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What's the Buzz about Nature Based Enterprises? Examining the the role of Nature-Based Enterprises in Urban Beekeeping for Urban Sustainability Transitions

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Abstract

Research problem and aim: Nature-based solutions have emerged as promising strategies for urban sustainability transitions, however, there remains a lack of clear understanding around crucial actors needed to implement them. One such actor is nature-based enterprises. Academic understanding of nature-based enterprises is still in the early stages, with limited insights thus far from the global south and industry sectors. Whilst collaboration is recognised as an enabling feature of both nature-based enterprises and urban sustainability transitions, these research fields have not been combined to date. To address these research gaps, this thesis focuses on urban beekeeping to investigate how nature-based enterprises collaborate and contribute to urban sustainability transitions. This research aims to raise awareness of nature-based enterprises and provide insights into their potential roles in urban sustainability transitions.

Theory: This research combines literature on nature-based enterprises, collaboration and urban sustainability transitions to inform the conceptual framework. The framework defines nature-based enterprises in terms of key partners, value proposition, and activities. Furthermore, five mechanisms (replicating, partnering, upscaling, instrumentalizing, and embedding) are identified to better understand their contributions to urban sustainability transitions.

Methodology: A qualitative embedded multiple-case research design is employed. The design focuses on the beekeeping sector in Harare and Amsterdam as case studies. Over the course of the research 22 interviews were conducted in total with NBEs, urban beekeeping organisations, key partners, and academic experts. Interviews were supplemented with document reviews and participant observation. A thematic coding strategy was employed to analyse the data.

Results: Harare and Amsterdam cases are presented according to operationalized empirical research questions on nature-based enterprises, collaboration, and urban sustainability transitions.

Discussion/Conclusion: Upon comparison of case results, findings suggest nature-based enterprises can play a crucial role in urban sustainability transitions. This may be due to their unique composition and capacity for diverse partnerships, positioning them at the crux of contemporary sustainability challenges. The study identifies five key roles nature-based enterprises can undertake to do so, namely: Context-Specific Educator, Hybrid Upscaler, NBS Provisioner, NBS Coordinator, and Corporate NBS Delivery. This heuristic framework contributes to literature by illuminating ways nature-based enterprises can mobilize and collaborate to contribute to urban sustainability transitions. Alongside academic relevance, the findings hold practical importance for nature-based enterprises seeking to further leverage their platforms for urban sustainability transitions.

Key words: *Nature-Based Solutions; Nature-Based Enterprises, Urban Sustainability Transitions; Urban Beekeeping*

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Positionality Statement

I was born in Zimbabwe and spent my childhood on a farm before moving to the Netherlands in 2018 to pursue my tertiary education. Growing up, my father's agricultural background exposed me to the beekeeping industry and the important links it has for agriculture in Zimbabwe. This sparked my curiosity about the future role of bees in our lives and informed my motivation for studying this nature-based solution. Being connected to both the Netherlands and Zimbabwe as my homes, I naturally carried these questions with me in both locations. The choice to focus on urban beekeeping in Amsterdam and Harare as case studies are thereby strongly influenced by my personal interests and the access to data I had as a researcher. In many ways, I consider myself a partial member of the urban beekeeping community in Zimbabwe, as I have an inherent understanding of the cultural context and pre-existing connections with urban beekeepers in the field before embarking on this research. I did not experience this element of group membership as strongly in Amsterdam where I had no prior connections to the urban beekeeping field.

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NBS	Nature Based Solution
NBE	Nature Based Enterprise
UST	Urban Sustainability Transitions

1. Introduction

With urban land area projected to triple between 2000 and 2030, it is imperative cities are acknowledged as sites of deep importance when considering where sustainability transition pathways need to occur (Adams et al., 2023). Urban sustainability transitions (UST) are long-term processes of change in which cities realise lasting sustainable changes through the reconfiguration of rules, services, and organizational structures within urban systems (Frantzeskaki et al., 2017). The interconnected nature of urban challenges calls for the implementation of transdisciplinary, collaborative, and integrated solutions, such as nature-based solutions (NBS). NBS have been seen to be connected to UST as they mediate new social relations and configurations, altering human-nature relationships and contributing to biodiversity improvements. NBS are inspired by and use nature with the intention of strengthening existing nature or drawing nature into the city to address urgent global challenges (Cohen-Shacham et al. 2016). In recent years, they have emerged as a promising approach to tackle challenges associated with the climate crisis. NBS offer viable solutions that address the complexity of this global issue by simultaneously mitigating biodiversity loss and supporting various sustainable development goals (Sarabi et al., 2019).

Urban beekeeping is one such NBS. It aims to address the rapid decline of honeybee populations. This decline poses a severe threat to agricultural and natural ecosystems as pollination is essential for many plant species to reproduce. Pollination by insects is valued at $235-577 billion USD annually in the agricultural industry alone (Potts et al., 2016). Furthermore, over 34% of the global food supply is derived from pollinator dependant plants or plants that benefit from animal pollination (Oldroyd & Nanork, 2009). The principal drivers of the honeybee loss are suspected to be disease, pesticides, climate change and infrastructure, alongside land use change, (Taniguchi et al., 2012; McMahon et al., 2016; Manzoor & Pervez, 2021) which is propelled by urbanisation (Baldock, 2020).

Paradoxically, recent studies have shown urban areas have extraordinary potential to serve as refuge zones for bees due to the diverse flora in cities that facilitates foraging and nesting (Hall et al., 2017). In terms of the impact of urban beekeeping on human society, this NBS has significant co-benefits such as: enhancing well-being, a stronger sense of community and cultural identity, and promoting sense of place and belonging (Kabisch et al., 2016). Consequently, the practice has been growing rapidly. In London for example, the number of urban beekeepers doubled between 2011 and 2015, additionally, between 2006 and 2012 the total documented hives increased by 44% in Berlin (Lorenz & Stark, 2015). Similar trends have been observed in: Japan and South Korea (Kohsaka et al., 2017) and African nations such as South Africa (Cadwallader et al., 2011), Zambia and

Zimbabwe (Lowore & Bradbear, 2015). Urban beekeeping is uniquely situated in a "complex mosaic of different land uses, ecological habitats (Baldock, 2020, p.63) and stakeholders and can therefore develop and manifest in multiple ways depending on the environment, stakeholders and how they collaborate (Sponsler & Bratman, 2020).

However, there is a lack of recognition and support of the specific actors who contribute to the delivery and implementation of NBS generally and specifically in the urban beekeeping sector (Adams et al., 2023). It is crucial to adopt an actor-centric perspective when studying NBS, as these solutions involve multiple actors who drive sustainability transitions at different rates and in various urban spaces (Pineda et al., 2017). For NBS to be effectively operationalized in cities, they cannot become just another buzzword for the aspiration of sustainability. These solutions need to be pursued, reformed, and continuously reframed by relevant actors to enable the displacement of unsustainable practices, assumptions, cultures, and norms that dominate the planning and development of urban land areas (Adams et al., 2023). Without understanding the role these change agents can play, cities run the risk of compromising the functionality, potential benefits of NBS and ultimately UST (Hörisch, 2015; Binz & Truffer, 2017).

Recent literature has highlighted contributions of business actors in particular including: sustainable entrepreneurs (Hörisch, 2015); small businesses (Burch et al., 2016); green entrepreneurs (Yu & Gibbs, 2020) and numerous studies on larger corporations to NBS. However, the unique strategy of NBS supports the emergence of new business actors called Nature-based enterprises (NBEs), "enterprises engaged in economic activity, that use nature sustainably as a core element of their product or service offering (Kooijman et al., 2021, p.2)."

NBEs have only been established as a distinct concept recently (Kooijman et al., 2021). They lack a standardized framework for classification and identification and more importantly are not widely recognised as important actors in delivering NBS. One known aspect of NBEs is that collaboration and partnerships are crucial external factors enabling their success (McQuaid et al., 2021a). Similarly, connectors, have been highlighted in the literature to play a vital role in mainstreaming and implementing NBS by facilitating communication, collaboration, and knowledge dissemination through networking or intermediary roles (Hölscher et al., 2019). Given the importance of collaboration for NBEs' success, it is essential to examine how NBEs collaborate and determine if they can assume intermediary roles for NBS and therefore UST.

This research aims to add to the academic foundations of what NBEs are and evaluate how they can potentially contribute to UST by drawing on insights from cases in the global north and the global south (Kooijman et al.,2021). Thus far, most scholarly investigations on NBEs have relied on perspectives from the global north, resulting in a disproportionate concentration of knowledge from this region (Mayor et al., 2021; McQuaid et al., 2021a). The incorporation of perspectives from the global south is imperative in the nascent stage of NBE research, to avoid establishing an understanding of NBEs which is not globally applicable. Compounding on this, the examination of UST in low- and middle-income countries is often overlooked even though 90% of the projected population growth between 2018 and 2050 is expected to occur in cities in the global south (Oates, 2021). The combination of these research caveats outlines the need to include diverse perspectives when addressing the aforementioned research fields.

With the inclusion of perspectives from the global north and south in mind, the findings from this thesis may have the potential to guide further research and policy agendas on how to instrumentalise NBEs to contribute to UST. Although urban beekeeping is already practiced in cities, the knowledge generated in this study can be utilized by NBEs and city planners in the sector to foster lasting transformations by reconfiguring rules, services, and organizational structures within urban systems.

Studying collaboration within the urban beekeeping sector and investigating NBEs in this context is relevant because unlike many other NBS, the urban beekeeping sector is well-established in many urban areas globally (Casanelles-Abella & Moretti, 2022; Matsuzawa & Kohsaka, 2022), with a significant presence of NBEs. NBEs engage in urban beekeeping for various reasons, generating profit through honey sales (Cadwallader et al., 2011; Egerer & Kowarik, 2020), environmental and food security concerns, corporate strategies to enhance employee well-being and engagement (Sampson, 2019; Sponsler & Bratman, 2021; Alvéole, 2022), adhering to ESG standards, or renting out colonies for agricultural pollination (Lorenz & Stark, 2015; Shaw et al., 2022).This provides a unique opportunity to study collaboration within the urban beekeeping, as opposed to other NBS sectors where only a few NBEs may exist.

Considering the identified research gaps and the significance of this study, as well as the understanding that UST are complex processes involving multiple actors and requiring collaborative endeavors to foster innovative approaches to thinking, acting, and organizing (Frantzeskaki et al., 2012), the central research question that guides this investigation is as follows:

How do nature-based enterprises collaborate and how can they contribute to urban sustainability transitions in urban beekeeping therein?

This research question is informed by the need to gain deeper understanding of NBEs in urban beekeeping given the relatively recent recognition of these actors in academia (Kooijman et al., 2021; McQuaid et al., 2021a). Moreover, as collaborative, and intermediary actors are considered essential to UST (Hölscher et al., 2019), the partnerships NBEs engage in need to be considered. Collectively, these insights on NBEs can be used to determine how they can contribute to UST through urban beekeeping. This leads to the following sub questions:

Sub-question 1: What types of nature-based enterprises engage in urban beekeeping?
Sub question 2: How do nature-based enterprises collaborate in urban beekeeping?
Sub question 3: How can/do nature-based enterprises in urban beekeeping contribute to urban sustainability transitions?

To address the research question and sub questions, Chapter 2 firstly presents literature related to transition theory, collaboration and NBEs. The defining features of NBEs, key activities, key partners, key resources, and value propositions are visualized. Furthermore, the way NBEs can collaborate to contribute to UST is visualized in the conceptual framework (Chapter 2.5). Following from the theory used to inform the research process, the research design, an embedded multiple-case study is selected. This approach entails the comparison of NBEs in urban beekeeping sectors in Harare (Zimbabwe) and Amsterdam (Netherlands). The cases chosen to expand upon the scope of previous studies on NBEs which have been conducted solely within the EU (Kooijman et al., 2021). Qualitative methods are used in this study and the data collection primarily involves semi-structured interviews with NBEs, urban beekeeping organizations, and experts. Additionally, document reviews and participant observation supplement the data collection process. The results of each case study are then presented and analyzed independently in Chapter 4. Thereafter cases are compared, and findings discussed and embedded in current literature streams in Chapter 5. Finally, overall findings in the form of roles NBEs can undertake to contribute to UST are presented before turning to reflect on limitations and avenues for future research.

2. Theoretical Background

The following chapter initially provides an overview of UST and explores how NBS are connected to this phenomenon. NBEs are identified as key actors in NBS development and planning subsequently, existing literature is synthesized to identify their defining features and knowledge gaps surrounding NBEs. Collaboration theory is then used to conceptualize who NBEs may partner with, how they may interact, and for what purpose. Finally, the review explores how NBEs can contribute to UST and how collaboration outcomes can lead to UST resulting in a conceptual framework.

2.1 Nature Based Solutions and Urban Sustainability Transitions

Frantzeskaki et al., define UST as "multi-actor processes, requiring collaborative efforts across sectors to shift to and establish new ways of doing, thinking, and organizing that aim to achieve sustainability (2012, p.3)". Due to the complexity of UST and the highly interdisciplinary nature of these phenomena Hölscher and Frantzeskaki (2021) distinguish between three perspectives in literature to help guide research: transformation *of the city*, *by the city* and *in the city*. The perspective relevant to this thesis is transformation *in* cities. This view zooms in on cities geolocated in an abstract point or space delineated by the city form and municipal boundaries (Wolfram et al., 2016). Cities are understood as places and spaces of transformations and thereby harbour unique potential (Hansen & Coenen, 2015, Frantzeskaki et al., 2017). Typically, this perspective is used as a lens of inquiry on research into the "black box" of a city, which is very broadly defined by socio-economic, political, and institutional dimensions (social); natural resources flows and physical phenomena (biological); and technological parameters (Hölscher and Frantzeskaki, 2021).

In a study which examined how local transition initiatives in EU contribute to UST, NBS were found to spark more innovation in cities than other types of initiatives and contributed to UST by fostering connections between stakeholders (Frantzeskaki et al., 2017). This finding is supported by other scholars who argue NBS set-in motion new ways of thinking about urban nature, novel ways of organising and collaborating (Sarabi et. al., 2019) as well as new practices (Frantzeskaki & Bush, 2021; Oke et al., 2021). This thesis draws of the definition of NBS as "actions inspired by, supported by, or copied from nature and which aim to address a variety of environmental, social and economic challenges in sustainable ways (Bauduceau et al., 2015, p. 7)."

The enablers and barriers of NBS have been well-explored in literature. A recent study compiled a list of key features needed to embed NBS in urban systems such that they disrupt established flows of power and resources. Partnerships were found to be a critical element in this process (Xie et al., 2022). Similarly, Frantzeskaki et al., (2017) found UST to be heavily dependent on collective agency

and more specifically, oftentimes, a small constellation of urban change agents to mediate and catalyse transformative processes. However, research on specific change agents and stakeholders in NBS has been mostly limited to citizen engagement (Ferreira et al., 2020; Kiss et al., 2022), the role of intermediary/ transboundary actors (Frantzeskaki & Bush, 2021), public/private partnerships (Toxopeus & Polzin, 2021) and municipalities (Kabisch et al., 2016) with very little explicit research on private sector and specifically business actors.

2.2 Key Actors: Implementation and Development of Nature Based Solutions

Sarabi et al. (2019) identified actors involved in NBS development and implementation categorised broadly as: micro-level actors (NBEs, citizens, landowners, NGOs), meso-level actors (city-wide departments), macro-level actors (regional, national, international authorities), and transboundary actors (facilitators between different organizations). Micro-level actors were found to be the most crucial for NBS uptake and implementation according to this study. One type of micro- level actor which has recently been identified as critical to NBS are NBEs (Koojiman et al., 2021; McQuaid et al, 2021a).

The concept NBE first emerged in the form of nature-based tourism enterprise studies whereby they were defined as "enterprises offering services in wilderness or related to wilderness", such as forests, mountain areas and recreational activities in rivers and lakes (Nybakk & Hansen, 2008, p.475). Various case studies examined how NBEs could alleviate poverty in rural areas whilst simultaneously protecting nature and biodiversity (Hodur et al., 2004; Spenceley & Goodwin, 2007; Anyonge-Bashir & Udoto, 2012; Chiteva et al., 2016). The multi-beneficial nature of NBE's has been preserved because the study of these enterprises has become more strongly linked to the implementation of NBS exclusively (Buchel & Frantzeskaki, 2015). Koojiman et al. (2021) distinguished between NBEs and other organisations which help to deliver NBS on the basis that NBEs both engage in economic activity and position nature at the centre of their activities (table 1).

Table 1 : Types of organizations delivering nature-based solutions (Kooijman et al., 2021)

	Nature at core of Activities	*Nature not at core of Activities*
Economic Activity	**Nature-based Enterprise**	Enterprise delivering nature-based products and services
No Economic Activity	Nature-based Organisation	Organisation delivering nature-based products and services

In principle, each urban area is unique in terms of social and cultural values, dominant infrastructure, city planning and diversity of stakeholders among other factors which impact the path-dependency of NBS (Dorst et al., 2019; Kabisch et al., 2016). Similarly, NBEs are not one homogenous group of actors and have varying purposes, business activities and ways of creating value (Kabisch et al., 2022). To capture the diversity of NBEs, elements from the NBE business model canvas can be used. This was originally created as a tool to be used by NBEs to support the development of NBS in urban areas (Connecting Nature, 2019).

The business model canvas is grey literature however, it is a deliverable from the Connecting Nature project (high credibility) and is published online as connected to this project (high retrievability) which improves its' reliability as a source (Hopewell et al., 2005). The NBE business model canvas is inspired by the original business model canvas (Osterwalder et al., 2005) but elements have been added and adjusted to tailor it to NBEs specifically. Components of NBEs can be found in Table 2. Some of these components can be used in this research to guide the identification and classification of NBEs.

Table 2: NBE Business Model Canvas (adapted from the Nature-Based Solutions Business Model Guidebook (Connecting Nature, 2019)

NBE Component	*Description*
Value Proposition	What value does the NBE offer to beneficiary groups (social, economic, and environmental).
Key Activities	What key actions or services are required to deliver the value proposition?
Key Resources	What key resources are needed in the key activities?
Key Partners	Which partners and partnerships are essential to the NBE key activities?
Key Beneficiaries	Who directly benefits from the value proposition?
Value Capture	How does NBE generate revenue from the NBS?

Firstly, given the purpose of NBS is to address various social, environmental, and economic challenges (Kabisch et al., 2016) it is important to consider how NBE's can offer value across these dimensions and consider potential trade-offs between them (Connecting Nature, 2019). This consideration is encapsulated in the *Value Proposition*. Benefits can be accrued directly such as fiscal

income from harvesting honey (Sponsler & Bratman, 2021) or indirectly such as aesthetic value and improving human well-being (Egerer & Kowarik, 2020).

Secondly, *key activities* have been explored by Toxopeus (2019) who identifies eight business models for enterprises delivering and maintaining NBS. This research was gathered from 18 different cities and using 54 case studies (2019). Examples of key activities include greening cities, environmental education, and reinvesting money from negative environmental impacts into urban nature (see Appendix A for complete list of key activities) (Mayor et al., 2021). However, this research was mostly situated in developed countries, with the exception of Cape Town and Mexico, and urban beekeeping enterprises were not used as case studies. It is therefore expected this research can contribute to this inventory of NBE key activities.

Adams et al. more broadly define four roles which actors can undertake which may define the types of key activities NBES can engage in as: NBS enablers, designers, connectors, and implementers (2023). Enablers direct and guide activities related to NBS by establishing enabling conditions through city-level leadership and acting as local champions for NBS (Stiller & Meijerink, 2016). The designer's key activities are related to NBS pathway innovation, experimentation and sharing and mainstreaming knowledge (Adams et al., 2023). Connectors play networking and intermediary functions. They diffuse knowledge through these channels. Implementors deliver the NBS and realize on the ground outcomes through managing the NBS and navigating contextual conditions (Hölscher et al., 2019).

Thirdly *key resources* can be considered when identifying and classifying NBEs. Kooijman et al., (2021) developed a preliminary typology of NBEs distinguished by how they use nature. This includes *direct* uses of nature such as: ecosystem creation, restoration and management, green spaces, water management, forestry, sustainable tourism, well-being, and sustainable agriculture. *Indirectly*, NBEs may offer advisory services, education, financial services, and technology for monitoring NBS. However, the authors acknowledge this indirect/ direct distinction is only an initial step in categorising NBEs and encourage future researchers to conduct "studies outside of Europe, and more detailed studies of individual organisation types identified in this research (2021, p.3)". In this way this research is useful to capture one element of NBEs and maps well onto the "key resources" dimension.

Lastly, *key partnerships* are considered important features of NBEs as "networking (Sarabi et al., 2020, p.3)", "co-production processes (Frantzeskaki & Rok, 2018, p. 47), "support and involvement

of various stakeholders (Lambooy & Levashova, 2011, p. 310)", "partnerships (Sarabi et al., 2019, p.10; Ferreira et al., 2020, p.6)", "knowledge sharing (McQuaid et al, 2021a, p.5) "and other collaborative instruments have been identified as key external enabling factors of these enterprises. These point towards the importance of collaborations across the specific NBS industry or market being of pivotal importance to the success of NBEs and thus implementation of NBS. However, NBE's have only been studied as individual entities as opposed to how they collaborate with each other and other stakeholders to facilitate UST (McQuaid et al, 2021a). The key partnerships NBEs engage in have frequently been discussed as one general enabling feature/barrier for NBS (Ferreira et al., 2020; Meek et al., 2010), and NBEs. However, extremely limited literature exists specifically on the ways actors collaborate around NBS and the outcomes of these partnerships (Makepour et al., 2021).

2.3 Collaboration

To look deeper into how NBEs collaborate three dimensions can be considered: (who) is part of the collaboration, what is the purpose of collaboration (why), and (how) do the processes of interaction take place. Given NBS mediate new actors (NBEs), networks and relationships (Frantzeskaki et al., 2017) it is important to conceptualise NBE collaborations in terms of principles specific to NBS. This triad (who, why and how) is informed by Malekpour et al.'s key principles and considerations for designing collaborations for NBS (2021).

Firstly, the "who" element of this triad pertains to stakeholders who take part in the collaborations, are affected by the decisions and outcomes of the collaboration and have the capacity to influence collaboration results and processes. This thesis focuses explicitly on NBE's as the primary stakeholder and other stakeholders that are not NBE's are periphery stakeholders (Reed et al., 2009). Who takes part in the collaboration can be distinguished based on three dimensions, firstly, vertical collaboration, between NBEs and different types of organisations or governing bodies, *horizontal* collaboration, between urban beekeeping NBEs and other business actors, and lastly *diagonal* collaboration, which includes collaboration with actors external to the industry. In this thesis, diagonal collaboration could relate to individuals and communities such as urban residents (Schirmer & Cameron, 2012).

Secondly, the ways in which collaborations happen occur at multiple scales. This variability can be captured by considering "*how"* collaboration occurs and can be categorised based on five levels of interaction defined by Makepour et al., (2021). This shows the different levels of interaction with "coordination" (level 1) demanding the least integration and level 5, "Ongoing structures" the most

formalised level of collaboration (fig. 1). An example of ongoing structures could be nationally or regionally recognised urban beekeeping associations for example whereas informal collaborations could refer to knowledge sharing amongst NBEs at events or over social media.

Level of Collaboration	Description
Level 1: Coordination	Individuals and organisations acting independently with limited engagement as needed
Level 2: Informal Connections	Informal collaborations are formed between individuals across stakeholder groups
Level 3: Coordinated Forums	Individuals and/or organisations establish coordinated forums for knowledge sharing
Level 4: Temporary Structures	Dedicated temporary structures are established with resource sharing on an ad hoc basis
Level 5: Ongoing Structures	Formal ongoing collaborative structures are established and embedded in practice

Figure 1: Levels of Collaboration (Makepour et al., 2021)

Lastly, "*why"* collaborations take place can be considered using several foundational theories. The first is *Social Capital Theory*, which outlines how social networks can facilitate collective action to enable the creation of trust and cooperation among individuals and organizations (Hulgård & Spear, 2007). NBEs may leverage their social capital to collaborate with other stakeholders in urban areas, such as policymakers, community groups, and residents, to promote sustainability transitions (Osborne et al., 2016).

Resource Mobilisation Theory emphasises the importance of resources in facilitating collective action however, there is a need to align stakeholder visions and incentives. If NBEs pool resources such as financial resources, expertise, social networks, and material resources they can collaborate more successfully to achieve shared goals (Mayor et al., 2021). This can also result in co-production of new knowledge which leads to new social ties between actors previously working in parallel (Frantzeskaki & Rok, 2018).

Finally, *Institutional Theory* supposes collective action is influenced by and responds to informal rules and norms which shape the behaviour of organisations. NBEs can therefore collaborate with other NBEs and stakeholders to create new institutions and norms to contribute to UST (Mendes et al., 2020). Cultural norms are oftentimes considered a barrier to NBEs which this collaboration can help to overcome (McQuaid et al, 2021a). This could pertain to the perception of bees in the city as

dangerous for example. These theories point towards to importance of *synergies* between partners (social synergies, resource synergies and institutional synergies). Frantzeskaki et al., (2014) argue synergies are a vital determining factor to understand the outcomes of collaborative partnerships.

2.4 Urban Sustainability Transitions

Partnerships can take different forms in realising UST. These can be understood according to two benefit pathways of collaboration (Frantzeskaki et al., 2014). Table 3 presents an overview of the collaboration benefit pathways based on categories identified in previous research. Additionally, table 3 draws on relevant supporting literature to enhance the understanding of these pathways.

Table 3: Collaboration Benefit Pathways

Collaboration Outcome	Description	Benefits
Action- orientated	Partnerships directly influence the delivery of the product (NBS) by providing local perspectives which improve planning or increase legitimacy of the process (Flyvbjerg et al., 2003; Sarabi et al., 2019). This is an operational out-come often realised through on the ground implementation and experimentation (Hölscher et al., 2019; Adams et al., 2023).	Partnering of actors reduces barriers to implemention and development of NBS. (Graham & Ernstson 2012; Frantzeskaki et al. 2014; Frantzeskaki et al., 2017).
Process - orientated	Generation of broader capacities directly influence UST rather than successful implementation/ establishment of NBS alone (Frantzeskaki and Kabisch, 2016). The sharing and mobilisation of activities and knowledge to implement NBS (Adams et al., 2023)	Broader capacities and synergies created through collaboration including: trust, innovative thinking or knowledge creation (Frantzeskaki and Kabisch, 2016). Communication and collaboration leads to diffusion of knowledge and best practices (Adams et al., 2023)

Many researchers recognise the need for UST but few offer insights into the role of change agents and the strategic actions they employ (Burch, 2017; Olsson et al., 2014). However, one approach has been applied to NBS in prior research, Frantzeskaki et al. (2017)'s five mechanisms of UST (table 4) and can be used in this study. These mechanisms are intended to be used as "handles" to reflect on UST and have been employed in prior studies to examine the acceleration dynamics of transition initiatives in EU cities (Gorissen et al., 2018; Ehnert et al., 2018). The use of these mechanisms in similar fields to this study help to substantiate the applicability to this thesis.

By using these mechanisms as a framework, researchers can reflect on the actions and collaborations NBEs engage in to gain insights into how these may facilitate UST. For example, *partnering* may occur when NBEs collaborate with governments, urban beekeeping organizations or other NBEs to promote the use of NBS in urban development (Ehnert et al., 2018). Alternatively, NBEs may *upscale* urban beekeeping practices through educating people on bees to expand the reach and impact of their practices (Frantzeskaki et al., 2017). All five mechanisms for UST are presented and explained in table 4.

Table 4: Mechanisms of Urban Sustainability Transitions (Frantzeskaki et al., 2017)

Mechanism of Reflection	**Definition**
Upscaling	The broadening of participation and engagement of new members with the NBS to spread new ways of organising, thinking, and practicing (Valkering et al., 2017). Involves the application of a practice beyond its core user-group (Frantzeskaki et al., 2017; Gorissen et al., 2018).
Replicating	The taking up of new ways of doing organising and thinking by different actors and the subsequent spread of these unconventional ways (Frantzeskaki et al., 2017).
Partnering	Pooling/ grouping of resources, abilities, and complementary capacities to create synergies between actors and ensure the continuity of these new ways of thinking and doing (Frantzeskaki et al., 2017). The ways actors leverage resources and pool synergies (Gorissen et al., 2018).
Instrumentalising	Take advantage of opportunities in the specific multi-level governance context of the urban to pursue resources which ensure continuity of the initiative (Chmutina et al., 2014).

Embedding	This is a formalisation of the initiative and aligns old and novel ways of doing and thinking. Embedding determines the extent to which the initiative can shape the urban space or context it operates in (Pinto et al. 2020). This involves the alignment of efforts, strategies, agendas, and goals across multiple scales (Frantzeskaki et al., 2017).

2.5 Conceptual Framework

To answer the research question by building on the concepts outlined thus far, the following conceptual framework is proposed (fig. 2). An overview of the key concepts included in the conceptual framework are summarised as follows:

- **NBS** are solutions which strengthen existing nature or draw nature into the city to address sustainability challenges. Urban beekeeping is an NBS.
- **NBEs,** actors responsible for the implementation of NBS and defined by their key activities, value propositions, key resources, and key partnerships (Connecting Nature, 2019).
- **NBE Collaborations** can be understood according to who the partner is, the level of collaboration and the reason why the NBE engages in the collaboration.
- **Urban Sustainability Transitions** - long-term processes of change realised through the reconfiguration of rules, services, and organizational structures within urban systems Frantzeskaki et al., 2017).
- **Action Outcome –** The outcome of partnerships which directly influence the delivery of NBS (Frantzeskaki et al. 2014).
- **Process Outcome –** The process of collaboration generates broader capacities and synergies which facilitate UST (Frantzeskaki et al., 2014).

To illustrate the connections between these concepts, numerical placeholders ranging from 1 to 5 are employed (fig.2). Drawing on these numbers, the way the concepts relate to each other as established in literature will now be explained. Firstly, NBS have been seen to result in UST (5) (Frantzeskaki et al., 2017), correspondingly, NBEs have been identified as important actors in the implementation and development of NBS (1) (Koojiman et. al., 2021). Key partnerships are important external enabling factors for NBEs (McQuaid et al., 2021a) (2) and can be understood in terms of who the stakeholders are, the purpose of collaboration and the level of interaction. The level of interaction includes Ongoing Structures, temporary structures, coordinated forums, informal connections, and coordination. Collaborations (partnerships) can contribute to UST.

Indirectly (action outcome), collaborations between NBEs help to overcome system barriers to NBS (3). The successful development and implementation of NBS leads to UST, which completes the link between collaboration and UST (5). Directly (process outcome), through collaboration, new ways of doing, organising, and thinking arise which contributes to UST (4). The role of NBEs and how they collaborate to contribute to UST can be reflected on in terms of upscaling, replicating, partnering,

instrumentalising and embedding. In figure 2, the orange boxes represent key theoretical elements that will be used as indicators to answer the research question. This is outlined in Chapter 3.3.

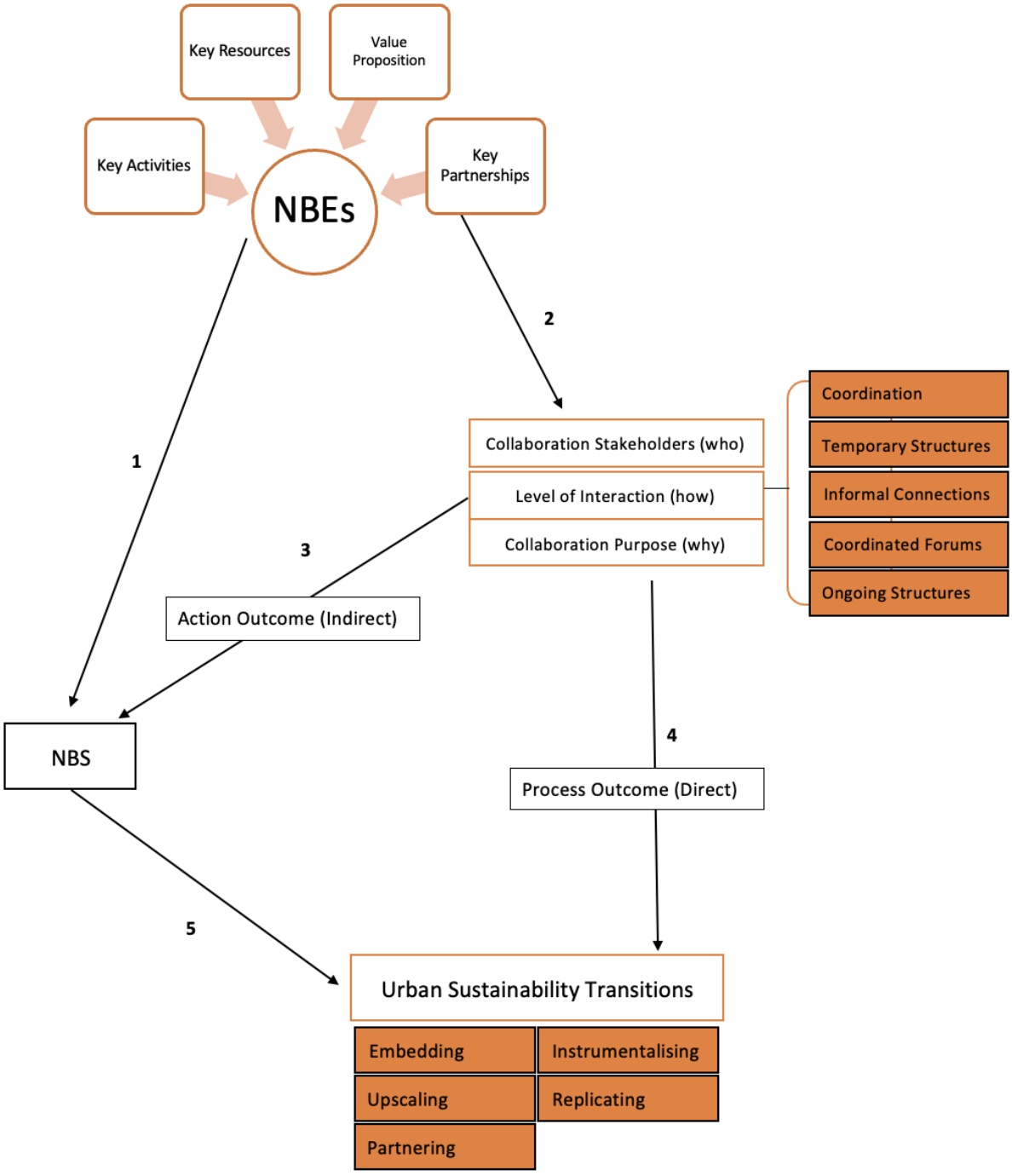


Figure 2: Nature-based enterprise collaboration for Urban Sustainability Transitions

3. Methodology

Now that the theoretical background of this study is established, the qualitative methodological tools and techniques used to explore the research question can be introduced and substantiated. Firstly, the research design of this thesis, an embedded multiple-case design will be introduced alongside its suitability to answer the research question. Next, the process employed for selecting the cases, followed by the introduction of the two chosen cities, Harare and Amsterdam, along with their respective embedded units of analysis are shown. Thereafter, the three data collection methods, semi-structured interviews, participant observation and document review are outlined before diving into how the data obtained is operationalised and analysed. Finally, the chapter concludes with a critical reflection on measures undertaken to ensure methodological rigor and research quality.

3.1 Research Design

A qualitative approach is employed in this study, which is selected in consideration of the limited understanding of NBEs and their potential contributions to UST (Marshall & Rossman, 2014). The research design utilizes an embedded multiple-case design, which involves examining two cases comprising multiple units of analysis (Yin, 2009, p. 52). In this study the city region is the case and the urban beekeeping sector (embedded unit of analysis 1) and NBEs (embedded unit of analysis 2) are the embedded units of analysis. In embedded case study designs, one of the key features is that subunits should be leveraged to return to the larger units of analysis. This is a fitting methodological choice to answer the research question because although NBEs are the analytical unit, their impact is ultimately discussed in terms of sustainability transitions at the city level (fig.3). Furthermore, the use of the case study approach in general is practical to study contemporary phenomena (Bryman, 2016).

A multiple-case study design is used rather than a single case-design to facilitate the in-depth exploration of NBEs as multiple case design allows for the incorporation of a broader scope of perspectives. This study aims to incorporate a diverse set of NBEs to provide rich insight into the theoretical propositions (Bryman, 2016). Following Yin (2009)'s methodology for multiple case studies, both individuals are investigated using the same protocol and then results from each case are compared. The comparison is used, not to look for causality and generalisation, but rather a method to map diversity and the breadth of NBEs in urban beekeeping and the ways they can contribute to UST against existing theory. This comparative approach facilitated by the multiple-case design enhances the depth and scope of the analysis. In addition, the incorporation of evidence from

various cases is often viewed as more compelling, lending greater robustness to the overall study (Gustafsson, 2017).

3.2 Case Selection

This study aimed to be sufficient both in terms of sample size and sample composition. Firstly, the sample size of urban beekeeping NBEs (embedded unit of analysis 2) is determined using theoretical saturation. When no new insights were gained from NBE cases, sampling NBEs stopped (Bryman, 2016). As a result, 6 NBEs in Harare are included in the study and 8 NBEs from Amsterdam. From each case one NBE is zoomed in on and one of their collaboration partners included in the study. This will be presented in detail in Chapter 3.3. Theoretical saturation is also used to guide the sample size for the urban beekeeping sector (embedded unit of analysis 1). However, only two urban beekeeping organisations are included per case because this was the total number cases identified that fulfilled the necessary criteria (Bryman, 2016) (fig.3). This selection will be explained in detail in chapter 3.3.1.

Secondly, regarding sample composition, the case studies are selected based on the following requirements: city has an active urban beekeeping sector and there are operational NBEs in the city. This is determined based on researcher's prior knowledge and document reviews (D8, D9, D11, D12, D14, D15). Secondly one city is required to be in the global north and the other in the global south. This condition is important to create more tension between comparisons and enable applicability of results across a wide geographical reach (Hammarberg et al., 2016). Given the necessary conditions the cases are ultimately elected based on researcher access to participants due to having a priori knowledge of the community and its members. This allowed for "expediency of access (Chavez, 2008, p. 482)", specifically swifter and more intimate access to the field. This stems from the researcher being resident both Zimbabwe and the Netherlands. Furthermore, given financial constraints, it was important the physical locations were accessible to the researcher.

The first case selected is **Harare,** the capital city of Zimbabwe (fig.3). It is a sprawling city characterized by a radial road-network which converges in the central business district, distinguishable by high rise buildings (Wania et al., 2014). Harare metropolitan is comprised of four districts: Harare urban, Harare rural, Chitungwiza and Epworth. The industrial areas are in the east and south whilst to the north and northeast are low density suburbs with plot sizes increasing from 1000 m2. These offer diverse foliage, a unique opportunity for urban beekeeping. To the south, southwest and west are high-density areas with plot sizes of 300 m2 and small housing units (Kamusoko et al.,2013). The number of urban beekeepers in Harare is undocumented as are the number of commercial hives. However, some national statistics are available. There are an

estimated 973 large scale beekeepers with an average of 51 hives and 7047 small-scale beekeepers owning 18 hives on average (Mwandifura et al., 2022).

The second case selected is the city of **Amsterdam** (Gemeente Amsterdam) has 853,312 inhabitants over an area of 219.3 km^{2}. It consists of an inner ring zone, the core of the city, which has the highest population concentration (500 000) and is 71.17 km2 in area (CBS, 2018). In recent years urban densification has led to reduction and fragmentation of urban green areas (Giezen et al., 2018). The city has diverse land uses including densely built-up regions, parks (Vondelpark; Amstelpark; Beatrixpark Frankendael; Sarphatipark; Oosterpark; Westerpark), forests (Amsterdamse Bos), water bodies and industrial areas (Stadsdeel Borough) (Rafiee et al., 2016). The research design and sampling approach for both cases is depicted in the following image (fig.3).

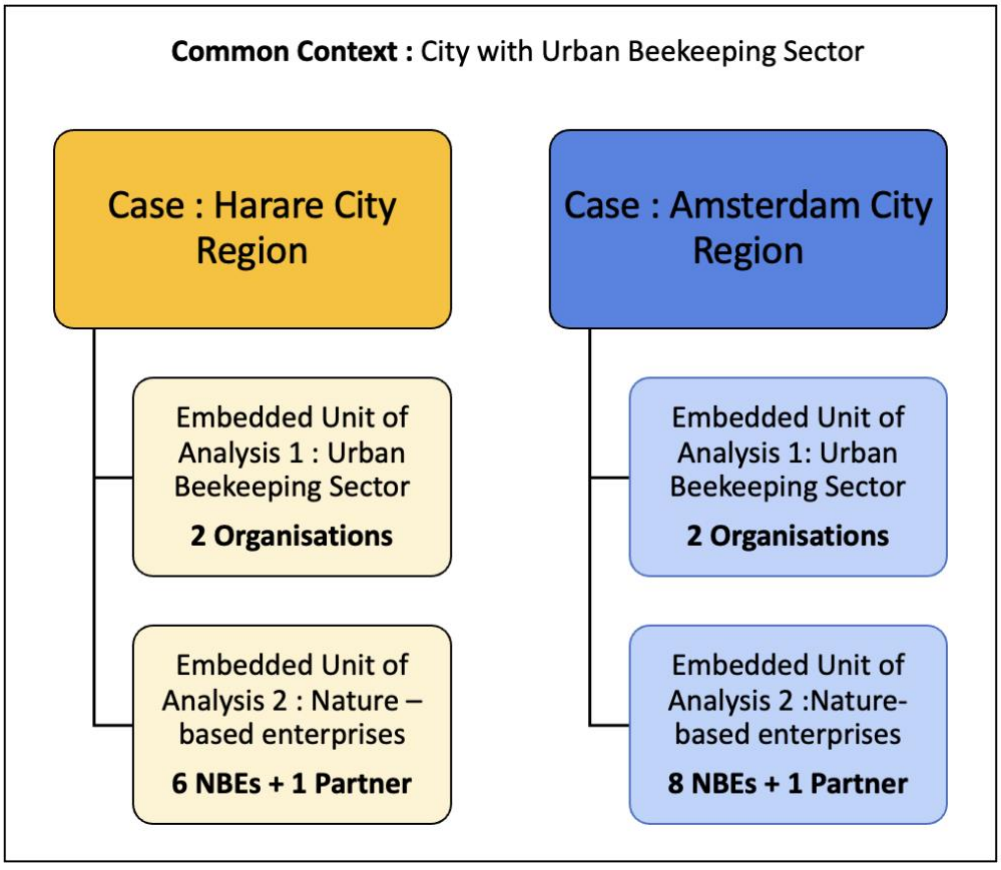


Figure 3: Embedded Multiple-Case study Approach

3.3 Data Collection

3.3.1 Interviews

The primary method of data collection is semi-structured interviews conducted online over Zoom and in person. A total of 22 interviews, lasting between 40-45 minutes, are conducted. Four interviews take place with members of urban beekeeping organizations. These organizations are

identified using the snowball sampling method in interviews with NBEs and document reviews (table 5). However, the identified organizations undergo a filtration process, and suitable participants are selected based on the following three criteria:

- Referral by an NBE: The organization must be referred by an NBE which indicates its involvement in the urban beekeeping sector.
- Location or Activities in Urban Area: The organization should be located in, or actively conduct activities within the urban area under study.
- Current Activity and Membership: The organization must be currently active and have at least one employee or member.

The process of selection and exclusion of organizations based on the established criteria can be found in Appendix B and for the final sample of organizations included in the study see Appendix C.1. The interviews with organisations are designed to gain a broader perspective on the urban beekeeping sector and delve into who the NBE stakeholders are, how they form partnerships and perspectives on UST linked to beekeeping. The interview guideline which operationalises this inquiry can be found in Appendix E.1.

The next cohort of participants selected for the semi-structured interviews are NBEs whose core business is urban beekeeping, that is they operate, maintain, or develop hives in an urban area and/or sell bee biproducts among other emergent activities (Devkota et al., 2016; Egerer & Kowarik, 2020). There are no publicly available databases of urban beekeepers in Amsterdam or Harare therefore NBEs are selected through document reviews and non-probability snowball sampling (Bryman, 2016). Sampling terminates when theoretical saturation is reached which resulted in 14 NBEs being included in the study (table 5), the NBE participants can be found in Appendix C.1. NBE Executive – level employees are contacted via email or LinkedIn and asked to participate in the study. This type of employee is selected because personnel at the executive level are “crystallization points (Trinczek, 2009, p.2)” for practical insider knowledge on the key activities of the NBEs. The NBE participant is asked to discuss the enterprise’s key activities, partners, how they collaborate with stakeholders and the purpose of doing so. Finally, the NBE participant is probed to reflect on their potential contributions to UST. The four-part NBE interview guideline is constructed to ensure these topics are addressed and can be found in Appendix E.2.

To cross-check responses and examine the NBE unit of analysis in detail, one NBE is selected from each city region and one of their collaboration partners interviewed (table 5). The interview

guideline for this exchange can be seen in Appendix E.3. and follows the same topics as the NBE interview guideline given the purpose of this interview is largely to substantiate responses from NBEs and urban beekeeping organisations.

Lastly two structured interviews are conducted with academic experts. One participant is an expert in the field of NBS and another in the field of NBEs. Here the interview guidelines are used to discuss insights observed in the case-specific interviews (table 5). These structured guides can be found in Appendix E.4 and Appendix E.5 respectively. In all interviews ethical principles are adhered to as all participants are asked to sign the consent form provided by Utrecht University (Appendix F) (Bryman, 2016).

3.3.2 Participant Observation

Direct participant observation is used as a complementary data collection strategy to interviews as it allows for inferences and comparison to be made between what is spoken about in the interviews and what is observed (D'Eredita & Barreto, 2006). Therefore, this method also helps to validate the interview guidelines (Appendix E) (Swain & King, 2022). Lastly, participant observation proved a useful tool to connect with individuals who act as "informal sponsors (Hammersley & Atkinson, 2007, p.56)" and help to ensure continuous access to the urban beekeeping field in Harare and Amsterdam.

Two types of participant observation are employed. The first is where NBEs are visited and the researcher takes on an active, participatory role. The second type is observations of group meetings where NBEs are participants. In these scenarios the researcher takes on a partial participatory role (Ciesielska et al., 2018). For example, in the case of a webinar the researcher poses questions related to the research question of this thesis. Participant observation of these events is particularly useful to corroborate tacit knowledge such as how NBEs collaborate. Field notes are used to record observations, findings and interpretations strongly guided by Wolfinger (2002)'s method of fieldnotes, the "salience hierarchy (p.89)". According to this approach, noteworthy interactions and observations which confirm, challenge or add nuance to other data streams are prioritized and documented first. This method is deemed appropriate due to the complementary function of participant observation in relation to the data collection process in this thesis.

For ethical considerations, the researcher transparently disclosed their role, except in certain group situations where the nature of admission, such as webinars or open days, where access is particularly open. In such cases, it was determined that it is not ethically necessary to explicitly

reveal the role as a researcher (Roulet et al., 2017). A record of the participant observations can be accessed in Appendix D.

3.3.3 Document Reviews

The final method employed is document reviews. The documents included in this study are official documents from private sources (Bryman, 2016). This included publicly available documents such as: websites and social media pages of NBEs and urban beekeeping organisations, and private documents shared upon request such as minutes of meetings and newsletters. According to Scott (1990)'s quality criteria, documents from private sources are meaningful in that evidence is clear and comprehensible but can be plagued by credibility and representativeness concerns. On this basis document reviews in this study are analysed in the context of data from interviews and participant observation. A complete inventory of documents reviewed in this thesis can be seen in Appendix G. Articles which interview participants shared with the researcher or recommended to be read are also included in the sample (D5, D6, D10).

In summary data collection methods occur in parallel and are carried out for each case, Harare, and Amsterdam. The sample sizes shown in table 5 are the total sample size, not per case study. Periods of investigating the field are also interposed with writing and analytical reflection to facilitate the iterative approach of this thesis.

Table 5: Data Collection Methods and Sample Sizes

Method	Unit	Sample	Function
Document Reviews	Urban Beekeeping	Company websites, social media groups, documents from beekeeping organisations (Appendix G).	Used to confirm suitability of case-studies to address research question in addition to identifying suitable NBEs and organisations and associations.
Participant Observation	NBE	4 NBEs	Visiting and observing the NBEs as well as having informal conversations with NBE employees will help to validate the interview guideline and generate background understanding due to limited availability of information on urban beekeeping from these city regions.

	Urban Beekeeping	4 online webinars or conferences attended by members of urban beekeeping NBEs.	Observe how collaboration takes place in formalised arenas between NBEs. Use as part of snowball sampling – contact NBEs and beekeeping organisation members willing to be interviewed.
Semi-Structured Interviews (40 Minutes)	Urban Beekeeping	4 Organisations	Construct overview or urban beekeeping sector, how stakeholders collaborate and types of NBEs.
	NBE	14 NBEs	Gather information on the type of NBE and how it collaborates with other stakeholders in the urban beekeeping sector and how this can contribute to UST. Create contact with other NBE's and urban beekeeping organisations (snowball sampling).
	NBE	2 Collaboration Partners	Zoom into a specific NBE and its partnerships to cross-check data and look deeper into Embedded Unit of Analysis 2.
Structured Interview: Expert Validation	Experts	2 Experts	Discuss emergent trends and preliminary findings from participant observation, document reviews and semi-structured interviews

3.4 Operationalisation

Theoretical concepts are operationalized through the construction of empirical questions and associated indicators (table 6). The indicators are derived from relevant literature on NBEs (Connecting Nature, 2019; Koojiman et al., 2021; McQuaid et al., 2021a), collaboration levels (Makepour et al., 2021; Xie et al., 2022), and pathways for UST (Frantzeskaki et al., 2012; Frantzeskaki & Kabisch, 2016; Frantzeskaki et al., 2017; Adams et al., 2023; Flyvbjerg et al., 2003; Sarabi et al., 2019). Emergent indicators from data collection are also included. For example, the indicator "mentorship" which connects to the empirical question "how do the NBEs understudy collaborate with their key partners" in the collaboration category (table 6) as well as the "symbolic collaborations" indicator which emerged as a way NBEs can collaborate. Moreover, existing

literature distinguishes value propositions into economic, social, and environmental categories. However, in practice, the emergent value propositions are not clearly linked to only one dimension. As a result, these value proposition variables are operationalized through a unified empirical question rather than being treated as separate and distinct categories.

Using indicators from both theory and data relies on iteration between research design and implementation thereby incrementally contributing to the reliability and validity of the study (Morse et al., 2002). According to Creswell and Poth (2016), verification strategies such as this should be entwined into every phase of qualitative research. The indicators are used to show how the researcher aims to empirically recognize concepts. For example, upscaling is identified by: the growth of members, practitioners or supporters and the spread of core ideas linked to urban beekeeping. The empirical research questions are organized into three distinct groups, each focusing on specific variables that can be observed and measured. The empirical research questions are operationalised in the interview guidelines (Appendix E) whereby indicators are embedded in broader questions (Merriam and Tisdell, 2015).

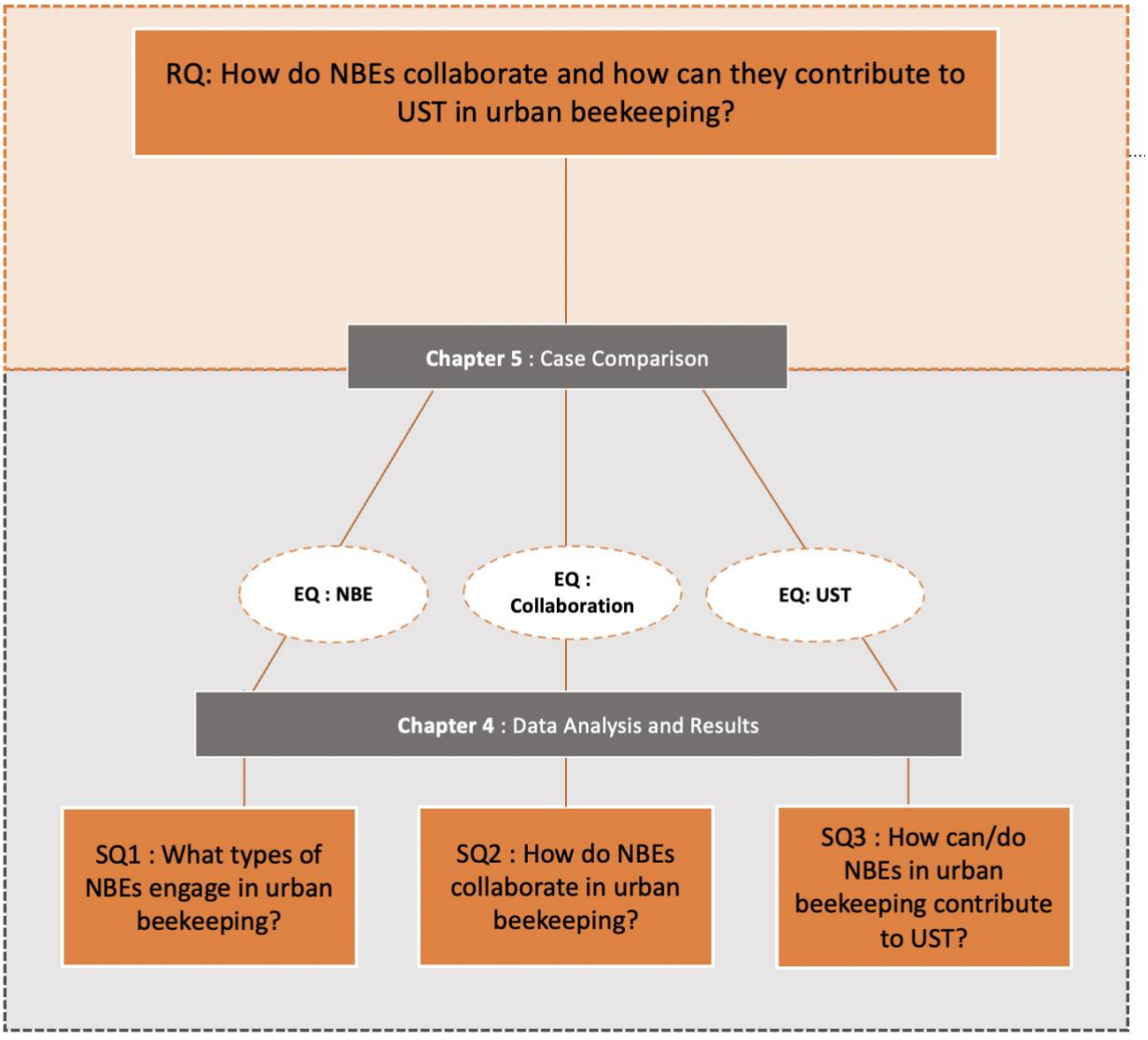
Table 6: Operationalization

Category	**Empirical Questions on NBEs understudy**	**Indicators**
Nature-Based Enterprises	What key activity(s) related to urban beekeeping NBEs do engage in?	Key activities, Complementary Activities
	What are the value propositions of NBEs?	Green jobs, business opportunities; economic gain, market access; Health and wellbeing, social cohesion, community support, social development; Biodiversity promotion, nature awareness, habitat creation
Collaboration	Who are the key partners of the NBEs related to their key activities?	Commercial farmers, other urban beekeeping NBEs, rural out growers, middlemen, aspiring beekeepers, urban residents,

		international actors, NGOs, businesses, bee organisations
	How do NBEs collaborate with their key partners?	Resource sharing, formal knowledge sharing, informal knowledge sharing, service delivery, mentorship, collaboration void, contractual collaboration, symbolic collaborations.
	What is the purpose for NBEs to collaborate with their identified key partners?	Streamline sector, access to markets, control disease, fulfil value propositions, increase capabilities, mobilise resources, support urban beekeeping community, risk distribution, mitigate challenges
Urban Sustainability Transitions	How do the NBEs contribute to UST by upscaling?	Growth of members, growth of supporters, spread core ideas, growth of practitioners
	In what ways do the NBEs understudy contribute to UST by replicating?	New ways of thinking, new ways of doing, new ways of organising
	How do the partnering strategies undertaken by NBEs contribute to UST?	Pooling resources/ capabilities/ expertise, collaboration
	In what ways do the NBEs understudy contribute to UST instrumentalising external funding?	Leveraging opportunities, external funding
	In what ways do the NBEs understudy contribute to UST by embedding?	Integration of local perspectives, improved legitimacy of NBS

There are three interview guides for urban beekeeping organisations, NBEs and NBE partners respectively which vary slightly according to the interviewee but adhere to the same structure (Appendix E.1, E.2 and E.3). The expert validation interviews do not follow this structure because they were used to cross-check emergent data from analysis.

As shown in figure 4, the empirical question categories operationalise the sub questions as follows: NBE category operationalises sub question 1, collaboration operationalises sub question 2 and UST category, sub question 3. The empirical questions are directed at each case separately in Chapter 4 and then the answers from this analysis are used for comparison to map out the breadth and diversity of NBEs in urban beekeeping in Chapter 5.



***EQ= Empirical Questions*

Figure 4 : Operationalization of Research Sub questions

3.5 Data Analysis

Interviews were transcribed, coded, and analysed using the Nvivo software. The coding process resulted in 317 codes each of which was allocated to one or more subcode which were categorised based on the operationalised questions they contained indicators for. The data analysis method is thematic, whereby themes were primarily determined based on theory related material expressed as the three operationalised categories: NBEs, Collaboration and UST in table 6 (Bryman, 2016).

During the coding process, if relevant data did not align with existing codes or sub-codes, a new code was established which allowed for the identification of novel ways NBEs collaborate or contribute to UST (Saunders et al., 2009). An example of an emergent category is "ecological dilemma" (Appendix H), which emerged during participant observation and interviews in Amsterdam. When a significant new category emerged during an interview, it was included in the interview guide and transcripts re-coded (DiCicco-Bloom & Crabtree, 2006). For example, after the code "ecological dilemma" emerged, subsequent interviewees were asked if they were aware of an ecological debate around honeybees and if so, how they perceived the debate. The coding process resulted in the full list of codes and descriptions used to guide the coding strategy can be found in Appendix H. Certain codes which were initially identified in the theory but did not emerge in the data were excluded, as on this basis they were not deemed relevant for analysis. Notable excluded theory-derived codes include process and action pathways for collaboration outcomes and key resources of NBEs.

For theory led thematic analysis Boyatzis (1998)' three stage-approach was followed: first themes established through reading and reflecting on the theory (p.2)", next "compatibility with raw information (p.3)" was checked by participant observation and pilot coding of two transcripts. Lastly the "reliability of the coder (p.36)" was tested by asking a peer to code a sample of the interviews and comparing analysis outcomes (Riff et al., 2005). Supplementary data from participant observation and document reviews has been analysed using the same coding method. Data analysis steps occurred in parallel, therefore there was interaction between the various "strands of data (Proudfoot, 2020, p. 4)" making this a highly iterative and reflexive process (Fereday & Muir-Cochrane, 2006).

3.6 Research quality Indicators

Research standards in this thesis are strongly informed by Yin (2009)'s criteria for trustworthiness in case study research. Firstly, multiple sources of evidence are used in the semi-structured interviews such as by interviewing NBEs as well as their collaboration partners which can help to improve *confirmability* and allow for the construction of a sequence of evidence from different perspectives.

During data analysis the “triangulation of sources (Patton, 1999, p.1193)” technique is used in the comparison of data across the Harare and Amsterdam case studies as well as between different data sources, participant observation, document reviews and interviews (table 5). This heightens the *credibility* of the data and is a means of cross-checking information from different sources to reduce sources of bias and false responses (Yin, 2009; Bryman, 2016).

Although external reliability is compromised by lack of a stepwise methodological approach which makes it difficult to replicate this thesis, conducting different types of data collection simultaneously can help to improve the alignment between the researchers’ observations and the theoretical ideas developed from the data (LeCompte & Goez, 1982). This unique approach helps to detect possible flaws and test whether the variables have been sufficiently operationalised (Dikko, 2016). To ensure *authenticity and fairness*, a draft version of results was sent to participants who have been directly cited. The process aimed to validate that the qualitative interpretations and analysis genuinely reflect the participants views and opinions (Bryman, 2016).

4. Case Analysis and Results

The results of each case Harare and Amsterdam are presented according to the operationalised empirical research questions presented in Chapter 3.3 and depicted in figure 4. First, the case study of urban beekeeping in Harare is presented, providing insights into the key activities of NBEs, how they deliver the NBS, urban beekeeping, affiliated value propositions and key partners. The results of this case also shed light on the configuration of collaboration networks in this context. Finally potential contributions to UST are presented in terms of the five mechanisms of UST. Next, the Amsterdam case study is outlined using the same analysis structure. The individual case results and analysis lay the foundations for meta-level case comparison in Chapter 5.

4.1 Case Study: Harare

Harare's urban landscape offers favorable conditions for urban beekeeping, characterized by a spacious urban layout, diverse foliage lining the streets, and large residential plots which provide abundant food sources for bees (I4, I7, I9). However, one key consideration unique to beekeeping in Zimbabwe is the prevalent species, *Apis mellifera scutellate*, colloquially referred to as the "African Killer Bee (I8)" due to the aggressive behaviour it exhibits. As a result, this species of honeybee requires careful management when kept within the urban space. The climate in Harare remains warm throughout the year, with a brief hibernation phase during the winter, allowing for year-round urban beekeeping activities. Alongside NBEs, there are hobbyist beekeepers who maintain hives on their private land. In Harare, regulations such as the Bee-Act require the registration of every hive with the authorities (I1). However, in reality this is difficult to enforce, and the exact number of hives and beekeepers is not officially documented. NBEs based in Harare engage in a range of activities across the urban landscape which is unpacked in the following analysis.

4.1.1 Types of NBEs in Harare

Six NBEs operating in Harare are identified in the study. There appear to be three NBEs who are larger operators: Mawungwe Honey, Thornwood Trading and Maweni. The remaining three NBEs are newer to the urban beekeeping sector (table 7). These enterprises are examined according to the key activities related to urban beekeeping they engage in and the associated value propositions they deliver, thereby addressing the following empirical questions:

- *What key activity(s) related to urban beekeeping do the NBEs under study in Harare engage in?*
- *What are the value propositions of NBEs in Harare?*

Collectively a wide range of key activities are carried out by these enterprises ranging from: the provision of pollination services to farmers (3 NBES), hive maintenance (5 NBES), honey harvesting (6

NBES), processing (4 NBEs) and honey retail (6 NBES). Furthermore, NBEs engaged in education, consultancy, disease prevention and beekeeping training. However, a general hierarchy of activities emerged. Namely, pollination services and honey value chain activities (harvesting, processing, hive maintenance and honey retail) are essential, core activities of certain NBEs and other activities such as education, beekeeper training and disease prevention for example are integral but appear to be complementary activities to the aforementioned. The types of NBEs identified in Harare are structured according to the two key activities identified: pollination services and honey value chain activities and value propositions concurrent with each respective key activity.

4.1.1.1 Pollination Service Provision

In Harare, three NBEs are actively engaged in providing crop pollination services whereby commercial farmers rent bees from NBEs for a specified duration to facilitate the pollination of their crops. This causes severe degradation to the health of the hive which the beekeeper monitors and substitutes unhealthy colonies for new colonies when necessary to continue pollination (I3, I4, O1). Demand for pollination services is a relatively new phenomenon in Zimbabwe as during the land reform program in 2000 virtually all commercial farms went out of business and Zimbabwe's "$300 million agricultural industry crashed down to zero (I4). Beekeepers stopped doing pollination work because there were no commercial farms left (I4)". In the years since, commercial farming has gradually picked up and pollination has become a viable part of some NBE's businesses again (I4, I8, O2).

This key activity seems to be exclusive to three NBEs, Mawungwe Honey, Thornwood Trading and Maweni who have a longer history of being operational in Harare. This may be a result of their reputation as urban beekeepers and pollination service providers being more established than that of smaller scale operators (I5). A rival explanation may be that economic barriers to pollination may prevent smaller-scale beekeepers from entering the market because a more expensive beehive is required than a regular beehive which is between "USD$100 and USD$120" as opposed to a "$25 top-bar hive (I6)". Secondly, the NBE needs capital to transport the hives from Harare and out to the commercial farms (I3).

As quickly as pollination has come into the fold of being a core activity for NBEs, this practice may simultaneously be shifting away from them. Many commercial farmers are developing their own in-house beekeeping services with trained beekeepers and their own on-site hives for crop pollination (I4). However, pollination services provided by the NBEs are a subset of urban beekeeping because the NBEs keep their hives at various locations in Harare where they have ample food and space.

Thus, the colony is strengthened in the city before being transported out to commercial farms to pollinate (I3, I4, I5, I8, O1). This is an important aspect of pollination as "one strong hive can do as much work as three- or four-week hives (I8)". The added value of strengthening colonies in the urban environment may help make the pollination service NBEs deliver superior to the pollination job the commercial farmer can carry out alone in-house, thereby safeguarding this element of business (I8). The strengthening of colonies is made possible due to the uniquely spacious urban layout of Harare (I2, I3, I4, I8). This is illustrated by an NBE involved in pollination services:

"Colonial town planning rules established whole suburbs where there are one- and two-acre plots throughout and this hasn't changed much since Independence in 1980. These low-density areas are accidentally now suitable for beekeeping. We have between 4000 and 5000 square meter plots throughout Harare, which really gives space for the bees(I8)."

To maximise the advantages of the city, NBEs who provide pollination services also place multiple hives in the gardens of urban residents (I4, I8). One NBE refers to these key partners as "hive guardians (I8)" because they provide a safe space for the hive within their walled gardens, protecting them from theft (I4, I8, O1, O2), and increase food availability by planting a wide variety of flowering plants. This was confirmed by a hive guardian who collaborates with Maweni. She does not engage in any maintenance of the hives or honey harvesting but undertakes certain responsibilities to ensure their wellbeing such as only mowing at night to prevent agitating the bees and planting specific flora for them on her property (I8, I9).

Another complementary activity to pollination services is the manufacturing of equipment specific for pollination, namely the Langstroth Hive which is smaller and easier to transport than regular hives (I4, I6, O2, D8). This equipment was previously imported from South Africa, but the re-emergence of the bee pollination industry in recent years has crafted out a space for local beekeeping equipment manufacturers to operate in Harare (I6).

The value proposition of pollination services is largely economic. Commercial farmers benefit from increased crop yields in terms of both quality and quantity of produce (I3, I4, I8). The presence of bees and their pollination services enhance the productivity of the crops, leading to higher yields and potentially better market prices for the farmers. This has benefits for biodiversity as commercial farmers do not have to rely on fertilisers to achieve the same result (I4). However, this environmental value proposition is only mentioned by one NBE. On the other hand, NBEs benefit

economically as they charge a fee for the use and placement of their hives in the farmer's fields during the pollination season (I3, I4, I8). This fee is compensation for the beekeepers' efforts and expenses associated with hive maintenance, transportation, and ensuring the health and well-being of the bees. Two NBEs mentioned an added value of the safety of the hives, as the farmer undertakes this responsibility for the duration of the pollination season (I4, 13). Social value propositions directly linked to pollination services are not mentioned by NBEs. However, the complementary activity, urban hive placement is reported to increase urban resident well-being (I9). However, realising this value proposition also requires the careful navigation of bee aggression such as by training urban residents on how to avoid agitating the bees (I4, I8, O1, O2).

4.1.1.2 Honey Value Chain Actors

The second set of key activities all NBEs in Harare engage in is the honey value chain. Four NBEs take part in all three stages of the honey value chain: harvesting, processing, and honey resale (I3, I4, I7, I8). Two NBEs only take part in honey harvesting and resale because they do not have access to a honey processor (I5, I6). Larger scale NBEs in Harare, namely Maweni Honey, Mawungwe and Thornwood Trading, harvest, process and sell honey under their own brand to local markets (I3, I4, I9). The market is relatively limited to local consumption due to a lack of permits for export (O2, I2, I9). However, local demand is high in Harare. To keep up with the needs of the domestic market, two NBEs collaborate with “middlemen (I9)” or “honey pimps (O1)”, such as Motso Honey. The role of this NBE is to link small scale out-growers in rural areas to the urban honey market in Harare (I6).

These actors train rural farmers to harvest honey correctly and how to monitor the wellbeing of the bees in the hive (I6). The rural out-growers are also taught quality control measures to ensure the honey is suitable for market and has not been over-smoked for example when extracting honey (I6, I8, O1). Honey traders coordinate the resale of the rural honey as they weigh each out-grower’s harvested honey and transport it back to Harare where it is processed and sold by NBEs under their own brand name (I3, I6, I8, O1, O2). If the honey is not up to the quality standards of the NBE it will not be bought (I8).

Training and collaborating with rural out growers are considered a complementary activity to the core NBE activity, the honey value chain. Other complementary activities to the honey value chain include making value addition products such as wax sheets, lip balms and creams (I3, I8, O1, O2) and education of urban residents. Two NBEs try to generate awareness locally about the positive impacts of bees for pollination (I3, I6, O1) and the health benefits of honey consumption as opposed to ordinary sugar (I3). NBEs do so to help strengthen and grow their customer base for honey as well as

other value addition products (I3, I6). As well as being a complementary activity to pollination services urban hive placement in resident's gardens is also undertaken to improve honey yields (I3, I4, I8). Other complementary activities include education and training of novice beekeepers, consultancy, sale of value addition products and bee removal.

The value proposition of the honey value chain activities varies largely depending on the complementary activities the NBE engages in. Firstly, the value proposition of this training and partnering with rural out growers is two-fold. On one hand the NBEs have a supplementary supply of honey which spreads risk and ensures they have enough supply for resellers in Harare throughout the year. This is a form of economic security. On the other, NBEs can contribute to economic and social development in the rural areas by facilitating a market for their rural produce (I3, I5, I8, O1). This value proposition is highlighted in the following quote from an NBE who operates as a honey trader and beekeeping trainer of rural out growers:

"The honey market grew, and I couldn't keep up, so I had to come up with an initiative. I looked to the rural areas and decided to partner with them and give them the necessary knowledge. They produce honey, they get the money and I get to satisfy the market. I also have a passion for improving livelihoods especially for the vulnerable communities. It's a win- win for both of us (I5)."

Table 7 provides a summary of the key activities and complementary activities undertaken by NBEs in Harare. Additionally, it presents a concise overview of the value propositions associated with these activities. Value propositions can occur across social, economic, and environmental dimensions. However, for the purpose of presentation and analysis, they are consolidated and discussed within a unified category.

Table 7: Summary of Harare NBE Activities and Value Propositions

NBE	Key Activity	Complementary Activity(s)	Value Proposition
Mawungwe	Entire Honey value chain	Education and seminars on benefits of honey; beekeeping training, contract beekeeping; value addition products.	Teach people how to generate a side-line income; stimulate awareness around the benefits of bees and honey.
Thornwood Trading	Entire Honey value chain	Urban hive placement; Education; Disease Prevention; consultancy	Protect and grow beekeeping industry
	Pollination Services		Improve crop yields and reduce food insecurity
Motso Honey	Honey Harvest and Resale	Contract Beekeeping (rural out-growers); honey transport; Beekeeping Education	Connect rural out-growers to urban markets and prevent market shortages in Harare. Help out-growers generate side-income (social development).
Jasmine Apiary	Honey Harvesting and Sale	Beekeeping equipment manufacture; education on agroforestry and biodiversity; Bee Removal and Consultancy	Maintain and protect biodiversity by protecting bees. Sell equipment at reduced prices to lower economic barrier of starting beekeeping for low-income earners.
Lock Honey	Entire Honey Value Chain		Protect and maintain biodiversity
Maweni	Entire Honey Value Chain	Urban hive placement; Education; value addition (wax processing and trading); Beekeeping equipment sale; bee removal	Grow and streamline beekeeping industry. Protect and maintain biodiversity.
	Pollination Services	Consultancy; Beekeeping education	Improve crop yields and reduce food insecurity

4.1.2 Key Partners of NBEs

Now the value propositions associated with the key and complementary activities of NBEs have been presented, we turn to their key partners to address the empirical question:

- *Who are the key partners of the NBEs under study in Harare related to their key activities?*

NBEs in Harare partner with a variety of local and international actors and groups who can be considered according to the following three categories:

- National and Global Beekeeping Bodies (Vertical Partnerships)
  This category groups key partners that transcend sector boundaries, including national beekeeping organizations, NGOs, and international actors in the case of Harare. These key partners have a wider sphere of influence than NBEs and act across sectors.
- Industry level actors (Horizontal Partnerships)
  This category encompasses enterprises actively involved in the urban beekeeping industry who NBEs partner with. These are predominantly other NBEs in the case of Harare as well as commercial farmers and middle-men (honey-traders). Motso Honey stands out as the sole case that falls into two categories of partnerships, as an NBE that also engages in honey trading as a complementary activity to their honey value chain.
- Individuals and Communities (Diagonal Partnerships)
  This category encompasses the participation of individuals and smaller groups within the urban beekeeping ecosystem who NBEs partner with. In Harare, these include, rural out growers, urban residents, and aspiring beekeepers.

The key partners associated with the identified key activities (and complementary activities) are shown in figure 5. This depicts how NBEs collaborate with middlemen, rural out growers, aspiring beekeepers, other NBEs and urban residents in the honey value chain key activity. Key partners exclusive to the pollination services are commercial farmers. Interestingly, collaboration with other NBEs was mentioned frequently regarding both pollination services (Frequency = 3) and honey value chain (Frequency = 5).

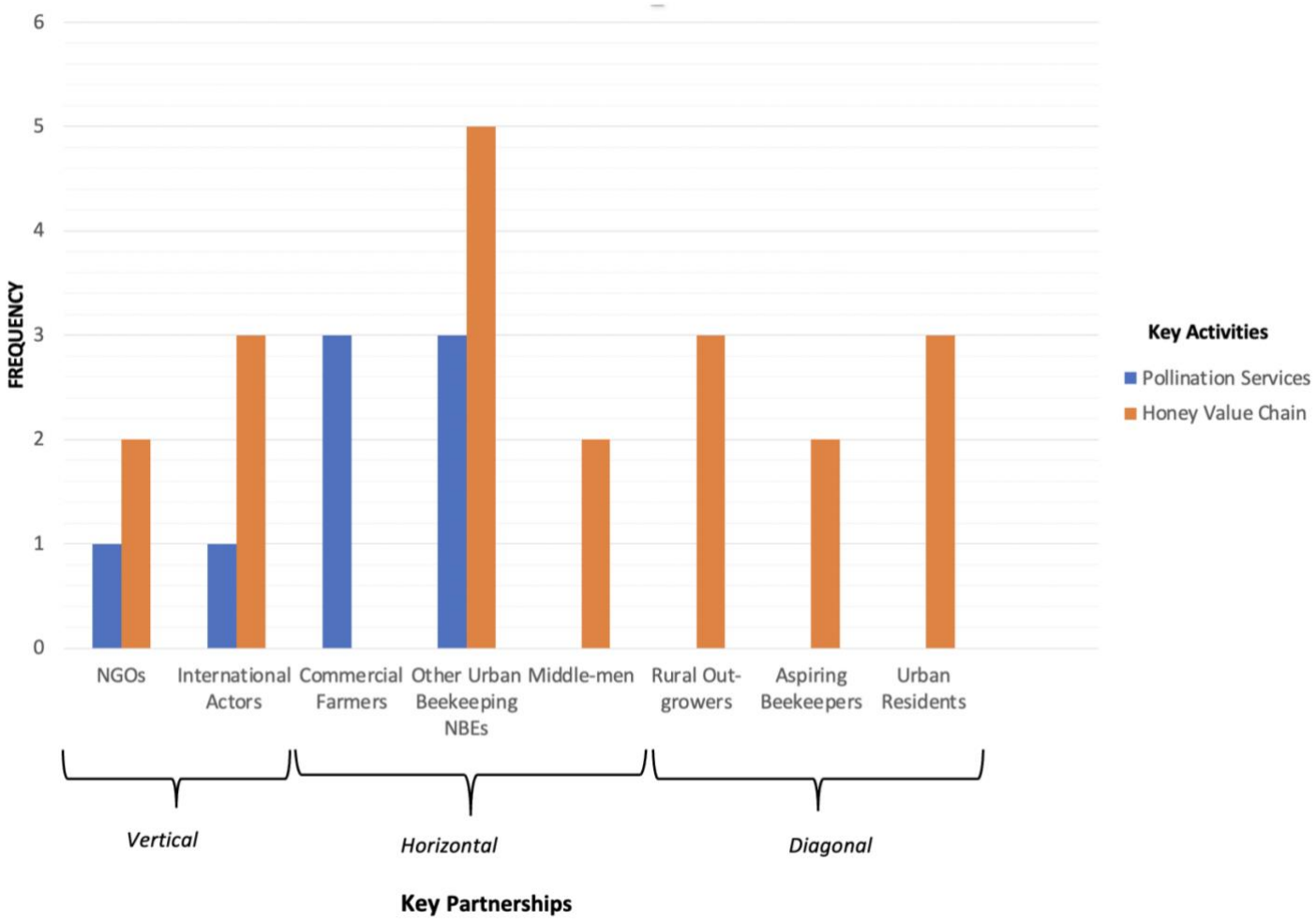


Figure 5: Key partners associated with identified key activities in Harare.

This illustration documents the different constellations of key partners NBEs engage with. For example, as illustrated, three NBEs partner with commercial farmers and other NBEs in pollination services. The reason for this partnership is NBEs are motivated to partner with other urban beekeeping NBEs to ensure they can meet the number of hives required by the commercial farmer. This is "not a static number (I4)" per client, type of crop or even per annum (I4, I5). Partnering helps to maintain the reputation of the NBE as they are able to deliver the pollination services required (I4). The key partners of NBEs in Harare have been identified in figure 5 but insights into how and why they collaborate with these different actors still needs to be unpacked.

4.1.3 NBE Collaborations in Harare

Findings on the collaborative efforts of NBEs in Harare and the rationale behind their specific partnerships will now be analysed and structured according to the categories of collaboration

partners: vertical, horizontal and diagonal. This analysis will provide insights into the empirical questions:

- *How do the NBEs collaborate with their key partners?*
- *What is the purpose for NBEs to collaborate with the identified key partners?*

4.1.3.1 Vertical Collaborations

Collaboration between NBEs and National and Global Beekeeping Bodies is the first set of identified key partners. During participant observation at Maweni honey, the CEO of Maweni and a University of Zimbabwe master's student, who was a beekeeper himself were present. When asked about collaboration across the urban beekeeping sector in Harare both parties laughed and explained this was non-existent as enterprises are secretive and there are no active associations (O1). This statement was flagged and further explored in the participant interviews (Appendix E).

Although two organisations are identified by NBEs, BKAZ and Mashonaland Beekeeping association (MBA), several participants confirmed little meaningful collaboration currently occurs between NBEs and beekeeping associations (I3, I4, I5, I8). The MBA dissolved during COVID and has not reconvened since. However, beekeepers reminisce on field trips and knowledge sharing at events organised by this association (I3, I7, I8, D1, D2). The connectivity void between actors which this association facilitated in the past collaboration was highlighted by an NBE, who attended the Durban Apiculture Symposium in 2023, and thought he was the only Zimbabwean beekeeper attending before "ten others popped up (I5)" that he had not met before.

On the other hand, BKAZ claims to be active in facilitating grassroots projects, market research and consultancy to "help beekeepers realise the dollar" from beekeeping (I1). However, BKAZ was only mentioned by two NBEs who described the organisation as "dormant to the best of [their] knowledge and in place solely to "attract donor funding (I8)" from NGOs. BKAZ offers a promising formalised collaborative structure in theory (I1), but this does not appear to be the case for NBEs in Harare. This may also be due to BKAZ being orientated towards rural empowerment as opposed to developing beekeeping practices in urban areas (O1, O4, D8).

NBEs in Harare have expressed a strong desire for collaboration and partnerships at the national beekeeping level, despite the lack of such engagements. Three NBEs specifically emphasized the importance of collaboration at an institutional level to obtain third country status, which would enable them to export honey to the EU. Presently, NBEs sell honey on the local market (I2, I5, I6, I7, I8, D2, O2, O4), with a few exceptions who export to Hong Kong (I3) and South Africa (I4). However,

attaining third country status entails the involvement of government institutions, securing funding for applications, and streamlining the industry to ensure consistent adherence to international quality standards (I2, I4, I8, O2, O4).

Additionally, NBEs expressed the need for increased formal collaboration within the industry to combat disease, such as the looming threat of American Foulbrood (I4, I5). The potential spread of this disease is concerning, according to one NBE, “If it spreads in the country, you are looking at all natural bees dying out over a period of time. The only hives left would be in a commercial setting where beekeepers have the wherewithal and the knowledge to manage it (I4)". NBEs recognize the importance of collaboration with veterinary services and the Ministry of Agriculture to restrict imports from South Africa and minimize the risk of American Foulbrood entering Zimbabwe (I6). However, there is a sense of despondency among some participants regarding the likelihood of national-level collaboration (O1, O2). This may stem from prior disappointment, as previous attempts to establish a national beekeeping organization involving enterprises and government members did not yield fruitful participation or constructive engagement (I8).

Despite past challenges, participants acknowledge that the urgency of pest control and the need for EU third country participation may serve as significant motivators for bringing together concerned parties and foster meaningful long-term collaboration (I5, I8, O4). The most optimistic outlook which emerged from data collection is, pressing issues could potentially galvanize stakeholders to overcome previous obstacles and establish ongoing collaborative structures (I4, I5). Although there is a void in collaboration with national beekeeping authorities NBEs in Harare were seen to engage in Horizontal Collaborations with other NBEs and other commercial industry level actors.

4.1.3.2 Horizontal Collaboration

Horizontal collaboration occurs between NBEs and commercial farmers in pollination services. Three NBEs have ongoing contracts with commercial farmers of various crops, most frequently mentioned were blueberries (I3, I4, I5, I8, O1). The farmer usually has a contract with one dedicated beekeeper whereby the beekeeper is paid for transporting hives to the crop and the degradation caused to their bee colonies as a result of the pollination (I3, I4, I7, I8).

Collaborations between commercial farmers and NBEs providing pollination services heavily rely on reputation and trust-building. While some farmers have their own in-house beekeepers (I3, I4, I6, I8), others depend solely on the expertise and feedback of the beekeeper contracted for pollination

services (I5, I8). In this dynamic, the farmer places significant confidence in the NBE, trusting that the hives provided are robust and healthy, to result in maximum benefits for their crops (I4, I5, I8).

Given the temporary nature of these contracts, if an NBE breaches the trust of a farmer, the farmer has the option to partner with a different NBE in the following season (I4). This underscores the importance of maintaining a strong and trustworthy reputation for NBEs to secure long-term collaborations with commercial farmers and retain their business. Meeting the required number of hives can be difficult as the commercial farmer's needs vary during a season and can fluctuate year to year (I4, I7, O1). Two NBEs described they respond to this challenge by intra-sector collaboration with other NBEs, namely asking another beekeeper to lend them hives which they then deliver to the commercial farm (I4, I8, O3).

NBEs were observed to collaborate with each other within the honey value chain, assuming different roles and forming a chain of operations (O1, O2). For instance, Mawungwe and Motso honey engage in training rural out growers (I3, I5, O1), with Motso honey taking on the responsibility of transporting the honey to Harare (I5). Maweni honey and Mawungwe honey handle the processing, packaging, and resale of the honey under their own brand (I3, I5, I8) (fig. 6). The primary motivation behind such collaborations is the sharing and pooling of resources. By working together, NBEs in Harare can leverage their individual strengths and capabilities to achieve shared goals more effectively (I5). This collaborative approach allows for the optimization of resources, enabling each NBE to focus on their respective expertise within the honey value chain. It also promotes efficiency and enhances the overall competitiveness of the NBEs involved.

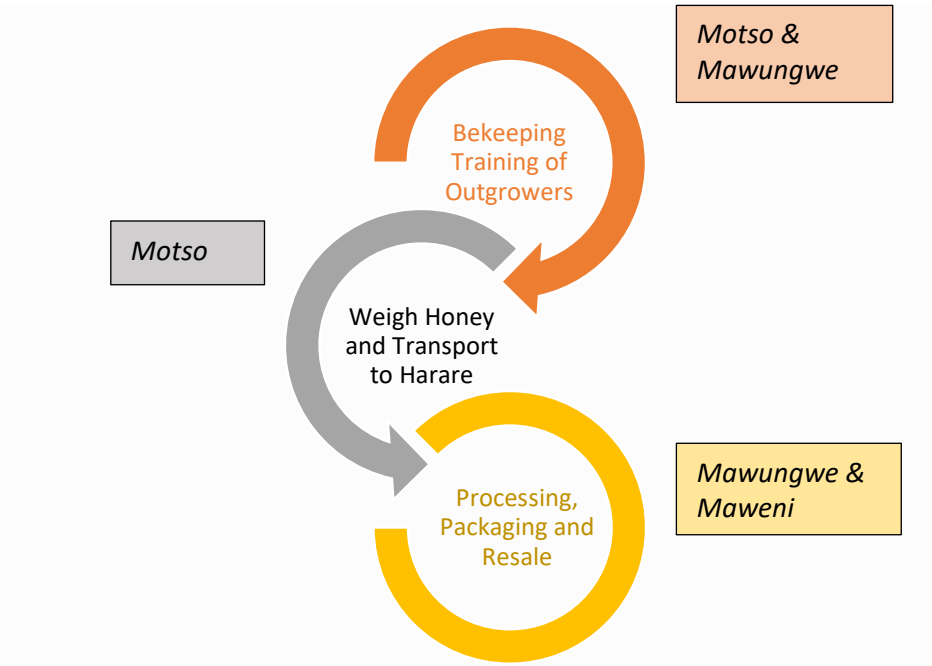


Figure 6 : Collaboration between NBEs in the honey value chain

However, these collaboration chains are present where mutual gain is attainable. In the honey value chain for example, this may be because demand for honey is not a limiting factor. Another rival explanation may be the crossing of rural/urban boundaries in this instance which may require more sophisticated coordination between actors. Other sectors appear to be more competitive such as hive removal services and equipment manufacture. One NBE highlights how competition within the industry foster reluctance to collaborate:

"I avoid working with others because I have my own company that supplies beekeeping equipment, and my competitor sells the same equipment. We might say we collaborate, but at the end of the day, I need to pay my bills, and my colleague needs to pay his bills" (I6).

Furthermore, two NBEs expressed uncertainty about the activities of other actors in the sector (I6, I7). Rather than sharing knowledge with local actors, four NBEs formed partnerships with international actors from South Africa, Namibia, Zambia, and New Zealand to acquire skills such as value addition (I3, I4, I5, I6, O1). These findings point towards collaboration voids, lack of trust, and limited enterprise-to-enterprise cooperation within Harare, as indicated by a preference for international partnerships over domestic ones (I6). These observations may point to a broader lack of synchronisation within the sector between NBEs. The presence of collaboration voids, limited enterprise-to-enterprise cooperation, and the preference for international partnerships over local

ones indicate fragmentation within the sector. However, NBEs in Harare are also seen to form partnerships with individuals and groups.

4.1.3.3 Diagonal Collaboration

Collaborations between NBEs and individuals and communities are a form of diagonal collaboration. This is observed with hive guardians, residents of Harare, and rural-out grower communities (fig.6). Two NBEs engage in an informal collaboration with urban residents, referred to as "hive guardians" (I8). The NBE places a certain number of hives in the urban residents' gardens and hive maintenance and harvesting of the honey is solely undertaken by the NBE (I4, I8, I9). The hive guardian takes on minor responsibilities to ensure the well-being of the bees and their own safety such as mowing the lawn in the evening (I4, I7, I8, I9, O1). The collaboration is largely informal, "there's no business deal or commercial thing involved (I9)". The only exchange between the two parties is an occasional jar of honey from the NBE to the hive guardian as a token of appreciation (I8, I9). These collaborations are enduring in many cases, one hive guardian describes how she has undertaken her role for twelve years (I9). NBEs pursue these partnerships in many cases to maximize the utilization of the abundant biodiversity and high nectar production in Harare (I4, I8). For the hive guardians, their incentive to participate in this collaboration often stems from their love and fascination for bees (I4, I8, I9, O2). However, it is important to note that the perspective of only one hive guardian is included in the thesis.

In some cases, there is very little interaction between the NBE and hive guardian once the hives have been placed (I4), but in others new social ties emerge (I8). One hive guardian saw herself as part of the beekeeping community through the role she plays even though she is not an urban beekeeper directly. Similarly, one NBE expressed a sense of community within his network of hive guardians due to a shared mindset. This participant felt people who ascribe to have bees in their garden naturally share his nature-centric mindset (I8). Creating a network of enthusiastic hive guardians therefore naturally draws together a pool of like-minded individuals interested in conservation and natural development. From this observation, one could tentatively say NBEs even help to facilitate the formation of communities from previously disconnected, like-minded individuals.

When undertaking residential hive placement, it is necessary for NBE's to coordinate with surrounding neighbours from a safety perspective (I4, I8) In one instance, horses were kept next door to a property which had beehives (kept by a hobbyist beekeeper). On one extreme occasion the bees were agitated by the horses and "stung to death two of the horses and the third one died with the child watching it (I4)". Another NBE had hives close to a primary school, during break time when

all the children brought out their juices and snacks the bees would start swarming (I8). In response the NBE moved some hives off the property and requested the children drink their juices in the classroom before going outside to play. The teachers were also given some honey as a signal of goodwill (I8, O1). These examples show that NBEs collaborate to mitigate the health risks of undertaking beekeeping in urban spaces.

Collaboration with rural out growers is another community NBEs collaborate with. In this partnership, Harare-based NBEs supply out-growers with beekeeping equipment, as they do not have the capital to do so themselves, and train them over a few days (I3, I5, I6, I8). In return for the honey harvested, the NBE guarantees a market in Harare for the rural farmer's honey (fig.6). However, this model faces several challenges. The first is ensuring the quality of the honey (I3, I8), "if the guys don't have protective clothing, then they use a lot of smoke when they're harvesting, and it has a distinct whiff afterwards (I8)". The second challenge is competition with other middlemen (O1) who offer to buy the honey in cash at a higher price than what the NBE offers (I3, I8). To overcome these hurdles, rural farmers sign a contract with the NBE that they will only sell honey to the NBE or middleman they are affiliated to (I3, I5, I8). These contracts are put in place to protect the relevant parties in the collaboration process. In this way collaboration with rural out growers is more commercial or formalised than hive guardian partnerships.

Information sharing, however, in NBE to rural-out grower collaborations is informal and sporadic (I5). NBEs communicate with out-growers primarily through their Facebook platforms and WhatsApp group chats (D8). These online platforms serve as forums for knowledge sharing, where out-growers can ask questions and seek assistance. As there "are 300/ 400 people in a group, when someone asks for help the others will be getting the help too (I6)" and benefit from the shared knowledge and support. Knowledge exchange amongst NBEs and other aspiring beekeepers is evident in the "African Women in BEEK" WhatsApp group, where participants share homemade tutorials, links to relevant articles, and best practices related to various aspects of beekeeping, such as harvesting techniques (O3). These digital platforms facilitate the dissemination of information, foster collaboration, and create a supportive community among both out growers and aspiring beekeepers with NBEs.

The final partnership NBEs in Harare engage in is with individuals wanting to learn beekeeping. NBEs appear to be a hub for knowledge training new beekeepers. This may be in response to the lack of

established national or regional forums for practical training. There is some beekeeping training at universities and agricultural colleges, according to one NBE:

"Very often they don't have bees, it is just chalk and talk (I8). This makes it difficult for the industry because if somebody wants to start a beekeeping business and employ people, there is no pool of trained, practical beekeepers that you can employ (I8)".

This finding was corroborated by three NBEs that were part of this study, all of whom were self-taught in the field of beekeeping. Therefore, in some cases, NBEs teach aspiring beekeepers to broaden their labour base. The threat of competition does not dampen this collaboration because aspiring beekeepers oftentimes do not transition beyond small-scale honey production. This may be due to difficulties in accessing markets and commercialising their practises (I8) due to lack of access to skilled labour and resources to scale up (I5, I8).

4.1.4 NBE Contributions to UST in Harare

The focus now shifts to analysing the impacts of the NBEs considering their key activities and ways they collaborate. Insights can be derived regarding NBE contributions to promoting and advancing UST in Harare. This analysis is structured according to the UST mechanisms identified in literature and the data sample which informs the empirical research questions related to the UST category in Chapter 3.3. The first question to be addressed is, *how do NBEs contribute to UST by upscaling?*

4.1.4.1 Upscaling

Upscaling of the core practices of beekeeping by training aspiring beekeepers occurs in Harare (I3, I5, I8, O1, O2). Some NBEs serve as hubs for beekeeping training. These NBEs fill a void created by the absence of formalized structures and active organizations, who would be expected to undertake such training as discussed in Chapter 4.1.3.1. The significance of NBEs for upscaling is evident when considering the importance of contextualized knowledge in urban beekeeping. For example, a participant from Harare, who learnt beekeeping through self-study, was frequently stung during the learning process as a result of relying on videos primarily featuring European beekeepers, who work with less aggressive bee species compared to African bees. Consequently, this participant's family members expressed concern and urged them to discontinue (I6). This example highlights the challenges faced by self-taught NBEs when accessing knowledge that doesn't align with the local context. The discrepancy between available information and the realities of beekeeping in Harare underscores the necessity for context-specific resources and training opportunities which can be provided by NBEs (I3, I6, I8).

One of the key criteria of *upscaling* UST is the transmission of core ideas and principles of sustainable practices to new members. Biodiversity is one such crucial component as bees rely heavily on a diverse and abundant food supply to produce high quality honey. Among the NBEs understudy in Harare, three NBEs mentioned their efforts in disseminating this component to new members (I6, I7, I8). Jasmine Apiary for example, couples selling beekeeping equipment with spreading knowledge on the importance of trees for the bees. This participant even distributes seeds to customers to encourage them to plant trees to ensure a constant nectar supply for the bees. To convey the importance of biodiversity he employs the analogy of a wedding, traditionally a large gathering and important event in Zimbabwean culture:

"I tell people, imagine you invite 200 people to your wedding, and you don't give them any food … they will abscond and just leave you at the venue alone. We don't want that. The bees need to be happy, so we need to plant the trees (I6)".

Although promoting agroforestry is highly valued by Jasmine Apiary (I6) and others, not all NBEs expressed the same standard of dedication to biodiversity improvement in the urban. All six NBE participants in the study did mention the fertility of Harare and the high honey flow, which occurs as a result of the diverse range of flora throughout the year including specific plants by name such as the Jacaranda (I3, I4, I6, I8), Brazilian fire trees (I6) and Msasa (I3, I7). This demonstrates a shared awareness of the importance of biodiversity between NBEs in Harare but does not necessarily indicate a consistent effort to upscale this key component of urban beekeeping among others for the sake of contributing to UST.

The ways NBEs can contribute by replicating is analysed next. This can be distinguished from *upscaling* as where the latter refers to the growth of new members and supporters, essentially expanding the reach and impact of the NBS. *Replicating*, on the other hand, involves adopting new ways of thinking, doing, and organizing to propagate the NBS principles and practices to new locations or communities. Thus, the next question to be addressed is, *in what ways do NBEs contribute to UST by replicating?*

4.1.4.2 Replicating

A clear instance of how NBEs contribute to UST through replicating is in the diffusion of beekeeping practices to rural out growers to supplement the urban honey market in Harare. NBEs successfully broaden participation in beekeeping through new ways of doing and organising. This new way of

organising is shown in figure 6, whereby urban out growers pool together the honey they have harvested into buckets and sell it in bulk to the middleman who then transports it on to the NBE in Harare (I3, I5, I8, O2). In the past NGOs have tried to replicate beekeeping practices to urban, peri-urban and rural communities around Harare to equip them with skills to supplement their income (D8). However, these efforts have largely been unsuccessful. Two NBEs describe how NGOs have "inflated expectations raised beyond the level of achievement (I4)" which leads to misguided help. For example, an NGO supplied a community with a honey processing factory without thoroughly training the community in honey quality control and harvesting (I4). As a result of lack of understanding of the context these projects have been seen to fall apart after a few years (I4, I8). In comparison, NBEs have been more successful in *replicating* the practice and thereby contributing to UST. One NBE summarises this distinction by stating although NGO efforts can be effective in some ways, they often collapse after a few years whereas their "company will be around for quite some time and help improve the industry alongside [their] business (I8)."

Another example of *replicating* by NBEs for UST is their collaboration with urban residents, commonly known as hive guardians. This innovative approach to organizing hives can expand the reach and impact of urban beekeeping. However, the extent to which this replication contributes to UST is uncertain. One NBE points out that people who willingly host hives in their gardens typically already possess a love for nature and a conservation mentality. As a result, while hive guardians may learn about bees and make slight adjustments to accommodate them, the elements of sustainability thinking and nature -awareness may not extend beyond individuals who are already sustainability orientated (I8, O2).

4.1.4.3 Partnering

The ways NBEs engage in partnering has been explored in detail in Chapter 4.1.3. However, i*n what ways NBEs contribute to UST by partnering*, specifically is yet to be analysed. Partnerships in Harare's beekeeping sector are characterized by diverse constellations, as illustrated in figure 5. These partnerships take various forms, ranging from informal to formal connections, and differ in terms of their duration, purpose, and organizational structure. Partnerships that NBEs engage in are frequently observed to underpin other mechanisms of UST. For instance, NBEs partner with rural out growers, aspiring beekeepers, and hive guardians to *replicate* and *upscale* urban beekeeping practices (I6). Attention should also be directed towards the ways NBEs engage in partnerships with individuals, which can potentially contribute to the establishment of communities among previously disparate yet ideologically aligned individuals. This phenomenon is evident in cases where NBEs establish networks of "hive guardians" (I8). Furthermore, when partnering does not occur pathways

to UST can be compromised. For example, limited vertical collaboration with national beekeeping organisations compromises NBEs ability to upscale activities to EU markets due to lack of overall coordination of the industry (O4). Furthermore, NBEs warn the longevity and security of beekeeping is at risk due to the threat of unmanaged disease which could decimate bee populations (I4, I6, I8).

Partnering between NBEs is limited in Harare in scenarios where competition is high, oftentimes stimulated by limited business opportunities such as a small or exclusive customer base (I6). For example, when NBEs compete amongst each other to secure external donor funding (I3, I6). However, an additional way partnering can underscore other mechanisms of UST is where NBEs in Harare partner with NGOs to mobilise external funding. This leads onto the next empirical question, which asks *in what ways NBEs contribute to UST through instrumentalising external funding*.

4.1.4.4 Instrumentalising

Instrumentalising is evident in NBE engagement with international, development-oriented NGOs through grant applications. Three NBEs specifically mentioned their collaboration with such NGOs in Harare (I3, I4, I6). However, instrumentalizing seems to be contingent upon the NBEs' own fundraising capabilities. These enterprises have undergone a learning process to professionalize their fundraising activities over time. This entails putting forward convincing proposals to the funding bodies (I3, I4, I5, I8) and navigating the complex national governance context in Zimbabwe. For instance, one NBE shared an experience where, even after securing an NGO grant, 30% of the funds had to be paid to the Zimbabwe Revenue Authority (ZIMRA). Additionally, national officials demand an extra 5-7%, “they will tell you point blank there is no way that they will release all this money without you giving them something (I6).” Through their efforts in instrumentalizing, NBEs in Harare demonstrate their adaptability and resourcefulness in accessing external funding sources, despite the challenges and additional demands imposed by the national government.

4.1.4.5 Embedding

Finally, the possible *ways NBEs contribute to UST by embedding* is hereby addressed. NBEs can play a significant role in *embedding* UST by improving the legitimacy of urban beekeeping in Harare. Three NBEs engage in activities aimed at educating and providing information to the public regarding the health benefits of honey (I3) and the importance of pollinators and biodiversity (I6, I8). While these activities are driven by the goal of expanding the customer base for honey and value addition products (I3, O1), they also have a broader impact on raising awareness about bees and pollinators, consequently garnering increased support for urban beekeeping. This implies a potential increase in

the extent to which urban beekeeping is recognized by the public at large as being appropriate and beneficial as a result of NBE activity.

Interestingly, two participants highlighted a specific issue in Harare where limited awareness about the importance of bees and pollinators has led urban residents to call pest control services to eliminate bees that settle in their homes, instead of contacting beekeepers to remove them (I6, I8). The reluctance to employ beekeepers for this task often stems from the perception that it is a more expensive and time-consuming service (I6). This situation is problematic as it has adverse effects on bee populations in Harare, including the reduction of natural swarms and other insect species (I6). By enhancing awareness and legitimizing urban beekeeping, NBEs can contribute to mitigating such unsustainable practices that compromise urban beekeeping and ultimately contribute to *embedding* UST.

4.2 Case Study: Amsterdam

The following case study examines NBEs in Amsterdam. The city's awareness and concern for pollinators and honeybee populations have a historical foundation, dating back to the mid-1940s when declines in bee populations were observed in the Netherlands due to increased pesticide use and landscape pressures (I10). National level action has been taken to protect honeybees such as the Bee Health Action Program in 2013 (I11) and the National Pollinator Strategy in 2018 (I10, I18). In Amsterdam there is no registration requirement to become a beekeeper(I17). A culmination of factors such as this lack of regulation and perception of the city as a refuge for pollinators has led to a proliferation of hobbyist beekeepers in Amsterdam, who maintain just one or two hives (I10, I11). As a result, there is a relatively high density of hives in Amsterdam, on average between six and seven bee colonies per square kilometre on average (figure 7).

However, public perception towards urban beekeeping in Amsterdam has been characterized by extreme fluctuations, ranging from strong support to intense scrutiny. Recent studies suggesting that honeybees may potentially out-compete other pollinators, such as solitary bees, have contributed to this dynamic (I10, I11, I12, I17, I18). This context presents an intriguing challenge that NBEs operating in Amsterdam mention the need to navigate and is referred to as the ecological dilemma in this case study. Given the breadth of actors involved in urban beekeeping in Amsterdam and space constraints it can be difficult for actors to professionalise their activities (I10, I11, I17). The ways in which NBEs do so and how this can contribute to UST is presented in the following analysis.

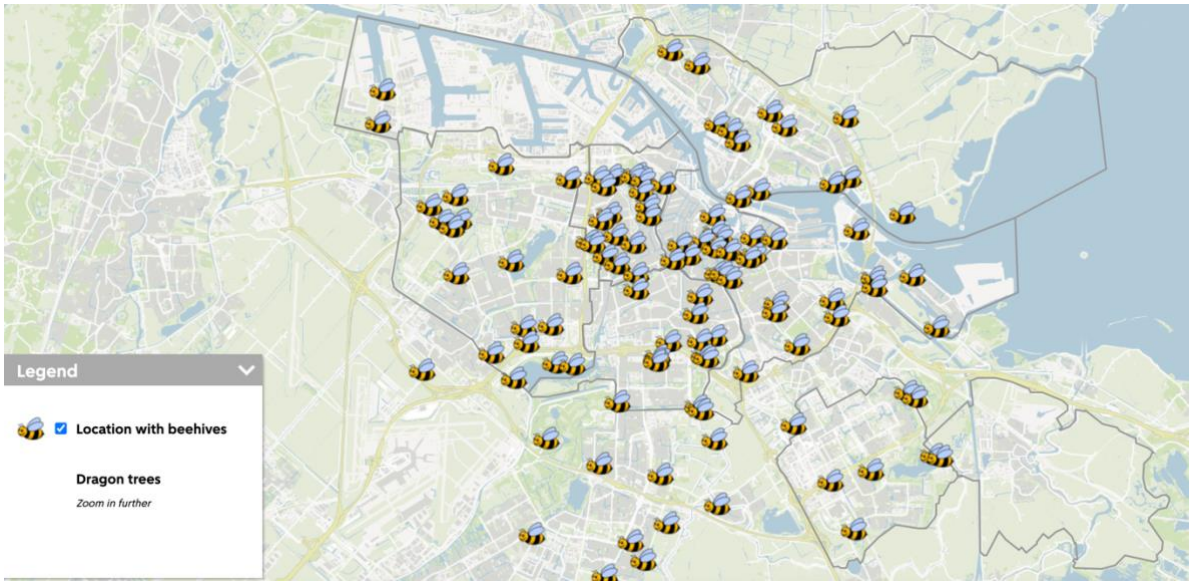


Figure 7 : Map of registered beehives in Amsterdam (Municipality of Amsterdam, 2023).

4.2.1 Types of NBEs in Amsterdam

This study identified eight NBEs focused on urban beekeeping in Amsterdam. However, there are indications that there may be additional NBEs operating on a smaller scale within the honey-value chain, as well as several others involved in corporate hive placement, who are not included in the study. NBEs in Amsterdam were found to engage in key activities and complementary activities. The key activities identified are honey value chain activities, corporate hive placement, pollination, queen breeding and education. The key activities will now be explained and linked to the respective NBE value propositions to answer the following empirical questions:

- *Which key activity(s) related to urban beekeeping do NBEs in Amsterdam engage in?*
- *What are the value propositions of NBEs in Amsterdam?*

4.2.1.1 Honey Value Chain Activities

Five NBEs engage in honey value chain activities as core activities to their business (table 8) NBEs engage in the maintenance of hives, honey harvesting, processing and in some cases resale. An interesting variation of key activities associated with the honey value chain is the case of Amsterdamse Honey. This is a social networking NBE that creates links between urban beekeepers and local consumers to facilitate a shift from a global, industrialised commodity food system to a more localised, smaller scale productive food system. This NBE decides which beekeepers' products can be included on the platform on their hygiene standards and quality of their honey to ensure the product being sold is of a suitable standard (I12, I17). This NBE has emerged in response to the struggling honey market in Amsterdam, whereby honey is consistently priced low in relation to neighbouring countries such as Germany, Belgium, and France (I10, I12, I17, O7).

The Value Proposition of the Honey value Chain can be discussed in two parts. Firstly, Amsterdamse honey proposes to facilitate a win-win situation for the producer and the consumer as "Amsterdam beekeepers receive a higher price for their honey [...] and the people from Amsterdam are able to taste their own local honey" (I17). Urban beekeeping enterprises are motivated to work with Amsterdamse honey because they receive a higher price for their goods due to reduced transport and packaging costs (I17). However, for Amsterdamse honey, the purpose of working with these actors is an altruistic contribution to the Amsterdam beekeepers club and local beekeepers (I17).

Secondly, two NBE's who are involved in the honey value chain mentioned their beekeeping style was guided by the natural beekeeping philosophy whereby the beekeeper believes the bees can look after themselves and their role is to only "interfere in the most extreme circumstances (I16)" such as treating for Varroa mite which bees do not naturally have the capacity to defend themselves against, and harvesting a minimal volume of honey from the bees so they can sustain themselves through winter (I12, I16, I17, O7). The Beekeepers who followed this philosophy see their value proposition as fulfilling a stewardship role, protecting nature and biodiversity by creating a home for bees in the urban where one does not exist for them naturally (I16, I17). Harvesting large quantities of honey is therefore not a priority for these NBEs.

Cases of reduced honey harvesting are a result of this philosophy and the price of honey being extremely low in Amsterdam in comparison to other EU countries, so economic profit from honey is oftentimes not a large incentive (I12, I15, I16, I17, O6, O7). The price of a 450-gram pot of honey is between six to eight euro in the Netherlands, however this falls far short of the what the real cost would be if the labour time invested was valued (I12). In the past, beekeepers often sold their honey to a large corporate that repackaged it and sold it under their own brand at retail stores and farmers markets (I17). The minimal economic gain accrued is why, for many of these NBEs, beekeeping is a passion project, where they realise value from their work through their own enjoyment (I12, I16, I17). One NBE expressed this intrinsic motivation to urban beekeeping compellingly:

"Human beings are fascinated with bees and this fascination is why people keep the bees until they die. Beekeepers stay beekeepers until their body can no longer support the bees, when you cannot support the bees anymore then you give up. The real beekeeper has the bees in their heart, and they go on until the body can't anymore (I16)".

4.2.1.2 Queen Breeding

In queen breeding, beekeepers strategically select desirable traits such as nonaggression, high honey production, and disease resilience (I12, I15, I17, 06, 07). This essential practice is carried out by two NBEs under study in Amsterdam. Annually, during the months of May and June, queen cells are extracted from the colonies. In July, all participating stakeholders in queen breeding gather on the island, Marken in the Netherlands to facilitate the mating process between their drones (worker bees) and the queens. This activity holds significant importance for the survival and growth of the urban beekeeping industry, directly tied to its value proposition.

The value proposition of queen breeding is to contribute to a healthier, more productive bee population and therefore support the beekeeping sector (I14, I15). In addition to this, during winter oftentimes several bee colonies do not survive, therefore other NBEs may purchase queens from queen breeders to replenish their hives (I14). These actors ensure continuity and growth of the urban beekeeping sector.

4.2.1.3 Corporate Hive Placement

The next key activity is undertaken by two NBEs as a key activity and two others as a complementary activity to the honey value chain (table 8). In corporate hive placement, NBEs partner with corporations such as banks, hotels, the municipalities, and others, who sponsor equipment and labour in exchange for the hives to be placed on their building premise or rooftop (I14, I15, I17, I19). Several NBEs mentioned the company can also purchase the branded and packed honey from the NBE to give away as corporate gifts or feed to their guests in the case of hotels (I14, I15, I18, I20, D12, D14).

The value proposition of corporate hive placement is to create awareness around nature for employees of the corporation. Alvéole for example, conducts several workshops with clients and visits regularly with the intention of maximising engagement via various channels such as social media, corporate gifts and in-person demonstrations (I18). Bee Amsterdam has a more light-touch approach in comparison and interacts with clients depending on their level of curiosity (I14, I20). This was confirmed by the Hyatt hotel who collaborates with Bee Amsterdam (I20). For the corporate involved, value propositions include increased employee engagement and wellbeing in addition to being an effective CSR strategy (I14, I15, D12, O8). However, social value propositions are only realised in some cases. For example, if the hives are physically visible and at relatively smaller companies the employees are more eager to learn from the NBE about bees (14). At larger

corporations such as hotels "*nobody sees them, so they tend to forget about them*(I14)" coupled with the reality that employees do not want to do extra work by looking after the bees.

In cases where corporate hive placement is a complementary activity, the objective is not educational but rather to make their beekeeping business economically viable (I12, I15, O8). However, corporate hive placement is controversial in Amsterdam as many stakeholders and other NBEs see it as a form of "greenwashing (I10, I12, I20)" by the corporation which the NBE enables. Although many NBE's have undertaken corporate hive placement in the past some actors are potentially discontinuing their business (I14) due to the recent, heated ecological debate around honeybees in Amsterdam (I10, I12, I15, D10). There is a body of research which views honeybees as domestic animals, which eat the available nectar and out-compete other important pollinators such as wild-bees (I10, I13, D10). For NBEs who engage in corporate hive placement, some fear their "selling point is not so sexy anymore (I14)". However, three NBEs in this study argued the real problem is a lack of nature outside the cities and the act of blaming the honeybees for the pollinator crisis and lack of biodiversity is condemning the symptom and not the root cause (I15, I13, I17, D10). In contrast, one NBE was not aware of the on-going ecological debate at all, in addition to one corporation who partners with NBEs in corporate hive placement (I16, I20). The value proposition of corporate hive placement is a thus point of contention In Amsterdam.

4.2.1.4 Education

Similarly, to corporate hive placement, education is a complementary activity to many NBEs key activities. Additionally, education is undertaken as a key activity by one NBE who trains aspiring beekeepers through the NBV. In the past there was an inundated demand for such services, however, recently, as a result of controversy around beekeeping in the public eye, demand for courses has fallen (i10, I11, I12). Education is frequently undertaken as a complementary activity to honey value chain activities. Two NBEs collaborate with universities and beekeeping organizations to generate and share expert knowledge on urban beekeeping, bee welfare, and the ecological debate surrounding honeybees (I13, I15, D10). Alongside this three NBEs mentioned talking to curious people and children about the bees due to their hives being placed in public spaces (I12, I15, I17)

The value proposition of education can be examined from two perspectives. Firstly, it aims to enhance nature awareness and provide training for aspiring beekeepers in practices that support the environment (I16). By educating individuals about bees and beekeeping, knowledge is passed on regarding nature conservation and sustainable practices. Additionally, beekeeping training plays a crucial role in ensuring the longevity and continuity of the sector. Two NBEs expressed their

concerns about the aging population and the predominance of "men with grey hair" within the beekeeping sector in the Netherlands (I10, I13, I17). This highlights the importance of attracting and training new generations of beekeepers to sustain the industry's growth and ensure its future success.

4.2.1.5 Pollination Services

Pollination Services are a significant key activity of only one NBE in Amsterdam (I13). This NBE actively engages in pollination by utilizing their own on-site hives to support the pollination of seedlings. In addition to pollination, education and research are also prominent complementary activities pursued by this NBE. It is interesting to note that urban beekeeping activities seem to be strongly rooted in the urban environment.

The value proposition of pollination for this NBE in Amsterdam lies in enhancing seedling quality and quantity. This technique can lower reliance on fertilisers to improve the crop and can therefore yield positive biodiversity gains. Pollination services are quite novel and uncommon in the Netherlands. This NBE places strong emphasis on education and research as complimentary activities to pollination services which further demonstrates their commitment to exploring innovative approaches within the beekeeping field (I12, I13, I15).

Table 8 provides a summary of the key activities, complementary activities, and corresponding value propositions of the eight NBEs analysed. The value propositions are closely aligned with the key and complementary activities, illustrating how different combinations of these activities can lead to diverse outcomes. For instance, Bee Amsterdam incorporates the honey value chain as a complementary activity alongside corporate hive placement. In contrast, Alvéole focuses solely on corporate hive placement, but differentiates itself by exclusively selling corporate gifts and holding regular workshops to improve employee engagement. While Bee Amsterdam aims to generate environmental value by promoting local food production, Alvéole contributes to environmental value by raising nature awareness. The table 8 presents a comprehensive overview of how the various activities and value propositions intersect among the NBEs in Amsterdam.

Table 8: Summary of Amsterdam NBE Activities and Value Propositions

NBE	Key Activity	Complementary Activity(s)	Value Proposition
Bee Amsterdam	Corporate Hive Placement	Education of corporate employees; Honey harvest, process, and sale (corporate gifts)	Increase nature awareness; edible cities (produce food locally)
Company 1	Pollination	Education and Research; planting variety of flora and fauna	Improve quality and quantity of seedlings; Protect and grow beekeeping industry; improve biodiversity
Company 2	Urban Hive placement and maintenance	Disease prevention (biological dynamic beekeepers' philosophy)	Biodiversity improvement
	Entire Honey value Chain	Harvest, process and sell honey. Bee Park Maintenance	Personal Passion and support urban beekeeping community
Blijmer Bloemenhoning	Sale of Queen bees	Transport queens to breeding station in Marken and gene selection	Economic gain; Support urban beekeeping community
	Entire Honey value Chain	Corporate and urban resident hive placement; Value addition products; education of experts; expert knowledge publications; report colony statistics	Economic Sponsorship from corporates; stimulate nature awareness; personal passion
Soetheem	Education	Course Instructor through NBV, urban placement of hives at educational zones.	Improve Nature awareness
	Honey Value Chain	Harvest, process and sell honey and other value addition products. Placement of hive sin public spaces	Economic Gain, monitor bee wellness

Amsterdamse Honey	Honey Value Chain	Networking between producers and customers; quality control and hygiene checks	Support urban beekeeping community; edible cities (local food production)
	Queen Breeding	Transport queens to breeding station in Marken and gene selection.	Economic gain; Support urban beekeeping community
Alvéole	Corporate Hive Placement	Education via company workshops, honey value chain (corporate gifts); value addition products (corporate gifts); Research on bees in the urban	Stimulate nature awareness and Economic Gain; improve biodiversity
Company 3	Queen Breeding	Transport queens to breeding station in Marken and gene selection.	Economic gain; Support urban beekeeping community
	Entire Honey Value Chain	Corporate hive placement	Economic Sponsorship from corporates; stimulate nature awareness; personal passion

4.2.2 Key Partners of NBEs

In addition to acknowledging the key activities and value propositions of NBEs, it is also important to account for who their key partners are to address the following empirical question:

- *Who are the key partners of the NBEs under study in Amsterdam related to their key activities?*

The identified key partners of NBEs (as shown in figure 8) can be broadly considered according to three categories:

- National Beekeeping Bodies (Vertical Partnerships)

  The two actors mentioned by participants are the two primary beekeeping groups in the Netherlands: the NBV (I11) and the Professional Dutch Beekeepers Association (I10). The NBV has associations all over the country and three in Amsterdam: Amstelland (Amstelveen), Waterland (Amsterdam North) and AVBB (Amsterdam West, Amsterdam South, Amsterdam Center). Most beekeepers in this study are members of either one or more of these associations (I12, I14, I15, I16, I17).
- Industry level actors (Horizontal Partnerships)

This category includes partnerships NBEs engage in with other NBEs, in addition to partnerships NBEs have with enterprises or corporates who are not directly part of the urban beekeeping sector.

- Individuals and Communities (Diagonal Partnerships)
  This category encompasses the participation of individuals and smaller groups within the urban beekeeping ecosystem who NBEs partner with. In Amsterdam, this pertains to urban residents, and aspiring beekeepers primarily.

Figure 8 displays the key activities and the frequency of times each key partner per key activity was mentioned by NBEs. For example, in undertaking the key activity, corporate hive placement three NBEs mentioned working together with other businesses that were not NBEs, whereas 4 NBEs worked with other businesses as part of their honey value chain. Bee organisations such as the NBV are mentioned as key partners in relation to key activities Education (frequency = 3), Honey Value Chain (frequency =2) and corporate hive placement (frequency = 1).

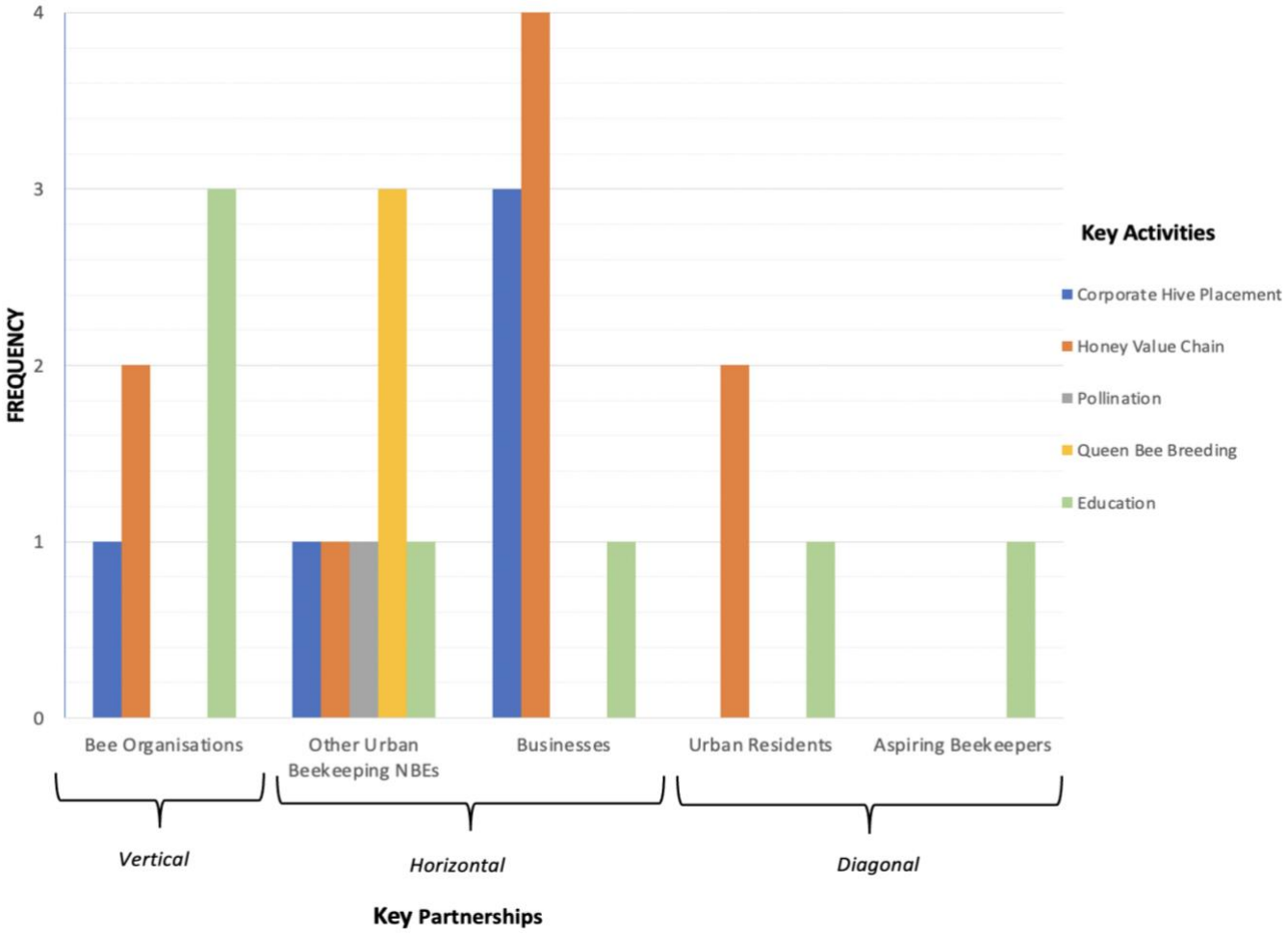


Figure 8 : Key partners associated with identified key activities in Amsterdam.

4.2.3 NBE Collaboration in Amsterdam

Given the key partners of NBEs have been identified, this chapter dives into the how and why behind these collaboration patterns and partnerships. Answers are structured according to the groups of key partners: vertical partners, horizontal partners in the beekeeping industry and external to the beekeeping industry and diagonal partnerships (individuals and groups). This structure guides formulation of results to the following empirical questions:

- *How do the NBEs in Amsterdam collaborate with their key partners?*
- *What is the purpose for NBEs to collaborate with the identified key partners?*

National Beekeeping Bodies (Vertical collaboration) and NBE industry level partnerships (Horizontal collaboration) are tightly interwoven as the NBV, and its sub-associations form a comprehensive collaboration network in Amsterdam. Therefore, vertical collaboration will be analysed alongside horizontal collaborations.

4.2.3.1 Vertical and Horizontal Collaboration

Only one NBE in the study did not mention having any interaction with the NBV (I14). This network connects actors through providing a shared physical space where beekeepers can meet each other and social bonds arise (I10, I11, I12, I16). The NBV associations serve as hubs for many of the urban beekeeping NBE activities. For example, they have an on-site centrifuge which members can use to process their honey. These associations are often situated near a green space or Volkstuinen (a non-commercial allotment where individuals grow vegetables and fruit), where there are a designated number of spaces for beekeepers to place their hives (I16, O5, O7). However, this is oftentimes inconvenient for urban beekeepers as they must travel far away from their homes every day to check the hives. Alternatively, NBEs can seek out suitable spots in the urban core such as neighbours' gardens, parks and kinderboerderij (petting zoos) (I12, I15, I16, O5). Additionally, two NBEs mentioned once a month or so the urban beekeepers affiliated to the organisation meet at the association and carry out some gardening and general maintenance (I12, I16).

This shows how members collaborate to contribute to the longevity of the association (I10) and how sharing some resources provided by a vertical stakeholder may result in more horizontal collaboration between NBEs. An example of additional collaborations which arise is informal knowledge sharing between NBEs. This was observed when participants spoke about the opening of hives after winter to assess colony survival which was being undertaken by many NBEs during the data collection period of this study (I10, I12, I14, I15, I16, I17, O5, O6). Three NBEs mentioned the percentage of their own hives that survived and compared this with the sector, indicating prior informal knowledge sharing among NBEs had taken place (I15, I16, I17).

Notably, two NBEs expressed interest in the hive mortality rates of other NBEs who were mutually connected because they had referred me to interview them, via the snowball sampling method (I15, I16). This can be interpreted as eagerness to exchange knowledge across the urban beekeeping sector. These discussions also prompted conversations about the potential reasons behind the unusually high colony loss rates during the winter (I13, I15, I16, I17). This exchange of information, coupled with my personal role as a researcher, revealed the potentially collaborative nature of the NBE ecosystem, where knowledge and experiences are shared to enhance the overall success of urban beekeeping endeavors. One participant expressed:

"We talk with each other, and all have opinions on what it [colony loss over winter] could be, so we communicate with each other regularly. I have some friends who are beekeepers as well, so we meet up to learn from each other and share information. If we come across new articles or investigations, we pass them on. Being part of the associations keeps us well informed about what's happening" (I15).

Elements of a collaborative and supportive environment among NBEs is further illustrated in two cases where NBEs suffered large colony losses (I14, I17). One NBE conveyed he had some "good friends that still had some colonies left, so they [would] get [him] started again". Another NBE explained she would contact a queen breeder, who was included in this study, and buy some of their populations to replace the hives she had lost for the upcoming season (I14). These two contrasting examples show there are several collaboration pathways for NBEs to respond to the same challenge.

4.2.3.2 Horizontal Collaborations

Now that horizontal collaborations linked to the NBV and other vertical bodies have been analysed, the following section will look at horizontal collaboration structures between NBEs more generally. Beekeeping partnerships at the industry level are seen to occur frequently between NBEs, but one participant expressed that because the urban beekeeping sector is quite small, "every professional beekeeper has their own niche in this niche (I10)". Although the beekeepers are not necessarily over-protective of their niche, they do not meaningfully engage outside of the niche they occupy (I10). For example, queen breeders collaborate with fellow queen breeders during mating season (I15, I19) and honey producers collaborate with other honey producers to sell their honey (I17) by pooling together their resources to transport honey to markets in Germany where it can be sold at a higher price (I10). Within this niche several honey producers also collaborate with Amsterdamse

honey, a social networking NBE that creates links between local consumers and their nearest beekeeper (I17). (I17)".

A notable exception to the inter-niche collaboration is an NBE that has their own in-house bees and collaborates with external beekeepers for pollination (I13, D16). Although they have the capacity to undertake all pollination jobs themselves, they choose to collaborate with actors from various niches to their own to distribute the risk amongst actors (I13). For example, if their hives get a disease, they will not be without bees due to their partnerships with other beekeepers. Furthermore, the value placed on education by this NBE is confirmed through the hosting open days (I12), research projects with universities and "contact with other beekeepers to share knowledge (I13)". These statements were confirmed in other interviews as several participants had attended open days at the company. Furthermore, my own experience as a researcher, cemented the claims that this company is eager to contribute to knowledge sharing (I11, I10, I12, I17, O7). In summary, this company collaborates across various niches in the urban beekeeping sector to distribute risk and develop the beekeeping industry, "their main business is crops but they are doing a lot for the beekeepers and beekeeping companies because they know in the long-term it will benefit them (I10)".

NBEs also engage in horizontal partnerships with industry actors outside of the urban beekeeping sector such as businesses and corporates. The reason to engage in this type of partnership, in some cases, is because NBEs face the challenge of limited space availability for hive placement, requiring them to spread their hives across multiple locations in the city. This results in significant travel time and effort to manage their colonies (I12, I15, I16, O5, O6). Unlike other regions, Amsterdam's space constraints are specific to the city, as noted by an NBE operating in multiple global locations (I18). To address this issue, NBEs establish formal contracts for hive placement with corporates (I10, I12, I14, I15, O6, O8). The purpose of these collaborations varies among NBEs, with some, like BEE Amsterdam and Bijlmer Bloemenhoning, focusing on resource sharing whereby the NBE makes use of the space the corporate building provides and the corporation in theory reaps the social rewards of the bees such as increased employee engagement (I14, O8), increased awareness of nature and "brownie points (O8)" for their ESG reporting (I18, D14, D12). This is exemplified by one participant from Bee Amsterdam:

"We started telling people about what we were doing because we needed a place to put the beehives. People were more enthusiastic about the bees and the beehives than the honey. So, they said, "I would like to have one at my office, and I would like to have one at my office". It grew from there and we had a few spots where we could place our hives".

NBEs who collaborate with corporates for resource sharing mentioned limited to no engagement with employees (I14, I15). The level of information sharing with employees was described to depend on the employees' own level of curiosity (I20), the visibility of the hives and the size of the company (I14, I15). However, another NBE (Alvéole) who collaborates with corporates via hive placement to generate nature awareness among employees and provide them with "a piece of nature on their property they can connect with which would then help them recognize blooms in their city, which would encourage them to stop using pesticides" and so on (I18, D12). They only place one hive on each corporate site in Amsterdam as it is purely for educational purposes and fostering this human-nature connection (I18, D12, O8). With engagement being the focus for this NBE they collaborate on a regular basis with their clients' employees and have various channels of communication such as: workshops, social media updates and branded corporate bee product gifts to maximise engagement (I18, D12). In the workshops this NBE tries to encourage people to really interact with the bees and even hold the hive frame, which they refer to as a "frame moment (I18)". In addition to placing hives on corporate buildings, NBEs also place hives in other spots in the city which can lead to diagonal collaboration.

4.2.3.3 Diagonal Collaboration

NBEs form partnerships with individuals and communities in urban hive placement. One NBE places hives in urban residents' gardens (I15). However, most commonly these collaborations take place in the form of knowledge sharing whereby NBEs may host information sessions or educate people who see their hives in public areas on bees and pollinators (I16, I17, O5). NBEs also collaborate with aspiring beekeepers in the form of mentorship (I10). This mentorship style of collaboration can even involve the passing on of hives. Several participants mentioned they acquired bees from other experienced beekeepers which kickstarted their journey (I12, I16):

"My colleague from the beekeeping course had a disease and asked me to help him look after his bees. He had a severe illness and was dying. That's a sad story, but also a wonderful story. When a beekeeper asks you to take care of his bees, you cannot refuse it, I had to say yes. We harvested his honey; he tasted it and three days later he passed away and I became the caretaker of 10 colonies. So that's how it happened, and my journey started in 2009/ 2010 (I12)".

This testimonial illuminates this mentorship style of collaboration, whereby experienced beekeepers pass on their knowledge and resources to novice beekeepers. Furthermore, it emphasizes the importance of these connections for the longevity of the urban beekeeping sector. However, it is worth noting, this participant began their beekeeping journey over a decade ago (I12). Further examination is required to assess if this collaborative approach still holds relevance and effectiveness in the landscape of urban beekeeping at present.

4.2.4 NBE Contributions to UST in Amsterdam

The types of NBEs in Amsterdam have been identified as well as how and why they form vertical, horizontal, and diagonal partnerships with various urban stakeholders. Using these results, the ways NBEs can contribute to UST will now be reflected on, guided by the empirical questions pertaining to the UST category in chapter 3.3. The first question to be addressed is, *in what ways do NBEs in Amsterdam contribute to UST by upscaling?*

4.2.4.1 Upscaling

Given the ecological debates around urban beekeeping in Amsterdam, many NBEs are critical about upscaling via the growth of new members (I10, I11, I12, I14, I15, I19). In the past urban beekeeping as a hobby has been a hype trend, often undertaken by nature-conscious individuals who want to do something to save the endangered bees. However, they often lose interest and discontinue the practice after one or two seasons (I10, I16). This can be detrimental as uncared for hives can lead to disease outbreak (I18). According to one participant:

"If you want to do something for nature and the environment, don't start beekeeping. These are farm animals. It's not a natural environment. Bees are very important but if you really want to do something for nature then just plant some trees and flowers and create some new nature where there is none (I10)."

This quotation highlights the recognition among participants and NBEs that while there may be scepticism about expanding the practice of urban beekeeping to new members, there is an understanding of the importance of disseminating core concepts related to urban beekeeping. These concepts include promoting nature awareness, educating people about biodiversity, and emphasizing the significance of diverse pollinators (I10, I11, I15). Upscaling knowledge on these concepts is seen in key activities related to education which 6 NBEs actively engage in. The active engagement in upscaling is also a distinguishing feature whereby some NBEs may consciously

engage in practices to spread nature awareness, whereas others, by default, contribute in this way due to the visibility of their hives in the urban space (I16, I17, O5,)6). Upscaling is also restricted in Amsterdam due to the deflated market for honey whereby the market price for honey does not reflect the labour time and resources involved. As a result, NBEs in Amsterdam have made innovative steps, and engaged in new ways of organising to make urban beekeeping more viable. This leads on to the replicating mechanism of UST.

4.2.4.2 Replicating

This chapter aims to provide insight to, *the ways in which NBEs in Amsterdam contribute to UST by replicating*. One example is the Amsterdamse honey platform. This networking NBE serves as an intermediary between urban residents (food consumers) and local honey producers (NBEs), to reduce transport and packaging costs that previously cut into the profit margins of NBEs selling honey (I17). In facilitating these connections, Amsterdamse honey actively supports urban beekeepers and their practices. Moreover, Amsterdamse honey acts as a filtering mechanism, endorsing only NBEs that adhere to hygiene standards and embody the core principles of urban beekeeping, which shows how replicating in this case may underpin upscaling, as only actors embodying the core ideas of urban beekeeping are validated (I17).

The practice of urban honey sales inherently can promote novel and transformative ideas. For example, one NBE mentioned how initially they thought “the idea of honey from the city sounded contradictory (I14)”. This highlights that NBEs could play a pivotal role in shaping a more localized food market and challenging conventional notions that food solely originates from farms. By innovating new methods of food distribution and fostering connections between producers and consumers, they actively propagate nature awareness and the core principles of urban beekeeping.

4.2.4.3 Partnering

Given the ways NBEs engage in partnering has been established in detail in Chapter 4.2.3, we can now turn to address the empirical question, *how do the partnering strategies undertaken by NBEs contribute to UST?* Firstly, vertical partnering occurs frequently and is oftentimes facilitated by the NBV and its sub associations. This also leads to trickle down horizontal collaborations between NBEs who are members of the association.

In general, NBEs are seen to partner more often with other NBEs in their same niche or domain. Intra-niche collaboration often involves the grouping of resources between actors which lead to new ways of doing. For example, by pooling honey together and sharing transport costs to Germany,

NBEs in Amsterdam can access new markets. Similarly, the creation of Amsterdamse honey platform requires both NBEs and urban residents in Amsterdam to take up new ways of doing and organising as well as thinking about urban food and edible cities. This highlights how partnering may be an essential entry-point for replicating and upscaling in Amsterdam. Additionally, NBEs form partnerships with corporations to mobilise external funding which is explored in the following.

4.2.4.4 Instrumentalizing

The empirical question this chapter aims to address is*, in what ways do NBEs contribute to UST by instrumentalising by mobilizing external funding.* This is observed when NBEs in the urban beekeeping sector establish partnerships with corporations, thereby complementing their honey value chain. However, it is important to distinguish this approach from NBEs whose primary activity revolves around corporate hive placement, where they typically only install a few hives for educational purposes (I18, O8, D12).

In the former scenario, NBEs are essentially "sponsored (I15)" by corporations, who pay a monthly fee for hive maintenance and an initial, once-off fee to supplement start-up costs (I15, I19). This arrangement enables NBEs to tap into additional resources and support provided by the corporate partners. By collaborating in this way, NBEs can leverage external assistance to expand their beekeeping operations and honey flow. However, whilst NBEs leverage the opportunity of hive sponsorship to support their activities, corporates can leverage NBE activities for their own purposes such as ESG reporting. There is some scepticism among NBEs included in the study that this is a form of NBS malpractice whereby NBEs enable “greenwashing” by unsustainable companies (I10, I11, I12). Against this backdrop, some NBEs are critical of who they should accept or reject as a corporate partner and essentially donor. Some NBEs prefer to stay self-sustaining to protect their autonomy (I16) whereas others partner only with sustainable initiatives or companies (I12). Another approach undertaken by NBEs is to shift their practices entirely, thereby incorporating new knowledge and aligning old and new ways of doing. This will be discussed in the context of the embedding mechanism of UST.

4.2.4.5 Embedding

Embedding can be a vital part of some NBE’s activities, whereas for others embedding is not necessarily central to their mission. Rather, NBEs understand themselves as passionate practitioners of urban beekeeping as opposed to catalysts of UST (I17). These NBEs struggle to adjust their activities to integrate holistic perspectives on urban sustainability. However, others display interesting transformative qualities that align old and new ways of doing. This can be observed in the

context of the raging ecological debate surrounding urban beekeeping at present. This debate has gathered relevance as contrary to other NBS, there is high public awareness around the practice of urban beekeeping in Amsterdam. In the past urban beekeeping became overwhelmingly popular and was “hyped and fashionable (I16)” particularly among young people who would start beekeeping to contribute to biodiversity protection but then give up a year or two later(I11).

These findings reveal a poignant contrast between NBEs and individuals regarding the role they can play in implementing NBS for UST. Where support of NBS from individual actors fluctuated, this did not appear to be the case for NBEs. Most NBEs were seen to pivot or expand their practices to include support of biodiversity as opposed to only honeybees. In this way NBEs integrate contemporary knowledge into their practices, thereby aligning old and new ways of doing for UST.

For example, two NBEs expanded their activities to include growing other plants on site which are known to be good habitats and nectar sources for a variety of other insects (I13, I16, O5). Similarly, Alvéole disclosed that whilst corporates in North America are more focused on having the beehive on site for ESG points and engagement (I18, O8), in the Netherlands companies are more “intense and thorough in the way they want to implement biodiversity and how they see it impacting their property (I18)”. They take a holistic view of their impact on biodiversity and then refer to certifications such as ESG standards and BREEAM as secondary benefits. As a result, Alvéole has had to shift its practices. These changes include only installing one hive per property for educational purposes and to include information on other local pollinators in their workshops. This embedding process is captured in the following testimony:

“The Netherlands is definitely a lot more advanced. As a company and especially in my role, we’re trying to learn as much as possible and get on the same level of a lot of the policies that already exist here (I12)”.

These examples highlight how NBEs can play a vital role in responding to and incorporating new information in their practices to deliver necessary changes. NBEs demonstrate the ability to sustain UST over time, distinguishing them from hobbyist beekeepers with intermittent engagement. However, that is not to say this is true for every NBE, Bee Amsterdam for example is in the process of dissolving the enterprise due to the “negative vibes people have about owned a beehive (I14)” in Amsterdam.

5. Discussion

Now that findings from the individual case studies have been presented, we turn to relate these back to the research aim, to add to academic foundations on NBEs and how these actors collaborate to contribute to UST. To do so, insights from Harare and Amsterdam are compared and findings situated against existing bodies of literature on NBEs, collaboration theory and UST research. Overarching findings which have been corroborated through expert interviews are also interwoven in the discussion (I21, I22).

The structure follows the levels of analysis defined by the embedded multiple-case study approach. Therefore, firstly NBE key partners, value propositions, key activities, and complementary activities are addressed to foreground answers to sub question 1. The perspective of the discussion subsequently zooms out to reflect on how urban beekeeping NBEs collaborate across the industry with various stakeholders, thereby addressing sub question 2. Finally, a macro-level perspective is adopted to compare findings on NBE contributions to sustainability transitions at the city level which relates to sub question 3. Findings from each embedded level of analysis are synthesised into five key roles NBEs can undertake to contribute to UST in urban beekeeping. These roles are a heuristic framework which ultimately provide a comprehensive answer to the main research question.

5.1 Nature Based Enterprises in Urban Beekeeping

A diverse array of urban beekeeping NBEs are identified in Harare and Amsterdam. Two key activities are common to both city contexts: honey value chain activities and pollination services. Education, queen breeding and corporate hive placement only occur in Amsterdam. However, alongside these key activities, NBEs took part in a vast array of complementary activities. Complementary activities are seen to help support the realisation of NBE's key activities and value propositions. An example of this in Harare is when NBEs collaborate with rural-out growers to meet urban honey market demands, thereby contributing to social development of low-income earners. However, this is a complementary activity to the actual key activity, selling honey in Harare (honey value chain activity). Through the coupling of complementary activities and key activities, NBEs can generate several benefits that are received by multiple, diverse stakeholders (Mayor et al., 2021).

As of yet, NBE multifunctionality, as observed in NBEs in urban beekeeping is not built into the most contemporary NBE business model canvas (Connecting Nature, 2019). This could be problematic as Mayor et al., (2021) have observed that difficulties in financing NBS can occur because positive externalities are frequently not captured in market prices. These complications are recognisable in Amsterdam where the price of honey is particularly low. However, in Harare, when increased prices

for urban beekeeping services were included, such as the high cost of bee removal in comparison to bee extermination, clients were often dissuaded from opting for the more sustainable alternative. One explanation for this in literature, is that increased environmental awareness can improve consumer willingness to pay for more sustainable products NBEs deliver (McQuaid et al., 2021a). Therefore, improving awareness and legitimacy of NBEs may be an important first step towards incorporating the services they deliver into market prices. However, difficulties NBEs face in accruing economic gains for the services they offer can also points towards other schools of literature. Some scholars have highlighted that translating the benefits of NBS into monetary units is part of a broader systemic issue. Namely the dominant valuation and accounting methodologies have historically led to underinvestment and over-exploitation of natural resources and continue to do so when attempting to value NBS (Mayor et al., 2021; McQuaid et al., 2021a; Sarabi et al., 2019; Toxopeus & Polzin, 2021).

Leading on from NBE multifunctionality, this thesis also considers the value propositions NBEs deliver. An intriguing finding from case comparison is that despite NBEs engaging in the same activity, they can exhibit completely inverted benefit distributions in Harare in comparison to Amsterdam. To illustrate this point, in both cities NBEs collaborate with other stakeholders to enhance honey production, thereby expanding the number of beehives they have active across the city. There are some exceptions to this such as Alvéole in Amsterdam, who primarily places hives for educational purposes. In Harare, the NBE informally compensates urban residents for the use of their space in the form of honey or a percentage of honey sales. The exact opposite is true in Amsterdam. In this case, residents and corporations pay NBEs to place their hives on their premises. These examples illustrate a complete inverse in the value chain associated with identical activities. In one case the NBE is compensated and in the other the NBE is charged for placing hives on private urban property.

This inversed benefit chain could be attributed to different levels of recognition placed on value proposition dimensions by stakeholders. In Amsterdam, biodiversity gains of having the bees onsite are valued highly, potentially due to top-down policies which institutionalise this benefit such as the *EU Biodiversity Strategy for 2030* (Hermoso et al., 2022). In Harare, the hive guardians report intrinsically appreciating having the bees in their gardens, but this value is not institutionally incentivised. As a result, hive guardians in Harare may be less sensitive to the significance of the nature stewardship role they play in comparison to urban residents and corporations in Amsterdam. Nevertheless, this example indicates that varying degrees of priority can be assigned to the different

facets of value propositions NBEs deliver. This can in turn ultimately define the type of NBE and activities they undertake.

This observation highlights the importance of understanding how NBEs in urban beekeeping navigate priorities across the value proposition dimensions. This has been acknowledged to a certain extent in the NBE business model canvas. Here the authors indicate there can be trade-offs between economic, social, and environmental value propositions (Connecting Nature, 2019). In the results of this thesis NBEs were rather seen to have to balance the extent to which they prioritise environmental, social, and economic benefits rather than choosing between dimensions. This finding is discussed in an expert interview (I22), who confirms the need to understand value propositions of NBEs on a spectrum as opposed to fulfilled or not fulfilled. The significance of the multi-faceted value propositions NBEs can have, along with the recognition of multi-functionality, is illustrated in figure 9.

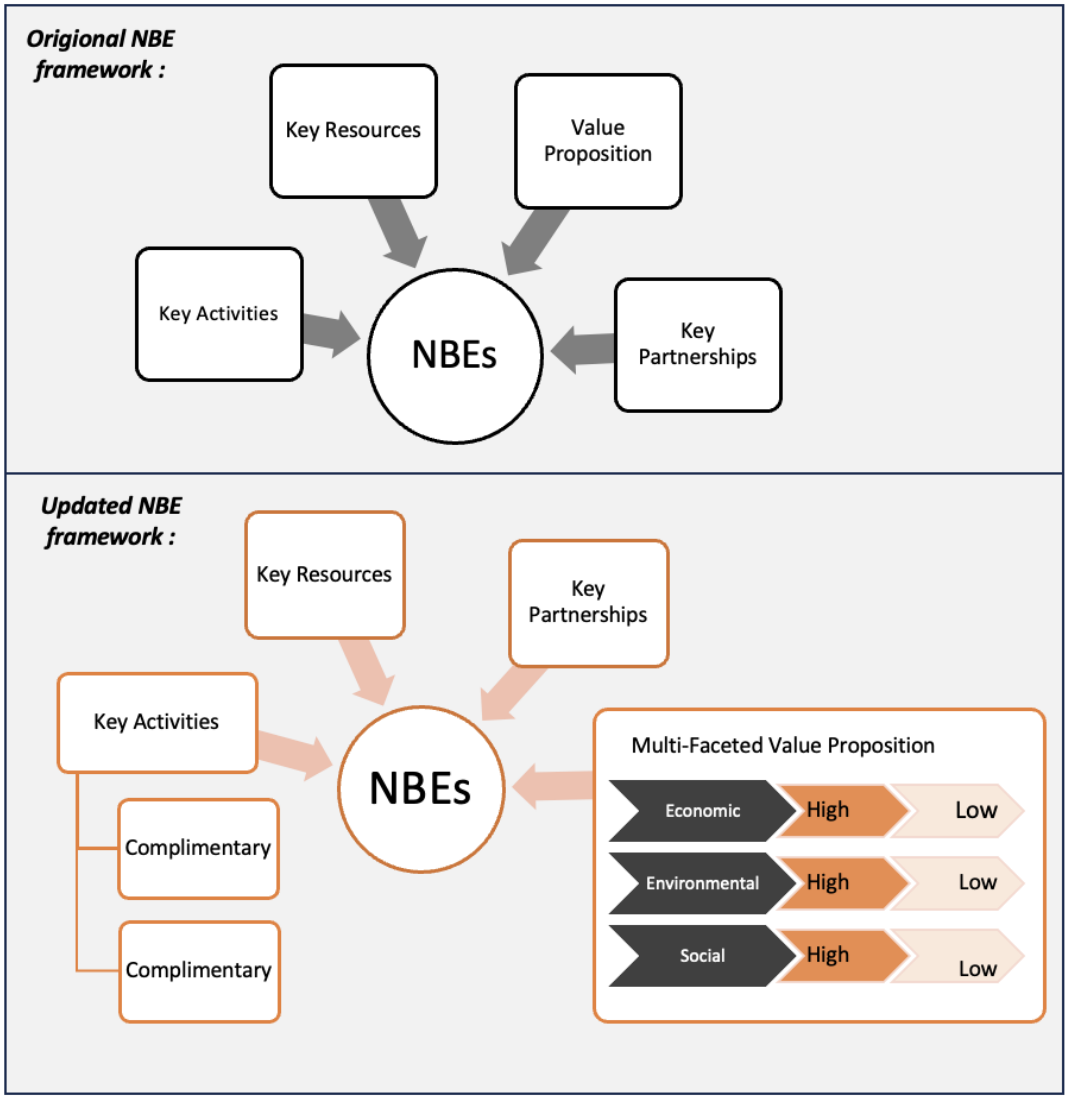


Figure 9 : Contributions to conceptualizing NBEs.

This image depicts how findings from this thesis can be used to understand NBEs components in a more detailed light than how they are currently understood in literature (Connecting Nature, 2019).. Firstly, key activities are shown to be supplemented by complimentary activities. Secondly, Value propositions are shown to be multi-faceted whereby different dimensions can be valued or realised to different extents (high or low). The updated NBE framework is by no means a final and comprehensive account as adjustments are made only from the urban beekeeping sector insights and may not hold in other NBS sectors. Nevertheless, case-specific insights from NBEs in the urban beekeeping sector and cases from the global north and south, may be useful to add some nuance and depth to a relatively novel literature field.

In addition to the adjustments included in the updated framework (fig.9), the examination of NBE types across case studies reveals the influential role of contextual factors in shaping the implementation of urban beekeeping. Contextual differences can result in diverse manifestations of NBEs. Factors such as bee species and climate and city planning are seen to dictate the boundaries of NBE beekeeping operations in Harare and Amsterdam. For example, the practice of corporate hive placement, which is common in Amsterdam, does not occur in Harare. This may be due to factors such as higher bee aggression in African bees (Apis mellifera scutellate), also known as the African killer bee, compared to the more docile European bee (Apis mellifera). It is crucial to acknowledge and consider these diverse contexts and factors when making comparisons. Understanding the influence of local characteristics is essential to comprehend the complexity and variability within the NBE landscape. This study confirms the important role NBEs play in both Amsterdam and Harare in developing expertise on the ground for the practical delivery, management, and stewardship of NBS projects (McQuaid et al., 2021a).

5.2 Collaboration Patterns

Having situated empirical findings on types of NBEs in urban beekeeping in literature, we now zoom out to examine NBE collaboration across the urban beekeeping sector. This reflection compares insights on how and why NBEs collaborate with their key partners, thereby addressing the second sub-question of this thesis. The discussion delineates NBE collaborations according to which key partners they engage with and the level of interaction: ongoing structures, temporary structures, coordinated forums, informal connections, and coordination (Makepour et al., 2021), while also considering the occurrence of collaboration voids and symbolic collaborations. A summary of the

comparison between NBE collaborations in Harare and Amsterdam is provided in Appendix I. This discussion firstly investigates the outcomes of vertical partnerships.

5.2.1 Vertical Partnerships for Industry Cohesion

Urban beekeeping organisations are identified in both Harare and Amsterdam, however, distinct differences in how NBEs collaborate with these organisations emerge. In Harare the urban beekeeping organisations identified are largely dormant or inactive. NBEs in this context only participate in *symbolic* vertical partnerships to bolster their credibility among international donors. On the other hand, in Amsterdam, NBEs actively engage in sustained collaborative relationships with urban beekeeping organizations, *establishing ongoing structures of collaboration*. These contrasting approaches result in distinct opportunities and challenges in each context.

In Amsterdam *ongoing formal collaboration* with urban beekeeping organizations has trickle-down effects, such as the emergence of other types of collaboration including *informal interactions* and *cooperation* with other NBEs. These enabled NBEs to leverage shared knowledge and resources. Such collaborative practices enhance their capacities and contribute to the overall growth and development of the NBE ecosystem. On the other hand, the absence of vertical partnerships in Harare is seen to hamper cohesion across the industry, as inadequate formalized structures compromise NBE abilities to manage disease outbreaks and access EU markets for honey export.

While the findings naturally highlight the necessity to cultivate stronger vertical partnerships, which has been identified in previous literature regarding collaboration (Schirmer & Cameron,2012), it is essential to consider the degree of control NBEs possess over such connections (Muñoz & Cohen, 2017). Previous studies have demonstrated that NBEs and sustainable entrepreneurs often lack access to policy makers (Gast et al., 2017; McQuaid et al., 2021a). In the case of Harare, NBEs did undertake efforts to involve government officials, however, they were unsuccessful due to a lack of consistent interest from these actors or willingness to make payments associated with gaining EU certifications. The challenge to meaningfully engage with policy makers is not unique to urban beekeeping in Harare. A study focusing on barriers facing NBEs in different European city-contexts, similarly, found inconsistent policy approaches and a lack of coordination to pose significant challenges to NBEs as this "stymied market development (McQuaid et al., 2021a, p. 13)". Combining insights from the cases and literature, we can reason that although ongoing vertical partnerships appear to have multiple advantages, they are not always possible or accessible to NBEs.

5.2.2 Horizontal Partnerships

NBEs engage in horizontal partnerships through *temporary collaboration structures* with other business actors (non-NBEs). In Amsterdam, NBEs engage in corporate hive placement, where corporations can purchase bee packages which include workshops, corporate gifts (branded honey), and on-site hives. Alternatively, some corporations simply sponsor NBE hive placement for a specific period of time. In Harare, NBEs establish *temporary collaborations* with commercial farmers through pollination service provision.

Horizontal partnerships between NBEs and corporates have been touched on in literature. McQuaid et al. (2021a) examined the collaborations between NBEs and private actors as a financing mechanism for NBE initiatives. Their assessment revealed a prevalent "lack of fit" between NBEs and these business-actors, which they attributed to the prioritisation of short-term investment perspectives by corporate entities (p. 14). However, the findings of this study present a contradictory perspective. The temporality and time-sensitivity of contractual arrangements, intertwined with the pivotal role of trust and reputation, serve as motivation for both NBEs and their partners to fulfil their respective commitments. Furthermore, NBEs in both Harare and Amsterdam expressed satisfaction with these types of collaboration. A possible explanation for the disparity between this thesis and previous studies could also be that urban beekeeping provides relatively instant benefits in comparison to other NBS. Commercial farmers for example see improvements to crop yields the same annum. Therefore, in urban beekeeping, it is possible short-term returns are valued by both parties which is more conducive to productive collaboration synergies.

In this thesis, temporary collaborations with business actors are observed to yield lucrative opportunities for NBEs. However, another concern in literature is that the multiple benefits generated by NBS and NBEs are not fully captured by market prices (Connecting Nature, 2019; Mayor et al., 2021; McQuaid et al., 2021a; Sarabi et al., 2019). NBEs who collaborated with corporates valued these partnerships highly as a source of income. This may indicate that these partnerships deserve more attention as a potential means to realise the economic and non-economic activities of NBEs more wholly.

In both Amsterdam and Harare NBEs engage in horizontal collaborations with other NBEs in urban beekeeping. However, some divergent patterns emerged between the two contexts. In Amsterdam, NBEs frequently partner with other NBEs from within their own niche (intra-niche collaboration). For example, honey resellers pool together their honey and share transport costs to Germany where they trade their goods at higher market prices. NBEs in Harare, on the contrary, opt to collaborate

with partners who undertake distinctly different roles to their own (intra-niche collaboration). For instance, some NBEs reach out to international urban beekeeping enterprises for guidance on how to make value addition products. Both types of collaboration between NBEs involve sharing expertise or material resources, although thus far they have not been observed to co-exist strongly in the same sector and geolocation.

Several studies have highlighted the importance of collaborative processes for implementing NBS and for the success of NBEs (McQuaid et al., 2021a; Sarabi et al., 2020) However, collaboration has only been acknowledged broadly as an enabling tool for NBEs. This is possibly due to the limited in-depth focus on NBEs within specific sectors in previous literature (Kooijman et al., 2021a). Nevertheless, findings on how NBEs collaborate with other NBEs from this thesis support the academic consensus that collaboration is an essential element of NBEs' operational structure. Therefore, these findings help to validatee and add nuance to the existing, but relatively thin body of literature on this topic (Appendix I).

5.2.3 Diagonal Partnerships

Urban hive placement in residents' gardens, occurs in Harare and Amsterdam. In this partnership, the pooling of resources and capabilities takes place whereby urban hive residents provide a space for beehives and therefore a gateway to urban garden food sources. NBEs, on the other hand, provide expertise and labour on hive maintenance and honey harvesting. These diagonal partnerships often take the form of *ongoing structures* in Harare but also involve other types of collaboration such as *coordination* with neighbours. In both cases, NBEs collaborate with individuals and groups in the form of beekeeping training and knowledge sharing. However, in Harare NBEs collaborate to mobilise actors for economic benefits and stimulate social development. Partnerships with individuals and groups in Amsterdam revolve heavily around informally generating legitimacy around urban beekeeping or diffusing biodiversity awareness via coordinated forums linked to the NBV.

The findings align with existing literature on partnerships with individuals and communities to a certain extent. Co-production of NBS with local community members is recognized as a significant enabling factor for NBEs as highlighted in previous research (McQuaid et al., 2021b; Mayor et al., 2021). The co-production of NBS with citizens has been examined in terms of knowledge co-production (Adams et al., 2023) as well as in terms of the maintenance and implementation of NBS (McQuaid et al., 2021a). However, when engaging with urban residents in hive placement for example, the NBE largely guides the terms of collaboration and how the hive is maintained, which

opens up questions regarding the extent to which both parties are actively involved in the *co-production* of urban beekeeping or whether the urban residents take on a more passive role. Nevertheless, stakeholder engagement with local citizens is shown to be an important feature of NBE organisational structures.

5.3 Reflecting on NBE Contributions to UST

Having explored NBE collaborations across urban beekeeping sectors we now broaden our perspective to examine the impacts of these collaborations on the scale of sustainability transitions at the urban level. The results of this thesis indicate all five mechanisms of Frantzeskaki et al.'s (2017) UST framework - upscaling, replicating, partnering, instrumentalising, and embedding - are present in the case studies, albeit in different ways. This suggests NBEs do indeed have the potential to contribute to UST through urban beekeeping. Learnings from the study include: the rural/urban hybrid nature NBEs can take on and the unique capacities NBEs have to iterate and improve their practices. Furthermore, it is important to note multiple dynamics are observed simultaneously, and there are synergies and tensions between different pathways NBEs can undertake to contribute to UST which are hereby unpacked.

5.3.1 Upscaling within and beyond the Urban Core

NBEs facilitate the growth of members, users, and supporters in urban beekeeping through contextualized knowledge sharing and training in Harare and Amsterdam. They do so by spreading core ideas such as biodiversity improvement and nature awareness linked to activities such as hive placement and information sessions. NBEs are effective in *upscaling* urban beekeeping practices because they have context-specific expertise, this is particularly relevant in Harare, where knowledge is not accessible from other sources. One such way NBEs contribute to upscaling in Harare that did not occur in Amsterdam is by partnering with groups outside of the urban core such as rural out growers. In this way, in Harare urban NBEs are seen to take on a hybrid nature to expand the reach and impact of their practices.

Mayor et al., (2021) have suggested the rural context may have the capacity for larger-scale operations by NBEs through the involvement of a broader scope of stakeholders including farmers. On this basis, these scholars suggest future research should examine rural NBEs specifically. When considering upscaling beyond the urban core in Harare, we see NBEs are not necessarily only urban or rural models, rather, these enterprises have the potential to, and in some cases rely on, cutting across rural-urban frontiers. As observed in Harare, extending urban beekeeping practices to rural areas does have the capacity to increase the scale of the NBS. This finding has implications for future studies whereby, given NBES may have transient qualities expressed in innovatively *upscaling* key

activities beyond the urban core, simply contrasting rural NBEs to urban NBEs be too simplistic of a distinction (Mayor et al., 2021).

However, it is also important to acknowledge these findings regarding NBE hybridity may not hold true to every context. In Amsterdam, the empirical data on NBE key activities did not indicate these hybrid rural/urban qualities. This disparity may be due to the Dutch countryside being a relatively hostile environment for bees, primarily due to the use of chemicals and intensive agricultural practices. Therefore, the inherent nature of the NBS in question and contextual factors need to be taken into account when considering the potential of *upscaling* beyond urban boundaries for UST.

5.3.2 Replicating and Upscaling Symbiosis

Replicating is seen to occur in order to upscale practices by NBEs in both Harare and Amsterdam (Frantzeskaki et al., 2017). This phenomenon can be observed in NBE activities in each city. In Amsterdam, the Amsterdamse Honey platform revolutionizes the trade dynamics between honey producers and consumers to upscale honey sales to new markets. In Harare, replication is evident through the implementation of hive placement models involving urban residents and the honey value chain which facilitates collaboration among rural out growers, middlemen, and NBEs (see fig.6).

In both cases, there is a symbiotic relationship between replication and upscaling, characterized by the implementation of quality checks that are closely intertwined with these replication processes. Although synergies between mechanisms of UST have been established in literature prior to this thesis (Frantzeskaki et al., 2017; Gorissen et al., 2018), the ways replicating can support upscaling have not been acknowledged. In Harare NBEs ensure rural out growers avoid excessive smoke use that can harm bees. Failure to adhere to this practice can result in rural out growers' products not being taken to the market. Similarly, Amsterdamse Honey monitors the quality of traded honey, emphasizing good practices, hygiene, and bee health. These quality control measures serve to promote and uphold the core principles of urban beekeeping, thereby showing how *replicating* by NBEs can be a useful way to preserve the core principles of urban beekeeping when *upscaling*. This finding contributes to better understanding the mechanisms of USTs which are used as a framework in this study.

Iteration for Sustained UST Contribution

NBEs are observed to be flexible and iterative and therefore contribute to UST through *embedding* and aligning old and new ways of doing (Frantzeskaki et al., 2017). In Amsterdam, urban beekeeping

has been subject to intense public debate. Whilst some NBEs are reducing their hive placement activities in light of this debate others, such as Alvéole are adjusting their practices to help keep urban beekeeping relevant in a constantly changing landscape. For example, they are reducing the number of hives on corporate buildings, placing more emphasis on education and supporting other pollinators by creating habitats for them. Similarly, in Harare, NBEs are seen to adapt to changing circumstances and seize emerging opportunities, such as the revival of agriculture in Zimbabwe. NBEs responded by offering pollination services to support agricultural activities.

These findings indicate that NBEs may have the potential to contribute to UST by embedding because of their capacity to iterate their practices. Where Moss et al. (2014) describe an important aspect of UST initiatives to be the ability to shape the context around them, this can be enriched in the context of NBEs whereby it is important for them to both shape and be shaped (react) to the context around them.

5.3.3 Tensions and Trade-offs

Several valuable ways NBEs can contribute to UST are identified in Harare and Amsterdam. However, the ways in which NBEs can contribute to UST are not without their trade-offs. Thus the case results from this thesis inform a more critical outlook on how NBEs negotiate UST than the slightly approbatory lens towards these mechanisms that has been employed in previous literature (Frantzeskaki et al., 2014; Frantzeskaki et al., 2017, Gorissen et al., 2018). For example, in both cases an antagonistic tension between upscaling and descaling is observed. NBEs can be hesitant to introduce new members to practicing urban beekeeping due to concerns over improper practice of beekeeping, that is, they fear the core ideas are not consistently practiced. In Amsterdam where there is an ecological debate around the benefits of honeybees (Theodorou et al., 2020), upscaling can be undesirable on this account due to the perception that there are already enough beekeepers. This tension is reflected in literature and described as “limits to growth (Ehnert et al. ,2018, p.19)”, the point at which the management of quantity can eclipse the management of quality.

Accordingly, it can be crucial not to overestimate the impact NBEs can have on UST by replicating. This cautionary approach stems from the observation that undertaking new ways of doing and organizing may primarily reach individuals who are already nature aware, such as hive guardians in Harare. Similarly, in Amsterdam people who are already environmentally orientated, or interested in the concept of edible cities may engage with innovative platforms such as Amsterdamse honey. Appealing to an environmentally pre-disposed group of people can help to solidify sustainable ways of doing and thinking but it may not proliferate change and transitions. This finding was

corroborated in an expert interview where the importance of including a diversity of participants to generate lasting change was discussed (I21).

A second critique relates to *instrumentalizing.* The acquisition of sponsorship or funding from external actors, gives rise to notable tensions in both case studies. For instance, when NBEs in Harare received financial support from NGOs, they encountered the challenge of prioritizing instant outcomes over pursuing incremental yet enduring changes. The recognition of potential tensions arising from instrumentalizing can also be found in the work of Ehnert et al. (2018), who acknowledge conflicts between NBEs' reliance on external actors and resources and their own core values and autonomy. Their observations highlight inherent conflicts between instrumentalizing approaches and the independence of transition initiatives.

However, navigating this tension is complex. As shown in Amsterdam, when NBEs partner with corporates to instrumentalize funding, this can have favourable outcomes. However, a divide in opinion exists in the NBE sector on whether partnering with corporates in urban hive placement is ethical or not. Toxopeus and Polzin (2021) share these cautionary sentiments, namely, when mobilizing finance for NBS, decision-making on how and where to develop these solutions becomes heavily influenced. This can result in NBS being implemented to progress a "neoliberal green growth agenda (p.9)" as opposed to generating more equitably spread socio-economic gains. By critically examining perspectives in literature and aligning them with the findings of this study, it becomes apparent that the potential advantages derived from instrumentalizing practices are contingent upon the nature of the partnering entities involved. This leads onto the next point of discussion, given the demonstrated significance of partnering in instrumentalizing and other UST mechanisms, collaboration emerges as a key factor underpinning UST in this thesis.

5.3.4 Partnering underpins UST Mechanisms

NBEs engage in *partnering* with a broad range of stakeholders including other NBEs in urban beekeeping, organisations, urban residents, and corporate actors. A multitude of reasons for partnering and ways of partnering have been identified, discussed, and presented in Appendix I. When analysing partnering in terms of how NBEs can contribute to UST through the lens of this mechanism, a prevalent finding across the case studies emerged. Specifically, when NBEs engage in partnering, this appears to underscore other mechanisms of UST. This finding is congruent with previous literature on UST mechanisms which have found partnering to be an entry-point for embedding (Ehnert et al., 2018), a precondition for scaling up sustainable impacts (Gorisson et al., 2018) and according to Frantzeskaki et al. (2017), a necessary condition to catalyze UST.

The findings of this thesis show NBEs in urban beekeeping can fulfil these connector-type roles and thereby facilitate UST. The ways NBEs in urban beekeeping do so can be understood in a nuanced light by considering which types of partnerships and levels of interactions specifically underscore other mechanisms of UST. Studies on NBEs have emphasized how both formal and informal collaboration structures are key to NBS implementation (McQuaid et al., 2021a). This thesis builds on this to show which levels of interaction can link to UST mechanisms. For example, in Amsterdam horizontal partnerships in the form of temporary contracts can underpin instrumentalizing (fig.10)

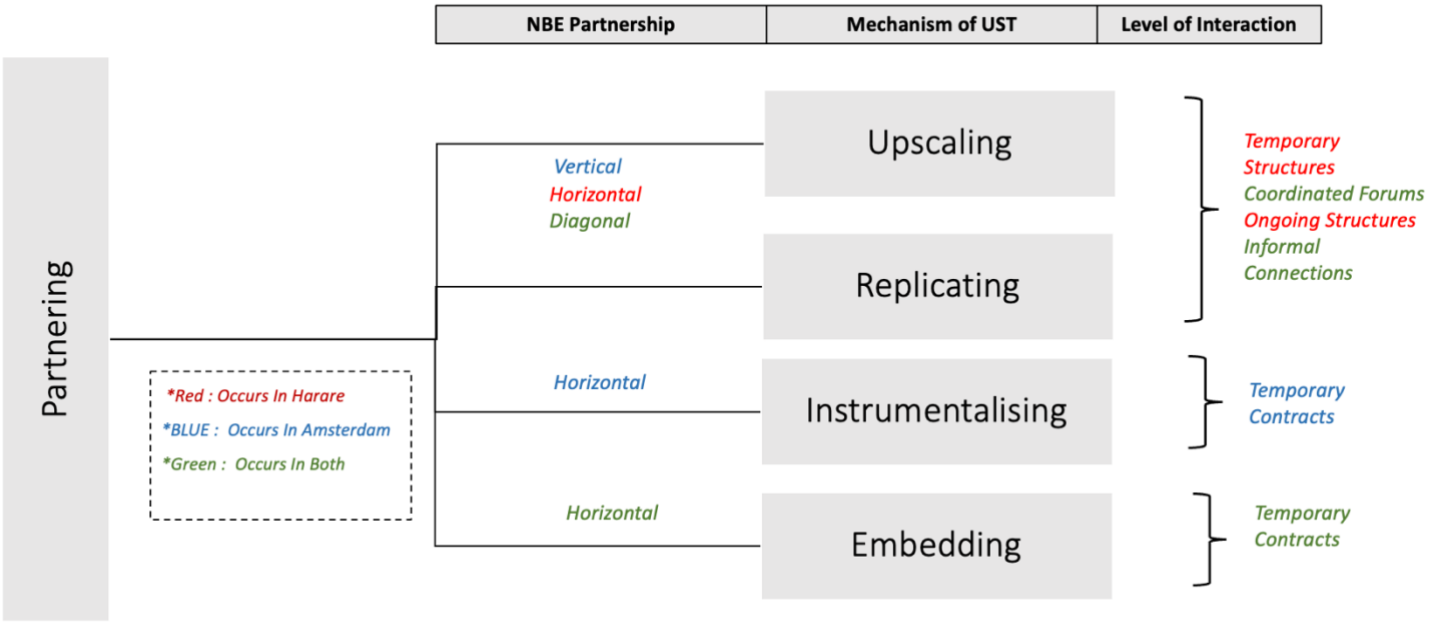


Figure 10: Partnering by NBEs underpins other mechanisms of UST

5.4 Roles to Contribute to UST

Insights from the case studies regarding types of NBEs, collaboration patterns and contributions to UST have now been explored and embedded in existing literary fields. With these contributions to literature in mind, the findings are further synthesized and conceptualised in terms of roles NBEs can undertake to contribute to UST in urban beekeeping. Roles are defined as "a set of recognisable activities and attitudes used by an actor to address recurring situations (Wittmayer et al., 2017, p.49)". These roles are by no means static, and it is expected they will continue to be renegotiated and challenged by NBEs in the field. The roles are developed by adjusting, and adding nuance to, existing NBE typologies in literature. This is undertaken by drawing on the updated conceptualisation of NBEs established in this thesis (fig. 10) and insights from the case studies. Where no foundations

or reference points exist in literature, roles are developed purely from comparative insights on the case studies.

The roles identified in this thesis are intended to serve as a heuristic framework for transition research on NBEs. Considering that UST are inherently complex and uncertain processes (Frantzeskaki et al., 2017), characterized by diverse patterns and pathways of collaboration, roles can offer valuable academic tools for studying transitions. They provide a suitable vocabulary to conceptualize actor interactions within sustainability transitions (Wittmayer et al., 2017). One critique of approaches which focus on individual actors as change agents (Ferreira et al., 2020; Kiss et al., 2022) or levers for UST is that transitions are inherently multi-actor processes (Farla et al., 2012; Frantzeskaki et al., 2012). Taking this into account, the constructed roles in this study demonstrate sensitivity to both the defining characteristics of NBEs (fig.9) and their collaborative dynamics (Appendix I, fig.10) to capture how these actors interact to contribute to UST. Here, five archetypical roles NBEs in urban beekeeping can undertake are described.

Role 1: Context-Specific Educator

This education dimension of role 1 builds from the "*green education model* (*Appendix A)"* identified by Mayor et al. (2021). These scholars capture how NBEs can play a role in facilitating nature awareness and environmental education. These activities have been identified in the case studies. However, the findings add nuance to this model to include that NBEs can conduct specialised training on how to protect/improve/ support nature. This is seen in the case of both Harare and Amsterdam in the form of beekeeping training and how this activity is strongly coupled with biodiversity education as a complimentary activity. This role is thereby associated with the spreading of new ways of thinking and doing to contribute to UST. The second dimension of this role, context specific, has been recognised in prior research. Adams et al. (2023) explain the importance of actors who have place-based knowledge in realising on the ground outcomes of NBS. NBEs in Harare and Amsterdam are seen to exhibit this quality. Therefore, this role encapsulates the value of leveraging contextualised knowledge for UST through education and partnerships.

Role 2: Hybrid Upscaler

This role is largely informed by findings from the Harare case study whereby NBEs undertake complimentary activities in both the rural and the urban contexts to upscale their activities and sustainability impacts. To exemplify this, NBEs are seen to strengthen their hives in the city for pollination services in the countryside or expand their honey value chain by collaborating with rural

out growers. Based on these findings, NBEs can contribute to UST by taking on a rural/urban hybrid role. Reflection on NBEs in relation to the spacial dynamics they traverse has previously not been explored in literature, although scholars have expressed interest in investigating juxtapositions between rural and urban NBEs (Mayor et al., 2021).

Role 2: NBS Provisioner

In this role, the NBE delivers products and services that are essential for the NBS. This falls into indirect activities as defined by Koojiman et al. (2021). This study identified indirect activities such as education, advisory services, and technology for monitoring NBS but overlooked the provision of essential products and equipment required. Findings, from Harare, indicate the role of NBEs in delivering the equipment needed for urban beekeeping such as hives, and protective gear is essential and has thus far not been captured in literature. This may be a consequence of previous studies being conducted solely within the EU. The NBS Provisioner role can also include direct activities (Koojiman et al., 2021) as observed in Amsterdam. NBEs collaborate with horizontal partners in queen breeding to deliver a more specialised honeybee for other NBEs to use in urban beekeeping which helps to support sector longevity.

Role 4: NBS Coordinator

The fourth role is defined by the collaborative practices NBEs can undertake to involve multiple stakeholders in the maintenance or implementation of NBS. The stakeholders may engage with the NBS by offering resources such as space, time, or expertise. A key activity which exemplifies this role is urban hive placement, whereby the peripheral stakeholders (urban hive guardians) contribute the garden space they have and the NBE coordinates the overall management of the hives across the city. Adams et al. (2023) identify the importance of actors to play a networking function to diffuse best practices for NBS. This study confirms NBEs can fulfil this intermediary role to engage multiple stakeholders and coordinate efforts. In this role, NBEs can play a pivotal role in shaping out a space for co-creation pathways between citizens and NBS to emerge.

Role 5: Corporate NBS Delivery

Mayor et al (2021) previously identified the "*local stewardship role* (Appendix A)", whereby enterprises empower both citizens and businesses to foster nature in their local context. This study revealed that the role in delivering NBS to corporate groups is markedly different from interactions with citizens. A prominent motivation for corporates to work with NBEs is to help them realise ESG goals largely driven by top-down agendas such as the *EU Biodiversity Strategy for 2030.* With

biodiversity protection and maintenance becoming institutionalised at a top-down level this role may take on growing prominence. This role is also observed in the delivery of pollination services in Harare.

The roles identified in this study contribute to the existing literature by providing a comprehensive overview of how NBEs can be mobilized and collaborate as drivers of UST. The notable convergence of key activities, value propositions, and partnerships for UST spotlights the unique composition of NBEs, which distinguishes them from other sustainability-orientated actors. The distinct configuration of NBEs positions them at the intersection of various sustainability challenges we currently face, emphasizing the ongoing need to recognize their distinct transformative capacities, some of which have been highlighted in this thesis. Considering that NBEs are still a relatively new and underexplored phenomenon (Kooijman et al., 2021), these insights can pave the way for further research and promising avenues for future investigation.

5.6 Limitations and Future Research

Now that the findings have been presented, we turn to critically reflect on the possible caveats of this thesis and opportunities for future research. The first limitation of this study relates to the data collection process which is heavily informed by the perspectives of NBEs as these participants make up a majority of the interviewee sample. In this thesis, NBEs are encouraged to reflect on their own collaborations and potential contributions to UST. This may have been a source of bias as actors can be disposed to portraying themselves in an overly positive light (Kvale,1994). This approbatory perspective may have filtered down into conclusions drawn regarding the potential impacts NBEs can have on UST. To minimise this limitation, future research could include a broader range of qualitative perspectives such as those of urban citizens, government officials and biodiversity experts external to the urban beekeeping industry. Moreover, future work could integrate quantitative methods into this research design, such as by including quantitative biodiversity indicators. This could help to supplement qualitative reflections on UST. One means of doing so could be including citizen science to monitor pollinator counts for example (Birkin & Goulson, 2015).

An additional methodological limitation of the study was the presence of language barriers. In both Zimbabwe and Amsterdam, many participants spoke Shona or Dutch as their first language, which may have affected their ability to express themselves completely. For example, several participants expressed they were tired from speaking English towards the end of the interview, and one interviewee sent an article which he felt embodied his opinion as he couldn't find the English words. Additionally, during the sampling process, participants were contacted in English, and the lack of

response from some individuals who may have preferred to communicate in their native language could have led to the exclusion of valuable insights. Future research should consider employing bilingual or multilingual approaches to engaging with participants in their preferred language to ensure inclusivity and gather a more comprehensive range of perspectives.

The use of two cases studied from significantly different geopolitical spaces did facilitate the collection of broad and diverse NBE data. However, this distinct comparison presented several limitations. Firstly, as a result of comparing vastly different contexts, some differences observed between the cases may not have been exclusively due to the units of analysis (NBEs and collaboration in the urban beekeeping sector) (Bryman, 2016). For example, during the data collection phase (March and April), it was spring in the Netherlands. Subsequently NBEs were in the process of opening their hives after a five-month closure over winter (bee hibernation) to assess colony survival rates. Conversely, in Harare, bees remained active during these months due to reversed seasons between the hemispheres. These contextual differences could have vastly impacted the key activities mentioned by the NBEs as well as their attitude towards urban beekeeping. To mitigate the influence of seasonal variations, future research could repeat the data collection and analysis process at six-month intervals. This limitation may also serve as a useful learning point for future studies on urban beekeeping, and possibly other NBS, being that accounting for seasonality when investigating NBS is important given their interconnectedness to nature.

Secondly, the transition frameworks used in this study have predominantly been developed and applied to cases in the global north. Some scholars have noted that when applying sustainability transition theories to the global south oftentimes many inherent theoretical hypotheses do not hold (Feola, 2020). Therefore, comparing Amsterdam and Harare using frameworks inherently more compatible to the Amsterdam context may have compromised or excluded interesting findings from Harare.

This study fills a research gap on NBES and contributions to UST from a specific sector which allows for rich micro-level insights. However, this narrow focus on the specific case of urban beekeeping, can also be a limitation when making broader statements about NBEs in terms of typologies and roles. To address this limitation and further enrich the insights presented in this study (fig.9, fig.10), future research should consider applying the same methodological steps of this thesis to different NBS sectors and global contexts. Researchers are encouraged to gather more iterations of data and gain a deeper understanding of the dynamics between NBEs and UST in different NBS industry

contexts. This would provide a more comprehensive understanding of the topic and allow for the development of an even more robust framework.

Finally, the scope of this study was delineated by Hölscher and Frantzeskaki (2021)'s lens of inquiry, urban sustainability transitions *in the city*, whereby the boundaries of the sustainability transitions are dictated by geopolitical lines and abstract space. In this thesis, NBEs in Harare were seen to have hybrid rural/urban characteristics. To gain a more comprehensive understanding of the role of NBEs in UST, future studies could explore NBEs operating in rural, urban, and peri-urban areas. By examining their collaboration and contributions in diverse landscapes, researchers can expand beyond the urban-centric perspective used in this thesis and uncover the dynamics between NBEs and sustainability transitions in various contexts.

6. Conclusion

This study aimed to contribute to understanding the collaboration dynamics and roles NBEs can undertake to address sustainability challenges through the practice of urban beekeeping. An embedded multiple-case design was employed using the two cities, Harare and Amsterdam as case studies. The data collection strategy primarily entailed semi-structured interviews with NBEs, beekeeping organisations and NBE collaboration partners in addition to participant observation and document reviews. Next, the data was analysed using thematic coding and guided by operationalised empirical research questions. Results for each case study relating to types of NBEs, the collaborations NBEs engage in and the ways they contribute to UST were presented for each case before comparing findings and embedding these in existing literature on NBEs, collaboration and transitions studies.

Through these steps, the thesis aimed to answer the research question, how do nature-based enterprises collaborate and how can they contribute to urban sustainability transitions in urban beekeeping therein? Three sub questions were constructed to answer the research question. We now turn to answer each of the sub questions before presenting overall conclusions to the study.

Sub-question 1: What types of nature-based enterprises engage in urban beekeeping?

A diverse range of key activities including honey value chain activities, pollination services, queen breeding, education and corporate hive placement are identified as key activities of NBEs along with a vast array of complimentary activities. The key and complimentary activities NBEs engaged in led to the realisation of value propositions such as improving biodiversity and nature awareness, socio-economic development, and wellbeing alongside economic gains for the NBEs and other stakeholders. However, in some cases NBEs need to navigate between the extent to which they prioritise different value proposition dimensions. This leads to the core findings which are firstly, the types of NBEs in urban beekeeping are multifunctional as they engage in complimentary activities to support their key activities. Secondly, NBEs in urban beekeeping have multi-faceted value propositions that need to be considered along a spectrum to capture the ways different types of NBEs negotiate the prioritisation along these dimensions. These findings prompted the need to refine the ways in which NBEs are currently conceptualized in literature. On this basis, the findings were incorporated into the most current NBE framework.

Sub question 2: How do nature-based enterprises collaborate in urban beekeeping?

NBEs collaborate by engaging in vertical, horizontal, and diagonal partnerships. In vertical partnerships the presence of ongoing structures, such as coordinated forums and informal connections, can be essential for NBEs to navigate challenges in urban beekeeping. The absence of partnerships with vertical actors can pose challenges to market access and sector longevity. Horizontal collaboration between NBEs occurs through intra-niche and inter-niche collaborations, enabling the pooling of resources and fostering mutual support. Finally, NBEs can leverage temporary contracts with corporates and other entities, such as individuals and groups, to scale up their operations. These collaborations provide opportunities for NBEs to expand the reach and impact of their activities. In literature collaboration has been recognized as an important enabling factor for NBEs, but exactly how they collaborate and with whom was a significant gap prior to this research.

Findings from this study confirmed the importance of collaborations for NBEs in urban beekeeping and contributed detailed understanding on the ways NBEs engage in these partnerships. Some valuable academic contributions from this thesis included the importance of considering the feasibility of vertical partnerships and providing new insights into advantages collaborations with corporate actors can yield. Partnerships are seen to be highly relevant for the sustainability impact of NBEs because they underpin other mechanisms or processes of UST. This leads us to the final sub question.

Sub question 3: How can/do nature-based enterprises in urban beekeeping contribute to urban sustainability transitions?

The results of this thesis indicate there is evidence of all five mechanisms of Frantzeskaki et al.'s (2017) UST framework: upscaling, replicating, partnering, instrumentalising, and embedding, in both case studies, albeit in similar and different forms. This suggests that NBEs do indeed have the potential to contribute to UST in urban spaces through urban beekeeping. The ways they can do so firstly include upscaling practices beyond the urban core. Secondly, carving out new ways of doing and organising in urban beekeeping which can also double as a filtering mechanism to ensure core ideas are effectively upscaled. Thirdly, NBEs may have the potential to contribute to UST through their capacity to iterate their practices and integrate new knowledge. However, certain struggles interwoven in the ways NBEs navigate pathways for UST are also identified. These included tensions between upscaling and descaling urban beekeeping practices, the drawbacks of capitalizing on external funding and the potential to overestimate the sustainability impacts of replicating.

One of the motivations for this research is rooted in the recognition that NBS need to be actively pursued, reformed, and consistently re-evaluated by relevant stakeholders, such as NBEs. This is to ensure that they do not fall into the trap of becoming hollow buzzwords for sustainability without substantial impact. To support the realisation of this in practice, we turn to a set of policy recommendations aimed at guiding NBEs in their endeavours to contribute to UST. These are formulated based on academic insights from the cases. Importantly, the inclusion of case studies from both the global north and global south help to lend a universal perspective to the proposed policy advice, thereby enhancing the applicability of the following recommendations.

1. **Engage in Vertical Collaborations when feasible and accessible.** Vertical collaborations offer opportunities to form new partnerships and establish diverse forms of collaboration, which can effectively support sustainability efforts.
2. **Foster collaborations with individuals beyond the urban core** to replicate and upscale practices. This strategic approach can effectively broaden the reach and enhance the impact of activities.
3. **Shape and be Shaped.** Embrace a dynamic approach by continuously iterating and evolving practices to stay abreast of emerging knowledge and evolving opportunities. Actively engage with the urban context to align and embed both established and novel strategies for continued and effective contribution to UST.
4. **Exercise Caution when utilising external funding opportunities.** To avoid malpractice of NBS conduct comprehensive assessments of the objectives and attributes of partnerships with external actors to ensure responsible utilization of external funding.
5. **Embed filtering mechanisms when upscaling practices.** To ensure the integrity of practices ae maintained, strive to incorporate filtering mechanisms when upscaling practices. This can include quality control checks to ensure core ideas are effectively upscaled to new users and practitioners.

NBEs have the potential to play a crucial role in bridging the gap between generating biodiversity awareness, fostering economic value of nature, and helping to realize co-benefits of urban beekeeping beyond the preservation of bee populations. The ways these enterprises can do so are synthesized through the following roles they can undertake: *Context -Specific Educator, Hybrid Upscaler, NBS Provisioner, NBS Coordinator, Corporate NBS Delivery*. The identified roles in this study

contribute to literature to explain how and in what ways NBEs can be mobilized and collaborate as vehicles for UST.

In conclusion, NBEs have been a relatively under-explored phenomenon to date, and this study reveals their exciting and largely untapped capabilities in urban beekeeping. NBEs are seen to have a unique composition and broad capacities for various partnerships. The roles NBEs can play in UST highlight their interesting transformative capacities which may be inaccessible to other actors. In this way, NBEs are seen to contribute to UST not just through the practice of urban beekeeping, but also through multiple complimentary activities which add value along numerous dimensions. This study is just an initial step in understanding these actors yet provides exciting indications that NBEs deserve attention when considering how to advance urban sustainability transitions.

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Appendix A

Business Models for Urban Nature-Based Solutions

Business Models	Description
Risk reduction model	The risk reduction model reduces financial risks by building resilience towards adverse environmental events through infrastructure changes.
Green densification model	The green densification model increases real estate value through greening cities.
Urban offsetting model	The urban offsetting model captures monetary flows from negative environmental impacts, re-routing this to re-invest into urban nature.
Green health model	The green health model employs active involvement with green spaces to improve citizens' physical and/or mental health.
Local stewardship model	The local stewardship model empowers citizens and local businesses to foster nature in their local area by offering their resources (money, time).
Vacant space model	The vacant space model facilitates the well-being of citizens through low-cost access to underutilised terrains.
Green heritage model	The green heritage model enables preservation and utilisation of pre-existing natural heritage sites through recreational access.
Green education model	The green education model facilitates the environmental education of (often young) citizens, building a culture of connectedness to nature.

Eight business models and corresponding key activities extracted from Mayor et al. (2021)'s study on business models for nature-based solutions.

Appendix B

Urban Beekeeping Organization Selection Criteria

	Criteria		
Organisation	**NBE Connection**	**Location**	**Active**
	Harare		
Zimbabwe Parks and Wildlife Management Authority	√	√	√
BKAZ	√	√	√
MBA	√	√	X
Apimondia Africa	X	√	√
	Amsterdam		
NBV	√	√	√
Professional Dutch Beekeepers Association	√	√	√
Amstelland Beekeepers Association	√	X	√
Wellbeeing	X	√	√

Appendix C

Interview Participants

Table C.1: Case Study Interviewees

	Interviewee	**Label**
	Case: Harare	
Organisations	BKAZ	I1
	Zimbabwe Parks and Wildlife Management Authority	I2
NBE	Mawungwe	I3
	Thornwood Trading	I4
	Motso Honey Company	I5
	Jasmine Apiary	I6
	Lock Honey	I7
	Maweni Honey	I8
NBE Partner	Hive Guardian	I9
	Case: Amsterdam	
Organisations	Professional Dutch Beekeepers Association	I10
	NBV	I11
NBE	SOETHEEM	I12
	Company 2	I13
	Bee Amsterdam	I14
	Bijlmer Bloemenhoning	I15
	Company 1	I16
	Amsterdamse Honey	I17
	Alvéole	I18
	Company 3	I19
NBE Partner	Hyatt Hotel	I20

Table C.2: Expert Interviewees

Field of Expertise	**Interviewee**	**Label**
Nature based solutions and urban sustainability transitions	Expert 1	I21
Nature based enterprises and nature-based solutions	Expert 2	I22

Appendix D

Participant Observation

The participant observations for the case study involved four observation events per case study. In Harare, two NBEs were visited, and the researcher actively observed their beekeeping activities. Additionally, the researcher actively participated in the African women in Beekeeping (BEEK) WhatsApp group for a duration of five months. This group consisted of women engaged in beekeeping from Zimbabwe and other African countries. Lastly, the researcher attended a Zimtrade discussion hosted by a Zambian beekeeping organization. The purpose of this discussion was to provide advice to Zimbabwean beekeepers regarding the international market for honey.

In Amsterdam, the researcher visited one NBE (O5) and a collaboration partner who works closely with BEE Amsterdam. The first event attended in Amsterdam was the Insect and BEE Open day, where NBEs played an active role in educating urban residents about biodiversity and the importance of pollinators. Finally, the researcher participated in the NBS webinar which was an online event organized by Alvéole. During this webinar, the company presented itself, and representatives from partner companies shared their experiences with corporate hive placement.

Observation Event	Case	Label
NBE Visit: Maweni Honey	Harare	O1
NBE Visit: Mawungwe	Harare	O2
African Women in BEEK WhatsApp group	Harare	O3
Discussion ZimTrade	Harare	O4
NBE Visit: Vinko Surnan	Amsterdam	O5
NBE Collaboration Partner: Vondeltuin	Amsterdam	O6
Insect and Honeybee Open Day	Amsterdam	O7
Nature Based Solutions Webinar Alvéole	Amsterdam	O8

Appendix E

Operationalization of Interview Guide

Table E.1: Interview guideline Organisation Members

Operationalised Variable	Interview Questions
	Part 1 Thank you for agreeing to participate in this research study. The first part of this interview will be an introduction into your organisation.
Key Activities	• Could you tell me a bit about yourself and your role at X organisation?
	Part 2 The next part of this interview is about nature-based enterprises in urban environments. These are actors or businesses whose core activities are related to bees or bee products. Examples are beehive owners, people who maintain other bees or organisations that implement and maintain beehives on corporate buildings.
Collaboration Stakeholders (who)	• Can you share an example of a time when your organization engaged with a similar enterprise in X city? *Probing:* Can you recall other encounters with these enterprises/actors?
Purpose of Collaboration (why)	• Do you feel either you or the enterprise benefited from this interaction, how so? *Prompt:* in the form of knowledge and skills, networking.
Interaction (how)	• I'm interested in understanding the practical aspects of these interactions. How often do you have meetings with these enterprises, and where do these meetings generally happen?
	Part 3 The final part of this interview is about the impacts of Nature-based enterprises and urban beekeeping.
Urban Sustainability Transitions	• Can you take me back to a time when you saw the impact of collaboration on the urban beekeeping sector? • In your opinion, have there been any changes regarding the popularity and growth of urban beekeeping?

	• In your experience, what specific factors in X city contribute to the suitability of urban beekeeping? *Follow up:* how are these conditions being utilised by actors? • Have you been successful in bridging the gaps between different stakeholders and their interests in the beekeeping sector? If so, can you share your approach?
That concludes all the questions I had prepared for us. Do you have any questions for me or points to include that you think are relevant and we didn't quite get to? Thank you very much for taking part in this research.	

Table E.2: Interview Guideline NBE expert employees

Operationalised Variable	Interview Questions
	Part 1
	Thank you for agreeing to participate in this research study. The first part of this interview will be an introduction into your organisation.
Key Activities	• Could you tell me a little bit about yourself and your role at X business? *Prompt:* primary activities, purpose of the enterprise, main source of revenue.
Value proposition	• How would you describe your business' aspirations or goals when it comes to promoting sustainability? *Prompt:* Economic (job creation), the community, environmentally speaking
	Part 2
	The next part of this interview is about how you interact and potentially collaborate with other stakeholders in the urban beekeeping sector.
Collaboration Stakeholders (who)	• Could you share a story or experience of a partnership between your business and another stakeholder?
Collaboration Purpose (why)	• Do you feel either you or the other actor benefits from this interaction, how so? Prompt: in the form of knowledge and skills, networking.
Interaction (how)	• I'm interested in understanding the practical aspects of these interactions. What is the setting and atmosphere like?
Collaboration Stakeholders (Who)	• Could you describe other meaningful partnerships or collaborations you have with: - Citizens of Harare - NGOs and other organisation - Businesses in the urban beekeeping sector?
	Part 3
	The final part of this interview is about the impacts of urban beekeeping.

Urban Sustainability Transitions	• From your perspective, what are the potential impacts of collaboration for the beekeeping sector? *Follow-up: and for the city as a whole* • Have you experienced changes in the popularity and growth of urban beekeeping? Follow-up: How do you feel about this? • In your experience, what specific factors in X city contribute to the suitability of urban beekeeping? • Have you been successful in bridging the gaps between different stakeholders and their interests in the beekeeping sector? If so, can you share your approach?
That concludes all the questions I had prepared for us. Do you have any questions for me? Thank you very much for taking part in this research.	

Table E.3: Interview guideline NBE Partnerships

Operationalised Variable	Interview Questions
	Part 1
	Thank you for agreeing to participate in this research study. I was kindly put in touch with you by X company and would be very interested to learn more about your partnership with them.
Key Activities	• To start us off could you tell me a bit about yourself and how you came to work with X company?
Value proposition	• Can you share your thoughts on the impact of X company's activities on sustainability?
	Part 2
Collaboration Stakeholders (who)	• Can you share any memories or anecdotes that highlight your experiences with X company?
Purpose of Collaboration (why)	• What motivated you to collaborate with X company? *Follow-up:* have you experienced benefits because of this collaboration
Interaction (how)	• I'm interested in the practicalities of this partnership, what is the setting and atmosphere of the meetings/ interactions/ conversations?
	Part 3
Urban Sustainability Transitions	• Do you think urban beekeeping is becoming more popular? Follow-up: why? • Are there any systems in place for exchanging ideas, information, or resources between the collaborating organizations? • To what extent do you feel part of the urban beekeeping community?
	That concludes all the questions I had prepared for us. Do you have any questions for me?
	Thank you very much for taking part in this research.

** X refers to the specific NBE who this participant collaborates with

Table E.4: Expert Interview Guideline Nature Based Solutions and Urban Sustainability Transitions: Alexander der Jagt

Operationalised Variable	**Interview Questions**
Introduction Thank you for agreeing to participate in this research study. After drawing on your work for my thesis it is a pleasure to speak with you. I am looking at how nature-based enterprises collaborate. Nature-based enterprises being any business with nature at the core of their activities and engage with or facilitate the implementation of nature-based solutions, and how they can potentially contribute to urban sustainability transitions. I am using the urban beekeeping sector as my nature-based solution case study and drawing on insights from urban areas in Zimbabwe, Southern Africa, and the Netherlands. The interview will consist of roughly 10 questions and will last around 40 minutes.	
Urban Sustainability Transitions	• Could you tell me a bit about why you were drawn to studying nature-based solutions and why you think they are important for urban sustainability transitions?
	In your paper "*mosaic governance for urban green infrastructure: upscaling active citizenship from a local government perspective"* you discuss active citizenship and how it can contribute to the maintenance and quality of green spaces and other nature-based solutions and especially collaboration between citizens and governance bodies. I'm looking at how NBEs collaborate with citizens. One example that has come up is a scheme where beekeepers place hives in residents' gardens and pay them some honey every year in return for the space for example. • Can you describe an example where you saw NBEs meaningfully collaborate with citizens?
	In your email you mentioned you do not have direct, academic knowledge on enterprises. In my research I have seen nature-based enterprises help disseminate knowledge on the NBS because it is advantageous to their business so for example in Zimbabwe, one beekeeper has many information sessions on the benefits of honey rather than sugar to help

	create a customer base. Or others hold meetings on bee pollination benefits for farmer sto encourage them to use the pollination services they provide. • Can you think of an NBE who has been present in any of the cases you have studied and, how do you see the role of nature-based enterprises in the success of nature-based solutions?
Collaboration (how)	I'm also looking at different types of collaboration, such as formalised meetings through beekeeping organisations where members meet regularly, newsletters are sent out and informal WhatsApp groups between beekeepers, or sporadic information sharing among colleagues. I use 5 levels to define this. • Which types of collaboration have you seen have impact on the quality and maintenance of NBS?
Collaboration (why)	Your work on the steppingstones to implementing nature-based solutions, emphasizes the importance of collaborations and partnerships in implementing NBS. • How have you seen this work in practice, especially in urban areas?
Upscaling	• What are some of the challenges of upscaling and replicating nature-based solutions?
	I'm looking at Nature-based enterprises in urban beekeeping in Harare and in Amsterdam. There are of course quite some differences. • How important do you think it is for nature-based solutions to be embedded in the urban context and how can nature-based enterprises help with this?
Ecological dilemma	In my research i have come across a phenomenon whereby urban beekeeping became a "hype trend" in the Netherlands, so many people started doing it. Then a few years ago people became aware that honeybees can limit biodiversity as they compete with other pollinators. • Can you think of a time when a nature-based solution maybe did not quite deliver all it was promised to do? Please can you explain the situation to me.

That concludes all the questions I had prepared. Is there anything you would like to add that you feel is important, but we did not quite get to? Thank you very much for taking part in this research.

Table E.5 Expert Interview Guideline Nature-Based Enterprises: Esmee Kooijman

Operationalised Variable	**Interview Questions**
Introduction Thank you for agreeing to participate in this research study. After drawing on your work for my thesis it is a real pleasure to speak with you. Before we begin, I will give you a brief introduction to my topic. I am looking at how nature-based enterprises collaborate to potentially contribute to urban sustainability transitions. I conceptualise Nature-based enterprises according to your definition of an enterprise that has nature at the core of their activities and engage with or facilitate the implementation of nature-based solutions and engage in economic activity. I distinguish types of NBEs using the NBE business model canvas from the adapted from the Nature-Based Solutions Business Model Guidebook part of the Connecting Nature project.	
Key Activities	In your paper Innovating with Nature: From Nature-Based Solutions to Nature-Based Enterprises, you talk about why recognising the value created by NBE is essential for market development of the NBS sector and its potential to facilitate the wider adoption of NBS. • To start us off could you tell me a bit about why you were drawn to studying nature-based enterprises and why you think it is important to understand them and their activities deeply?
NBEs	In your paper Innovating with Nature: From Nature-Based Solutions to Nature-Based Enterprises you speak about the use of nature as a core activity of NBEs is difficult to quantify and evaluate. I have come up against similar difficulties. For example, in urban beekeeping someone may be a beekeeper themselves and harvest honey or educate other novel beekeepers. • How do you understand the use of nature as a core activity?

	Follow up: where do you draw the line between what constitutes a regular enterprise and a nature-based enterprise?
Key Partnerships	In your paper "Innovating with Nature: Factors Influencing the Success of Nature-Based Enterprises" you look at the key external factors influencing sustainability orientated enterprises which pointed towards the importance of some collaborative instruments. I'm looking at different types of collaboration, such as formalised meetings through beekeeping organisations where members meet regularly, newsletters are sent out and informal WhatsApp groups between beekeepers, or sporadic information sharing among colleagues. • In your experience, in what ways have you seen collaboration influence the development and success of NBEs? *Follow-up:* Follow up: can you talk me through an example of this?
Key partnerships: Other NBEs	I have also seen NBEs partnering with each other, such as NBEs providing pollination services in Zimbabwe will sometimes ask other beekeepers to lend them hives if theirs aren't strong enough. Similarly, after a bad winter when some hives do not survive beekeepers in Amsterdam will ask colleagues to split their hives and give them some. • Can you think of an example where you have seen NBEs across a specific industry or sector working together and can you describe the impacts of this?
Value Proposition	In my research I have come across some companies who place hives on corporate buildings, and they are in essence sponsored by them to do so, whilst the corporation improves their ESG rating and in some cases does improve employee wellbeing. Other people who I have interviewed have blatantly called this greenwashing. • Have you seen instances of this in your research and what do you think some of the dangers of NBEs implementing nature-based solutions may be?
Ecological Dilemma	In my research I have come across a phenomenon whereby urban beekeeping became a "hype trend" in the Netherlands, so many people

	started doing it. Then a few years ago people became aware that honeybees can limit biodiversity as they compete with other pollinators. You shared a similar sentiment in “Innovating with Nature” where you mentioned that there can be trade-offs between ecosystem services, you use the example of “Natural forests, grasslands, and wetlands store more carbon or provide higher biodiversity than managed ecosystems such as parks or green roofs. Yet, these managed systems could increase urban cooling, water retention capacity, and contribute to overall health and well-being. In my case I have seen some NBEs taking control of the narrative, and reinterpreting the debate in some ways, or pivoting their business, like corporations who place hives on buildings have widened this to planting greenery for other pollinators. • What role you think nature-based enterprises can play in navigating the trade-offs around NBEs?
Urban Sustainability Transitions	I’m looking at Nature-based enterprises in urban beekeeping in Harare and in Amsterdam. There are of course quite some differences. • How important do you think it is for nature-based solutions to be embedded in the urban context and how can nature-based enterprises help with this?
That concludes all the questions I had prepared. Is there anything you would like to add that you feel is important, but we did not quite get to? Thank you very much for taking part in this research.	

Appendix F

Utrecht University Informed Consent Form

In this study we want to learn about nature-based enterprises, how they collaborate with other stakeholders and what the outcomes of this may be. Participation in this interview is voluntary and you can quit the interview at any time without giving a reason and without penalty. Your answers to the questions will be shared with the research team. We will process your personal data confidentially and in accordance with data protection legislation (the General Data Protection Regulation and Personal Data Act). Please respond to the questions honestly and feel free to say or write anything you like.

[Only in case of anonymous handling: Everything you say or write will be confidential, and anonymous. This means that we do not ask for your name, and no one will know which respondent said what.]

I confirm that:

- I am satisfied with the received information about the research.
- I have no further questions about the research at this moment.
- I had the opportunity to think carefully about participating in the study.
- I will give an honest answer to the questions asked.

I agree that:

- the data to be collected will be obtained and stored for scientific purposes.
- the collected, completely anonymous, research data can be shared and re-used by scientists to answer other research questions.

I understand that:

- I have the right to see the research report afterwards.

Do you agree to participate? o Yes o No

Appendix G

Document Reviews for Case Selection and Data Analysis

Label	Source Type	Document
D1	Meeting Minutes	Mashonaland Beekeepers Association Minutes of Committee Meeting 1st November 2014
D2	Interview Transcript	Commercial urban beekeeping in Zimbabwe-The experience of Rene Fischer. Interview Transcript.
D3	Meeting Minutes	MASH BEE FIELD DAY - Saturday 16th November 2013 written account.
D4	Interview Transcript	Brief Urban Beekeeping in Harare by Rene Fischer.
D5	News Article	Mambondiyani, A. (2023). Why Farmers in Zimbabwe Are Shifting to Bees. Retrieved 26 April, from : https://www.resilience.org/stories/2023-02-15/why-farmers-in-zimbabwe-are-shifting-to-bees/.
D6	News Article	Nature conservation SO (2015). Retrieved 28 April, 2023, from : http://heliam.net/Stichting/natuurbeschermingzo/blog/honing-halen-in-het-gaasper.html
D7	Advertisement	ZIMEXAPP (2022). Raw Honey Both Combed & Liquid At Retail & Wholesale Prices. Retrieved 2 May, 2023, from : https://zimexapp.co.zw/4185-raw-honey-both-combed-liquid-at-retail-wholesale-prices.
D8	ILO Report	International Labour Organisation (2015).Skills for Youth Employment and Rural Development Programme in Zimbabwe: An Assessment of Firms in Economic Subsectors. Retrieved 3 May, from : https://www.ilo.org/wcmsp5/groups/public/---africa/---ro-abidjan/---sro-harare/documents/publication/wcms_622971.pdf.
D8	Facebook Page	APICULTURE (BEE KEEPING ZIMBABWE. Retrieved 4 May, 2023, from : https://www.facebook.com/groups/167179817306826/.
D9	Twitter Page	Harare Honey Company. Retrieved 4 May, 2023, from : https://twitter.com/learnmorechada2/with_replies?lang=en
D10	Article	Honey cowboys and McDonald bees

D11	Organisation Website	NBV (2023). Retrieved 5 April 2023, from : https://www.bijenhouders.nl/.
D12	Company Website	Alvéole Amsterdam. Add bees to your green rooftop in Amsterdam. Retrieved 12 April, from : https://www.alveole.buzz/cities/europe/adopt-beehives-in-amsterdam/.
D13	NBV Newsletter	NBV Member Beekeeping magazine. Retrieved 28 April 2023, from : https://online.fliphtml5.com/qefa/sdwm/#p=36
D14	Company Website	Bee Amsterdam (2023). About Us. Retrieved 1 May 2023, from : https://www.bee.amsterdam/about-bee-amsterdam.
D15	Company Website	Soetheem. Retrieved 12 May 2023, from : https://soetheem.nl/index.html.
D16	Company Website	Bejo. Retrieved 15 April, from : https://www.bejo.com.

Appendix H

Coding Framework

Theme	Code	Subcodes	Description
Nature-based Enterprises	**Key Activities**	Value Addition Products	*The creation and sale of products such as wax, propolis and lip balms.*
		Queen Breeding	*Controlled genetic selection of favorable bee characteristics.*
		Pollination Services	*Renting out hives for crop pollination*
		Beekeeping Training	*Training novice and experienced beekeepers*
		Consultancy	*Advising others on beekeeping or other related services*
		Bee Removal	*Removal of colonies in urban environments where they are dangerous or unwanted*
		Corporate Hive Placement	*Placing and maintaining hives on corporate property*
		Urban Residential Hive Placement	*Placing and maintaining hives on urban residents' property*
		Beekeeping equipment	*The manufacture and/or resale of beekeeping equipment.*
		Disease Control	*Treating bees for varroa mite and American foulbrood for example*
		Honey Harvesting	*The extraction of honey from the comb*
		Honey Processing	*Processing raw honey to remove it from the comb.*
		Honey Resale	*The sale of processed honey*
		Education	*Education on bees, pollinators, biodiversity and other related topics.*
	Key Partnerships (Who)	Urban Resident University Other NBE NGO Middlemen	*Key Partnerships were any partnerships mentioned by the NBE that were important Stakeholders in helping them carry out their key activities.*

		Government/ Municipality Commercial Farmers Rural Out-growers Researcher Client/ Customer Urban Beekeeping Organisations	
	Value Proposition	Nature Awareness	*The facilitation of increased contact with nature or awareness of nature.*
		Health Benefits	*Benefits of honey and honey products*
		ESG-Goals Biodiversity	*Environmental reporting standards criteria* *Increased biodiversity or support of nature*
		Economic Gain	*Supplement own income or that of others.*
		Social Development	*Improve the livelihoods of other people and communities.*
Collaboration	**Purpose (why)**		*Reasons for collaborating such as sharing resources or knowledge and navigating challenges.*
	Level of Interaction (How)	Ongoing structures	*The level of interaction. social media groups, open days, food market fairs*
		Temporary Contracts	*Agreements between NBEs and other actors that had a fixed term or could be terminated upon request or malpractice*
		Coordinated Forums	*Organised knwoledge sharing either through formal channels or at predetermined times and locations*
		Informal Connections	*Uncoordinated knwoledge sharing, ad hoc and without structure or set frequency.*
		Coordination	*Light touch collaboration which involved minor adjustments or communication between NBEs and other actors*

		Symbolic Collaboration	*Giving the impression of enaging with another actor in ordert o increase ones credibility*
		Collaboration Void	*Instances where NBEs purposefully choose not to collaborate. For example: "keeping an eye on what's happening is too important. So that's why we do it ourselves (I13)"*
Urban Sustainability Transition	**UST Enablers**	Upscaling	*The growth or spreading of the core principles of urban beekeeping. This included training people in the practice as well as education on biodiversity, bee health or the benefits of honey.*
		Replicating	*New ways of doing, thinking or organising to navigate challenges urban beekepeing faced or to take advantage of oppotunities.*
		Partnering	*The pooling and leveraging of resources, expertise and capabilities between NBEs and other actors.*
		Instrumentalizing	*Tapping into external funding oppotunities from various actors such as NGOs and businesses. The external funding was still connected to urban beekeeping.*
		Embedding	*The aligning of old ways of doing with new ways of doing. In particular how NBEs responded to system shocks, changes in perception around urban beekepeing and navigated this to reach some form of continuity/ longevity.*
	UST Challenges	Bee Aggression	*Instances of bee Aggression and non-Aggression and how this impacts the practice*

Political and Legal Climate	*Political and legal factors which impacted how urban beekeeping was carried out or in what ways activiteis are restricted and controlled*
Climate Bee Dynamics	*Ways in which the bees are seasonal and how this impacts the NBEs activities*
Experience as a Researcher	*Personal impactful or revealing moments*
Ecological Dilemma	*Debate around native pollinators and honey bees.*

Appendix I

NBE Collaboration Patterns

	Harare NBE Partner			Amsterdam NBE Partner		
Level of Interaction	**Vertical**	**Horizontal**	**Diagonal**	**Vertical**	**Horizontal**	**Diagonal**
Ongoing structures	Ø	Ø	O	O	O	X
Temporary Structures	X	X	O	Ø	X	X
Coordinated Forums	Ø	Ø	O	O	O	X
Informal Connections	Ø	X	X	O	O	X
Coordination	Ø	X	O	O	O	X

O = *Collaboration does occur Frequently (more than two NBEs)*

X = Collaboration occurs but not frequently (two or less NBEs)

Ø = *Collaboration Void (no NBEs)*

Appendix I presents a complete overview of the various collaborations undertaken by NBEs in both Amsterdam and Harare. The collaborations are categorized based on the key partners involved and the level of interaction between the NBEs and their partners. The table offers valuable insights into the diverse collaborative engagements of NBEs in different geographic contexts.