

MSc Development and Rural Innovation Thesis

No one-size-fits-all: Co-production of nature-based solutions in urban contexts

A Comparative Case Study
Genk, Belgium and Glasgow, Scotland



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24th August 2020



drift for transition

ABSTRACT

The concept of nature-based solutions (NBS) has been introduced in recent years as a plausible approach to address issues related to increasing levels of urbanisation and climate change in cities. However, there are various challenges surrounding how best NBS should be implemented and governed in cities. The concept of NBS is deemed by many as complex and vague. Dangers of increasing equity issues in relation to green gentrification also exist. Many cities have employed co-production for urban NBS implementation and governance in an attempt to overcome the challenges associated with the concept. Co-production involves the inclusion and engagement of all relevant stakeholders on an equal basis in the design and implementation of NBS in cities. Although it is seen as a credible approach for NBS implementation, little is known about the conditions that affect NBS co-production. This thesis aims to address this research gap by conducting a comparative case study, to identify the context conditions that have influenced NBS co-production processes in the cities of Glasgow, Scotland and Genk, Belgium, and investigate how the processes have been influenced by said context conditions.

Through the design of a conceptual framework based on existing literature, key context conditions and process variables were identified and subsequently investigated by conducting empirical research on the two cases. This involved analysing city documents, conducting semi-structured interviews and attending a number of workshops and events to get a better insight into NBS co-production as a context-dependent process.

The research findings illustrate that NBS co-production processes in both cities thus far have been influenced by a variety of different context conditions. This thesis also brings to light a number of significant novel findings that illustrate the sheer complexity of the relationship between NBS co-production and the context, namely the following: (1) *context conditions are not mutually exclusive*, (2) *institutional support from high political levels is imperative*, (3) *NBS co-production processes can influence context conditions*, (4) *incorporating informality is important*, and (5) *ensuring inclusivity is extremely challenging*. Lastly, (6) *experiences with COVID-19* is considered as an emerging context condition, having obvious effects on NBS co-production in recent months. Moving forward, I recommend that additional research be carried out in the future to investigate the key findings further in order to gain a better understanding of the non-linear relationship between NBS co-production and the context in which it is carried out. With regards to COVID-19, it will also be important to investigate the extent to which the pandemic impacts NBS co-production processes, and how it influences the meaning of NBS co-production in different contexts.

ACKNOWLEDGEMENTS

It would not have been possible to write this thesis without the help and support of many people who have made this experience over the last few months so rewarding.

Firstly, I am very grateful for all of the interviewees from Glasgow and Genk who agreed to speak with me and for the fruitful conversations that I had with them. It was great to see the interest that they expressed in my research. I really appreciate the time they took to speak with me, despite busy schedules and changing work arrangements due to COVID-19.

I am extremely thankful for the support I have received from my supervisors. A massive thanks to Robert Coates, who has been very helpful and supportive over the last few months and who has encouraged me to push myself and develop new research skills since starting this thesis. I also want to thank Katharina Hölscher for giving me the opportunity to write my thesis and work with DRIFT and Connecting Nature, a project that truly encapsulates all of my main research interests. I will be forever grateful for the support I have received from her, especially the encouragement she has given me which has helped me stay motivated, even during these challenging times. She has been tremendously kind to me and has always provided me with reassurance whenever I doubted myself.

I also would like to thank the other colleagues at DRIFT for their kindness. In particular, I would like to thank Marleen Lodder and Kato Allaert, who welcomed me to the Connecting Nature project with open arms and made me feel like a true member of the team.

Lastly, I would like to thank my family and friends, both in The Netherlands and at home in Ireland. The last few months have been strenuous, writing this thesis while not being able to return home. However, the support I have received from loved ones via daily chats on WhatsApp and weekly Zoom calls allowed me to keep sane and continue with my research. Without their support, the writing process would have been a lot more challenging.

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LIST OF ABBREVIATIONS

CN	Connecting Nature
EC	European Commission
GCC	Glasgow City Council
GSS	Greenspace Scotland
NBS	Nature-Based Solution(s)
OSS	Open Space Strategy
SG	Stad Genk (City of Genk)
SRQ	Sub-Research Question

1 INTRODUCTION

The first chapter introduces the background context for the thesis, as well as the purpose of the research. Firstly, I give a brief account into urbanisation. This is followed by an introduction to nature-based solutions (NBS), along with a description of their potential for dealing with the arising challenges related to urban growth in cities. Next, the challenges associated with implementing NBS are explained, followed by an introduction to NBS co-production as a possible governance approach to deal with said challenges. The problem statement and research objective of the thesis are then defined. Finally, I introduce the research questions which were formulated based on the problem statement and research objective.

1.1 *The Context: Urbanisation*

Our planet has witnessed a significant growth in urban areas over the past few decades. Since 2008, more people now live in urban, rather than in rural areas worldwide (UN-Habitat, 2016). Urban areas are frequently viewed as places of hope and opportunity, but also necessity due to employment possibilities. These are a few of many reasons why cities are continuing to increase in population size at a rapid pace and predictions indicate that urban areas will continue to grow over the upcoming decades. Urban land is expected to increase by 1.5 million km² by 2030 compared to 0.7 million km² in 2001. It is also estimated that approximately 65% of the global population will live in urban areas by 2050 (Seto et al., 2011).

Recent studies have shown that urbanisation is a major contributing factor to global sustainability issues such as global warming, ecosystem disruption and health-related problems. Urban sprawl has accelerated habitat and biodiversity loss (Seto et al., 2012), which has led to a decrease in the availability of ecosystem services for urban citizens. Air, water and noise pollution levels have increased as a result of urban expansion, while the number of green and blue spaces has decreased. This, in combination with sealed surfaces and increased human activity in cities, has led to the creation of the urban heat island effect, whereby the average temperatures in urban areas are significantly higher than the surrounding rural areas (Connop et al., 2016).

Currently, urban areas around the globe are becoming more vulnerable to the damaging effects of climate change and efforts to increase resilience are becoming more strenuous as a result of unsustainable urban growth. Extreme weather events will occur more regularly and are likely to have more severe impacts on urban areas than before. Longer and hotter heatwaves are becoming more common, which will in turn exacerbate the urban heat island effect (McCarthy et al., 2010). An increase in frequency of coastal storms and floods has also been predicted, which will in turn make cities situated near major rivers or coasts even more vulnerable (Rosenzweig et al., 2011). Increased urbanisation is also affecting the health and well-being of urban inhabitants, with problems such as overcrowding, increased pollution and stress-related illnesses arising (Godfrey and Julien, 2005). There is a growing need within cities for innovative sustainable solutions that will contribute to dealing with the various negative effects associated with unsustainable urban growth and climate change. The ultimate aspiration is to increase the liveability of cities by achieving environmental, economic and social sustainability within the cities (Lowe et al., 2015) before irreversible damage has been done. According to critical urban theorists, these transformations are not easy to achieve and have often been suppressed by capitalist discourses embedded in cities that are focused on continuing urban industrial development for economic growth (Brenner and Schmid, 2015).

1.2 Nature-Based Solutions: a way forward for urban planning?

The concept of NBS has been introduced in recent years as a plausible approach to tackle the emerging sustainability issues connected to increased urbanisation and climate change. Originally the focus was on employing NBS for biodiversity and ecosystem conservation as well as climate change adaptation to increase global environmental sustainability (Dorst et al., 2019). More recently, the focus has shifted to incorporating both social and economic sustainability goals, as well as environmental, into urban NBS design and implementation. This is because cities are looked at as complex social-ecological systems, with society, economy and environment intrinsically interconnected (Connop et al., 2016). Full consideration of environmental, economic and social factors was introduced in 2015, when the European Commission released a report, entitled “*Towards an EU Research and Innovation policy agenda for Nature-Based Solutions & Re-Naturing Cities*”. The report defines NBS as “actions which are inspired by, supported by or copied from nature” that can “result in multiple co-benefits for health, the economy, society and the environment” (European Commission, 2015, p.4). The report explains how adapting existing urban planning policies and procedures, by incorporating NBS, will ensure the long-term resilience of cities for the future, with more sustainable economies, thriving ecosystems and healthier citizens (European Commission, 2015).

NBS can contribute significantly to environmental sustainability in cities. An increase in tree density within urban environments provides cooling and insulation, which can significantly reduce the urban heat island effect. Afforestation also increases the levels of carbon sequestration which reduces the impacts of climate change on cities (European Commission, 2015). NBS can also improve air quality and reduce noise levels in cities (European Commission, 2015, Connop et al., 2016). Additionally, they can enhance disaster risk management in cities, reducing the frequency and intensity of extreme weather events (Balian et al., 2014, European Commission, 2015). Certain NBS play a role in Sustainable urban Drainage Systems (SuDS) for improved water attenuation, mitigating water runoff and reducing flood occurrence (Connop et al., 2016). Furthermore, implementing NBS into city planning practices plays a huge role in enhancing already existing ecosystems, restoring degraded ecosystems as well as creating new ones. This gives rise to biodiversity conservation, subsequently ensuring the continued delivery of various ecosystem services to citizens (European Commission, 2015, Nesshöver et al., 2017).

NBS can bring about a variety of social benefits for citizens. NBS provide spaces of recreation for people in urban areas. These spaces can act as places where people can socialise with each other, and/or as places to engage in healthy physical activities. Providing spaces like this in cities can increase social cohesion on the community level as well as physical health and mental well-being on the individual level (European Commission, 2015). By designing NBS in an aesthetically pleasing way, citizens will accept them more readily and will likely be more satisfied (Frantzeskaki, 2019), further increasing human well-being. NBS also have the ability to provide citizens with a sense of place in their own city (Connop et al., 2016).

It has been suggested that the design and implementation of NBS can also contribute to the emergence of more sustainable economies in cities, that are less resource-intensive (Faivre et al., 2017). As mentioned above, NBS can enhance the provision of ecosystem services to citizens. These have been defined as the “benefits that people obtain from ecosystems” (Alcamo et al., 2003), which include multiple economic benefits. For example, NBS can be used to decrease the risk of flooding, as previously mentioned. This decreases the amount of monetary investment required for cities to recover from flood damages (Saraev, 2012). Many have suggested that NBS can also boost local economies by

creating new opportunities for more sustainable tourism in cities, while also making room for new employment and education opportunities (Saraev, 2012, European Commission, 2015).

1.3 Challenges for NBS Implementation

Since the EC report promoting the benefits of NBS was published in 2015, more efforts have been made to gradually incorporate NBS into urban planning as a multifunctional approach to combat the effects of urbanisation and climate change, while simultaneously providing benefits to both the environment and inhabitants in cities, and also contributing to sustainable economic development within cities (Lafortezza et al., 2018). However, this has proven to be difficult for cities, with many challenges and controversies arising.

One prominent recurring issue that has been recognised since the introduction of NBS is how exactly they should be designed, implemented and governed across cities to ensure the utmost benefit of the stakeholders involved. This problem has arisen due to the fact that the term NBS has been difficult to comprehend. The concept has often appeared as vague and unclear as it can be interpreted and defined differently amongst individuals (Nesshöver et al., 2017, Miller and Wyborn, 2018). It also overlaps with an array of other concepts which were introduced in urban planning before the concept of NBS. These concepts include, but are not limited to, *Ecological Engineering*, *Green/Blue Infrastructure*, *Ecosystem-Based Adaptation and Mitigation* and *Ecosystem Services* (Nesshöver et al., 2017). This can increase the risk of “business as usual” just merely being re-labelled under NBS (Pauleit et al., 2017), as well as the uncertainty surrounding the innovative potential that nature-based solutions have (Albert et al., 2017).

NBS are multifunctional and can provide multiple benefits within cities (European Commission, 2015). This, however, makes the process of design and implementation even more complex and challenging. To embed NBS into urban planning policies and procedures successfully is a challenge, as it involves the consideration of multiple individuals with diverse backgrounds, perspectives and goals of what NBS should look like in their cities, as well as different approaches to design, implement and govern NBS (Nesshöver et al., 2017, Sekulova and Anguelovski, 2017). As a result, governance approaches which can effectively deal with complex, multi-layered nature of NBS are being sought after within cities.

From an urban political ecology perspective, NBS can also be viewed as a controversial solution to tackling unsustainable urban growth and climate change. Researchers in this field have expressed concern that urban greening, through nature-based solutions for example, can give way to the rise of green gentrification. This can exacerbate already existing inequities between different socio-economic classes within cities, ultimately leading to the exclusion of lower-income, minority citizens from the benefits of NBS, while creating a sense of environmental privilege amongst the more affluent citizens. Progress to deal with inequity among these citizens is slow (Anguelovski et al., 2019). A potential explanation for this slow progress is due to the fact that urban greening can increase the attractiveness of city neighbourhoods, which can contribute to a rise in property values (Conway et al., 2010). As cities are in constant competition with each other in today’s world (Jensen-Butler, 1999), they feel it is necessary to continue developing and supporting urban greening initiatives to boost their economies further, while giving minute consideration to the possible negative impact this may have on lower class citizens. Anguelovski et al. (2019) suggest that more inclusive approaches, involving all relevant community members, may be able to help deal with inequality issues, resulting in more just, as well as sustainable, cities.

1.4 NBS Co-production: a possible solution to the challenges?

The challenges surrounding NBS mentioned above have given rise to questions regarding what approaches can and should cities use to design, implement and govern NBS most effectively. As stated by the European Commission, “*New forms of stakeholder engagement and citizen participation in urban design and planning must be explored in order to harvest... innovative capabilities, resources and cooperation*” (European Commission, 2015). One potential way of dealing with the challenges, which can encourage stakeholder participation and engagement, is through the co-production of NBS in cities.

Co-production is a relatively new form of collaborative governance for NBS cities. It is a governance approach that has commonly been used for the production of knowledge by science, policy and practice, whereby these actors interact with one another to pool their knowledge systems together to co-define sustainability issues and to ultimately co-produce solutions to resolve them (Bäckstrand, 2003). The term is described in existing literature as a complex process as it involves multiple “producers” and multiple “products” (Miller and Wyborn, 2018). Co-production has been considered as a plausible approach for urban NBS governance as it aims to include and engage all relevant stakeholders in the design and implementation of NBS in cities, as well as the different types of knowledge that these stakeholders have (Frantzeskaki and Kabisch, 2016).

Conventional public/state-based governance processes have been viewed as inefficient for the upscaling and stewarding of NBS over long periods, especially when sudden changes in public administration occur. This affects the availability of resources for NBS governance (Young and McPherson, 2013). Co-production has been seen as a promising alternative form of NBS governance, encouraging iterative collaboration (Lemos and Morehouse, 2005) and resulting in social learning among diverse groups of individuals (Djenontin and Meadow, 2018). By promoting inclusivity and focusing on incorporating the needs of all local citizens into NBS planning procedures (Frantzeskaki, 2019), it can also be regarded as an appropriate method to address equity issues in relation to green gentrification, allowing everyone to contribute to the process. The inclusion of all relevant stakeholders in NBS co-production should result in a comprehensive co-definition of the existing problem as well as a shared vision/goal of what the NBS should look like (Wittmayer and Schöpke, 2014, Djenontin and Meadow, 2018). Co-production processes are also favourable for NBS implementation and governance as they enhance the capacity and willingness of local stakeholders, giving rise to community empowerment in cities (van der Jagt et al., 2019).

1.5 Problem Statement

Co-production shows a lot of promise as a novel approach for NBS governance within cities, but at the same time, concerns arise in relation to how to design a co-production process that ensures that results will be successful. Previous research on co-production has shown what ideal processes of co-production should look like (Hegger et al., 2012) in order to ensure success and to result in desirable outcomes (mentioned under Section 1.4). However, other authors have raised the issue that co-production is context-dependent (Sorrentino et al., 2018), and can be influenced by an array of context conditions (Lemos and Morehouse, 2005, Djenontin and Meadow, 2018). Some studies have identified certain conditions and have touched upon how they can influence co-production processes. These include, but are not limited to; institutional, cultural (Djenontin and Meadow, 2018), legal (Brix et al., 2019) and organisational conditions as well as conditions in relation to local citizens/end-users (Voorberg et al., 2015). However, the context in which co-production is carried out is still very much understudied and a comprehensive study of exactly how certain context conditions can influence the success of co-

production processes is lacking (Sorrentino et al., 2018). Some of these conditions mentioned above will be further elaborated on in Chapter 2. It is important consider context conditions when designing a co-production process in order to facilitate a successful process, more specifically for this case of co-producing nature-based solutions.

1.6 Research Objective

In relation to the problem statement above, my research objective is to address the existing knowledge gap by conducting an in-depth investigation into how certain context conditions can influence NBS co-production processes. This will be achieved by investigating certain context conditions, based on the framework in Chapter 2, in two cities (Genk, Belgium and Glasgow, Scotland) that have been experimenting with the NBS co-production approach. The research will also involve examining how these context conditions may influence NBS co-production processes in the two cities. These context conditions include organisational conditions, individual conditions and political conditions and are described in more detail in *Section 2.1*.

By investigating the above, this research project will give a better insight into co-production and reveal the extent to which it is a context-dependent process, specifically in relation to NBS implementation and governance. The identification of key context conditions which affect co-production processes can provide valuable lessons for the future (Djenontin and Meadow, 2018). By investigating how context conditions influence co-production processes, clearer processes can be implemented, by designing them to fit the existing context. This is useful when the context conditions are beyond the control of the process (Lemos and Morehouse, 2005, Djenontin and Meadow, 2018) and are too difficult to adjust. Alternatively, identifying the key contextual conditions which influence co-production processes in the two cities can reveal what needs to change in order to enhance the success of the overall process in the cities (Muñoz-Erickson et al., 2017). This research will also provide other cities, who are experimenting with NBS co-production, with valuable insights into what they should take into consideration when designing and implementing NBS co-production processes.

1.7 Research Question

Based on the research objective above, the following main research question has been developed:

- *“How are nature-based solutions co-produced in Genk and Glasgow?”*

The following sub-research questions have been developed:

- SRQ1: *“How can co-production processes be conceptualised for more effective NBS governance across different contexts?”*
- SRQ2: *“What are the key context conditions that influence NBS co-production processes in Genk and Glasgow?”*
- SRQ3: *“How do the context conditions relate to the NBS co-production processes in Genk and Glasgow?”*

Answering the sub-research questions above will subsequently answer my main research question.

2 CONCEPTUAL FRAMEWORK

This chapter introduces the framework that I have developed for this thesis. The framework is used to investigate NBS co-production processes in Glasgow and Genk, with a focus on understanding the context in which they take place and how they are possibly influenced by the context. I carried out extensive desk research to develop the framework, which involved analysing existing co-production literature and theories, as well as literature on various other concepts related to co-production. These include *Collaborative Governance*, *Adaptive Co-management*, *Transdisciplinarity*, *Interdisciplinarity*, *Joint Knowledge Production* and *Interactive Research*.

The framework is comprised of two main dimensions: *Context Conditions* and *Process Variables*. These two dimensions incorporate various sub-dimensions, which ultimately give more structure and clarity to the research. For *Context Conditions*, these consist of *Organisational Conditions* and *Individual Conditions*. For *Process Variables*, these consist of *Engagement*, *Power* and *Trust*. Within these sub-dimensions, a variety of variables also exist. These variables will be used as a guidance tool to develop appropriate interview questions for data collection in order to answer the research questions. In this chapter, I introduce and define the dimensions, their sub-dimensions and variables. Furthermore, I explain the importance of each of them and why they are included in the framework for this research project.

The framework is an important element of this thesis as it helps to give the empirical research a clear direction, while simultaneously allowing me to answer the first sub-research question – “*How can NBS co-production processes be conceptualised as context-dependent approaches for NBS governance?*” It sheds light on what context conditions should be considered when designing and carrying out NBS co-production processes, as well as what specific elements of the processes the conditions can affect, based on literature.

2.1 Context Conditions

The context of co-production processes is fundamentally the environment in which the processes take place (Djenontin and Meadow, 2018). For this research project, the general context in which the co-production processes take place is in urban environments. The specific contexts in which the processes are carried out are in the cities of Glasgow and Genk. *Context Conditions* comprise of a variety of factors existing in this environment which have the potential to influence how co-production is carried out, with some factors being beyond control of the process (Lemos and Morehouse, 2005, Djenontin and Meadow, 2018). This research project encompasses the following two categories of context conditions, which are explained below in further detail:

- (1) *Organisational Conditions*
- (2) *Individual Conditions*

2.1.1 Organisational Conditions

Organisational conditions are defined as the inputs that are needed for the organisers of a co-production process to design and facilitate the process successfully (Djenontin and Meadow, 2018, Voorberg et al., 2015). Usually, NBS co-production processes are initiated and organised by a certain department within a city government. This is the case for both Genk and Glasgow. For this reason, I will be examining the organisational structures that are currently in place for NBS co-production within the two cities. These structures encompass the following four elements:

- (1) *Resources for Co-production*
- (2) *Skills for Co-production*
- (3) *Institutional Support for Co-production*
- (4) *Existing Relationships for Co-production*

These elements are important to take into consideration when carrying out NBS co-production processes. If any are lacking, it can have a negative impact on how the processes progress, whereby project goals and objectives may not be reached and certain groups or individuals may be excluded (Voorberg et al., 2015).

Resources for NBS Co-production

Resources refer to both the material and non-material resources that are needed to effectively organise co-production processes. These resources can determine the quality of co-production processes and include funding, time, and infrastructure. *Funding* is of utmost importance and is a necessary requirement in order to organise, design and implement co-production processes. Having sufficient funding available enables additional important components to be included in the co-production process, such as equipment and individuals with valuable knowledge and information. Provision of funding can come from the public sector, private sector or from a plurality of sources (Lemos and Morehouse, 2005). If funds are insufficient or unavailable, this can majorly hamper opportunities for collaboration (Leach and Pelkey, 2001, Wyborn, 2015, Cvitanovic et al., 2016).

Time is another important resource that is critical in shaping how co-production processes are carried out (Lemos and Morehouse, 2005, van Kerkhoff and Lebel, 2015). Individuals involved in organising a co-production process need to set aside a sufficient amount of time to organise it properly. Research has suggested that it is imperative that individuals initially recognise and accept that co-production takes time and it is inevitably a long-term process (Armitage et al., 2009). This acceptance may be difficult for some and easier for others, depending on an individual's work experience. Both Cvitanovic et al. (2016) and Polk (2015) have explained how individuals' existing workloads and normal day-to-day responsibilities can reduce the amount of time they can invest in co-production. It may take several years between defining the objectives and goals of the project and observing effective outcomes for stakeholders (Lemos and Morehouse, 2005) so sufficient time must be invested when it comes to the organisation of the process.

Infrastructure is another resource that must be given due consideration when organising co-production processes. This concerns the availability of meeting spaces, equipment and supplies for co-production activities (Lemos and Morehouse, 2005). Infrastructure can also refer to the tools and methods available to inform individuals about the co-production processes (Voorberg et al., 2015). These infrastructural components can increase the capacity for individuals to engage in iterative processes (Lemos and Morehouse, 2005). Finally, during co-production processes, provision of incentives to stakeholders should be considered. These incentives can encourage stakeholders to collaborate with others during the process (Voorberg et al., 2015). Such incentives can be tangible, and include, goods, services, economic gains for stakeholders. Non-material incentives are ones that give vast consideration to the intrinsic needs of the stakeholders involved in the process (Alford, 2002).

Skills for NBS Co-production

Other organisational conditions that are needed to organise co-production processes include the *skills* of those responsible for organising co-production processes. These include professional expertise and

skills that can enhance the success of co-production processes, such as communication, facilitation and negotiation skills (Djenontin and Meadow, 2018). Without these various skills present, the likelihood of collaboration taking place decreases. These skills can be incorporated into the process through the employment of professional facilitators, also known as champions (Armitage et al., 2009), who are proficient at dealing with conflict and building capacities (Wittmayer and Schöpke, 2014).

Institutional Support for NBS Co-production

Support within institutions is an important factor to take into account when organising co-production processes. Institutions are defined as the formal and informal rules and arrangements embedded in a certain setting that fundamentally influence what individuals choose to do and how they interact with each other within this environment (Ostrom, 2005). Formally embedded institutions include laws and constitutions, while informal institutions consist of behavioural norms and codes of conduct (Armitage et al., 2009).

Institutional support for NBS co-production therefore concerns whether the institutions embedded in a certain environment are supportive of the organisation of NBS co-production processes within that environment. If the level of institutional support is low, then it is more likely that barriers will arise during the process. Institutional support for a co-production process can be demonstrated within institutions through the provision of education and training for those who want to carry out a co-production process (Djenontin and Meadow, 2018), as well as through official policies and strategies that promote collaboration across departments to work towards a certain goal (Wyborn, 2015, Armitage et al., 2009). If institutional support for co-production is strongly embedded, then this should allow departments within city governments to be more flexible in order to be able to organise processes focused on collaboration and social learning (Armitage et al., 2009, Armitage, 2011). In contrast, institutional lock-ins exist in many cases (van Kerkhoff and Lebel, 2014), whereby traditional institutional structures are rigid, ultimately limiting opportunities for flexible working arrangements focused on exploring new ideas, experimentation and co-production.

For this research project, I focus specifically on the institutional support for NBS co-production processes within local city governments since they are the central organisations in which NBS co-production is organised. I also investigate institutional support beyond the local level, looking at regional and national institutional structures as these could also have impacts on the way in which NBS co-production is carried out in the cities.

Existing Relationships for NBS Co-production

This condition refers to the “relationships that allow co-production to happen” (Filipe et al., 2017). In order for co-production processes to be organised, designed and implemented well, existing relationships between stakeholders must be of good quality. The quality of existing relationships is likely to affect the willingness of people to participate in co-production processes. If people are asked to take part in a project involving co-production, their choice may be influenced by how well they know and trust the people who originally asked them to take part (Bussu and Galanti, 2018). If weak relationships between stakeholders exist, this is likely to weaken the success of co-production by restricting the level of trust building, even when sufficient resources are in place to support the process (Armitage et al., 2011, Bowen et al., 2015). Crona and Parker (2012) explain how the several relationships that one individual developed during his time in academia as well as during his career within the water policy sector significantly aided him to facilitate social learning processes between the two distinct communities to enhance water governance.

Previous studies have focused on institutionally embedded relationships between researchers, practitioners, government and local communities (van Kerkhoff and Lebel, 2015, Armitage et al., 2011) and how these relationships affect the ease at which co-production processes are organised, designed and implemented.

For this research project, I focus on examining the existing relationships between the city government departments that are involved in carrying out NBS co-production processes. These relationships are essential to investigate since NBS are multifunctional and their design and implementation requires expertise from several city departments, meaning smooth collaboration between these departments is vital. I also examine the existing relationships between the city governments and local stakeholders external to the city government, such as local residents, local organisations, businesses, etc. These stakeholders all play an important role in NBS co-production processes, so it is therefore imperative to investigate their relationships with the city governments responsible for organising the processes. Other significant relationships that may have influenced NBS co-production processes are also taken into account.

2.1.2 Individual Conditions

Individual conditions represent the traits required for carrying out successful co-production processes at the level of the individual. The traits (beliefs, values, norms) of the individuals participating in co-production processes are important to consider as they can greatly influence how they view co-production as an NBS governance approach and how they engage in various co-production processes (Voorberg et al., 2015). I have limited this research project to investigating only one element of individual conditions, *Individual Openness*, due to the breadth and complexity of this variable. More specifically, I focus on examining individual openness towards the following:

- (1) *Individual Openness to the process of Co-production*
- (2) *Individual Openness the concept of NBS*

Individual Openness to Co-production

This context condition specifically relates to different stakeholders' levels of openness towards engaging in the process of co-production. As co-production is a complex process, there are many elements that individuals must be open to in order for it to run smoothly. As the process involves many different stakeholders with different types of knowledge and information, participants should be fully open to these different types of knowledge and information during the process. This includes expert knowledge and local contextual knowledge (van der Jagt et al., 2019). Not only should participants be open to new knowledge and information that they may not necessarily be familiar with, they should also be open to sharing their own knowledge and information during NBS co-production processes with others (van Kerkhoff and Lebel, 2015). Individual openness to co-production also encompasses stakeholders' openness to the uncertainty and long-term nature of the process (Armitage et al., 2009). The extent to which individuals recognise and accept the existence of the uncertain and complex nature of co-production processes will have effects on the overall process itself. Freeth and Caniglia (2019) state that when individuals have more of an appreciation and tolerance for uncertainty and complexity during co-production processes, collaborative capacities can be enhanced. Increasing collaborative capacities through the acceptance of uncertainty and complexity can ultimately enhance social learning between groups during co-production (Armitage et al., 2011).

Individual Openness to NBS

In order to ensure the success of co-production processes, stakeholders involved in the process must show an adequate level of openness to what is being co-produced. Therefore, it is important to consider different stakeholders' openness to the actual concept of NBS in order to successfully co-produce NBS. As previously discussed, there have been difficulties in how NBS are interpreted by different stakeholders, with many finding it difficult to grasp the concept and the purpose of NBS since their introduction (Nesshöver et al., 2017, Miller and Wyborn, 2018). This is likely to have an influence on how NBS co-production processes play out in cities, making it an essential variable to include and investigate as part of this thesis.

For the purpose of this research project, I examine how open different (groups of) stakeholders involved in NBS co-production have been during co-production processes in relation to the factors described above, based on existing city documents, observations and participants' opinions.

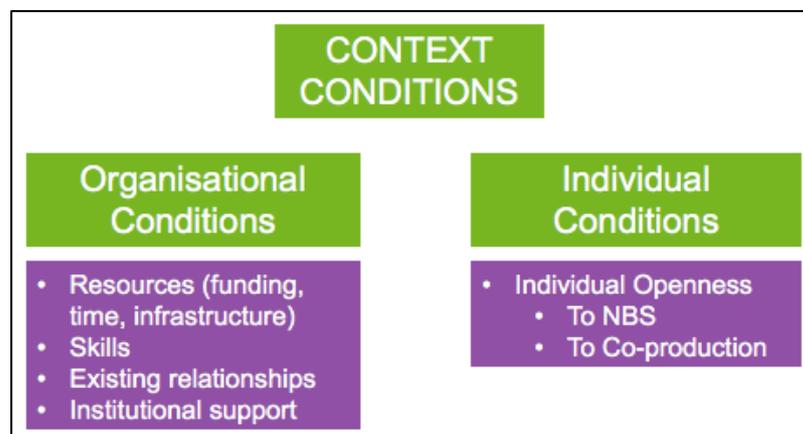


Figure 1. Context Conditions

2.2 Process Variables

This section provides a description of each of the process variables that make up the process component of the conceptual framework. These process variables represent key elements that are necessary to incorporate into co-production processes in order for co-production to be carried out successfully (Djenontin and Meadow, 2018). Incorporating these elements should lead to effective outcomes that are beneficial for participants of the process as well as other stakeholders who will be affected. These “success” process variables have been identified and extracted from previous studies on co-production.

2.2.1 Engagement

The engagement variables represent key process activities that facilitate effective engagement and communication which allow for richer co-production processes. For this research project, the engagement variables relevant for co-producing nature-based solutions include:

- (1) *Inclusivity*
- (2) *Facilitation*
- (3) *Meetings, Workshops, Face-to-face Interactions*

Inclusivity

One of the most imperative components of co-production is inclusivity, whereby all relevant and interested stakeholders are included in the process, along with the different forms of valuable

knowledge each of them possesses. This is in order to ensure the success of the process and to limit the exclusion of stakeholders (Miller and Wyborn, 2018, van der Jagt et al., 2019). Sources of knowledge include expert knowledge, tacit knowledge as well as civic/local contextual knowledge (van der Jagt et al., 2019).

However, it is important to be aware that including all relevant stakeholders in the co-production process does not automatically ensure the integration of their knowledge. For example, Armitage et al. (2011) found that, while local Inuit people were included in a narwhal co-management project in Canada, their knowledge was not incorporated into decision-making processes or into the report that was produced at the end of the project. The report only included Inuits' names to make it appear as if their knowledge was used (Armitage et al., 2011). Djenontin and Meadow (2018) discuss how it is necessary to fully integrate local knowledge into the co-production process in order to enhance the usefulness of the process and to allow for the needs of local community members to be met. Berkes (2009) also describes the imperativeness of ensuring intensive participation of local communities during the process. Similarly, Wiek et al. (2012) highlight the significance of local knowledge integration and conclude that it should occur at the very beginning of the co-production process. This can strengthen local citizens' interest to stay engaged in the process (Wiek et al., 2012).

Ensuring inclusivity of all relevant stakeholders and knowledge forms is a crucial step in the process, as it allows for subsequent co-productive tasks to be carried out. Once all stakeholders and their knowledge are included in the process, knowledge systems can be combined together (Folke et al., 2005) in order to create a shared understanding of the existing problem, along with shared normative visions and goals that will bring benefits to all stakeholders in the future (Hegger et al., 2012, Wittmayer and Schöpke, 2014).

Facilitation

Facilitation specifically concerns the facilitative processes that contribute to stakeholder engagement and enable smooth collaboration between different groups of stakeholders during the co-production process. It is often seen as the backbone for co-production processes. Facilitation is usually mediated by employing stakeholders who have prior knowledge and experience with facilitation. These actors include professional facilitators and network brokers (Klerkx and Nettle, 2013) as well as bridging organisations (Folke et al., 2005, Crona and Parker, 2012). The extent to which processes are facilitated successfully depend on the skills of these facilitators. It is crucial to examine how facilitative the co-production activities are as facilitation plays an important role in reaching desirable project outcomes for project participants. Research has shown that facilitation is an important element of co-production processes as it can empower participants to lead while also creating a sense of co-ownership of a project between stakeholders (Wittmayer and Schöpke, 2014).

Meetings, Workshops, Face-to-face Interactions

Organising meetings, workshops and other engagement activities for relevant stakeholders to participate in during the co-production process enables stakeholders to interact with each other. These activities can enhance knowledge transfer between stakeholders, whilst simultaneously allowing stakeholders to learn from each other. In order for effective knowledge transfer and mutual learning to take place, meetings and engagement activities with stakeholders must be held on a regular basis (van der Jagt et al., 2019). Having a limited number of meetings can lead to the emergence of other problems during co-production. For example, Wiek et al. (2012) found that only having a small number of stakeholder meetings is likely to lead to stakeholders becoming unenthused and disinterested during

projects. They suggest that an increase in the number of meetings held can strengthen the willingness of the stakeholders participating in the process (Wiek et al., 2012).

Another important condition to enhance the productivity of meetings, workshops and other engagement activities is informal face-to-face interaction. Studies have shown that stakeholder interactions are richer and more productive when individuals are face-to-face with each other, rather than when they communicate digitally (Hampton and Parker, 2011, Freeth and Caniglia, 2019). Djenontin and Meadow (2018) explain that face-to-face meetings can act as a more effective method for active learning. As well as this, the setting for engagement activities should be designed in a creative way that encourages all stakeholders to be able to participate and engage in co-production with ease (Freeth and Caniglia, 2019).

2.2.2 Power

Power is a recurring theme in co-production literature. Co-production is inherently a political process, with stakeholders entering the process having different levels of power (Freeth and Caniglia, 2019). An ideal co-production process should be able to resolve problems associated with power. Based on existing co-production research, the following procedures must be incorporated into the process in order for this to occur:

- (1) *Shared Decision-Making Power*
- (2) *Division of Roles and Responsibilities*

These procedures allow for power differences to be destabilised, by devolving power to stakeholders or groups who usually possess little influence or power within decision-making processes, ultimately resulting in democratisation of the process (Berkes, 2009).

Shared Decision-Making Power

The sharing of decision-making power refers to how different groups of actors are provided with equal opportunities to make decisions during the co-production process (Armitage et al., 2009). This sharing of decision-making power can ultimately be used as criteria to measure the success of the overall co-production process (Berkes et al., 2009). The goal is to root out power imbalances in order to distribute more power to more marginalised stakeholders who frequently lack the ability to make decisions within city projects (Armitage et al., 2009, Freeth and Caniglia, 2019). The process of devolving power can only occur once the existing power dynamics are made explicit and discussable to everyone involved in the process (Freeth and Caniglia, 2019). However, the likelihood of this is said to be very context-dependent (Wittmayer and Schöpke, 2014). Shared decision-making power should ultimately lead to a more collaborative approach to complete the project where tasks, such as co-definition of the issue and methods, co-conceptualisation and co-design of the project, can be carried out efficiently (Djenontin and Meadow, 2018).

Division of Roles and Responsibilities

Careful consideration must be given to how stakeholder roles and responsibilities are divided during a co-production process. Recent literature indicates that an ideal co-production process involves dividing the roles and responsibilities equally across all participating stakeholders in order to hold each one accountable for the project and to prevent one stakeholder or group of stakeholders having more influence over the process compared to others. This, in theory, should result in an improved environment for co-production to take place by avoiding problems related to politicization (Crona and

Parker, 2012). Dividing roles and responsibilities may involve the distribution of tasks that are unfamiliar to certain stakeholders (Armitage et al., 2009). According to Roux et al. (2006), this can decrease the enthusiasm of stakeholders to participate. However, other studies have shown that stakeholders can take on new roles successfully. Researchers, for example, act as facilitators frequently in knowledge co-production processes to give more space for others, such as end-users, to generate knowledge (Hegger et al., 2012).

Equally dividing roles and responsibilities among participating stakeholders provides them with the opportunity to co-lead the co-production process. Co-leadership has previously been identified as a crucial element of co-production and can contribute to the success of the process (Polk, 2015). Making every stakeholder accountable through the division of roles and responsibilities can also enhance collective ownership of a project (Armitage et al., 2011), which can help sustain long term participation in the process (Boothroyd et al., 2017).

2.2.3 Trust

Trust is another recurring theme that is frequently discussed throughout the existing literature on co-production and its similar concepts. Trust building is essential for co-production processes to run smoothly (Berkes, 2009, Freeth and Caniglia, 2019). There are multiple key components that can enable trust to be built between stakeholders participating in co-production. These include:

- (1) *Creating Neutral Space*
- (2) *Relationship and Network Building*
- (3) *Conflict Resolution*

Creating Neutral Space

Creating a neutral space involves assisting stakeholders to express their own values, norms and beliefs and to make them explicit to all other stakeholders throughout the co-production process without any judgement (Crona and Parker, 2012). This can hugely contribute to the effectiveness of the co-production process (Wittmayer and Schöpke, 2014). Frequently during co-production, differing values and beliefs arise amongst participants. However, when the participants are made aware of these differences surrounding the topic at hand, it should make for an improved, open co-production process (Crona and Parker, 2012, Hegger et al., 2012). Ultimately, the goal is to view these differences as meaningful and to mobilise them for the benefit of the entire group taking part in the process (Freeth and Caniglia, 2019). Provision of a neutral space can also create more opportunities for social learning to take place, while also helping to lower cultural barriers existing between socially diverse groups (Crona and Parker, 2012). This in turn can build the level of trust between the groups. Maintenance of a neutral space can be supported by a professional facilitator or bridging organisation during the co-production process (Crona and Parker, 2012).

Relationship and Network Building

Co-production processes regularly involve a multitude of stakeholders with contrasting backgrounds (Hegger and Dieperink, 2014). Therefore, building relationships and networks between stakeholders is key to improving co-production processes (Wiek et al., 2012, van Kerkhoff and Lebel, 2015). Relationships formed throughout the co-production process can either be formal or informal. Formal relationships are those which develop between actors during formal interactions, such as official stakeholder meetings. Informal relationships are those which develop through social interactions within more casual settings, such as informal working groups. These informal settings have been identified as

a key component for enabling a smoother co-production process, as they promote more open communication and a higher amount of respect between stakeholders (Armitage et al., 2011, Stepanova, 2015).

Network building during co-production processes can increase both bonding and bridging social capital, which helps to mobilise collective action to solve multi-faceted problems. Bonding social capital is the result of connecting stakeholders “with similar values, beliefs, or status together”, while bridging social capital is the result of connecting stakeholders “with dissimilar values together” (Poocharoen and Ting, 2013). Many have put emphasis on the need to build stronger networks and relationships between stakeholders who differ significantly from each other. van Kerkhoff and Lebel (2015) for example, argue for the necessity of building relationships between scientists and governance stakeholders, while Berkes (2009) indicates how networking plays a significant role in connecting government with local institutions. Network building can increase the willingness of governments to create partnerships with these local institutions, while giving said institutions valuable experience in working with governments (Berkes, 2009).

Conflict Resolution

Previous research has argued that conflict should be considered as a normal, necessary part of co-production and is expected to occur at some point along the process between participating stakeholders (Armitage et al., 2009, Freeth and Caniglia, 2019). In order for the process to progress smoothly, conflicts that arise during the process must be made explicit, and then subsequently be dealt with and resolved effectively. In contrast, conflict avoidance has been viewed as an ineffective approach as it can cause other problems to manifest throughout the process. Armitage et al. (2011) discuss how Inuit people view conflict as a taboo subject and so attempt to avoid it at all costs. This had negative effects on a narwhal co-management project which an Inuit community participated in, ultimately lowering their willingness to engage in the process and resulting in poor decision making (Armitage et al., 2011).

Conflicts can be resolved through the employment of a professional facilitator (Berkes, 2009, Armitage et al., 2011). Other methods to resolve conflicts between stakeholders involve allowing participating stakeholders to develop skills in conflict resolution, deliberation and negotiation (Cheruvilil et al., 2014), as well as ensuring the full integration of various knowledge sources (Stepanova, 2015). The ability to resolve existing conflicts can be influenced by the existing levels of trust between stakeholder groups. Conversely, the ability to build trust among stakeholders depends on the potential conflict that exists between them (Kelman, 2005).



Figure 2. Process Variables

3 METHODOLOGY

This chapter introduces the methodological approach for this research. First, I will provide a description of the research design chosen and the reasoning behind my choice. Next, I will describe the selection process of the two cases that were studied for the research and a description of the cases. This will be followed by an explanation of how the data were collected and analysed. Finally, I conclude the chapter explaining the impact that COVID-19 has had on my methodological approach for the project.

3.1 *Research Design*

The research design for this Master thesis constitutes a qualitative comparative case study, whereby NBS co-production processes represent the phenomenon to be investigated, with Glasgow and Genk chosen as the two cases for the study to be compared. Case studies are a commonly used research design in the field of social science to explore complex phenomena and gain a comprehensive insight into them (de Vaus, 2001). It was therefore suitable to use a case study design for this Master thesis due to the exploratory nature of the research as well as the complexity associated with NBS co-production as an urban governance approach.

3.2 *Case Selection and Description*

This Master thesis is conducted in collaboration with the Dutch Research Institute For Transitions (DRIFT), Rotterdam, and various other partners within the Connecting Nature project. The five-year project is funded by the European Commission's Horizon 2020 Innovation Action Programme and is urban-focused with the aim of upscaling urban resilience, innovation and governance through the co-production of nature-based solutions. The project is currently applying this approach to three European front-runner cities: Glasgow (Scotland), Genk (Belgium) and Poznań (Poland), as well as eight European fast-follower cities: A Coruña (Portugal), Bologna (Italy), Burgas (Bulgaria), Ioannina (Greece), Malaga (Spain), Nicosia (Cyprus), Sarajevo (Bosnia and Herzegovina) and Pavlos Melas (Greece).

Having taken feasibility issues into consideration, such as the scale of the theoretical framework and the limited time available for conducting the research project, I decided to limit the study to two cities. Genk and Glasgow, two of the front-runner cities, were selected as the case study sites which will be researched for this thesis. I chose these cities as their city governments have been actively experimenting with the NBS co-production approach and have designed and implemented a number of co-production processes so far. They have demonstrated progress with respect to attempting to integrate nature-based solutions into urban planning practices through co-production. Therefore, there was a substantial amount of information available to obtain from these two cities, which allowed for a comprehensive investigation of the cases.

3.2.1 *Glasgow, Scotland*

With a city population of just over 600,000, Glasgow is the largest city in Scotland (Glasgow City Council, 2017). As a result of industrialisation, rapid urbanisation took place in the city from the late 18th century onwards. Urban expansion continued throughout the 20th century despite the fact that the population was actually decreasing in size. With this urban expansion came the development of areas of open space in the city, as natural spaces or spaces of recreation for residents. In recent years, however, many of these open spaces have been neglected and/or misused (Glasgow City Council, 2018).

As the population begins to grow once again, Glasgow City Council have made it their mission to unlock the potential of the vacant and derelict land across the city. They are trying to achieve this through the development of an Open Space Strategy (OSS). Creating such a strategy provides a vision to ensure that open spaces are well-managed, well-located and well-connected in Glasgow. The goal of the OSS is also to connect and deliver on other existing strategies and goals simultaneously, essentially connecting council members and external partners to each other. The strategy sets out a number of specific objectives, such as improving the health of Glasgow residents, enhancing the liveability of the city to make it more attractive for people and investment, and also to increase urban resilience against climate change, extreme weather events and food risks. Subsequent to the strategy, the city council are working collaboratively with local communities and organisations on the operational development and implementation of open space pilot projects, using an NBS co-production approach (Glasgow City Council, 2018).

3.2.2 Genk, Belgium

Genk is a relatively small city in the North East of Belgium, with a population of approximately 65,000 residents. Despite being one of the most industrial cities in this region of Belgium, it has a lot of potential for NBS implementation as it is also one of the greenest. The Stiemer Valley has been chosen as the area in Genk where NBS are to be implemented and up-scaled through processes of co-production. The valley runs diagonally through the centre of Genk and is a connection between various districts and neighbourhoods in the city. It was an area of neglect during the 20th century as a result of the mining industry as well as increased levels of urbanisation. As the city grew, the construction of sewage systems increased. The discharge of sewage water into the valley, in combination with heavy rainfall, led to frequent sewage overflows causing flooding in the area.

In recent years, however, the ecological importance of the valley has been recognised by the city, as well as the potential it has to connect local residents to nature. This has given rise to the development of the Stiemer programme, an initiative that employs NBS co-production processes with the goal of transforming the Stiemer Valley into a “multifunctional blue-green urban valley” that will provide multiple benefits to the natural environment as well as to the residents of Genk (Quartier et al., 2019a).

3.3 Data Collection and Data Analysis

For this research project, it was important to ensure that the cases were studied in a holistic manner in order to gain a full in-depth understanding of the phenomenon (de Vaus, 2001), i.e. the NBS co-production processes. To ensure this, both the data collection methods employed and data sources used were triangulated to enrich both the data collection and the data analysis processes. Employing triangulation results in more valid conclusions “through the convergence of information from different sources” (Carter et al., 2014). For example, after having attended workshops, I could interview individuals and ask them questions based on my observations from the workshops in order to gain a better understanding of what I observed.

To achieve triangulation, the data collection methods that I used to carry out the research include empirical research such as face-to-face interviews, video call interviews, workshops and observations during said interviews and workshops, as well as desk research such as analysing the minutes and notes from the various meetings that I have participated in as note-taker (*Table 1*), as well as analysing the official documents/reports of the cities. These documents were written by the city teams responsible for the projects as well as the various other official partners of the Connecting Nature project. Triangulation

of data sources was ensured by carrying out interviews with a variety of different stakeholders involved in NBS co-production processes in both cities.

Both the positive and negative attributes associated with the data collection methods used, such as interviews and observations, were taken into account for the research in order to determine the suitability of these methods for the research. I deduced that interviewing stakeholders in both cities was a suitable data collection method, based on what existing literature has stated. Interviews have been described as an effective approach to obtain data as they allow the researcher to gain a deeper understanding of matters which are difficult to observe (such as different individual values and perceptions) and draw concrete conclusions from using alternative methods (Partington, 2001), such as observations and analysing city reports. Observation is also an important method of data collection for this kind of study, as it can provide a clearer illustration into how people interact with one another and gives a better view of the context and processes in real-time (Mulhall, 2002).

Glasgow

I spent a total of twelve days in Glasgow. I first attended two workshops organised by both Glasgow City Council and Greenspace Scotland to observe the processes. Using the snowball-sampling method (Goodman, 1961), I subsequently asked the organisers if they could provide me with details of the participants of the workshops. I then contacted various participants from the workshops to arrange interviews. In total, nine face-to-face interviews were conducted with ten different stakeholders (*Table 2*). At the second workshop, I had a brief discussion with one participant who is setting up a food growing social enterprise in Glasgow. Following this, I arranged an online interview with her. During my time in Glasgow, I also visited the Bellahouston demonstration garden, a food growing garden situated in Bellahouston park, Glasgow, that has been co-produced by an array of different stakeholder groups. Furthermore, I visited the proposed site for the Growchapel project, an NBS co-production initiative which plans to develop a community garden in Drumchapel in the northwest of the city.

Genk

Data collection for the Genk case involved conducting interviews via online video calls and regular phone calls, due to COVID-19 (explained further later in this chapter). I planned the interviews after having contacted the Environment and Sustainable Development department of the City of Genk with an overview of my research topic. They sent emails to stakeholders who have been involved in NBS co-production processes in Genk, asking them whether they would be interested in taking part in an interview. Following that, I emailed interested stakeholders and arranged virtual interviews. I also arranged a further few interviews with stakeholders who were mentioned to me by other interviewees. In total, I carried out eight interviews with various stakeholders, who have been involved in NBS co-production processes in Genk, over a period of approximately four weeks (*Table 2*).

At the beginning of each interview, interviewees were informed about the purpose of the interview. Each interviewee was also given an interview consent form, whereby they gave formal permission to be interviewed. Interviewees were also asked whether they were comfortable for the interviews to be recorded before the interviews had begun.

The interviews were semi-structured. An advantage of this is that it gives the interviewer an opportunity to ask further questions based on the interviewees' responses, rather than only asking pre-defined questions. It also provides interviewees with a chance to elaborate on their responses (Hitchcock and

Hughes, 1989). Space was given for interviewees to elaborate by asking open questions. For example, at the start of each interview, I explained the focus of my research and asked each interviewee the question, “*What context conditions have you seen that have influenced NBS co-production processes, and how have they influenced the processes exactly?*”. Including this open question gave the opportunity for stakeholders to share their experiences openly, while providing me with additional insights that may not have been discussed if interviewees were only asked the specific questions based on the theoretical framework. At the beginning of each interview, I also asked interviewees who they were, what they/their organisation do and what role they have played in NBS co-production processes so far. This provided me with additional information while also showing interviewees that I was interested in who they are. This allowed rapport to be developed from the outset of each interview. Creating rapport is seen as essential in order to try and overcome potential barriers during interviews such as a reluctance to disclose certain information to the interviewer (Partington, 2001).

I then asked interviewees a range of specific questions based on the framework, as well as spontaneous questions based on interviewees’ answers to the specific questions. There was no specific order in which I asked the questions for the purpose of keeping the interview conversational and natural for both myself as the interviewer, and for the interviewees. This helped to further establish a rapport between myself and the interviewees. At the end of each interview, I asked a similar open question as the one at the beginning, “*Are there any conditions that we have not discussed yet that you have thought of since the beginning of our conversation and how did this influence the processes?*” This was to provide interviewees with the opportunity to share their final thoughts and experiences that they may not have initially remembered when first asked about the conditions at the beginning of the interview. Interviewees were also asked to think about context conditions that may arise in the future that could influence NBS co-production processes. This was done to provide insights for the organisation and implementation of future NBS co-production processes in the cities.

One limitation associated with conducting semi-structured interviews is that the interviewer must remain alert and always be prepared to formulate questions based on interviewees’ responses (Opdenakker, 2006). I overcame this barrier to the best of my ability via triangulation by extensively researching the existing city documents and notes from previous meetings before conducting interviews. This enabled me to have a good understanding of the cases (NBS co-production activities, stakeholders involved, etc.) prior to interviewing individuals. This allowed me to quickly identify links between interviewees’ answers and the city documents and meeting notes, which made it easier to formulate questions during the semi-structured interviews. Observations during workshops in Glasgow also facilitated overcoming the limitations of interviews. Conversely, conducting interviews allowed me to overcome the barriers associated with observations as a data collection method. One barrier with observation in particular is in relation to how it is interpreted and whether the interpretation is valid (Stiles, 1999). Through carrying out interviews, I could examine how I interpreted the observations by comparing them to the responses that interviewees gave during interviews.

Table 1. Full list of the meetings that took place with the Glasgow and Genk city teams along with DRIFT and other project partners. Learning Sessions were to reflect on the city’s progress. The CN NBS Framework Call was to reflect on using the different elements of the CN framework in their city projects. Co-production Webinars were to reflect on the cities’ progress specifically in relation to co-production. The Learning Experience Webinar was to reflect on the process of the learning sessions.

Date	Event	City
22nd October 2019	Learning Session	Glasgow
22nd October 2019	Learning Session	Genk
18th November 2019	Connecting Nature NBS Framework Call	Glasgow and Genk
21st November 2019	Learning Session	Glasgow
16th December 2019	Learning Session	Genk
30th January 2020	Learning Session	Glasgow
30th January 2020	Co-production Webinar	Genk
3rd February 2020	Co-production Webinar	Glasgow
4th March 2020	Learning Session	Genk
5th March 2020	Learning Session	Glasgow
10th March 2020	Learning Experience Webinar	Glasgow and Genk
1st April 2020	Learning Session	Glasgow
15th June 2020	Learning Session	Genk
23rd June 2020	Learning Session	Glasgow

Table 2. Workshops attended and interviews conducted for both cases.

Glasgow	Event	Actors involved
26th February 2020	Growchapel NBS Business Model Canvas Workshop – identifying possibilities for sustainable long-term financing of NBS for the Growchapel project	Glasgow City Council, Greenspace Scotland, Police Scotland, social enterprises, community group representatives, charities
27th February 2020	Opportunity and Stakeholder Mapping Workshop, Easterhouse – mapping existing NBS projects within Easterhouse, Northeast Glasgow, to connect stakeholders together and gather information for the Connecting Nature project	Glasgow City Council, Greenspace Scotland, local politician, social enterprises, community group representatives, charities, expert scientists
2nd – 6th March 2020	9 face-to-face interviews with 10 different stakeholders in Glasgow	6 interviews with 6 employees from Glasgow City Council, 1 interview with two members of a local social enterprise, 1 interview with 1 policeman from Police Scotland, 1 interview with 1 employee from Greenspace Scotland (national social enterprise)
3rd April 2020	1 virtual interview via online video call	Owner of a food growing social enterprise
Genk	Event	Actors involved
24th March – 23rd April 2020	8 virtual interviews via online video calls/phone calls	4 interviews with 4 employees of the City of Genk Municipality, including one neighbourhood manager, 4 interviews with 4 academic experts

I analysed the data subsequent to data collection. I transcribed each interview and then coded the data into categories and sub-categories based on the theoretical framework. After coding was completed, I wrote up the results for the cities using the lens of the framework. I compared the cases, whereby similarities and differences between the two cases were identified, as well as similarities and differences between the cases and the existing literature on (NBS) co-production. The cross-case comparison is found in the next chapter, while the comparison of the cases with the literature is described in the Discussion chapter.

3.4 Impact of COVID-19 on Methodological Approach

As mentioned above, due to the COVID-19 pandemic, I had to make alternative arrangements for conducting field research in Genk. Face-to-face interviews, site visits and field observations in Genk were not possible as a result of the health crisis and subsequent lockdowns brought about by COVID-19. Fieldwork in Genk had originally been planned for a period of two weeks. However, the online

interviewing process in Genk took longer than anticipated due to the fact that it overlapped with the initial stages of lockdown in Belgium. This resulted in many changes to stakeholders' schedules and routines, which resulted in uncertainties as to when they could participate in virtual interviews. Many interviewees in Genk also didn't have as much time, compared to interviewees in Glasgow, to take part in an hour long interview due to the circumstances that had arisen. In addition, many technical mishaps occurred during interviews, at times, on my end and at other times, on the end of the interviewee. To overcome these obstacles, I tried to use my time as efficiently as possible during the interviews and focused on asking the most pressing questions to the interviewees.

Field observations and site visits are lacking from the data for Genk due to COVID-19, which impacted efforts to triangulate both the data collection methods and the data sources. Despite this, I attempted to triangulate the data collection methods and data sources as best as possible, having contacted and interviewed different types of stakeholders and examining the city documents and reports in addition to conducting interviews. Another personal impact as a result of virtual interviews with stakeholders from Genk was that it was more difficult for me to develop a rapport with the interviewees over a video call. In Glasgow, I had more time and opportunity to chat with some people informally before interviewing them, be it at a workshop, in a taxi, or over a coffee. This was not possible with individuals in Genk, where the conversations that took place were solely limited to the virtual interviews. However, one advantage of this was that I could conduct the interviews from the comfort of my own home, which gave me more time to prepare for interviews directly beforehand, without having to travel somewhere to meet interviewees.

4 RESULTS

This chapter gives an in-depth account of the key context conditions present in both Genk and Glasgow, based on the empirical research conducted. I describe these conditions in detail, which includes the identification of the main similarities and differences of the conditions between the two cities. Furthermore, insights into how the conditions have influenced NBS co-production processes in both cities are provided throughout the chapter. The chapter is structured using the lens of the conceptual framework. New subheadings have also been formulated based on the empirical research findings.

4.1 Organisational Conditions

4.1.1 Resources for NBS Co-production

Funding

Funding timeframes can restrict NBS co-production

A number of different funding streams have been available and accessible for organising NBS co-production processes in both cities. However, interviewees have expressed how a large number of these funds actually fall short of being truly appropriate for NBS co-production in both cities, as their existing requirements do not align with the overall ideas, principles and goals of co-production. The funding streams tend to be more results-driven than process-driven, with strict deadlines that must be met within a limited amount of time.

In Genk, it has often been proven difficult to carry out effective co-production processes as the funding in place for these types of projects for municipalities is usually for the short term, “*which makes it very difficult to build up good relations and communities over time*”, according to Genk Expert 3 who has been involved in organising NBS co-production processes in Genk, as well as in other areas in Flanders.

In Glasgow, those organising NBS co-production processes have experienced similar difficulties, whereby all the funding secured must be spent within a limited period of time. This issue is common for city council projects.

“Working in any department, budgets are allocated for a certain length of time to be spent within a certain [period]. That doesn’t necessarily match with doing co-production” (GCC Employee 5).

This issue was confirmed by the interviewee from GSS who explained, “*if GCC want to do a co-production project, the timeframe of doing that properly wouldn’t fit the funding package that they maybe get – maybe they have 12 months to spend that money. So that is definitely a big barrier.*”

This barrier does not only exist within the city council, but also at the grassroots level in Glasgow. I spoke with one social entrepreneur who is setting up an NBS co-production process for food growing. She accessed funding from funders who actively seek ambitious, innovative projects. She explained that the first funding tier available is to trial the concept of the social enterprise, whereby one must demonstrate profitability within a short timeframe in order to access the second tier of funding, which is then used for further project development.

“So really you have to get from testing your idea to profitable in a year and you just can’t do that with a project of this scale... How can you do something really ambitious and at that scale that changes things in a transformational way with that sort of funding block?” (Social enterprise interviewee 1).

Despite the fact that funders are actively searching for these ambitious, innovative projects, the limited amount of time that they provide for project development and implementation can actually hamper the level of ambition of NBS projects, ultimately resulting in significantly less room for co-production to occur.

“Trusts think that you should be able to change the world in a matter of months. But that’s not how reality works” (Social enterprise Interviewee 1).

Co-production requirements in funding streams

Although the issue of short-term funding streams exists in Genk, many other funding streams available at the local and Flemish levels have co-production embedded as a project requirement, where projects must demonstrate their plans to use co-production to access the funding.

“When [the Flemish government] give subsidies to a local government for a certain project, co-production is, I think most of the time, criteria of giving money to local government. So in that way we are challenged or forced to bring in that element” (SG Employee 1).

This has helped to embed co-production further in Genk as a legitimate approach for city projects. Institutional support for NBS co-production and the Stiemerbeek Valley project has increased as a result of these requirements, with city government officials, including several figures of authority, showing more of an interest to develop and get involved in NBS co-production processes.

In contrast, in Glasgow, there have been fewer funding opportunities, locally and nationally, that require co-production and so, the potential of mainstreaming NBS co-production has been limited. This has been made more difficult due to the lack of evidence-based data to show the benefits of NBS co-production, as well as the austerity measures that were implemented in GCC as a result of the 2008 economic recession. As a result, the planning departments tend to receive less funding compared to others, as planning is *“not necessarily seen as important as education or health”* (GCC Employee 2), making it more challenging for them to co-produce NBS.

Time

Temporal opportunities and constraints in both cities

As mentioned above, the time available to organise NBS co-production processes in both cities is often dependent on the funding streams that are used during the processes. Despite the tight timeframes, most interviewees in both cities explained that there was sufficient time to organise processes and that most processes went very smoothly as a result of the extensive amount of time invested. However, organisers from both cities mentioned potential risks of investing lots of time in organising NBS co-production processes.

In Glasgow, one member of Greenspace Scotland explained how the vast amount of time and energy needed for organising NBS co-production events can be overlooked by other participants. This can cause a sense of frustration and demotivation among the organisers of these processes to a certain extent, as they can often feel that the work they’ve put in hasn’t been acknowledged as much as they would

have liked. Similarly, in Genk, one academic expert indicated that a large volume of time has been spent in preparing workshops for participants, which has resulted in very successful processes that have been engaging and straightforward. However, this has sometimes resulted in participants feeling inspired to organise similar events, without considering “*the complexity of simplicity*” (Genk Expert 4). The same expert has also seen that this can result in failed co-production processes, ultimately frustrating participants, increasing conflicts and discouraging individuals from participating in future co-production processes.

Infrastructure

Inclusive, informal and accessible spaces for events

NBS co-production processes in both cities have focused on providing infrastructure that is inclusive, accessible and comfortable for local stakeholders, which has helped to make the processes more engaging for everyone involved.

In Glasgow, efforts have been made to host events in settings that are familiar and attractive to participants, allowing for an informal atmosphere to be developed making individuals feel more comfortable. Attention has also been paid to the venue accessibility, whereby the organisers have tried to choose venues that are easily accessible by public transport in order to ensure that the process is inclusive to all stakeholders.

Likewise, in Genk, informal and accessible spaces have been created and used to enhance NBS co-production. Within the city hall, a creative workspace, known as the Stiemer Loft, was set up and has been utilised to hold internal meetings and workshops to develop the Stiemer Valley project with various city government employees. A lot of information about the project in the form of maps, diagrams and timelines of events have been placed on the walls of the Stiemer loft, which has allowed other colleagues who frequently use the space for their own meetings to become more aware of the project (Quartier et al., 2019b). The Stiemer Lab, an urban living lab in Genk, has also been an important space to ensure longevity of co-production processes in the city, even after official project end dates. It has provided opportunities for researchers, locals, government representatives and other stakeholders to continue to engage with each other on an informal basis, while also facilitating the organisation of new co-production processes.

“The living lab made sure that even though there was time in between projects or a project was over, we kept close contact with the communities” (Genk Expert 3).

4.1.2 Skills for NBS Co-production

Involving professionals experienced in participatory processes

Those responsible for organising NBS co-production processes in both cities have recognised that it is no easy feat. For this reason, many individuals with valuable skills for co-production have been recruited for NBS co-production processes.

In Glasgow, Greenspace Scotland’s involvement has been fundamental to ensuring more inclusive and engaging processes, contributing their expertise in facilitation and stakeholder mapping. As a national organisation, they have several partners and are therefore very knowledgeable about who should be included in the processes. Many stakeholders have praised the skills that GSS has brought to the processes, including many city council employees.

In Genk, many project partners who were asked to help organise processes come from fields with a focus on participatory design and collaborative projects. These partners have brought in extra capacity for NBS co-production processes in Genk, having garnered their experiences and lessons learned from previous processes. For example, one expert from the Flemish Land Agency described the struggles that they experienced during a participatory project in De Wijers nature reserve in Hasselt, due to the fact that they failed to gather a lot of key local information at the beginning of their project. Another expert on participatory design learned that it's important to include stakeholders with expertise and/or an interest in nature at the very beginning of various planning projects. In the past, these stakeholders usually came secondary, which resulted in conflicts between groups, ultimately decreasing stakeholders' openness to co-produce.

“But because we started from the infrastructure and from the people, nature people felt... that they were asked too late for their position. And so that's why we learned to do the reverse, start from them and build up to people and infrastructure” (Genk Expert 3).

In both cities, the city teams responsible for organising NBS co-production processes have also ensured to mobilise skills within their organisations. In Glasgow, the community engagement officer from the Neighbourhoods and Sustainability Department has been a valuable asset to the process. This officer has many years of experience, having worked closely with several community groups before joining GCC, and has played a pivotal role in encouraging local community members to get involved in NBS co-production and dealing with conflicts arising in communities.

In Genk, the neighbourhood managers have played an instrumental role, engaging with communities and encouraging them to participate in NBS co-production in the Stiemerbeek Valley. Each manager is employed by the city government and has been responsible for managing and engaging with a specific neighbourhood in the city, some with over twenty years of experience. As a result, they are very knowledgeable about how to engage with the local citizens in Genk and who should be encouraged to participate.

“What has stimulated it for us is that we always had a neighbourhood manager who we could directly access who could immediately relate to different people, ‘these are people you should really involve because they're very active on this level’” (Genk Expert 3).

Simultaneously, the citizens have developed trust in these neighbourhood managers, ultimately bridging local communities and the city government together.

However, despite the involvement of these skilled professionals in each city, the task of carrying out NBS co-production is still a mammoth one and there are still struggles to include and engage many stakeholders in the processes. The neighbourhood manager who I interviewed from Genk expressed that, even for them, it is very difficult to communicate and motivate certain locals to participate, despite his twenty years of experience. In Glasgow, city council employees have said that one community engagement officer is not enough to ensure NBS co-production processes are successful. One council employee stated that:

“Parks have one community engagement officer who cannot engage. If we fired up everybody and said ‘right every community can take on a space’ she can't physically resource them to go ‘right, you need to do this, this is how you do a constitution, this is how you support this bit’” (GCC Employee 1).

Struggles with communication

The question of how best to communicate with local stakeholders during NBS co-production has been a fundamental question in both cities. There are various communication activities to consider that each city has struggled with throughout NBS co-production processes. The organisers in Genk and Glasgow have both expressed that they must get better at communication in order to reach more people and to ensure that the processes are more successful.

More specifically, in Glasgow, those involved in organising processes have been unsure about how NBS should be introduced and communicated to other stakeholders, due to the vagueness and complexity of the term. One council employee explained that introducing the concept to a variety of different stakeholders at events is difficult because “*some people know more than I do and other people won’t have a clue*” (GCC Employee 2). He often introduces the term as “multifunctional green infrastructure, which others have critiqued him for doing as the concept of NBS may not appear as legitimate and people will become less open to it as a novel innovation to achieve sustainability in Glasgow. In Genk, they have dealt with this problem by not explicitly introducing the concept to local stakeholders, but rather focus on explaining the project aims, which are more tangible for these individuals. They have also frequently organised separate processes for locals and for experts and city government employees to avoid challenges associated with introducing the concept to different stakeholders at events (discussed in further detail in Chapter 5).

The communication struggles that persist in Genk are more in relation to reaching a wider audience and also promoting the benefits of NBS co-production more effectively. Many interviewees mentioned that the tools and media that are currently being employed for communication do not suffice in order to promote NBS co-production processes in Genk, mainly attracting a certain demographic – older, white, and highly educated individuals.

“younger people living in the cities, they can’t reach them with the media they use as it’s not used by the younger people” (Genk Expert 2).

Many have advocated that, in order to make the processes more attractive and inclusive, additional means of communication should be utilised to create more diversified groups of participants, with a range of ethnicities, cultures and ages.

4.1.3 Institutional Support for NBS Co-production

Institutional embedding of support for co-production

Institutional support for NBS co-production is evident in both cities, albeit in seemingly different ways. In Glasgow, when asked about institutional support, interviewees mainly focused on the plethora of policies and strategies embedded in GCC and at the Scottish Government level. In Genk, when asked the same question, most interviewees focused on the support they have received, witnessed or heard about from specific important figures, such as the mayor and decision-makers in the city.

Many stated that the interest that Genk’s mayor has shown for co-production has been instrumental for ensuring adequate institutional support for NBS co-production processes. Following the local elections in 2012, the mayor introduced a new city slogan, “Creating the city together”, with the goal of increasing citizen engagement and involvement in official planning and policy- and decision-making in Genk (Gorissen et al., 2016). Since then, the city government has, and continues to, put a lot of effort into ensuring that co-production is embedded in everyday city practices in Genk. Some interviewees also

highlighted the important role that the previous alderman of participation had in embedding co-production in Genk.

“Our alderman was more a social person who’s really into co-production. It was one of her areas that she was very interested in. She’s also developed co-production processes herself, she had that profession I would say... she definitely... put all the seeds of co-production in my head” (SG Employee 1).

This has allowed other government employees in Genk to become more open to co-production and explore ways they can co-produce together, an opportunity that has been less common for city council employees in Glasgow. In order to advance opportunities for co-production in Glasgow, those involved in NBS co-production have actively pursued politicians, policy- and decision-makers at the high levels in order to have conversations with them and convince them of the value of co-production, as well as to convince them to get involved in order to ensure that NBS co-production processes become ubiquitous in Glasgow. It is also important to get these prominent figures involved in order to ensure the robustness of policies for co-production.

Despite these challenges in Glasgow, there are still a number of policies and strategies that demonstrate support for co-production, which have assisted NBS co-production processes. For example, the OSS has been praised as effective in terms of instigating co-productive ways of working within the council as it brings together various city council teams in order to align their strategies.

“I think the OSS is helping because it encompasses so many topics. We kind of need to talk to other departments to get it done” (GCC Employee 3).

Also embedded in the city of Glasgow is the Thriving Places Programme, an initiative that concentrates on improving ten deprived neighbourhoods in the city, while allowing community members to be involved in decision-making processes at the same time so that their needs are met. At the national level, the Community Empowerment Act has existed since 2015, which aims to build the capacity of local communities so they can take ownership of buildings and spaces in their areas.

Existing shortcomings of policy support

Although institutional support for NBS co-production has been evident in several policies in Glasgow, there are certain shortcomings associated with the majority of them, which can ultimately have an effect on the success of NBS co-production processes in Glasgow. For example, certain interviewees brought up a number of issues in relation to the Thriving Places Programme in Glasgow. One member of the council is sceptical of its ability to achieve long-term community empowerment for sustaining co-production practices, stating:

“It’s like a rollercoaster – we’ll bring 10 up and then we’ll reassess and if there’s somewhere else, we’ll abandon them and bring the next 10 up... They’re going to get them to thrive, get them out of the bottom 10 of the Scottish Index of Multiple Deprivation and then move on to the next ones. That’s going to hinder it, those places are going to rise and fall and rise and fall” (GCC Employee 1).

Another interviewee from GSS raised the concern that with this programme, certain communities are excluded from being a part of it as they are relatively not as deprived as the other areas, which has caused further problems. They explained that:

“it supports certain projects and certain people to make things happen but in other areas it doesn’t at all because being told “you have the right to do this now” doesn’t mean it makes things happen” (GSS Employee).

Policy and strategy shortcomings are not exclusive to Glasgow, with many interviewees from the city of Genk also raising points about discrepancies between existing policies in the city that can prevent co-production, and specifically NBS co-production from becoming a mainstream practice. One interviewee from the Neighbourhood Development Department in Genk explained that one co-production process that he tried to carry out in the city caused conflicts due to the fact that the project didn’t align with policies embedded in another department. However, when the issue was brought forward to the mayor and aldermen, they thought that *“the value of neighbourhood was more important”* (SG Employee 3), and so the co-production process could move forward. This example highlights how important institutional support is at the higher levels (further elaborated on in Chapter 5).

In both cities, many interviewees also mentioned that co-production in policy does not always result in co-production in practice. One expert in Genk pointed out that it is rather easy decision-makers to agree that involving locals should be essential for city projects. However, there is a great difference between solely agreeing to this and actually fully believing in the process and ensuring that as much effort as possible is put in to make projects co-productive.

“In practice, we see serious is not always that serious, you still have to fight for the position of inhabitants, or non-functional information that cannot directly inform the bricks” (Genk Expert 3).

Similarly, although policies have been created to include citizens in decision-making processes, a member of GSS highlighted that many of the efforts have involved more of a consultative approach, rather than a co-productive one. On the other end, there have been times where the communities have been left to carry out projects on their own accord, with very little guidance from the council.

“You know there’s a lot of either, ‘here take that on yourself and get on with it’ or there’s the council leading and probably not doing much co-production, I don’t know. I mean I think there’s consultation, but co-production is a very different thing” (GSS Employee).

4.1.4 Existing Relationships for NBS Co-production

Existing relationships between city governments and local stakeholders

Facilitative versus dependency cultures

Historically, the governments in both cities have played a large role in the provision of services to local communities. Government officials have worked closely with communities in Glasgow and Genk, but using different approaches, thereby resulting in the development of different relationships and perceptions between governments and communities in both cities.

In Genk, the city government appear to have very strong connections and good relations with the local communities throughout the city of Genk. These favourable relations have facilitated community members’ motivation to participate in NBS co-production processes in Genk as there has been a good degree of pre-existing mutual trust and respect between communities and the city government which has developed over several years.

Many of those interviewed believe this is due to the city's history of the coal mining industry. In the past, many immigrants were brought to Genk and were employed to work in the mines. They were taken very good care of by their employers, who provided them with work, housing and healthcare.

“The mines used to take care of everybody that worked for them, so they provided work, healthcare, housing and then when the mines closed in the 70s, 80s, the city took that over. So, the city very much took over the role that the mines had, to a lesser extent. Also started to facilitate and support people to do stuff and organise things for themselves” (Genk Expert 1).

“And actually, the city had to take over a lot of this responsibility and that history makes that Genk actually was in very close communication and connection with their population, took over the role in a very good way” (Genk Expert 3).

When the city was forced to terminate all mining activity in the late 20th century, those employed by the mines were left jobless. Many were then employed by the Ford Motor Company in Genk and received benefits similar to the ones they received when they were employed in the mines. However, Ford shut down its facility in Genk in 2014, leaving many people unemployed once again (European Commission, 2019). Over the last few years, the city government has taken over this ‘care-taking’ role unofficially for many community members. They have been praised for carrying out this role in a very efficient and effective manner, helping locals in an inspiring, facilitative way without making them become too dependent on the city government. This has provided the city government with a broader scope of opportunity for NBS co-production processes to take place in the city, as many locals feel that they have the capacity to contribute meaningfully to the processes and do not expect the government to implement and govern NBS in the city alone. The relationships between the government and the citizens continues to strengthen during NBS co-production processes in the city, due to the facilitative approach undertaken, which has been enhanced even further by the neighbourhood managers.

In contrast, a number of GCC employees have described the existing relationships between the council and local communities in Glasgow as relatively weak, with several trust issues existing between the two groups. A few members of the council explained that, to some extent, a dependency culture appears to exist in certain areas in Glasgow, whereby residents have become accustomed to the council coming in and solving any issues that exist in their local areas.

“If your house gets broken, the housing association or the council will fix it. If there's a problem in the park, the council will fix it” (GCC Employee 1).

“And for me, there is perhaps a requirement for breast feeding a lot of the time within Glasgow's communities and it's because that's the way it's always been done in the past” (GCC Employee 4).

This issue has existed in Glasgow since the 1980s, when unemployment rates were high and residents didn't have the capacity to deal with existing problems on their own and has persisted up until now in many deprived parts of the city. This has made it quite difficult for city council members to engage the more deprived communities in NBS co-production processes as the approach to projects like these have been historically done in a top-down manner. On top of this, GCC has historically been viewed in a more negative light compared to the government in Genk as it is also referred to as the “Local Authority”. This has created a perception among locals that the council perceive themselves as the most powerful in the city. At the Growchapel business model canvas workshop I attended, when asked about

what governance for NBS-related initiatives looks like within the city, one participant simply responded with “*of the hierarchy?*”. One council member stated that one implication of this has been that there has been more resistance towards the “authority” of the council, which has resulted in a lack of local openness to participating in NBS co-production processes with the council.

Informal engagement settings to build relationships

One approach that has been used in Glasgow to circumvent the issues raised above is through informally engaging with local community members in settings that are familiar and comfortable to the locals (as mentioned in Section 4.1.1). Two employees from a social enterprise in a local community in Glasgow highlighted the good links they have with the council, reporting that council employees often come to visit them, helping out and speaking to the locals on the ground about pertinent issues in the area. One explained that “*It’s great that our service users get to see the council as well because they know they’re being supported... it’s not just ticking a box, there’s a genuine interest*” (Social Enterprise Interviewee 2a). Having engaged with locals during community events in the past, council members have been able to break down barriers and improve the local perception of the council to a certain degree which has increased the willingness of local organisations and local community members to embrace NBS co-production processes and collaborate with the city council.

Existing relationships between city government departments

Existing relationships between departments influenced by embedded working traditions

In both cities, it is evident that the strength of interdepartmental relationships is determined by how the governments are organised and by the institutional spaces that are provided for colleagues to work collaboratively with each other. As Genk has a strong history with co-production, thanks to political figures such as the mayor and aldermen, the city departments have been provided with ample space to work collaboratively on projects. Interdepartmental relationships in Genk have been built over several years as a result which has facilitated the ease at which NBS co-production processes are organised. City departments have been able to connect with each other through the working group which was formed to mainstream collaborative processes within the city. Through this working group, departments have become more open to each other’s work and continuously look for opportunities to collaborate with each other.

As a result of the provision of institutional space for collaboration within the city government in Genk, the relationships between the Environment Department and the Social Departments have blossomed in particular due to the recent employment of a new team member who splits her time working between the two departments. Having this arrangement has allowed the departments to realise that the work they both do is intertwined, resulting in both becoming more open to exploring ways they can organise NBS co-production together. Those in the Social Department have learned more about the Stiemer Valley project and opportunities for NBS in Genk, while colleagues in the Environmental Department have gained a lot of knowledge on community engagement in the city, according to the director of neighbourhood development:

“I learned a lot about NBS, how water should infiltrate in the soil, how we can maybe redevelop the way that the river will flow. They learned a lot about how dealing with participatory processes in the neighbourhood, how working together with different kinds of stakeholders in the neighbourhood. We could learn a lot from each other” (SG Employee 3).

In contrast, the working environment in Glasgow City Council has historically involved city departments working in a very siloed manner, with little opportunities for organising collaborative

projects, such as NBS co-production processes. Employees from different departments have tended to adhere to their own specific roles and responsibilities within the council, creating a risk-averse culture, which appears to be even more evident in recent years since austerity measures were introduced as a result of the financial crisis in the late 2000s. This resulted in several staff reductions and further competition for resources and funding, which led to discouraging employees to take risks and strengthening divisions between departments. This has made the process of encouraging different departments to get involved in NBS co-production processes very tedious in Glasgow.

NBS co-production processes can negatively impact interdepartmental relationships

Although Genk's government appears to have more robust organisational structures in place that allow interdepartmental relationships to be built more easily than in GCC, this has not automatically resulted in all departments forming strong relationships with each other. Similar to experiences in Glasgow, the Environment and Sustainable Development Department in Genk have found it difficult to encourage certain departments to be open to the process of co-production. In particular, conflicts have arisen between them and colleagues in the Building and Infrastructure Department who, like many council employees in Glasgow, are used to adhering to very specific roles and ways of doing things within the organisation, and have no prior experience with co-production:

"...in the city of Genk, not all departments are experienced with co-production and participation... Genk has a tradition of participation, but I think that's more in the social kind. But the infrastructure department, that's more difficult" (SG Employee 2).

When asked more in depth about what the conflicts have looked like between them and their building and infrastructure colleagues, one employee from the environment and sustainable development department explained that they've *"had really tough discussions with them. We shouted at each other last time and we don't understand each other, and they really have another view of society and the world in my opinion"* (SG Employee 1). As NBS co-production processes are developing further in Genk, the relationships between these departments appear to be worsening. Employees from the building and infrastructure department have consistently shown a lack of openness towards co-production (described in further detail in Section 4.2). However, as co-production processes should include all relevant stakeholders to ensure success (Miller and Wyborn, 2018), there is still strong determination among those organising NBS co-production processes to convince the building and infrastructure department to get involved, despite the persistent conflicts that have arisen:

"My superior has to fight a lot. We don't give in on this, it's not like we say, 'ok they don't want it so we don't do it', no. So, it's really struggling and fighting and conflict. But she does the conflict" (SG Employee 2).

4.2 Individual Conditions

4.2.1 Individual Openness

Individual Openness to Co-production

Recurrent lack of openness between locals and experts

An occurring issue evident in both cities in relation to individuals' openness to co-production is that there has been a reluctance at times for certain experts and local citizens to accept each other's knowledge and information.

In Glasgow, many interviewees, from the city government and local organisations alike, have stated that the majority of stakeholders have been very open to sharing and receiving knowledge and information from different types of individuals. That being said, issues and conflicts have arisen between certain experts, ecologists in particular, and local communities in Glasgow. Ecologists have been reluctant to consider local community needs and knowledge in relation to the maintenance of natural urban spaces, due to the fact that their focus has been on preserving water vole populations in the city. They have not been entirely open to the information that locals have contributed as they believe their biodiversity solution is the most effective. On the other hand, locals have been less open to these biodiversity solutions as their needs have not been incorporated.

Likewise, local stakeholders in Genk have often shown scepticism towards expert knowledge as they feel as though they don't have a true proper grasp of what is going on in the area due to the fact that they do not live there and are not experiencing what the locals are experiencing, as mentioned by an employee of the city government:

“...citizens say that all these scientists think they know it, but they really don't know how it is. They're not living in the valley, they don't see the water that is overflowing, they don't see the dirt that is running through the water. Sometimes they say... 'they don't even come here to make all their plans, they just stay in Brussels or wherever and they're behind their computers with programmes that are predicting how it would be if they made changes but in fact they don't know'” (SG Employee 2).

Previous processes that have brought these two distinct groups together, along with other groups such as Natuurpunt nature organisation, have been successful, according to the same interviewee from the city government. During one intimate process focused on improving water flow, water experts presented their objectives to the other stakeholder groups, including local citizens, and also asked for their thoughts and ideas. The interviewee from the city government explained that it was a successful process, with a mutual understanding having formed between the groups. She also suggested that organising more similar processes in the future could stimulate people to become more open to exchanging knowledge and information with others, rather than involving them in separate co-production processes. Similar processes in Glasgow also seemed to have facilitated stakeholders' openness towards each other, whereby as NBS co-production has become more prolific in the city, stakeholders are becoming more aware that spaces for nature and spaces for society cannot be kept completely separated from each other in the urban setting:

“Ecologists understand that unless we find a way for nature and humans to co-exist in cities, there won't be space for nature. So, they're very open to these sorts of more creative solutions to these problems” (GCC Employee 1).

Lack of openness to co-production from city government employees

A lack of openness towards co-production has also been witnessed to a certain extent in both city governments. In Glasgow, various colleagues' lack of openness to co-production relates to the existing weak relationships between city departments and the risk-averse culture that is embedded within the working environment of many departments (as previously discussed in Section 4.1.4). In Genk, colleagues in the Building and Infrastructure Department have shown a true lack of openness towards co-production (as previously mentioned in Section 4.1.4). In particular, they are not open to the local knowledge and they really don't see the added value of involving citizens in the process in order to gather this knowledge needed for the project. They believe that involving locals would essentially be a

waste of time as they are not likely to contribute any novel knowledge or information that isn't already known by the city government or experts. This has sparked a series of arguments and debates between these two departments, which has resulted in a number of delays in trying to organise smooth NBS co-production processes.

“We said we wanted to have the opinions of the citizens and he said, ‘ok but of course we knew what would come out of that, it’s not new, they don’t have knowledge that we don’t have’. He said, ‘you do it but it’s a waste of time’” (SG Employee 2).

As NBS co-production processes progress in Genk, the lack of openness towards co-production from the Building and Infrastructure Department appears to continue to grow still, with no solutions emerging to deal with this problem.

Individual Openness to NBS

Personal memories of and interests in NBS as drivers to engage in the process

It is clear in both Glasgow and Genk that those who have shown more of an openness to NBS are individuals who have a significant interest in the natural world and who have fond memories of seeing, hearing and being in nature. A lot of these individuals from both cases seem to be older people.

Most individuals who have got involved in the Stiemerbeek Valley project in Genk are older individuals who possess vivid memories of playing in the valley in the past as children, before Genk grew in size and transformed into a city. These personal connections to the valley that the older citizens possess have inspired them to get involved. They have shown high levels of openness to NBS as they are motivated to restore the valley to a healthy state, similar to what it was like in the past. On the contrary, many of the younger inhabitants of Genk do not have very personal connections with the Stiemerbeek Valley from their childhood as they only immigrated to Genk later in life to work. This has resulted in very homogenous NBS co-production processes in terms of participants, with the majority being older white inhabitants.

“I think the people involved until now are the people who have memories from their own childhood. They went to play there. And a lot of the new inhabitants, they didn’t even know this spot” (SG Employee 3).

In Glasgow, it is also apparent that older generations appear to be more open towards the idea of NBS co-production, frequently recalling vivid memories of their connections with nature as children.

“Especially people who are sixty or over remember when there were birds in their gardens... I had a conversation with one of them and she says she feels it viscerally as something in her well-being, in her life and she knows it’s missing, and she wants it back and she’s really excited by what we’re proposing. But then you have other people, often mid 30s sort of age, they never knew that. And they tend to be more mistrustful” (Social Enterprise Interviewee 1).

As well as personal memory, direct personal impact seems to also play a role in individuals’ openness towards NBS co-production, whereby individuals who are more open seem to be those who are more likely to be directly affected by the processes. For example, with the Growchapel project, one member of a social enterprise explained that certain participants may be less open than others to the idea of NBS due to the fact they are relatively further away from the location of the NBS, so they won’t reap the benefits of NBS implementation as much as those who are in closer proximity. This has also been the

case in Genk, where stakeholders' interest in the Stiemerbeek Valley tends to be correlated to their proximity to the valley and how much they use it. A cause for concern here is that the stakeholders who are situated further away from the valley tend to be from the more minority groups. Many of these individuals have not got involved in the processes as they never use the valley. There are concerns about increased gentrification as a result (discussed further in the following chapter).

Table 3. Summary of Results

Conditions	Genk	Glasgow
Organisational Conditions		
Resources	<p>Funding:</p> <ul style="list-style-type: none"> - Funding timeframes can restrict NBS co-production. - Co-production requirements in certain funding streams at the Flemish level. <p>Time:</p> <ul style="list-style-type: none"> - Strict timeframes with funding streams. - A lot of time needed to organise good co-production. - Participants often overlook the time that is required to make complex processes seem simple. <p>Infrastructure:</p> <ul style="list-style-type: none"> - Inclusive and accessible spaces for events. - E.g. Stiemer Loft workspace and Stiemer Lab. 	<p>Funding:</p> <ul style="list-style-type: none"> - Funding timeframes can restrict NBS co-production. - Lack of internal funding for NBS co-production due to austerity measures and priority given to other city departments. <p>Time:</p> <ul style="list-style-type: none"> - Strict timeframes with funding streams. - A lot of time needed to organise good co-production. - Organisers sometimes don't feel the time invested is appreciated by participants. This can be demotivating for organisers. <p>Infrastructure:</p> <ul style="list-style-type: none"> - Inclusive and accessible spaces for events. - E.g. events in locations familiar to participants and easily accessible by public transport.
Skills	<ul style="list-style-type: none"> - Professionals (internal and external) experienced in participatory processes. - Communication struggles – lack of tools being used to communicate to wider audiences to reach “unusual suspects”. - Avoidance of explaining the concept of NBS. Instead, the focus is on explaining tangible project aims. 	<ul style="list-style-type: none"> - Professionals (internal and external) experienced in participatory processes. - Communication struggles – how to communicate the meaning of NBS to participants.
Institutional Support	<ul style="list-style-type: none"> - Institutional embedding of support for co-production by the city mayor and aldermen. “Creating the city together” as the city slogan. - Discrepancies between co-production policies and other city policies. - Co-production in policy does not always mean co-production in practice. 	<ul style="list-style-type: none"> - Institutional embedding of support for co-production seen in many policies and strategies - Organisers actively trying to engage with politicians and decision-makers to get co-production on the higher level political agenda. - Shortcomings with certain city strategies e.g. Thriving Places.

		<ul style="list-style-type: none"> - Co-production in policy does not always mean co-production in practice.
Existing Relationships	<p>Existing relationships between city governments and local stakeholders:</p> <ul style="list-style-type: none"> - Facilitative culture since the coal mines closure has helped SG to encourage locals to participate. <p>Existing relationships between city government departments:</p> <ul style="list-style-type: none"> - Institutional support from city mayor and aldermen has allowed city departments to collaborate on a regular basis. - - NBS co-production processes have negatively impacted relationships between Environment and Sustainable Development department and Building and Infrastructure department. 	<p>Existing relationships between city governments and local stakeholders:</p> <ul style="list-style-type: none"> - Perceived dependency culture since high unemployment rates in the 1980s between locals and GCC has made it more difficult to motivate locals to participate - Informality has enabled relationships between local stakeholders and GCC to be strengthened. <p>Existing relationships between city government departments:</p> <ul style="list-style-type: none"> - Lack of institutional space for city departments to collaborate. Risk-averse culture, where colleagues tend to stick to their own roles and responsibilities.
Individual Conditions		
Individual Openness to Co-production	<ul style="list-style-type: none"> - Lack of openness between locals and experts. - Lack of openness from the Building and Infrastructure department to local knowledge. 	<ul style="list-style-type: none"> - Lack of openness between locals and experts. - Lack of openness to co-production among GCC employees due to risk-averse culture.
Individual Openness to NBS	<ul style="list-style-type: none"> - Personal memories and interests in NBS as drivers to engage in the process 	<ul style="list-style-type: none"> - Personal memories and interests in NBS as drivers to engage in the process

5 DISCUSSION

The discussion chapter provides a detailed account of the main findings of this thesis based on the results. This chapter also examines and reflects on how these findings compare to the existing literature on co-production. The significance of each finding is described, as well as the implications this has for NBS co-production processes in Glasgow and Genk moving forward, as well as NBS co-production in general.

In this chapter, I first illustrate how context conditions are not mutually exclusive and can influence each other, as well as the process. This is followed by an account of the importance of institutional support for co-production, particularly at the higher political levels. Next, I describe how the framework developed for this thesis is non-linear, whereby NBS co-production processes can also influence the context conditions. This is followed by an explanation of the importance of informality for more successful NBS co-production processes. Then, I explain the various issues associated with ensuring inclusivity throughout NBS co-production processes. I then give a brief account into how experiences with the COVID-19 global pandemic can be seen as an emerging context condition that can influence NBS co-production processes. Lastly, the limitations of this research project are explained.

5.1 Main Findings

5.1.1 Context conditions are not mutually exclusive

The main aim of this research project was to address the existing research gap, which was that the context in which NBS co-production processes take place is often overlooked (Howlett and Ramesh, 2017). The empirical research provides insights into this and has highlighted the influence that context conditions can have on NBS co-production. This was important in order to understand how co-production processes are facilitated or hindered by these existing context conditions (Sorrentino et al., 2018). This thesis additionally reveals an interesting novel finding in relation to the context, whereby not only can context conditions influence co-production processes but, they can also influence and shape other context conditions in the cities. This thesis shows that the context conditions can influence each other positively or negatively. For example, as seen in Genk, co-production being a prerequisite in Flemish funding streams has had a positive impact on institutional support for NBS co-production at the local level. At the same time, the available funding for NBS co-production can have negative effects on other context conditions. This is illustrated in the results section (page 22-23) where certain funding streams available in both Glasgow and Genk have resulted in limited amounts of time available for NBS co-production, making less room to establish effective processes despite sufficient funds.

This observation that context conditions are not mutually exclusive should be given sufficient consideration when designing and carrying out NBS co-production processes in cities. It illustrates the significance of context conditions, not only in relation to the process, but in relation to each other as well. While context appears to be under-researched within the topic of co-production, the literature that does discuss context has tended to look at context conditions separately from one another (Voorberg et al., 2015). However, this thesis highlights the importance of examining the interrelationships between the context conditions within the cities. This can provide a better picture as to what knock-on effects they can have on each other, which can ultimately influence NBS co-production processes in the cities. These knock-on effects can be intended or unintended. Identifying the linkages between context conditions can allow cities to more clearly determine how NBS co-production processes could play out.

Cities can remain aware that, although certain conditions may appear to be beneficial for the process, they could adversely affect other context conditions, thereby creating unintended challenges for co-production.

5.1.2 Importance of institutional support at the higher political levels

Having carried out research in both Glasgow and Genk, it is evident that adequate *institutional support* for NBS co-production, particularly at the higher political levels (from mayors, politicians, policy-makers, etc.), is of utmost importance to the cities and is seen as one of the most crucial context conditions to ensure. This is because it can have fundamental impacts on other context conditions, as well as on the NBS co-production processes in both cities. This is evident in Genk, whereby the mayor of the city and many aldermen have supported the idea of co-production at the government level and at the city-wide level, which has in turn increased many citizens' and government employees' openness to co-production as a process. In Glasgow, there have been more challenges to receive institutional support and encourage involvement of local policy-makers, which has resulted in more limited opportunities for interdepartmental working in the city council. This has made it more challenging to put co-production on the political agenda, resulting in weaker relationships between city departments. To overcome these challenges in Glasgow, attention is being put on increasing efforts to talk with and influence policy-makers at the higher levels within the city council.

This point above is mirrored in much of the existing literature on co-production, whereby many authors have frequently expressed that without a foundation of adequate institutional support at both the local and the national level, co-production processes are not likely to be very successful in nature (Berkes, 2009; van der Hel, 2016). Edelenbos (2005) explains that the involvement of powerful figures such as politicians and elected government representatives is essential to ensure that co-production is fully supported and becomes ubiquitously embedded as a legitimate and effective governance approach in cities. Without their involvement and support, co-production processes run the risk of occurring in parallel with the more prolific, traditional governance and decision-making practices. According to Ferlie et al. (2019), this may result in the outcomes of co-production being discarded, ultimately limiting the perceived potential of co-production as an effective process. In addition, institutional support from the higher levels in local and national governments can contribute to a higher level of capacity and a greater abundance of resources that are needed to ensure successful co-production processes (Buijs et al., 2019). When local politicians are directly involved in co-production processes it can also contribute to inspiring and empowering communities in the local area to take action (Bussu and Galanti, 2018).

For NBS co-production processes in Glasgow and Genk, connecting with political stakeholders has been a vital part of the process to undertake. The intention of this is to increase institutional support for NBS co-production in order to cement it as a valued approach to achieving sustainable urban governance. However, it seems that not a lot of attention has been paid to the possible negative consequences of involving these types of stakeholders. While many authors have described the institutional value that political figures can bring to co-production processes, various others have brought attention to the potential issues that can ensue as a result of their involvement. As mentioned previously, co-production will inevitably involve stakeholders with different levels of power entering the process (Freeth and Caniglia, 2019). Although co-production seeks to level existing power differences during the process, certain authors have stated that these power differences can actually be reinforced as a result of co-production (Chatterton et al., 2018). When politicians and elected representatives actively participate in co-production processes, there is the danger that they may have a hidden agenda. Often, they do not actually consider the information and knowledge generated during co-production processes and disregard it when implementing policies. Political elites often view co-

production as a tokenistic process for themselves, whereby they are presented with the opportunity to promote themselves and their ideas to other stakeholders (Chatterton et al., 2018). Co-production can be used by these figures of authority for implicit manipulation and control, planting their own discourses in other stakeholders' heads (Bezner Kerr et al., 2018). Power differences can become more imbalanced as a result. Although there are no empirical examples of this occurring in either Genk or Glasgow, it is an important matter that should continue to be given full consideration when organising and carrying out NBS co-production processes in cities in order to prevent certain stakeholders from gaining more power over others and furthering their own personal agenda. Although institutional support for NBS co-production from the higher government levels has been deemed as vital in both cities, they must remain aware that this perceived support for the process does not necessarily mean true support for shared decision-making power

5.1.3 NBS co-production processes can influence context conditions

The issue raised above regarding the strengthening of power differences as a result of co-production processes relates to the finding from the empirical research of this thesis that the conceptual framework is in fact non-linear. In addition to providing insights into how NBS co-production processes are context-dependent in Glasgow and Genk, this research project also discloses how the context conditions can be process-dependent, by which NBS co-production has an influence on how the context is shaped in the cities. It has brought to light that co-production can have various effects on the context. In each city, NBS co-production processes have had positive effects on context conditions which has facilitated the processes. At the same time, NBS co-production processes have also shaped context conditions negatively, making it more difficult to design effective processes. Furthermore, certain context conditions have completely changed, while others have been replicated and reinforced as a result of NBS co-production processes.

These findings above highlight the importance of investigating not only how the context influences NBS co-production processes, but how the processes impact the context. Many authors state that it's imperative to understand the city contexts in which co-production processes are carried out in order to identify what context conditions facilitate and what context conditions hinder co-production (Munoz-Erickson et al., 2017, Sorrentino et al., 2018). However, this thesis brings to light that it is also valuable to explore how NBS co-production as a process can facilitate the creation of more favourable context conditions, while also remaining aware of negative ramifications it could have on the context. Various authors have implicitly touched on this. For example, both Chatterton et al. (2018) and Buijs et al. (2019) found that institutional support for co-production can be created as a result of local government representatives and citizens actively engaging with one another during co-production processes. According to Ferlie et al. (2019), collaborative dynamics during the process can influence stakeholders' motivations to participate further in the process. This is evident in both Glasgow and Genk, where some locals' openness to NBS co-production has dwindled as a result of NBS co-production processes.

Table 4. Empirical examples of the different ways NBS co-production can influence context conditions

	Process completely changes context condition	Process reinforces existing context condition
Positive	Glasgow: the once weak existing relationships between council employees and locals residents have now become stronger due to informal engagements with each other throughout the process.	Genk: strong existing relationships between local residents and city government have become stronger as a result of engaging processes (with support from neighbourhood managers).
Negative	Both cities: some local residents who were originally open to NBS co-production became less open to it after participating in the process due to the complexity involved.	Genk: as NBS co-production processes have progressed, the Building and Infrastructure department have become even less open to co-production than they were before.

5.1.4 Importance of Informality throughout NBS co-production processes

Having illustrated above how co-production processes can influence context conditions, I want to bring attention to one element of the process in particular, which has had beneficial impacts on various context conditions in both Glasgow and Genk. That is the incorporation of *informality* into NBS co-production processes. Existing literature on co-production has highlighted the role that informality can play during co-production processes. Although, this has been explained in a somewhat vague manner. Broadly speaking, incorporating informality into a co-production process can result in breaking down boundaries, developing trust (Chatterton et al., 2018) and resolving conflicts (Stepanova et al., 2020). This thesis adds to the existing literature on informality, providing more concrete examples into why it's beneficial to incorporate into NBS co-production processes and how it can create more favourable context conditions in the cities for future processes. Informality can contribute to local communities feeling more supported by the city governments. It allows city government officials to understand local issues more clearly by informally interacting with locals in their own communities. It can also enable city government officials to better connect with one another, outside of the formal city government environment. Through informality, context conditions have been influenced positively, with existing relationships between stakeholders being strengthened and individuals' openness to NBS co-production increasing.

Within the co-production literature, different authors have also given different limited accounts of what informal processes looks like. For example, Campbell et al. (2016) explain that informality comes in the form of "hanging out" opportunities for stakeholders during the process. On the other hand, Stepanova et al. (2020) simply state that stakeholder forums can be considered as informal processes. This thesis provides evidence which illustrates that informal processes go beyond solely organising a normal stakeholder forum or providing spaces for "hanging out" during co-production processes. Informal engagement processes can and should take place at any point in time. This includes the very beginning of the planning stages, as was the case in Glasgow, where city council colleagues went on informal site visits. The interdepartmental relationships began to strengthen as a result, as did the relationships between city council employees and the locals. Informal engagements can also continue to occur after official co-production processes end. This has been the case in Genk as a result of the Stiemer Living Lab, an informal environment where different types of stakeholders can interact with each other and create new relationships, even after NBS co-production processes have ceased. These informal relationships formed can then facilitate the success of future NBS co-production processes.

Nevertheless, informality does not come without challenges, despite it being considered an essential component of NBS co-production processes. In Genk, for example, some representatives from the city government didn't feel as comfortable with how informal some of the processes were, as informality is not something they are traditionally used to. This closely relates to much of the co-production literature which describes how city government officials are reluctant to co-production (Bovaird and Loeffler, 2012). Co-production literature has also brought up the issue that when informality is sometimes introduced to the process, it can influence the perceived legitimacy of the process for decision makers, whereby outcomes of informal processes are not adopted into policy (Edelenbos, 2005). These additional insights into informality are valuable for planning future NBS co-production processes in cities so those organising can be conscious of the various scenarios that could manifest when employing informality.

5.1.5 Challenges of ensuring inclusivity for NBS co-production processes

Inclusivity is another process component that has been deemed as vital in Glasgow and Genk, which can also have potential impacts on context conditions. Both cities have recognised the importance of ensuring inclusivity in NBS co-production processes, a point which has been given great attention in the literature. However, a discrepancy exists between the findings from the empirical research of this thesis and the literature. The literature tends to focus on highlighting the necessity of inclusivity and the benefits that it can manifest for the process (Miller and Wyborn, 2018, van der Jagt et al., 2019). However, many co-production authors have paid little attention to the potential issues and challenges with inclusive co-production processes. I argue that many variables must be considered when trying to organise inclusive NBS co-production processes. This includes the potential difficulties of designing inclusive processes as well as unintended consequences of inclusive processes, which are described below.

As discussed previously (page 11), a number of academics have stated that co-production should include all different types of stakeholders from the very early stages of the process (Muñoz-Erickson et al., 2017, Wiek et al., 2012). However, this thesis shows how this can be problematic. It has unveiled that there is a risk that, when locals are involved at the very early stages, participation fatigue and/or frustrations can develop quickly. This is due to the inevitably long time period between project vision and project implementation. This can negatively impact the level of openness towards NBS co-production and the relationships between city governments and locals.

Another issue associated with inclusivity in both cases is the uncertainty surrounding the integration of different knowledges during NBS co-production processes. This has been considered as a key part of co-production, where different types of stakeholders (i.e. government officials, scientific experts, local communities) come together to combine their knowledge to enrich the process (Folke et al., 2005). However, in both cities, concerns exist around potentially deterring different types of stakeholders by carrying out NBS co-production processes in this manner. Locals may feel overwhelmed by the topics being discussed, while experts may feel like their time is being wasted discussing subjects that they are already familiar with (i.e. NBS), with locals. This relates to a particular point raised by van der Hel (2016), who explains that more inclusive processes, specifically for knowledge co-production, could potentially limit the transformative potential of the process. As mentioned in the previous chapter (page 26), to avoid these issues in Genk, they have been inclined to organise separate processes for locals and experts, with the intention of keeping both groups content. I debate that this solution goes against the essence of co-production, due to the fact that the stakeholders do not have the opportunity to integrate their knowledge and information together. Although the complexity of knowledge integration could

frustrate and demotivate stakeholders from engaging, I argue that a lack of knowledge integration processes between stakeholders could be equally as frustrating and demotivating. I saw this in Genk, where a city government employee explained to me that there have been increasing tensions between locals and experts over perceived legitimacy, due to the lack of interaction between the two groups (page 32).

Lastly, in relation to inclusivity, it became apparent during my research that ensuring that NBS co-production processes are fully inclusive, with all interested and relevant stakeholders and their knowledges involved, is extremely difficult to do. This is influenced by the various context conditions in cities as described in the previous chapter. In addition, it may also be influenced by the sheer scale of NBS co-production processes in both cities, as well as the number of stakeholders who are deemed relevant and interested. Including relevant stakeholders proves to be particularly difficult given the fact that not all relevant stakeholders may necessarily be interested. This is evident among some of the more disadvantaged demographics, who have shown a reduced interest in NBS co-production processes in both cities due to other priorities. However, these stakeholders are still relevant as NBS co-production processes are likely to affect them. The existing literature has discussed the risk of increased inequity in public services as a result of a lack of participation among these disadvantaged groups, strengthening the divide between them and the more privileged demographics in cities (Sorrentino et al., 2018). Therefore, efforts to include disadvantaged groups in NBS co-production should still persist in order to deal with the growing risk of green gentrification in the cities (Anguelovski et al., 2019). These issues highlighted in this section indicate how complex inclusivity can be for co-production. In light of this, having shown the positive effects of informality in the previous section, I suggest that a potential way to deal with these issues could be to integrate informality in a more pervasive manner throughout NBS co-production in the cities. By organising more informal events before, during and after NBS co-production processes, this would give locals, experts and city government officials further opportunities to get acquainted with one another in a more natural manner, where a common ground between the groups could be more easily created and maintained for long periods of time.

5.1.6 Experiences with COVID-19 as an emerging context condition

One final significant observation, from my research in Glasgow and Genk, and from a broader perspective across the globe, that I would like to bring attention to is how the *COVID-19* pandemic and individuals' experiences with it can impact NBS co-production processes. At first glance, one could argue that the Coronavirus has had predominantly negative impacts on NBS co-production processes in cities across the globe. Strict lockdowns and social distancing restrictions have meant that many co-production events have been cancelled or postponed, working arrangements within city governments have changed, and public budgets for NBS co-production have become tighter. Despite this, COVID-19 has also highlighted new opportunities for NBS co-production in cities, positively influencing other context conditions, as well as the NBS co-production processes themselves.

Multiple studies conducted in recent months have highlighted the importance of natural urban areas during this pandemic, with many people now experiencing truly how beneficial nature is for their physical and mental health in cities (Fisher and Grima, 2020). The natural spaces present in cities are being utilised more as a result (Venter et al., 2020), allowing people to recognise the potential that NBS implementation has in cities. This has been evident in both Genk and Glasgow, where locals are showing a heightened interest in NBS projects that are taking place as the demand for high quality natural open areas escalates. The pandemic has also forced different groups to come together to deal with the challenges that have manifested. This has allowed local governments, organisations and

communities alike to realise the advantages of working collaboratively during difficult times like this. The acceptance of co-production as a process has now become more prolific in places, with a rapid increase in the number of co-production initiatives (Steen and Brandsen, 2020). It appears that many individuals are now conveying a greater interest in participating in co-production projects as a result, ultimately providing opportunities to establish more effective and inclusive NBS co-production processes moving forward.

5.2 Limitations

Although this thesis has provided a variety of practical insights into NBS co-production as a context-dependent process, the limitations of the study must not be overlooked. As briefly discussed in the methodology chapter, COVID-19 had an impact on the fieldwork that I was able to do in Genk. As a result, the reliability of the data from Genk was affected, having not had the opportunity to conduct field observations, site visits and interviews with a larger variety of stakeholders, which ideally would have included local residents, organisations and businesses. However, the majority of the interviewees in Genk have worked very closely on NBS co-production processes and are very knowledgeable about the topic, providing me with many rich stories and insights. Due to the limited time I had in Glasgow, I also did not get the opportunity to talk with as many representatives from these groups there. However, I gained insights into experiences of these groups with NBS co-production through attending the two workshops during my time there.

Another issue with ensuring reliability of the results was the fact that a number of interviews were retrospective, whereby the interviewees had not actively taken part in any recent processes, but rather processes from several months/years ago. Many interviewees also spoke anecdotally about their own experiences with NBS co-production and with the context conditions. Therefore, although I have identified and described the various context conditions that have influenced NBS co-production in both cases, this thesis does not objectively prove how exactly the context conditions have had an impact on the processes. Rather, it provides an indication of the effects of the conditions, based on a range of personal experiences and anecdotes.

Ensuring the external validity of this project was very difficult as the practice of co-production is not deemed as generalisable (Sorrentino et al., 2018). The generalisability of the research is limited for several reasons. Firstly, the cities I investigated were limited to Western Europe, so it is difficult to determine whether the outcomes of this thesis could apply to other cities, particularly outside of this region. Additionally, there is the matter of what is being co-produced (Brix et al., 2019). Although I have provided insights into how co-production is context-dependent, this only applies to NBS co-production processes. Therefore, it is not possible to say whether the context conditions would affect co-production processes in the same way if it were something else being co-produced. However, the framework is robust and flexible, and it is possible to adapt it, depending on what is being co-produced.

6 CONCLUSION

The purpose of this thesis was to investigate the complexity of NBS co-production processes by examining the various context conditions that can have an influence on how said processes are organised and carried out in cities. I have given an in-depth account of the organisational conditions and individual conditions present in the cities of Glasgow, Scotland and Genk, Belgium, and how these conditions have impacted NBS co-production thus far. The insights highlighted throughout this thesis are important and contribute to closing the research gap by providing a deeper understanding of co-production as a context-dependent process.

Adding to the literature that has highlighted the complexity of co-production, this thesis has also provided new insights into the complexity of co-production as a governance approach for NBS in cities, and as such has augmented current research literature on the subject. It has indicated that there is a strong interconnectedness between the context and the co-production process, whereby the relationship is not simply a linear one. Context conditions can affect other context conditions which can affect the process, while the process of co-production can also have several effects on the existing context conditions. In light of the current COVID-19 pandemic, this thesis also reveals the importance of taking context into consideration when organising NBS co-production processes due to the ever-changing nature of context conditions in cities, whereby said context conditions can evolve during the processes.

Moving forward, the insights that I have expounded throughout this thesis will provide the cities of Genk and Glasgow, as well as other cities that are co-producing NBS, with a better understanding of NBS co-production processes and their relationship with the context. With a heightened awareness of this relationship between context and process, it is my aspiration that, those responsible for organising NBS co-production processes will remain conscious of the opportunities and challenges that can arise, and ultimately be better equipped to prepare and accomplish them successfully.

5.3 Recommendations for further research

Based on the findings and limitations presented above, I recommend that further research is needed to understand NBS co-production processes and to what extent they are influenced by context conditions, in order to understand how best to design the processes in different settings. Additional in-depth research in both Glasgow and Genk, whereby more interviews could be carried out and project site visits could take place, would contribute to developing more concrete conclusions about the two cases and could provide further insights for other cities implementing NBS using a co-production approach. However, this would currently be difficult due to the COVID-19 pandemic.

This thesis also suggests that there is scope for further novel research which would contribute to developing a deeper understanding of NBS co-production, as well as co-production in general. For example, the possibility of further investigation into the non-linearity of co-production should be considered for future research, whereby the effects of co-production on the context conditions are examined in more depth. Additionally, as a result of the pandemic, we are now living in unprecedented times, where the meaning and process of NBS co-production may evolve as a result. Moving forward, it would therefore be critical to research and examine how NBS co-production processes, as well as the general meanings of NBS and co-production, may evolve and what this means for the contexts in which NBS co-production processes are organised and carried out.

7 REFERENCES

- Albert, C., Spangenberg, J. and Schröter, B. (2017). Nature-based solutions: criteria. *Nature*, 543(7645), 315-315.
- Alcamo, J., Ash, N. J. and Butler, C. D., et al. (2003). Ecosystem and human well-being. A framework for assessment. Millennium Ecosystem Assessment. Island Press, Washington, D.C. 245 pp.
- Alford, J. (2002) Why Do Public Sector Co-Produce? Towards a Contingency Theory. *Administration and Society*, 34(1), 32–56.
- Anguelovski, I., Connolly, J. J. T., Garcia-Lamarca, M., Cole, H., & Pearsall, H. (2019). New scholarly pathways on green gentrification: What does the urban ‘green turn’ mean and where is it going? *Progress in Human Geography*, 43(6), 1064–1086.
- Armitage, D., Plummer, R., Berkes, F., Arthur, R., Charles, A., Davidson-Hunt, I., Diduck, A., Doubleday, N., Johnson, D., Marschke, M., McConney, P., Pinkerton, E. L. and Wollenberg, E. K. (2009). Adaptive co-management for social-ecological complexity. *Frontiers in Ecology and the Environment*, 7(2), 95–102.
- Armitage, D., Berkes, F., Dale, A., Kocho-Schellenberg, E. and Patton, E. (2011). Co-management and the co-production of knowledge: Learning to adapt in Canada's Arctic. *Global Environmental Change*, 21(3), 995-1004.
- Bäckstrand, K. (2003). Civic science for sustainability: reframing the role of experts, policy-makers and citizens in environmental governance. *Global Environ. Polit.* 3(4), 24–41.
- Balian, E., Eggermont, H. and Le Roux, X. (2014). Outputs of the Strategic Foresight workshop “Nature-Based Solutions in a BiodivERsA context”. Brussels, June 11-12, 2014. BiodivERsA report, 45 pp.
- Berkes, F. (2009). Evolution of co-management: Role of knowledge generation, bridging organizations and social learning. *Journal of Environmental Management*, 90(5), 1692-1702.
- Bezner Kerr, R., Nyantakyi-Frimpong, H., Dakishoni, L., Lupafya, E., Shumba, L., Luginaah, I., & Snapp, S. S. (2018). Knowledge politics in participatory climate change adaptation research on agroecology in Malawi. *Renewable Agriculture and Food Systems*, 33(3), 238–251.
- Boothroyd, R., Flint, A., Lapid, A., Lyons, S., Jarboe, K. and Aldridge, W. (2017). Active involved community partnerships: co-creating implementation infrastructure for getting to and sustaining social impact. *Translational Behavioral Medicine*, 7(3), 467-477.
- Bovaird, T. and Loeffler, E. (2012). From Engagement to Co-production: The Contribution of Users and Communities to Outcomes and Public Value. *Voluntas*, 23, 1119-1138.
- Bowen, K. J., Miller, F. P., Dany, V. and Graham, S. (2015). The relevance of a coproductive capacity framework to climate change adaptation: investigating the health and water sectors in Cambodia. *Ecology and Society* 20(1), 13.
- Brenner, N. and Schmid, C. (2015). Towards a new epistemology of the urban? *City*, 19(2-3), 151-182.
- Brix, J., Krogstrup, H. K., & Mortensen, N. M. (2020). Evaluating the outcomes of co-production in local government. *Local Government Studies*, 46(2), 169–185.

- Buijs, A., Hansen, R., Van der Jagt, S., Ambrose-Oji, B., Elands, B., Lorance Rall, E., Mattijssen, T., Pauleit, S., Runhaar, H., Stahl Olafsson, A. and Steen Møller, M. (2019). Mosaic governance for urban green infrastructure: Upscaling active citizenship from a local government perspective. *Urban Forestry and Urban Greening*, 40, 53–62.
- Bussu, S. and Galanti, M. T. (2018). Facilitating coproduction: the role of leadership in coproduction initiatives in the UK. *Policy and Society*, 37(3), 347-367.
- Carter, N., Bryant-Lukosius, D., DiCenso, A., Blythe, J. and Neville, A. (2014). The Use of Triangulation in Qualitative Research. *Oncology Nursing Forum*, 41(5), 545-547.
- Chatterton, P., Owen, A., Cutter, J., Dymski, G., & Unsworth, R. (2018). Recasting Urban Governance through Leeds City Lab: Developing Alternatives to Neoliberal Urban Austerity in Co-production Laboratories. *International Journal of Urban and Regional Research*, 42(2), 226–243.
- Cheruvilil, K. S., Soranno, P. A., Weathers, K. C., Hanson, P. C., Goring, S. J., Filstrup, C. T. and Read, E. K. (2014). Creating and maintaining high-performing collaborative research teams: the importance of diversity and interpersonal skills. *Front Ecol Environ*, 12(1), 31–38.
- Connop, S., Vandergert, P., Eisenberg, B., Collier, M., Nash, C., Clough, J. and Newport, D. (2016). Renaturing cities using a regionally-focused biodiversity-led multifunctional benefits approach to urban green infrastructure. *Environmental Science & Policy*, 62, 99-111.
- Conway D, Li CQ and Wolch J (2010). A spatial autocorrelation approach for examining the effects of urban greenspace on residential property values. *The Journal of Real Estate Finance and Economics*, 41, 150–169.
- Crona, B. and Parker, J. (2012). Learning in Support of Governance: Theories, Methods, and a Framework to Assess How Bridging Organizations Contribute to Adaptive Resource Governance. *Ecology and Society*, 17(1), 32.
- Cvitanovic, C., McDonald, J. and Hobday, A. J. (2016). From science to action: principles for undertaking environmental research that enables knowledge exchange and evidence-based decision-making. *Journal of Environmental Management*, 183, 864–874.
- de Vaus, D. A. (2001). *Research Design in Social Research*. London: SAGE.
- Djenontin, I. and Meadow, A. (2018). The art of co-production of knowledge in environmental sciences and management: lessons from international practice. *Environmental Management*, 61(6), 885-903.
- Dorst, H., van der Jagt, A., Raven, R. and Runhaar, H. (2019). Urban greening through Nature-Based Solutions – key characteristics of an emerging concept. *Sustainable Cities and Society*, 49, 101620.
- Dziubala, A., Madajczyk, N. and Osipiuk, A. (2019). Nature-based Solutions: A New Urban Planning Process for Implementation: The Poznań Experience.
- Edelenbos, J. (2005). Institutional implications of interactive governance: Insights from Dutch practice. *Governance*, 18(1), 111–134.
- European Commission (2015). Towards an EU Research and Innovation policy agenda for nature-based solutions & re-naturing cities. *Final report of the Horizon, 2020*.
- Faivre, N., Fritz, M., Freitas, T., de Boissezon, B. and Vandewoestijne S. (2017). Nature-Based Solutions in the EU: Innovating with nature to address social, economic and environmental challenges. *Environmental Research*, 159, 509-518.

- Ferlie, E., Pegan, A., Pluchinotta, I. & Shaw, K. (2019). Co-Production and Co-Governance: Strategic Management, Public Value and Co-Creation in the Renewal of Public Agencies across Europe Deliverable 1.1: Literature Review. 770591, 1–60.
- Filipe A., Renedo, A. and Marsten, C. (2017). The co-production of what? Knowledge, values, and social relations in health care. *PLoS Biol* E2001403., 15(5), 1–6.
- Fisher, B., and Grima, N. (2020). The importance of urban natural areas and urban ecosystem services during the COVID-19 pandemic. *SocArXiv*. Retrieved from <https://doi.org/10.31235/osf.io/sd3h6>
- Folke, C., Hahn, T., Olsson, P., and Norberg, J. (2005). Adaptive Governance of Social-Ecological Systems. *Annu. Rev. Environ. Resour*, 15, 441–473.
- Frantzeskaki, N. (2019). Seven lessons for planning nature-based solutions in cities. *Environmental Science & Policy*, 93, 101-111.
- Frantzeskaki, N. and Kabisch, N. (2016). Designing a knowledge co-production operating space for urban environmental governance—Lessons from Rotterdam, Netherlands and Berlin, Germany. *Environmental Science & Policy*, 62, 90-98.
- Freeth, R. and Caniglia, G. (2019). Learning to collaborate while collaborating: advancing interdisciplinary sustainability research. *Sustainability Science*, 11(3).
- Godfrey R. and Julien, M. (2005). Urbanisation and health. *Clin Med*, 5, 137-141.
- Goodman, L. A. (1961). Snowball Sampling. *Annals of Mathematical Statistics*, 32(1), 48-170.
- Hampton, S. E. and Parker, J. N. (2011). Collaboration and Productivity in Scientific Synthesis, *BioScience*, 61(11): pp.900-910.
- Hegger, D., Lamers, M., van Zeijl-Rozema, A. and Dieperink, C. (2012). Conceptualising joint knowledge production in regional climate change adaptation projects: success conditions and levers for action. *Environmental Science & Policy*, 18, 52-65.
- Hegger, D. and Dieperink, C. (2014). Toward successful joint knowledge production for climate change adaptation: lessons from six regional projects in the Netherlands. *Ecology and Society*, 19(2).
- Hitchcock, G. and Hughes, D. (1989). *Research and the Teacher: A Qualitative Introduction to School-based Research*. London: Routledge.
- Howlett, M. and Ramesh, M. (2016). Achilles’ heels of governance: Critical capacity deficits and their role in governance failures. *Regulation and Governance*, 10(4), 301–313.
- Jensen-Butler, C. (1999). Cities in Competition: Equity Issues. *Urban Studies*, 36(5-6), 865-891.
- Kelman, H. (2005). Building trust among enemies: The central challenge for international conflict resolution. *International Journal of Intercultural Relations*, 29(6), 639-650.
- Klerkx, L. and Nettle, R. (2013). Achievements and challenges of innovation co-production support initiatives in the Australian and Dutch dairy sectors: A comparative study. *Food Policy*, 40, 74-89.
- Lafortezza, R., Chen, J., van den Bosch, C. K. and Randrup, T. B. (2018). Nature-based solutions for resilient landscapes and cities. *Environmental Research*, 165(December 2017), 431–441.

- Leach, W. D. and Pelkey, N. W. (2001). Making watershed partnerships work: a review of the empirical literature. *J. Water Resour. Plan. Manag.*, 127, 378–85.
- Lemos, M. C. and Morehouse, B. J. (2005). The co-production of science and policy in integrated climate assessments. *Global Environmental Change* 15(1), 57-68.
- Lowe, M., Whitzman, C., Badland, H., Davern, M., Aye, L., Hes, D., Butterworth, I. and Giles-Corti, B. (2015). Planning Healthy, Liveable and Sustainable Cities: How Can Indicators Inform Policy? *Urban Policy and Research*, 33(2), 131-144.
- McCarthy, M., Best, M. and Betts, R. (2010). Climate change in cities due to global warming and urban effects. *Geophysical Research Letters*, 37(9).
- Miller, C. and Wyborn, C. (2018). Co-production in global sustainability: Histories and theories. *Environmental Science & Policy*.
- Muñoz-Erickson, T. A., Miller, C. A. and Miller, T. R. (2017). How cities think: Knowledge co-production for urban sustainability and resilience. *Forests*, 8(6), MDPI AG.
- Nesshöver, C., Assmuth, T., Irvine, K., Rusch, G., Waylen, K., Delbaere, B., Haase, D., Jones-Walters, L., Keune, H., Kovacs, E., Krauze, K., Külvik, M., Rey, F., van Dijk, J., Vistad, O., Wilkinson, M. and Wittmer, H. (2017). The science, policy and practice of nature-based solutions: An interdisciplinary perspective. *Science of The Total Environment*, 579, 1215-1227.
- Opdenakker, R. (2006). Advantages and disadvantages of four interview techniques in qualitative research. *Forum Qualitative Sozialforschung*, 7(4).
- Ostrom, E. (2005). Understanding institutional diversity. Princeton, NJ: Princeton University Press.
- Pauleit, S., Zölch, T., Hansen, R. and Randrup, T. B. (2017). Nature-based solutions and climate change – Four shades of Green. In A. Kabisch, N. Korn, H. Stadler and J. Bonn (Eds.). *Nature-based solutions to climate change adaptation in Urban areas: Linkages between science, policy and practice* (pp. 29–49). (1st ed.). Springer International Publishing.
- Partington, G. (2001). Qualitative research interviews: identifying problems in technique. *Issues in Educational Research*, 11(2), 32–44.
- Polk, M. (2015). Transdisciplinary co-production: designing and testing a transdisciplinary research framework for societal problem solving. *Futures*, 65, 110–122.
- Poocharoen, O. and Ting, B. (2013). Collaboration, Co-Production, Networks: Convergence of theories. *Public Management Review*, 17(4), pp.587-614.
- Quartier, M., van de Sijpe, K. and Vos, P. (2019). Nature-based Solutions: A New Urban Planning Process for Implementation: The Genk Experience.
- Rosenzweig, C., Solecki, W. and Hammer, S. (2011). *Climate Change and Cities: First Assessment Report of the Urban Climate Change Research Network (ARC3)*. Cambridge University Press.
- Roux, D. J., Rogers, K. H., Biggs, H.C., Ashton, P. J. and Sergeant, A. (2006). Bridging the science-management divide: moving from unidirectional knowledge transfer to knowledge interfacing and sharing. *Ecology and Society*, 11(1), 4–23.
- Saraev, V. (2012). Economic benefits of greenspace: a critical assessment of evidence of net economic benefits. Forestry Commission Research Report. Forestry Commission, Edinburgh.

- Sekulova, F. and Anguelovski, I. (2017). The Governance and Politics of Nature-Based Solutions. Deliverable 1.3: Part VII. NATURVATION project. Retrieved from https://naturvation.eu/sites/default/files/news/files/naturvation_the_governance_and_politics_of_naturebased_solutions.pdf
- Seto, K. C., Fragkias, M., Güneralp, B. and Reilly, M. K. (2011). A meta-analysis of global urban land expansion. *PLoS One*, 6(8), 1–9.
- Seto, K., Güneralp, B. and Hutrya, L. (2012). Global forecasts of urban expansion to 2030 and direct impacts on biodiversity and carbon pools. *Proceedings of the National Academy of Sciences*, 109(40), 16083-16088.
- Sheridan, S., Williams, P. and Pramling Samuelsson, I. (2014). Group size and organisational conditions for children's learning in preschool: a teacher perspective." *Educational Research*, 56(4), 379-397.
- Sorrentino, M., Sicilia, M. & Howlett, M. (2018). Understanding co-production as a new public governance tool. *Policy and Society*, 37(3), 277–293.
- Steen, T., and Brandsen, T. (2020). Co-production during and after the Covid-19 pandemic: will it last? *Public Administration Review*, n/a(n/a). Retrieved from <https://doi.org/10.1111/puar.13258>
- Stepanova, O. (2015). Conflict resolution in coastal resource management: Comparative analysis of case studies from four European countries. *Ocean & Coastal Management*, 103, 109-122.
- UN-Habitat (2016) Urbanization and Development. Emerging Futures. World Cities Report 2016. UN-Habitat: Nairobi.
- van der Hel, S. (2016). New science for global sustainability? The institutionalisation of knowledge co-production in Future Earth. *Environmental Science and Policy*, 61, 165–175.
- van Kerkhoff, L. and Lebel, L. (2015). Coproductive capacities: rethinking science-governance relations in a diverse world. *Ecology and Society*, 20(1).
- Venter, Z., Barton, D., Gundersen, V., Figari, H. and Nowell, M. (2020). Urban nature in a time of crisis: recreational use of green space increases during the COVID-19 outbreak in Oslo, Norway. *SocArXiv*. Retrieved from <https://doi.org/10.31235/osf.io/kbdum>
- Voorberg, W. H., Bekkers, V. J. J. M. and Tummers, L. G. (2015). A Systematic Review of Co-Creation and Co-Production: Embarking on the social innovation journey, *Public Management Review*, 17(9), 1333-1357.
- Wiek, A., Ness, B., Schweizer-Ries, P., Brand, F. and Farioli, F. (2012). From complex systems analysis to transformational change: a comparative appraisal of sustainability science projects. *Sustainability Science*, 7(S1), 5-24.
- Wikström, S. (1996). The customer as co-producer. *European Journal of Marketing*, 30(4), 6-19.
- Wittmayer, J. and Schöpke, N. (2014). Action, research and participation: roles of researchers in sustainability transitions. *Sustainability Science*, 9(4), 483-496.
- Wyborn, C. (2015). Co-productive governance: A relational framework for adaptive governance. *Global Environmental Change*, 30, 56-67.

Young, R. F. and McPherson, E. G. (2013). Governing metropolitan green infrastructure in the United States. *Landscape and Urban Planning*, 109(1), 67-75.

8 APPENDICES

Appendix 1. List of Interviewees

Glasgow

GCC Employee 1	Development and Regeneration Services team and Connecting Nature Glasgow team
GCC Employee 2	Development and Regeneration Services team and Connecting Nature Glasgow team
GCC Employee 3	Development and Regeneration Services Department and Connecting Nature Glasgow team
GCC Employee 4	Neighbourhoods and Sustainability team
GCC Employee 5	Neighbourhoods and Sustainability team
GCC Employee 6	Community Engagement Officer, Neighbourhoods and Sustainability team
GSS Employee	Greenspace Scotland employee working with Connecting Nature Glasgow team
Social Enterprise Interviewee 1	Scrumptious Garden food growing enterprise
Social Enterprise Interviewee 2a	Fortune Works Glasgow
Social Enterprise Interviewee 2b	Fortune Works Glasgow

Genk

SG Employee 1	Environment and Sustainable Development team and Connecting Nature Genk team
SG Employee 2	Environment and Sustainable Development team and Connecting Nature Genk team
SG Employee 3	Neighbourhood Development team
SG Employee 4	Neighbourhood Manager, Neighbourhood Development team
Genk Expert 1	Luca School of Arts
Genk Expert 2	Vlaamse Landmaatschappij (VLM) (Flemish Land Agency)
Genk Expert 3	Department of Architecture and Art, Universiteit Hasselt
Genk Expert 4	Institute voor Natuur en Bosonderzoek (INBO) (Institute for Nature and Forest Research)

Appendix 2. Interview Consent Form

Informed Consent Form

Title of research study:

No one-size-fits-all: Co-production of Nature-based Solutions in Urban Contexts

This study and this consent form have been explained to me. I believe I understand what will happen if I agree to be part of this study.

I have read, or had read to me, this consent form. I have had the opportunity to ask questions and all my questions have been answered to my satisfaction. I freely and voluntarily agree to be part of this research study, though without prejudice to my legal and ethical rights. I have received a copy of this agreement and I understand that, if there is a sponsoring company, a signed copy will be sent to that sponsor.

Name of sponsor:

PARTICIPANT'S NAME:

PARTICIPANT'S SIGNATURE:

Date:

Date on which the participant was first furnished with this form:

Participants with literacy difficulties: I have witnessed the accurate reading of the consent form to the potential participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely and understands that they have the right to refuse or withdraw from the study at any time.

Print name of witness: _____

Signature of witness: _____

Date (Day/month/year) _____ Thumbprint of participant:

Statement of investigator's responsibility: I have explained the nature, purpose, procedures, benefits, risks of, or alternatives to, this research study. I have offered to answer any questions and fully answered such questions. I believe that the participant understands my explanation and has freely given informed consent.

Researcher's signature:

Date:



Appendix 3. Interview Structure and Questions

Start of Interview

I introduce myself and the topic of the thesis to interviewee.

Ask interviewee about who they are, what their organisation does, what their involvement has been in NBS co-production processes so far.

Openly ask what conditions they've witnessed so far that have influenced NBS co-production processes and how these conditions have influenced the processes.

Organisational Conditions

Resources:

How much available time have you had to organise (and carry out) co-production processes? How did this affect the processes?

What sources of funding/financing have been available to organise and carry out NBS co-production processes? How has this affected the process?

What infrastructure (type of meeting spaces, equipment, online material, etc.) was available for the process? How did this affect the process?

Skills for Co-production

What skills and expertise have been mobilised to organise and carry out co-production processes? What skills have been lacking? How has this affected the processes?

(For other participants who were not involved in organising – were the processes organised well? How did this affect the processes? Was there anything that could have been improved in relation to the organisation of the processes?)

Institutional Support

How has NBS co-production been supported institutionally through existing city council/national government formal and informal arrangements, policies and rules? How has this affected the processes?

Has there been any lack of institutional support for NBS co-production within city council/national government? How has this affected the process?

Existing Relationships

What have the existing relationships been like between city departments and members in the city council connected to NBS co-production processes? How have these relationships affected NBS co-production processes?

What relationship does the city council have with local citizens? How has this affected co-production processes?

Are there other existing relationships between particular stakeholders that have influenced how co-production processes have been carried out?

Individual Conditions

Individual Openness

How have you experienced stakeholders' openness to sharing and receiving different types of knowledge and information during the processes? How has this influenced the processes?

How open have stakeholders been to nature-based solutions and co-production, particularly to the uncertainty and complexity associated with both terms? How has this influenced the processes?

End of Interview

Are there any other conditions that we haven't discussed that have influenced the processes?
How have they influenced the processes?

Are there any conditions that you could see affecting NBS co-production in the future? How do you think they are likely to influence the processes?

Do you have anything left to add?