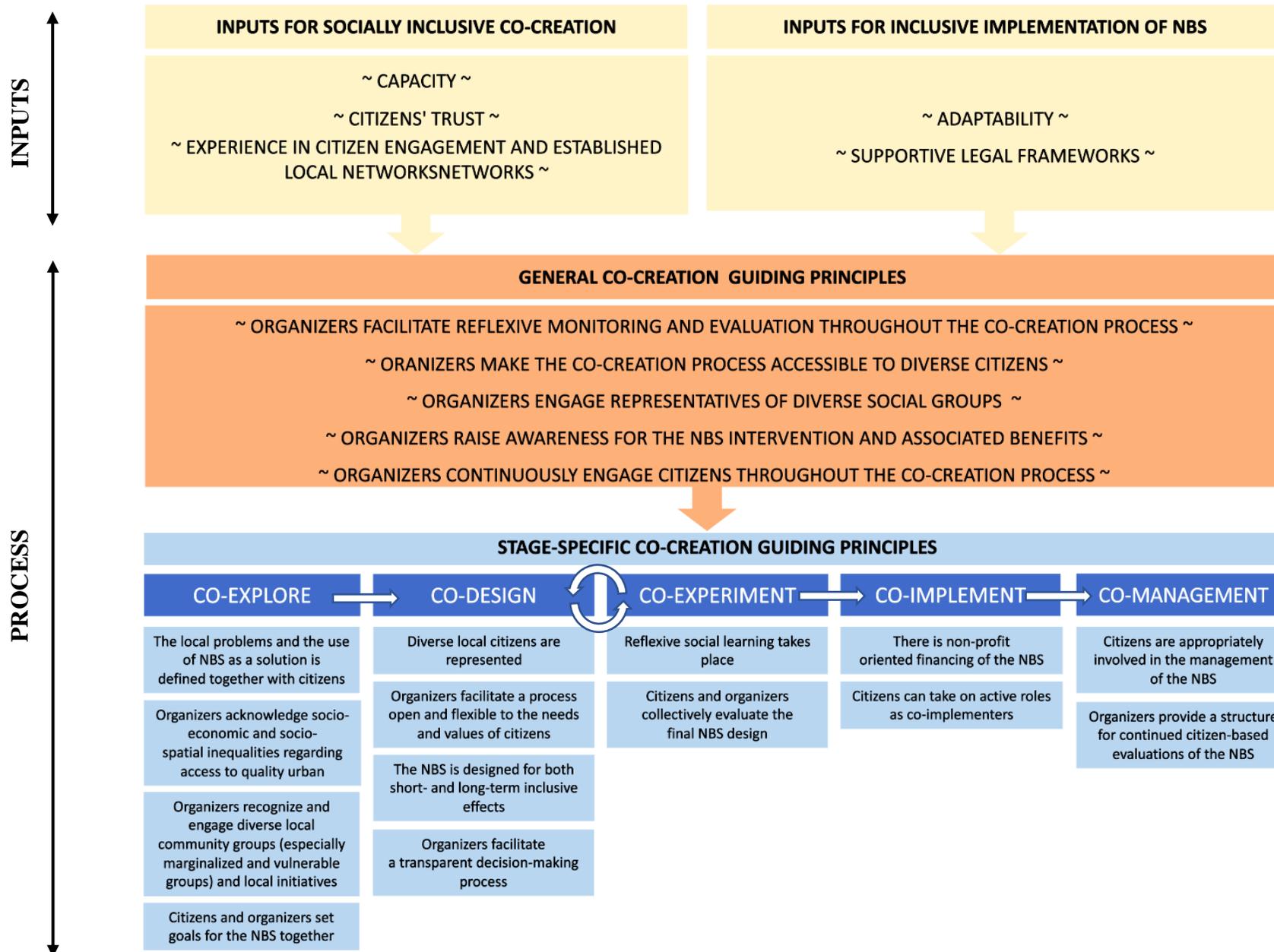


Figure 26. Validated framework for socially inclusive co-creation of urban NBS

CHAPTER 7. DISCUSSION

This chapter will answer SQ 5 by providing a reflection on the empirical findings from the results chapter (chapter 5) by first discussing the overall results of the case evaluations and then delineating some key elements of the validated framework (section 7.1). This will be followed by lessons on *how* and *when* to facilitate a socially inclusive co-creation process and *which* NBS and scale should be considered by reflecting on the findings, linking them to the broader academic debate, and generating recommendations for practitioners (7.2). Finally, this section will end with a reflection on the research approach (section 7.3).

7.1. Overall reflection on findings

7.1.1 Reflection on case evaluations

The case evaluations and comparison of the CLEVER Cities project Front Runner (FR) cities Hamburg and Milan, contribute to the literature on urban NBS by filling the gap on empirical evaluation of urban NBS projects, and enrich current academic debates by specifically evaluating the aspect of social inclusivity within NBS projects (Raymond et al., 2017, Haase, 2017). Moreover, the evaluations contribute to literature on co-creation by providing empirical evaluations and lessons learned of the extent to which a co-creation process adheres to socially inclusive principles (Leino & Puumala, 2020, Basnou et al., 2020). Firstly, looking at the general scoring of Hamburg and Milan, both cases have an overall encouraging scoring (+ and ++) in terms of meeting the indicators of social inclusivity throughout the co-creation process thus far and for plans for the upcoming co-creation stages (see Table 21). This indicates that the aim of the CLEVER Cities project to co-create socially inclusive urban NBS has been actively translated into designing a co-creation process that attempts to promote socially inclusive and valued solutions. Upon closer inspection of the individual co-creation stages, it becomes clear that the highly encouraging scoring occurs mainly in the co-explore and co-design stages, the limited scoring mainly occurs in the co-explore and co-management stages. A brief overview of the evaluations of the CLEVER Cities cases will be presented according to the co-creation stages.

Co-explore

Within the co-explore stage, the limited scoring is caused by the lack of citizen collaboration when defining the local problems, and the ways in which an NBS could be a solution to those problems. This is partly due to the structure of a EU Horizon 2020 project which requires justifications for project actions beforehand in order to receive approval for funding. However, it also raises questions about the rationale for citizen participation in the co-creation process if citizens are not involved from the beginning when local problems are defined. Limited citizen involvement in problem definition limits their influence in the direction of the co-creation process and outcomes. This relates back to the claims by Uittenbroek et al. (2019b) that citizen participation may be used for an instrumental rationale such as generating legitimacy for the outcomes rather than for a normative rationale such as empowering marginalized groups. Moreover, the case in Hamburg received a limited scoring for the distributional aspect of the project, since the location of the NBS interventions was not considered for redressing inequalities in access to quality greenery. Without placing the NBS in areas deprived of greenery, the Hamburg project can be questioned on the basis of distributional justice

(Schlosberg, 1999; Tozer et al., 2020; Castán Broto & Westman, 2019). By not using the NBS placement to redress spatial inequalities regarding access to benefits of urban greenery, the project contributes to the exacerbation of spatial inequalities (Tozer et al., 2020, Anguelovski et al., 2019).

Co-design

Both cases score considerably well in the co-design phase for their efforts to make the co-design process accessible through their use of language and communication with the participants, the transparency of the co-design decision-making and their openness and flexibility towards citizen's inputs in the process. The representation of the diversity of citizens was pursued through the involvement of social group representatives. However, since both cases did not define or clearly identify vulnerable groups in the area, questions arise around for *who* the co-design process was accessible for, and *who* in the end was recognized and represented in the design of the NBS. This links back to the interrelatedness of the environmental justice pillars (Schlosberg, 1999; Bulkeley, Edwards & Fuller, 2014). Namely, although the procedure may be on the right track towards principles of justice, without fulfilling recognition of the interests of marginalized and vulnerable groups, the justice of the procedure itself is hampered. Additionally, the long-term considerations for the potential negative effects of the NBS, such as price effects for citizens or social exclusionary effects did not seem to be a main concern of the project partners at the time of the interviewees. Although the co-design stage is in this regards critical for balancing trade-offs between social, environmental and economic NBS benefits early on (Haase et al., 2017).

Co-experiment

The reflexivity between the co-experimentation and the co-design stage for both the Hamburg and Milan case scored encouragingly due to the iterative process of re-designing the NBS based on new citizen inputs. The reflexivity and social learning was centred around the development of the NBS design, but less about the normative aspects of the co-creation process itself. As van der Jagt et al. (2021) state, reflexivity in and of the governance procedures for NBS in relation to the pillars of environmental justice are needed to address social power imbalances and to obtain a socially just procedure and NBS outcome.

Co-implement

As the Hamburg and Milan co-creation process is still ongoing, they have yet to approach the co-implementation stage, and thus the interviewee responses are based on current plans for this stage. Both cases are planning to involve citizens in the implementation of the urban NBS according to the wiliness and abilities of the citizens, as well as overall safety conditions regarding the implementation. In this regard, the CLEVER Cities FR cities appropriately takes into account the potentially limited capabilities of citizens to take part in the implementation and allows those who are able and want to contribute to the implementation of the NBS to do so (Schlosberg, 2012). Additionally, the co-implementation stage encompasses the financing of the NBS, which the Hamburg and Milan cases are looking to co-financing schemes with investors for long-term support of the NBS. However, as the evaluations pointed out there is a significant emphasis placed increasing the value of the buildings as a reason for motivation to realize the NBS. Thus remains the question of the financial motivations behind investments in the NBS, and if the improvement of environmental benefits and potential increase in property values is in the interest of the investors (Raymond et al., 2017).

Co-management

Lastly, the interviews highlight the efforts project partners in both cases are putting in to ensure citizens will be able to remain involved with the maintenance and management of the NBS after the CLEVER Cities project ends. A focus is placed on designing the NBS and associated maintenance requirements according to the capabilities and interests of the citizens during the co-design stage, and thus scores encouragingly. However, there remains uncertainty around the possibility for citizens to continue giving feedback and personal evaluations on the NBS, and how they will be supported to continue developing social relations once the project partners are no longer involved in the CLEVER Cities project. As Basnou et al. (2020) write, there should not only be a long-lasting output from the co-creation process, but also the ability to continue social learning through communities of practice. Thus, when the structure provided by the CLEVER Cities project falls away, it remains the question how this ongoing social learning can be sustained.

7.1.2 Reflection on the key elements of the validated framework

In this section some key elements and characteristics of the validated framework (see section 6.3) will be presented.

Inputs

The first key characteristic of the framework is the incorporation of inputs required for a socially inclusive co-creation process for urban NBS. More specifically, there are two categories of inputs, one particular for stakeholder engagement in the co-creation process and the other for the implementation of the NBS. The required financial and resource capacity of stakeholders has already been identified in the literature as an element needed for deeper levels of citizen engagement in a co-creation process (Wamsler et al., 2020). Therefore, the input of capacity in the framework which has been inductively derived from the case study analysis supports this claim. Moreover the characteristic of inputs requires for a co-creation process to be socially inclusive contributes to the literature on co-creation in two ways. Firstly, although literature on co-creation has pointed to elements such as capacity needed for successful engagement of stakeholders, these have not yet been characterized as required inputs for a co-creation process, and thereby the characterization of inputs in the validated framework contributes to the literature by enhancing the conceptual clarity of these required elements. Secondly, the empirically derived inputs required for a socially inclusive co-creation process and NBS output contribute to the literature on co-creation and urban NBS by delineating specific elements required for facilitating an urban greening process with incorporated normative aspects of social inclusivity. It should be noted that the empirically found inputs within the validated framework are not exemplary of an exhaustive list, and research should continue to build upon these findings.

Process

The second key characteristic of the framework is the process, conceptualized by general guiding principles and stage-specific guiding principles for the co-creation process. The general guiding principles are incorporated in the framework as a means to safeguard the quality of the entire co-creation process along principles of social inclusivity, and the stage-specific guiding principles enhance the alignment of each co-creation stage the normative principles of citizen empowerment and social inclusivity in the process of developing locally

valued solutions. The transition from indicators in the literature and empirically based framework, to a reconceptualization of guiding principles in the validated framework highlights the difficulty of developing a planning approach for a co-creation process. As was mentioned in the validation workshop, the co-creation structure by DeLosRíos-White et al. (2020) used as the backbone of the framework is a project planning approach for urban NBS thought out through a co-creation perspective, but does not fully represent the holistic nature of a co-creation approach. Therefore, through the incorporation of general and stage-specific guiding principles for the co-creation process, this framework contributes to the conceptual development and enhancement of co-creation elements within the DeLosRíos-White et al. (2020) co-creation structure. Overall the validated framework contributes to the literature on urban NBS and co-creation by filling the gap of a lack of a framework for the creation of urban NBS that combines the normative aspects of social inclusivity in part through deeper levels of citizen participation (Puskas, Abunnasr & Naabandian, 2021).

7.2 Reflections on facilitating a socially inclusive co-creation process for urban NBS

The previous section (6.1) already highlights some of the important elements for a socially inclusive co-creation process with the aim to avoid the exclusionary effects of NBS implementations in cities and potential gentrification effects. This section will continue building on these reflections by specifically discussing the lessons from the results on *how* and *when* to facilitate a co-creation process that will be socially inclusive and *which* NBS and scales are important to consider when designing co-creation processes for urban NBS deliver inclusive benefits (6.2.1 and 6.2.2 respectively).

7.2.1 How to... facilitate a socially inclusive co-creation process for urban NBS

This section will discuss the lessons and theoretical implications for how to facilitate socially inclusive co-creation processes for designing and implementing urban NBS. The lessons will be followed by recommendations for practitioners.

Collectively define the local problem

As the findings of the case evaluations show, there was limited citizen involvement in the definition of the local problems to be addressed through the CLEVER Cities project. In the case of Hamburg, citizens were able to help decide the contents of the Clever Action Labs and thus better attune the NBS to their needs. Whereas in Milan, citizens were predominantly involved in the co-design stage after the local problems and decision of the type of NBS as a solution had already been decided, which as an interviewee pointed out, led to a mismatch between the concerns of the project and the larger structural concerns of the citizens. Moreover the lack of involving citizens in the defining the problems and solution points to the false assumption that NBS is a panacea and will provide co-benefits regardless of the daily struggles of citizens (Kotsila et al., 2021). This implies the importance of involving citizens from the beginning of the co-creation process by allowing them to influence the direction of the co-creation process early on, to properly fit the co-creation process to the local struggles and empower citizens by solving their own local problems. This importance of involving citizens from the beginning echoes Lupp et al. (2021) who state that all stakeholders representing the Quadruple Helix (GH) need to be involved intensively from the beginning of the co-creation process. This is needed since the problem perceptions of local authorities and citizens often do

not overlap (Marschütz et al., 2020) and thus involving citizens after the problems have been defined will exclude numerous citizens from participating in the process because they cannot identify and do not prioritize the problem. In line with Lund (2018), this lack of citizen engagement in the problem definition highlights the political undertones regarding the question of whose problems are being solved, especially considering the barriers marginalized groups face to have their problems recognized. As Uittenbroek et al. (2019b) claim, public participation should be centred around solving the problem at hand, not about the quantity of participation activities. Thus, a socially inclusive co-creation process requires an understanding of the local problems citizens face, and using this understanding as the starting point of the co-creation process and building the solution according to these issues.

Based on this lesson, recommendations for ensuring the problems are tailored to the local context are:

- To conduct in-depth surveys on the problems faced by citizens in the local area to generate an understanding of how the NBS can appropriately address the locally faced issues
- To ensure the starting point of designing NBS is based on redressing existing socio-spatial and socio-economic inequalities between social groups' access to quality urban greenery

Diverse representation and recognition of social groups

A second aspect critical to when trying to facilitate a socially inclusive co-creation process is the extent to which the diversity of the community is mapped and recognized throughout the process. The cases in Hamburg and Milan both relied on the experience and networks of project partners to map and engage a diversity of social groups. Moreover, both cases relied on representatives of social groups to represent the interests of the citizens who adhere to the respective groups. The cases show that use of representatives of diverse social groups is important for representing the diversity of the community while still ensuring that the number of participants remains at a manageable scope and thereby supports the claim made by Uittenbroek et al. (2019b) that public participation should focus on a complete representation of interests rather than full inclusion of all citizens in the absolute sense. However, as the cases have also shown, there was no clear identification of marginalized or vulnerable groups in the area, and thus the projects run the risk of overlooking the interests of these groups, thereby exacerbating existing inequalities and perhaps creating maladaptive outcomes instead (Shi et al., 2016). As marginalized and vulnerable groups are less likely to have effective representation of their interests, the Hamburg and Milan cases show the importance of identifying marginalized groups early on to recognize and safeguard the representation of their interests even if they do not directly participate in the process (Rutt & Gulsrud, 2016). This again links to the interconnectedness of the environmental justice pillars which affirm that unjust recognition of marginalized and vulnerable groups in turn limits the justness of the procedure and distribution (Bulkeley, 2014).

Moreover, the representation and recognition of diverse social groups also requires taking into consideration the power imbalances between these groups and how this determines the ability for some to be represented better than others (Leino & Puumala, 2020). As van der Jagt et al. (2021) point out that perhaps only marginalized or vulnerable groups should be targeted for the creation of NBS to ensure their interests will not be overridden by more powerful social groups. This is in line with Collins' (2003) argument for targeted selection rather than an equal treatment principle which fails to take into account power imbalances. Nevertheless,

facilitating a socially inclusive co-creation process thus requires identifying local marginalized and vulnerable groups from the start and learning about their needs and interests to ensure they can be represented and recognised throughout the process even if they do not directly participate.

Based on this lesson, recommendations for ensuring the diverse representation and recognition of social groups are:

- To collaborate with social workers to identify and engage representatives of marginalized and vulnerable groups in the local area
- To collaborate with local citizens when conducting the stakeholder mapping, to better identify the diverse social groups in the area, and to use local knowledge to understand which vulnerabilities social groups are experiencing

Flexibility and openness of the co-creation process

In line with the previous element of diverse representation of social groups, the co-creation process should also be flexible and open to the different forms of knowledge and experiences the citizens contribute to properly tailor the process and solution to the local context. As was shown in the case of Hamburg, the project partners responsible for citizen engagement made sure to be flexible towards incorporating citizens' inputs during the co-design stages so as not to discourage citizens for their efforts. The interviewees pointed out that the understanding of 'nature based solutions' was loosely interpreted to ensure that citizens' inputs, even if not directly applicable to the definition of an NBS, could be used to tailor the solution to include citizens' needs and experiences. This reflects the importance of using NBS as a boundary object, on the one hand being flexible enough to incorporate diverse inputs and reflections, while on the other hand being grounded enough to "form a common language to work together" (Dorst et al., 2019 p. 5). The openness and flexibility towards the understanding of NBS and citizens' inputs is required to accommodate for the varying understandings and values people hold towards nature (Frantzeskaki et al., 2019). In other words, the framing of what nature is and how it can be used as a solution should be broad enough to represent the multiculturalism of how nature is experienced by different social groups (Rutt & Gulsrud, 2016). The importance of a taking on a broad and flexible framing of nature is exemplified by Woroniecki et al. (2020) who state that narrowed and dominant frames of nature constrains knowledge production to reinforce existing power relations. Thus the narrowed framing limits the ability to redress inequalities as marginalized views are excluded from the narrowed framing.

To facilitate the flexibility and openness of the co-creation process, both Hamburg and Milan have demonstrated the significance of using engagement tools that provide room for discussion and deliberation between citizens and organizers. The face to face interactions between citizens and organizers provides the opportunity for unrestricted expressions or comments by citizens which contribute to widening understanding and frame of nature as a solution in the local context. Moreover, deliberative formats of citizen participation in the co-creation process can enhance the degree of influence citizens hold over the decision-making process (Uittenbroek et al., 2019b). This is in contrast with digital participation tools such as surveys or forms which limits the possibility for deliberation and restricts the level to which citizens can influence the process by pre-determining the inputs that citizens can give (Puskas, Abunnasr & Naabandian, 2021). Overall, the recommendation is to use NBS as a boundary object to promote the flexibility and openness towards citizens' diverse values of nature in the design of the solution, and to best do this through deliberative engagement tools or activities.

Based on this lesson, recommendations for ensuring flexibility in the co-creation process are:

- To use the term ‘nature-based solutions’ as a boundary object to facilitate collaboration with citizens when gathering their ideas and experiences
- To utilize engagement activities and tools that promote deliberation with citizens to allow for greater expression of local knowledge and concerns, as well as facilitating a deeper level of participation and social learning throughout the co-creation process

Accessibility of the co-creation process for citizens

For the co-creation to be socially inclusive, the cases have shown that participation in the process should be accessible to diverse citizens. Both project partners in Hamburg and Milan have put efforts in facilitating an accessible form of communication with the citizens by using language that citizens can understand, and by reaching out to group representatives who can act as mediators between the project and the citizens. This emphasizes the point made by Leino and Puumala (2020) who state that mediators are important for making the co-creation process more approachable to citizens, and they can translate the messages from the project to citizens in a form that is appropriate to the specific social group. More importantly, the cases both demonstrated the importance of tailoring engagement activities to specific social groups based on their needs and capabilities. This echoes the statement by Lund (2018) that measures to include social groups need to be designed based on their capabilities, especially for marginalized groups who do not have the social resources often required to take part in public participation activities (Ferilli et al., 2016; Rutt & Gulsrud, 2016). For instance, marginalized and vulnerable groups often do not have the time to participate in such projects since they have multiple jobs, or have familial responsibilities. This time poverty that some social groups experience becomes a barrier for their inclusion in the process and thus they are often underrepresented. The projects in Hamburg and Milan have taken this into account by consulting with the social group representatives to conduct the participation activities during times convenient for the citizens. However, the third CLEVER Cities FR city, London, shows that this is not enough to represent underprivileged groups.

In the CLEVER Cities project in London, the project is taking place in Thamesmead, a social housing estate approximately 15 kilometers East from central London. The estate houses some of the lowest social income groups, and has some of the highest rates of childhood obesity, placing Thamesmead in the 5 percent worst areas in London regarding childhood obesity (CLEVER Cities, 2021). A large proportion of Thamesmead residents experience time poverty, and thus cannot afford to participate in the co-creation process. As a response to this barrier, the project partners in London have established a community research group comprised of eight Thamesmead residents (L1). The community researchers help with reaching out to the residents in the estate, and collect their feedback to be represented in the co-design processes. Moreover, the community researchers are paid for the time they dedicate to supporting the co-creation process as a means to help citizens overcome the barrier of time poverty. In response to this payment system, the project partners in London were able to reach a greater diversity of local residents. The efforts made by the co-creation organizers in London reflect the necessity to re-design participatory processes so that they can redress power imbalances and uplift the voices of underprivileged groups who would otherwise go unheard (Leino & Puumala, 2020; Ferilli et al., 2016).

Based on this lesson, recommendations for ensuring the accessibility of the co-creation process are:

- For organizers to consult with social group representatives to agree on appropriate times and spaces for collaborative activities with citizens
- For organizers to consider recompensating the efforts of citizens who face structural barriers to participate in the process with financial contributions to provide more opportunities for citizens to participate

Reflexive monitoring

The cases of Hamburg and Milan both take on a reflexive approach for designing the NBS by continuously integrating new inputs by citizens, and thus contributes to the inclusivity of the design. Moreover, as the CLEVER Cities project is required to deliver a report on the impacts of the NBS, the projects in Hamburg and Milan both conduct monitoring of social aspects such as safety and social cohesion before and after the implementation of the NBS. Although this reflexivity is needed to develop inclusive outputs and measure the associated impacts, the cases lack monitoring of the co-creation process itself. This is reflected by the response of an interviewee who mentioned that they miss the feedback from citizens during the engagement activities. Self-evaluations of the co-creation process by citizens is more critical and perhaps valuable compared to post reflections of the process organizers, and have better contributions for the learning process (Douthwaite et al., 2003). Since the co-creation process should be of value to all participants, especially the citizens taking part (Leino & Puumala, 2020), reflexive monitoring of the experiences of citizens throughout the co-creation process would be valuable for the continuous improvement of the process to strive for diverse recognition, flexibility towards different values and experiences, and the accessibility of the process.

For instance, one issue that was faced in the case study of Hamburg was the challenge of balancing and engaging and communicative process with the threat of participation fatigue. This is reflected by Uittenbroek et al. (2019a) who have stated that participation fatigue may be a result of overburdening citizens with responsibilities. Thus one suggestion for future co-creation processes is to monitor and ensure that citizens feel engaged and motivated in the process but are not overburdened by through the requirements needed to participate. Moreover, van der Jagt et al. (2021) highlights the importance of reflexive governance for urban NBS based upon the three pillars of environmental justice as a means to a just urban sustainable transition. In other words, the co-creation process requires constant reflections about who benefits from the NBS and who is burdened, who has access to participate in the co-creation process, and who is represented and recognized in the process. These reflections are important for adjusting the co-creation process to be socially inclusive, but are also necessary to be continued after the implementation of the NBS (van der Jagt et al., 2021).

Based on this lesson, recommendations for ensuring reflexive monitoring throughout the co-creation process are:

- For organizers of a co-creation process to monitor the representativeness of the participating citizens, and react upon any imbalances in the representation of diverse social groups
- To collect citizens' feedback on their experience throughout the co-creation process as inputs for continuous improvements of the process

7.2.2 When to... ensure a co-creation process can be socially inclusive

This section will discuss the lessons and theoretical implications for when is the right time to facilitate socially inclusive co-creation processes for designing and implementing urban NBS. The lessons will be followed by recommendations for practitioners.

Motivation, willingness and capacity

Although there may be intentions from organizers to promote a socially inclusive co-creation process and outcome, ultimately, the extent to which this can be done rests upon the motivation and willingness from all stakeholders from the start, not to mention the capacity needed to conduct a socially inclusive co-creation process. The co-creation process in Hamburg and Milan demonstrate that most of the decisions have ultimately been decided based upon the willingness and capacity of stakeholders involved in the process. As (Uittenbroek et al., 2019a) conclude in their paper on citizen responsibilities for urban climate adaptation, citizens must both be capable and willing to take part in adaptation projects, without this, citizens who do not prioritize climate or nature as a main issue or do not have the correct capabilities will be excluded from joining. Moreover, part of citizens' willingness and motivation to join co-creation processes also stems from their trust towards the stakeholders and trust that they will be represented (Leino & Puumala, 2020). Specifically regarding organizers and stakeholders involved in the co-creation process, it is important that they are motivated to facilitate a co-creation process that aims to raise the voices of citizens, especially those or marginalized and vulnerable groups, and thus they also require the willingness and motivation to develop new capacities and take on new rolls in order to do so (Leino & Puumala, 2020). Citizens and stakeholders must find the topic and core aspect of collectively solving local problems meaningful for the co-creation process to be successful and representative (Leino & Puumala, 2020).

Based on this lesson, recommendations for when a co-creation process should be facilitated in order to be socially inclusive are:

- When citizens are trusting towards local authorities, and local authorities have experience with public participation practices
- When stakeholders involved in organizing the co-creation process have the skills and motivation to actively engage with citizens and represent the interests of marginalized and vulnerable groups in the area

Availability of resources; finance, expertise, time

Besides the willingness and motivation of stakeholders, the abundance of resources has also shown to be an important element required to facilitate a co-creation process that can be socially inclusive. The CLEVER Cities projects receive substantial funding through the EU Horizon 2020 program to carry out large-scale activities with citizens, and to implement the NBS interventions designed through citizen input. Moreover, due to the nature of the research project, the CLEVER Cities project is supported by a team of experts from different fields working together. These resources with which the cases in Hamburg and Milan are embedded with reflects the necessity of financial and human resources to support a co-creation process that enables higher levels of citizen participation (Puskas et al., 2021; Wamsler et al., 2020). Although it should be noted that the CLEVER Cities project may not be exemplary of local municipal-led climate adaptation projects, as the CLEVER Cities project is a pilot project and receives tremendous funding from the EU which may otherwise not be the case. Furthermore,

pilot projects have more room for experimentation, meaning that learning from successes and failures is inherent. Whereas failures in municipal-led projects project may risk the credibility of local authorities, and thus the learning process is not as encouraged. The financial resources, expertise and experimentation are successful ingredients for pilot projects, shown by the cases of Hamburg and Milan, but the lessons and conditions that make pilot projects successful cannot be transferred out of the context of small scale projects. This is known as the pilot project paradox (Buuren et al., 2016). However, one of the pitfalls of the CLEVER Cities project is the lack of long time scales, which has shown to restrict some of the activities needed for full engagement of citizens. Long time scales are needed to invest in a process that can capture the deeper needs and expertise of citizens, and reach a wider representation of citizens (Puskas et al., 2021).

Based on this lesson, recommendations for when a co-creation process can be socially inclusive are:

- When stakeholders looking to facilitate a co-creation process have the available financial resources to invest in both engagement activities with citizens, as well as investing in the implementation of the NBS without requiring a return on profit
- When stakeholders are able to invest time into the process over a long-term period

7.2.3 Which... urban NBS through co-creation and at which scale for socially inclusive benefits

This section will discuss the lessons and theoretical implications for how to facilitate socially inclusive co-creation processes for designing and implementing urban NBS. The lessons will be followed by recommendations for practitioners.

Apart from the *how* and the *when* to facilitate co-creation processes with socially inclusive benefits, there also needs to be consideration for *which* NBS and at *which* scale they should be implemented through a co-creation process. The cases from Hamburg and Milan show that the NBS interventions with technical elements such as the green roof in Hamburg and the train station in Milan provided the least room for deeper levels of citizen engagement. Technical NBS are less flexible to incorporate citizens' inputs in the design, and thereby implies that the level of citizen engagement that is possible with technical solutions is limited. On the other hands, non-technical solutions such as the school yard gardens and the community green roofs in Milan created more room for citizens to hold influence over the decisions for the NBS, since the designs are not as restricted to technical criteria that must be met. Thus, the recommendation for developing socially inclusive NBS is to focus on solutions that are non-technical and allow room for citizen engagement, as well as the possibility for citizens to stay engaged in the maintenance of the NBS in the long-term and thereby contribute to the continued sense of ownership and belonging through the NBS.

Furthermore, scholars point to the need for up-scaling of urban NBS interventions in order to facilitate the transition to sustainable cities (Frantzeskaki, 2019; Raymond et al., 2017). Although up-scaling of urban NBS is ultimately required for climate adaptation and mitigation measures, the cases from Hamburg and Milan give insights on the importance of small-scale urban NBS interventions through co-creation processes for socially inclusive benefits. The urban NBS interventions in Hamburg and Milan are all relatively small-scale such as single green roofs interventions (Hamburg and Milan), greening of a park (Milan CAL 2) or spot-like greening projects along the corridor (Hamburg CAL 1). The small-scale of the NBS show importance for two reasons. Firstly, the small-scale of the NBS allows citizens to be involved

at a deeper level of engagement in the co-creation process, because the small scale can create stronger feelings of connectedness to the local space (Frantzeskaki, 2019), and thus perhaps also a stronger sense of being able to influence the project. As compared to a large scale NBS project which may feel out of reach for citizens due to a lack of connection with a broader area. Additionally, increasing the scale of the NBS would require the co-creation process to involve a larger scale of citizens as well, which as literature shows becomes a challenge since large-scale public participation processes are often unable to reach deeper levels of participation and the mediation of interests becomes difficult (Wamsler et al., 2020).

Secondly, both the case in Hamburg and Milan have shown that project partners are not concerned for gentrification effects in the areas due to the small-scale of the NBS. Thus they believe the NBS are unlikely to attract large-scale investment in the area and spark a process of gentrification which has been shown to take place in large-scale urban greening projects (Anguelovski et al., 2019). Therefore, the small scale of urban NBS in combination with co-creation may provide more socially inclusive benefits by citizens having a better ability to connect with the local space, and by providing room for deeper levels of engagement in the co-creation process. Therefore in terms of future scaling of socially inclusive urban NBS, focus should perhaps be placed on scaling-out small scale co-creation processes for urban NBS projects horizontally to various local communities, rather than scaling-up NBS projects to higher institutional levels where connecting to the local context becomes challenging and where larger investments in urban NBS are at risk of creating long-term exclusionary effects. Nevertheless, while co-creation processes hold promises for collectively developing solutions that meet the interests of local citizens and thereby potentially avoid negative social impacts, they are not a panacea to develop socially inclusive urban NBS. Instead, these co-creation processes in some cases should be combined with housing policy regulations to safeguard the security of low-income households if NBS create an increase in property values (Kotsila et al., 2021).

Based on these lessons, recommendations for which urban NBS to implement and at which scale are:

- To focus on creating urban NBS which provides spaces for interaction between citizens, and engage citizens during the implementation and maintenance of the NBS
- To develop small scale urban NBS that can allow citizens to have influence over the decision-making
- To focus on scaling out co-creation processes rather than scaling up co-creation processes for urban NBS, to safeguard the ability to tailor the solution to the local context and the extent to which citizens can be involved in the decision-making process

7.3 Reflections on the research approach

The complex research question of how principles of social inclusivity can be embedded in a co-creation process required taking on various analytical steps to define, analyse and develop a novel framework to be used for ex-post evaluation and potentially help guide future co-creation processes. This multi-layered approach includes the creation of an initial literature-based framework, then applied using a comparative case study approach test and evaluate the cases to further adjust the framework through empirical confrontation. Finally, a validation workshop was conducted to further amend and validate the framework based on experts' critique. This mixed-methods and layered research approach enhances the value and comprehensiveness of the newly-developed framework for socially inclusive co-creation

processes for urban NBS. Despite the strengths this research approach brings for ensuring the value of the framework, it also comes with some flaws which will be discussed.

Firstly, considering the novelty of the framework, a personal interpretation of principles for socially inclusive urban NBS and co-creation was required as the first step for building the framework. This personal interpretation of the principles and complementary indicators used in the literature-based framework and subsequent operationalization are inherently driven by personal views, and thus may lessen the internal validity of the research (Verschuren, 2003). However, the fact that a framework for socially inclusive co-creation in the context of urban NBS has not been created before requires this personal interpretation as a starting point to allow further research to build on and enhance the validated framework. Additionally, since the concepts used to build the framework and initial indicators are sensitizing concepts rather than definitive concepts, again due to the novelty of the framework, they were intended to be further delineated through the application of the framework to the case study comparison and validation workshop. Therefore, the multi-layered approach used to continuously test the framework increases the internal validity.

Secondly, the data for the case study comparison was collected through semi-structured in-depth interviews to achieve a detailed understanding of the complex co-creation process in Hamburg and Milan. The choice of in-depth interviews with project partners was required to obtain a thorough understanding of the co-creation process, although the approach itself also comes with limitations. As Verschuren (2003) points out, in-depth interviews are influenced by the researchers' personality and thus may question the internal validity of the process, and thus the internal validity of the case study results may be limited. Nevertheless, this bias was partly overcome by developing the interview questions in accordance to the indicators of the literature-based framework. Additionally, although a questionnaire is less influenced by a researchers' personality, it would not have led to the same in-depth findings that a semi-structured interview provides (Verschuren, 2003). Furthermore, the use of semi-structured interviews also poses threats to internal validity due to the bias of the interviewees towards the co-creation process. In order to counter this bias, a conscious selection of interviewees representing different sectors was chosen to deflect and spread out the bias to achieve a more holistic view of the co-creation process. This also strengthens the results by showing the perspectives different stakeholders have towards the social inclusivity of the process.

Thirdly, in relation to the data collection for the case study comparison, the initial plans to collect participating citizens' experiences through surveys in the Hamburg and Milan co-creation processes was not possible due to overlaps with the citizen surveys of the CLEVER Cities project. This lack of data on the views of citizens regarding their experiences taking part in the co-creation, and perspectives on the social inclusivity of the process, limits the internal validity of the framework. Although this research is focused on understanding how the co-creation process should be conducted in line with principles of social inclusivity and therefore did not specifically require citizens' feedback, the addition of citizens' data would have enhanced the internal validity of the results by triangulating the data and supplementing the qualitative research with quantitative data (Verschuren, 2003). Therefore, further research, specifically in the case of the CLEVER Cities project but also for future co-creation projects with citizens, should research if citizens' experiences validate the elements in the framework.

Fourthly, the CLEVER Cities cases were selected for their uniqueness in reflecting both concepts of co-creation with citizens and socially inclusive urban NBS, and thereby provide an appropriate opportunity to test the framework and use the results from the cases to adjust the framework (Crowe et al., 2011). However, because of the fact that the cases are pilot projects

for the greater CLEVER Cities project funded by the EU Horizon 2020 program, the conditions of the cases are very specific to large scale funded projects. Therefore, this questions the external validity of the case results, as well as the framework which has been developed based on the empirical confrontation. Nevertheless, the validation workshop was included in the research approach precisely to reduce this limitation. The academic experts comments contributed to the generalization of the framework to a broader scale outside the context of the CLEVER Cities cases. In fact, participants in the validation workshop noted the usefulness of the framework for urban planners and practitioners, as well as the use of the framework outside of the context of urban NBD. Thereby this demonstrates the high external validity of the framework. Still, future research could contribute to strengthening the external applicability of the framework by applying it to different cases focused on co-creation processes intending to develop socially inclusive urban solutions.

CHAPTER 8. CONCLUSION & FURTHER RESEARCH

8.1 Conclusion

This thesis is centred around the current lack of emphasis on the negative social impacts and exclusionary effects caused by urban nature-based solutions (NBS) and the associated lack of both scientific and practical knowledge on how to make design processes for urban NBS more socially inclusive (Anguelovski et al., 2019; Haase, 2017). In combination, co-creation processes are a promising approach for facilitating a socially inclusive procedure, although current literature and practical implementations of co-creation processes are often limited in the extent to which they adhere to deeper levels of participation and diverse representation. With these interconnected problems this thesis sought out to contribute to the improvement of considerations for social inclusivity within urban nature-based solutions by focusing on a co-creation process as potential means to enhance citizen engagement and empowerment in decision-making. To make this social and scientific contribution, this thesis set out to develop a novel framework for socially inclusive co-creation of urban NBS. The research in this thesis was centred around the question:

How can principles of social inclusion be woven into a co-creation process for urban nature-based solutions?

The findings from this research show that weaving principles of social inclusion into a co-creation process requires guiding principles for the general co-creation process as well as stage-specific guiding principles. The guiding principles for the whole co-creation process include reflexive monitoring of the process, the accessibility of the process for diverse social groups, the engagement of social group representatives, raising awareness for the NBS intervention and associated benefits, as well as the continuous engagement of citizens throughout the process. Moreover, the co-creation process requires stage-specific guiding principles which delineate the elements and goals for each co-creation stage, and ensure that the stages adhere to the principles of social inclusivity. This is important as each stages builds from the other, and thus limited achievements of social inclusivity within one stage will affect the rest of the process and the eventual outcome of the co-creation process.

Furthermore, to ensure the guiding principles of the co-creation process can be met, this research has found necessary inputs for a co-creation process to be socially inclusive, as depicted in Chapter 5. The inputs are broken down into two categories. Firstly, inputs regarding the engagement of citizens include the required capacity of both organizers and citizens, citizens' trust towards the organizers and the process, as well as the need for experience in citizen engagement and established local networks. Complementary to these inputs, the research also delineates inputs required for the implementation of the urban NBS, namely, the adaptability of the co-creation process towards the local context and unexpected disturbances, as well as supportive legal frameworks. These inputs and aforementioned guiding principles are supported through the empirical confrontation of the CLEVER Cities comparative case study in Chapter 5, as well as the validation workshop in Chapter 6.

As depicted in the theoretical background (see Chapter 2) the principles for social inclusivity are closely related to the pillars of environmental justice. Thus, the guiding principles required for the co-creation process are centred around issues of a just distribution of urban NBS, just procedure, and just recognition for the diversity of social groups, especially marginalized and

vulnerable groups. Regarding a just procedure for urban NBS, the co-creation process itself shows to be the means for a just procedure if the principles in the framework are met.

The comparative case study in Chapter 5 has emphasized that a key point for insuring the social inclusivity of urban NBS through co-creation processes requires collectively defining the local problems experienced in the area and using this knowledge to develop the solution, a point that was also supported by the validation workshop. Moreover, the accessibility of the co-creation process for different social groups should be taken account by the organizers for the tools used to engage and gather citizens' input, the form of communication with citizens, as well as the facilitation of engagement activities. Additionally, to reach a representation of the diversity of the community without creating challenges for the level of participation that is possible in the co-creation process due to large numbers of individuals, the empirical confrontation and validation workshop both support the important role that social group representatives play in representing diverse interests. A last key point is the importance of considerations of the long-term social impacts, specifically negative impacts, of the NBS early on in the co-creation process. As depicted by the case study comparison in Chapter 5, the implications for the maintenance of the NBS are important to consider as this will either support the long-term engagement of citizens with the NBS, or may become a burden for citizens if not properly addressed beforehand.

In conclusion, this thesis contributes to the literature on co-creation by specifying the guiding principles needed to ensure the social inclusivity of co-creation processes for urban NBS. The framework can be used for both ex-post evaluations of co-creation processes, as well as tool for guiding co-creation processes. Overall, the framework also contributes to the literature on urban NBS and green gentrification by providing an enhanced co-creation framework as a potential means for future design processes for urban NBS which can avoid the associated exclusionary effects of urban greening.

8.2 Avenues for further research

The novel framework developed in this research contributes to enriching the literature on urban NBS and green gentrification by showcasing co-creation processes as a potential means for enhancing socially inclusive benefits. This research also adds on to the literature on co-creation processes by presenting lessons learned for how to incorporate deeper levels of citizen participation and embed principles for social inclusivity within a co-creation process. Nevertheless further research on citizens' experiences within co-creation processes is needed to further strengthen and validate the framework. Additionally, research should analyse citizens' motivations for participating or not participating in a co-creation process to understand where this participation dichotomy stems from and use this knowledge to adapt co-creation processes accordingly. Furthermore, the validation framework took on a structure inspired by the impact pathway, and due to the scope of this thesis the focus was only placed on the elements within a co-creation process, rather than the outputs. Therefore, further avenues for research should continue building onto this framework by identifying outputs for each co-creation stage, and outcomes of the entire co-creation process. Also, since this research did not aim to produce an exhaustive framework but to set the first step in the direction of supporting socially inclusive co-creation processes, further research is needed to build onto the inputs and guiding principles, through more case studies.

Moreover, the CLEVER Cities project has shown that funded experiments create the perfect conditions for experimentation and engagement of citizens, however, once these projects end,

the conditions required for structured collaboration and sustained relations with citizens falls away. Thus, research should be conducted on how to facilitate long-term co-governance of urban NBS with citizens. Longitudinal research is needed to analyse the social impacts of a co-creation process in order to investigate the causal relations between the developed framework and socially inclusive effects.

Lastly, although the framework provides a means to guide design processes of urban NBS to be socially inclusive, co-creation processes are not a panacea. Further research should investigate relevant policy mixes that are a necessary contribution alongside co-creation processes, for instance, rental control and subsidized housing, as well as requirements for access to urban green space.

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APPENDICES

Appendix A – Interview guide

Interview Guide

Introduction about the research:

- Master thesis project, topic on inclusive urban nature based solutions
- NBS are needed as an environmentally and economically beneficial feature in cities to adapt and mitigate climate change pressures
- NBS are said to have positive social impacts, yet these remain vague, and at times, good intentions for the implementation of NBS can lead to negative externalities such as green gentrification
- Additionally, literature has found an uneven placement of greenery in cities, correlating with socio-economic spatial difference, often excluding marginalized groups from the benefits of NBS
- Co-creation is increasingly being promoted as a process which can offer inclusive participation of a diversity of stakeholders, and puts the citizen as a central player in the process
- Therefore, it seems that the co-creation process holds potential for developing an inclusive design and implementation structure for urban NBS
- Using literature from inclusivity in NBS, citizen participation in urban planning and co-creation processes I have developed an evaluative framework to analyze the inclusivity of urban NBS projects
- The framework is structured according to the co-creation stages
- In order to further develop this framework I am using the CLEVER Cities project as a case study to use the lessons learned for further development of my framework
- Ask permission to record the interview

Introduction interviewee:

- Can you please introduce yourself, where you work and your role in the CLEVER Cities project in Hamburg?
- How were you involved in the different CALs in [city]?
- How do you define social inclusivity within the project in [city]?

Co-Explore:

How was the initial problem in [city] initially framed and how was the use of NBS seen as a solution regarding a larger goal of social inclusivity?

- How was the social and environmental problem in [city] framed, and was the diversity of citizens considered when planning the NBS to address the problem?
- To what extent was the problem framing of the [city] area conducted collectively with residents?
- How were socio-spatial differences in the city considered when deciding on the location of the NBS?
- Which types of citizens were considered stakeholders for the co-creation of the NBS in [city]? And how were they approached?
- Were specific target groups were set for engaging different groups of citizens, and were they approached and engaged in different ways?

- Was there an effort to reach out to citizens who are often excluded/marginalized?
- When engaging citizens, did you focus on which capabilities are needed for people to participate in the project? In the sense of making it easier to participate?
- Were citizens involved in setting the goal and success criteria to be reached through the NBS (to develop a solution to the problem)?

Co-Design:

What is your view on the interaction between the organizing actors and local citizens during the co-design phase?

- Which citizens were participating in the design of the NBS, and which demographics were represented in the process?
- Through which mediums were citizens able to express their needs and preferences for the NBS? How was this information taken up and incorporated into the design?
- Were different tools used for different community groups?
- Was there consideration for both the short and long term effects of which citizens would be able to benefit from the NBS?
 - For positive social effects, but also negative effects such as potential gentrification and exclusion of communities?
- How was the communication with citizens organized, and how were the decisions on the trade-offs in the design of the NBS shared with the citizens?
- How were the different interests of all the stakeholders, and between citizens collectively organized? Were there any trade-offs that had to be made?
 - Were these communicated?
- Did you encounter any distrust from citizens? If so, how did you overcome this?

Co-Experiment:

How do you view the learning process and reflexivity that took place when designing the NBS?

- Based on which aspects was the NBS being evaluated? How is this in return fed back into the co-design of the NBS?
- How was the evaluation of the NBS design organized? And to what extent were citizens able to engage in the evaluation process?

Co-Implement:

In your opinion, has the implementation of the NBS been planned in a manner that will promote short and long-term inclusivity?

- How is the financial support arranged to (implement) maintain the NBS? Are there plans for sustainable financing of the interventions?
- Are there mechanisms in place that will prevent the price of the area to remain stable, and prevent rent seeking behavior in the area?
- Will citizens be involved in the implementation of the NBS? If so, to what extent? If not, why not?

Co-Management:

After the implementation, in your opinion, how do you view that the continued management and monitoring will tend to the diversity of local needs?

- Will a structure be put in place after the implementation to allow citizens to continue being involved in the NBS through monitoring and managing?

- How will the NBS be monitored and evaluated after implementation regarding social inclusion?

Final questions:

- Can you explain some strengths and weaknesses you have experienced in the process and final design in Hamburg regarding the inclusivity of the NBS?
- Are there differences in the intended process and outcomes of the NBS compared to what actually happened?
- Do you feel that there was room for reflexivity and flexibility within and between the stages to respond to the local needs?
- If you could start the process again, would you do anything different to make the process more inclusive?

Appendix B – Interview consent form

Consent for participation in research interview

*Master thesis research project – Co-Creating Inclusive Urban Nature-Based Solutions
Research conducted by Charlotte Stijnen (char.stijnen@gmail.com)
Student at Utrecht University*

1. I agree to participate in a research project conducted by Charlotte Stijnen from Utrecht University.
2. I have been informed about the purpose and the nature of the research. The purpose of my participation as an interviewee in this project and the future processing of my data has been explained and is clear.
3. My participation as an interviewee in this project is completely voluntary. There is no explicit or implicit coercion whatsoever to participate. I understand that I can withdraw from the interview at any time, and ask that data prior to the withdrawal will be deleted.
4. Participation involves being interviewed by Charlotte Stijnen from Utrecht University. The interview will last approximately 60 minutes but may be subject to slight extension if allowed by myself. I allow the researcher to take notes during the interview. I also allow the recording of the interview.
5. I understand that all information I provide for this study will be treated confidentially, and that only the researcher will have access to my information and interview recording/transcript.
6. I understand that the signed consent forms and original audio recordings will be retained confidentially by the researcher for a period until the final results of the research have been awarded by Utrecht University, approximately until 15th July 2021. After the master thesis has been awarded a passing grade the researcher will provide me with the only copy of my interview transcript if I wish to receive it, and all my data including the interview transcript and recording possessed by the researcher will be deleted.
7. I understand that in any report on the results of this research my identity will remain anonymous. This will be done by disguising my name, and details of the interview which may reveal my identity of the identity of people I speak about. This will be done by coding the speaker per CLEVER city (ex. H1, M1, L1), and by describing the speaker as a participant of the project at the abstract level (ex. public sector, research, private sector etc.).
8. I understand that disguised extracts from my interview may be quoted in the researcher's final thesis.
9. I understand that I am free to contact the researcher to seek further clarification and information.
10. I have carefully read and fully understood the points and statements of this form. All my questions were answered to my satisfaction, and I voluntarily agree to participate in this study.

Participant's signature

Date

Researcher's signature

Date

Appendix C – Validation workshop consent form

Consent for participation in research workshop

*Master thesis research project – Co-Creating Socially Inclusive Urban Nature-Based Solutions
Research conducted by Charlotte Stijnen (char.stijnen@gmail.com)
Student at Utrecht University*

1. I agree to participate in a research project conducted by Charlotte Stijnen from Utrecht University.
2. I understand that by participating in the workshop I give the researcher permission to use the recording of the workshop and results on the online whiteboard for data processing.
3. My participation as a participant in the workshop is completely voluntary. There is no explicit or implicit coercion whatsoever to participate. I understand that I can withdraw from the workshop at any time, and ask that data prior to the withdrawal will be deleted.
4. Participation involves participating in the workshop conducted by Charlotte Stijnen from Utrecht University. The workshop will last approximately 90 minutes. I allow the researcher to take notes during the workshop and save my contributions on the online whiteboard. I also allow the recording of the workshop.
5. I understand that all information I provide for this study will be treated confidentially, and that only the researcher will have access to my information and workshop recording/transcript.
6. I understand that the signed consent forms and original audio recordings will be retained confidentially by the researcher for a period until the final results of the thesis have been awarded by Utrecht University, approximately until 15th July 2021. After a passing grade for the thesis has been awarded to the researcher, the workshop recording will be deleted.
7. I understand that researcher will contact me to ask permission for using my name in the thesis, and that I can always choose to stay anonymous per request. If I choose to stay anonymous I will be disguised by a code name, and described at the abstract level (ex. public sector, research, private sector etc.) while my field of study may be described in closer detail.
8. I understand that disguised extracts from the recording may be quoted in the researcher's final thesis.
9. I understand that I am free to contact the researcher to seek further clarification and information.
10. I have carefully read and fully understood the points and statements of this form. All my questions were answered to my satisfaction, and I voluntarily agree to participate in this study.

Participant's signature

Date

Researcher's signature

Date