Urban transition towards the inclusion of pollinators

A case study using a multi-level perspective of a pollinator-friendly Vienna

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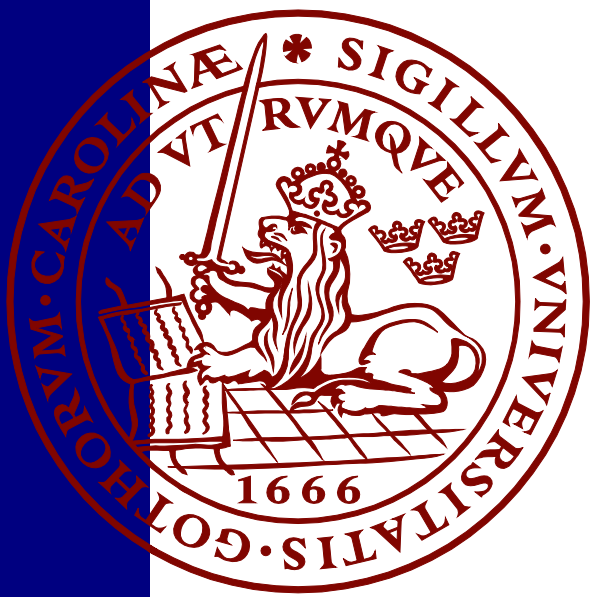

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Abstract:

Due to urbanization and the increasing number of people living in urban areas, cities play a significant role in conserving biodiversity, including pollination. In addition, pressures on surrounding agricultural land mean that pollinators increasingly find refuge in cities. However, local actors, such as civil servants, experts, landscape architects, and planners, face difficulties implementing pollinator-friendly spaces in urban environments. Drawing on transition theory, this paper uses a multi-level perspective framework to examine underlying drivers, opportunities, and barriers to such a sustainable transition in Vienna. These aspects were identified through interviews with 11 key stakeholders. The analysis shows that acceptance, maintenance issues, densely built-up areas, and missing regulations within zoning plans are the main barriers for local actors. Therefore, stricter regulations and requirements are fundamental to ensure a sustainable transition towards a more pollinator-friendly Vienna. Furthermore, communication and networking among the relevant actors for this transition are necessary.

Keywords: pollinators, urban planning, Vienna, multi-level perspective, transition

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1 Introduction

1.1 Problem framing

Green spaces within urban environments are expected to play an ever more essential role in human well-being and biodiversity conservation, including pollination (Aronson et al., 2017). Insect pollinator populations are negatively affected by pressures on the agricultural system through the intensification and homogenization of farmlands (IPBES, 2019; Kennedy et al., 2013; Kovács-Hostyánszki et al., 2017; Mogren et al., 2016). Nonetheless, the ongoing urbanization is an additional pressure on pollinators, research has shown that urban areas can be a refuge for pollinators (Hall et al., 2017). Therefore, a transition towards pollinator inclusion within urban environments is necessary. This process can be supported by providing biodiversity-friendly areas, such as the quality of green spaces through floral and nesting resources, the number of green spaces, and the connectivity of green spaces (Theodorou et al., 2020; Wenzel et al., 2020). Urban areas are heterogeneous, and pollinators are moving between sites. Therefore it is necessary to implement holistic strategies to sustain the connectivity of those areas (Baldock et al., 2019). Furthermore, many pollination services are not done by managed honeybees but by wild pollinators, but communication efforts mainly focus on honeybees for pollinator conservation (Baldock, 2020; Rader et al., 2016). The honeybees' role as keystone species is essential, but it is necessary to raise awareness because relying on only one species can be seen as a risk (Baldock, 2020; Winfree, 2008).

Local practitioners related to urban planning and urban space management who consider the creation and maintenance of green areas for pollinators a priority in cities are needed. However, actors included in this discussion face challenges in maintaining public green spaces. Challenges range from uncertain public support to conflicting interests between strategies for pollinator conservation and the public (Elderbrock et al., 2020; Nahrin, 2020). Therefore, a collaboration with local actors provides relevant insights into specific development strategies (Bellamy et al., 2017). Additionally, urban areas offer the chance to involve diverse stakeholders in this discussion, as they usually have more experience with complex problems and more resource availability to discover sustainable solutions (Khare et al., 2011). Therefore, lessons can be drawn by focusing on management issues to understand current challenges and improve future green space maintenance (Stevenson et al., 2020). Furthermore, people's knowledge, perception, and attitude toward pollinators can be advanced through communication and the promotion of biodiversity (Bernardo et al., 2021; Jaturas et al., 2020). First, urban residents need to understand the value and importance of urban green spaces for their well-being and a healthy city

as an ecosystem (Alves & Gaglianone, 2021). More than half of the world's population lives in cities, which is expected to rise to 70% by 2050 (United Nations, 2018). Due to this increasing number and growing disconnection by the urban population from nature, biodiversity programs can promote, re-connect, and raise awareness (Cumming et al., 2014). This allows urban residents to connect with nature and helps them getting informed about biodiversity conservation within their environment (Lepczyk et al., 2017).

In recent years, environmental impacts and management measures for sustainable development of urban environments have been researched (Aronson et al., 2017; Elderbrock et al., 2020; Johansson et al., 2018). However, more focus needs to be placed on ensuring that these management strategies are implementable, sustainable and beneficial to pollinators and how these areas are accepted and perceived by residents. The translation of scientific knowledge and these planning recommendations into practice is crucial. Nevertheless, the experiences and insights of local stakeholders must be incorporated to facilitate future planning strategies. This information can improve urban land management practices and develop sustainable recommendations for stakeholders. The key to improving urban areas for pollinators is to ensure that this information is shared with essential stakeholders and integrated into national and local pollinator strategies and conservation policies (IPBES, 2019). Therefore, the focus of this study is on local practitioners, namely civil servants, experts, landscape architects, and planners. Moreover, their role in driving and supporting the needed transition towards the inclusion of pollinators. The transition is analysed using the theories of urban sustainability transitions and a multi-level perspective framework to understand the involved variables.

1.2 Aim and Research Question

This thesis aims to identify how local practitioners are tackling the challenges of implementing new pollinator-friendly strategies in the urban environment of Vienna.

Hence, my research questions (RQ) are as follows:

1. What are the difficulties and barriers to implementing pollinator-friendly spaces in urban areas?
2. How is pollinator conservation communicated with residents?
3. How has the perception regarding pollinators changed, and what reasons were given for this awareness change?

1.3 Contribution to Sustainability Science

By answering these questions, this thesis makes a contribution to Sustainability Science, a field concerned with human-nature systems, that aims to bring science closer to people by addressing complex sustainability problems (Clark & Dickson, 2003; Rokaya et al., 2017; Spangenberg, 2011). This study focuses on the interactions between nature and society and how we can guide these towards a sustainable transition through social learning and knowledge co-production (Kates, 2016; Kates et al., 2001). Like Sustainability Science, this thesis utilizes an approach through interaction with practitioners and actors from a local community to better understand sustainable and implementable strategies to solve current practical problems (Kates, 2016). Furthermore, this thesis aims to understand real-life problems through the lens of urban sustainability transitions and multi-level perspective, which are important theoretical approaches within Sustainability Science (Frantzeskaki et al., 2018; Geels, 2002). Furthermore, since this research focuses on connecting different fields (conservation biology, urban planning, Sustainability Science) and gaining in depth-knowledge on current barriers, it can be seen as a contribution to the interdisciplinarity within Sustainability Science (Craps, 2019; Lang et al., 2012; Polk, 2014). By creating an increased knowledge base and a better understanding, I contribute to developing a more sustainable urban environment for pollinators. With this focus, two UN Sustainable Development Goals (SDG) are addressed: SDG 11 - Sustainable Cities and Communities, focusing on cities and their communities, aiming to make these areas inclusive, safe, resilient, and sustainable. Moreover, SDG 15 - Life on Land concentrates on terrestrial life and seeks to stop biodiversity loss to protect, recover, and promote these ecosystems (UN, 2016). Additionally, this study sheds light on how science-related issues are communicated to society.

1.4 Outline

This thesis continues by explaining the theories used to conceptualize dynamics and structures under study, namely urban sustainability transitions and multi-level perspective framework in Chapter 2. In Chapter 3, I introduce the case study methodology that the research process follows and motivate the selection of the case of Vienna and further explain the research process. Chapters 4 presents the findings and answers to the research questions and introduces the transition pathway Vienna is currently following towards a successful pollinator transition, while Chapter 5 develops these, establishes guidelines, and gives recommendations for future studies. Finally, in Chapter 6, I come to conclude this thesis and present an overall summary.

2 Theoretical frameworks

This chapter begins with an overview of urban sustainability transitions (2.1). This is followed by an introduction to the multi-level perspective framework (2.2) and further frames the multi-level perspective for this specific case (2.3). Finally, a description of different pathways on how transitions can emerge is established (2.4).

2.1 Urban Sustainability Transitions

In Sustainability Science, transition theory is developing into an important field that examines the networks of actors and institutions and how these are connected and dependent on each other (Markard et al., 2012). In transitions, a large diversity of actors is involved in a long process of changes. Those changes can range from technological, organizational, institutional, political, economic, and socio-cultural, leading to new developments, services, business models, and alliances (Markard et al., 2012). Sustainability transitions are a particular kind of transition associated with sustainability targets. Those targets are usually set by public actors asking for an even closer relationship between actors from different levels. Transitions which entail sustainable shifts within specific systems are multi-dimensional and long-term. Tackling grand sustainability challenges through transitions allows for combining and including many different perspectives, which is necessary for such a high level of change (Markard et al., 2012).

Over the last years, cities and urban areas have received attention within sustainability transitions (Frantzeskaki et al., 2019). Cities play a crucial role in specific dynamics and developing responses, especially in new ways of addressing and approaching climate change-related challenges (Frantzeskaki et al., 2019). To work strategically together, creating multi-actor dynamics from various institutional backgrounds is necessary to develop collaboration and alliances (Avelino & Wittmayer, 2017; Loorbach et al., 2017). One of the primary purposes of transition studies is to understand how these actors shape the speed and direction of transitions (Loorbach et al., 2017). Furthermore, social learning needs to be included, through which a shift in knowledge, interactions, practices, and behaviour within the various actors can be achieved (Loorbach et al., 2017). Shared and deeper insights need to be gained, resulting in further development (Loorbach et al., 2017; Scholz et al., 2009; Wiek et al., 2006).

Urban areas serve as perfect examples and experimental laboratories for changes, as the urban environment is shaped by land use and people (Egerer & Anderson, 2020). Therefore, experiments are at the heart of urban transitions, through which learning-by-doing activities make opportunities for change. Through that, actors further gain knowledge on how specific strategies can be implemented

better (Frantzeskaki et al., 2012; von Wirth et al., 2019). Another key motive for experimentation and further innovation by actors is to envision alternatives to construct goals and agendas for the future of cities (Frantzeskaki & Tefrati, 2016; Loorbach et al., 2017). Transitions in cities benefit from the high complexity and diversity of actors and resources, allowing experimentation of new design strategies on a small scale with inputs and knowledge from the various actors (Coenen et al., 2012). The main strength of a transition framework is that it allows looking at problems from different perspectives, which is comprehensible through the collective understanding of concepts and language of transition theory (Loorbach et al., 2017).

2.2 Multi-Level Perspective Framework

One of the most used conceptual frameworks within transition theory is the multi-level perspective (MLP) framework, which sees transitions emerging from changes and interactions at multiple levels (Geels, 2002). MLP focuses on three levels: *niches* at a micro-level, *regimes* at a meso-level, and *landscape* at a macro-level (See Figure 1). Changes in one level further influence the practices and strategies on the other levels (Geels, 2002; Næss & Vogel, 2012). These three levels represent functional relationships between actors, structures, and working practices (Geels, 2002; Markard et al., 2012; Rotmans, 2005).

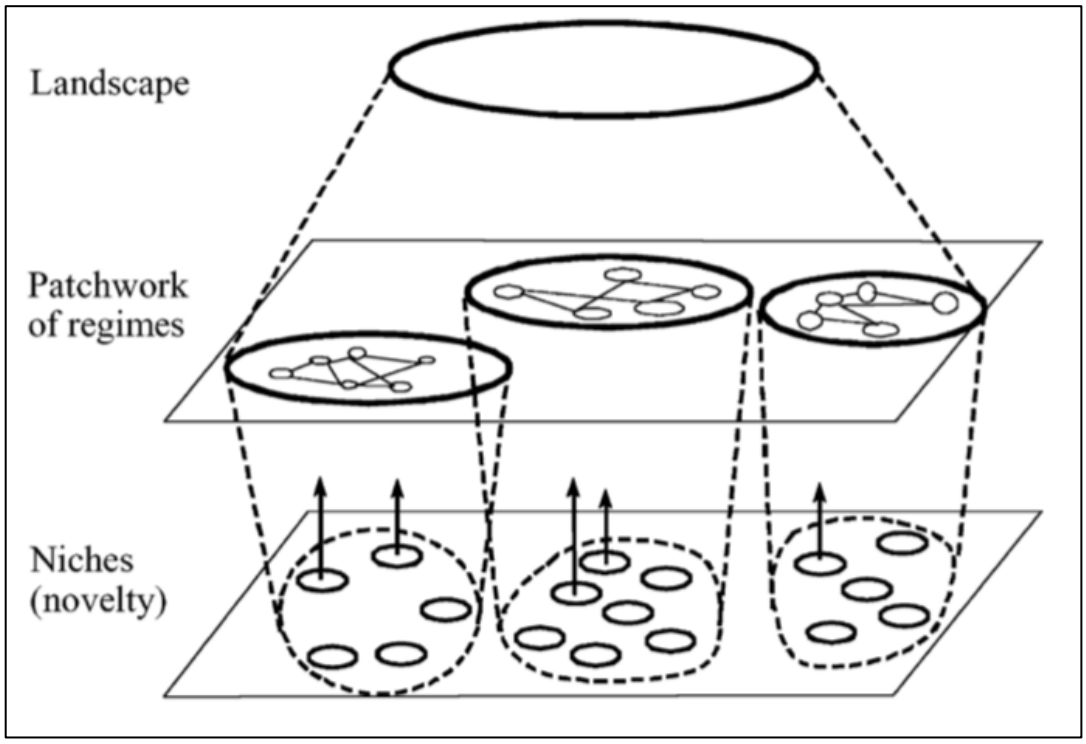

Figure 1. Multi-Level Perspective Framework (Geels, 2002, p. 1261)

This figure shows the three different levels relevant within the MLP: Landscape, Regime, and Niche.

The framework emphasizes how changes can emerge from any level and what influence these changes have on the other levels (Geels, 2002; Næss & Vogel, 2012). For instance, changes in current systems can occur on the landscape level, leading to pressure on the regime-level, making it possible for innovations on the niche-level and ending in fundamental changes in the regime (Markard et al., 2012). However, shifts at the landscape-level take a long time because of the involvement of influential variables, like cultural patterns, political developments, and historical issues (Geels & Schot, 2007). Another way how new systems can emerge is through learning processes, knowledge, and support from influential groups leading to niche-innovations (Geels & Schot, 2007). The last way of new systems creation is due to instabilities within the regime-level, leading to an open window and the possibility of innovations at the niche-level (Geels & Schot, 2007). The niche-level is seen as the location where radical innovations emerge because it consists of small networks of actors dedicated to the cause of change (Geels, 2002; Geels & Schot, 2007). Furthermore, regime changes are defined as shifts and interactions between regimes and the other levels (Geels, 2011). Changes in current practices can lead to the composition of new regimes emerging from modifications at the regime-level itself (Markard et al., 2012; Rip & Kemp, 1998; Schot & Rip, 1997).

Many different disciplines and research fields have used the ideas of transition theory. Therefore, three different approaches to seeing change have emerged (Loorbach et al., 2017). These three approaches are socio-technical, socio-institutional, and socio-ecological approach. Urban sustainability transitions are sitting in the interface between these three different transition approaches. Thus, addressing ecological (in)stabilities through a societal context is essential. Hence, a better understanding of societal issues within the ecological boundaries of an urban environment can be provided (Frantzeskaki et al., 2018; Loorbach et al., 2017). The focus of this study is on a specific geographical area and therefore influenced by a complex system of institutions, culture, and daily practices (Loorbach et al., 2017). Therefore, this study requires to include the socio-institutional approach. Additionally, socio-technical transitions do not only change existing systems and their structures but influence other domains, like societies, ecosystems, and institutions (Frantzeskaki et al., 2018). The analytical tool in use is the MLP, which sees change through a socio-technical lens. Hence, the primary approach for this study is also the socio-technical approach, whereas the other approaches are still considered.

2.3 Applying the MLP to study the transition to a pollinator-friendly Vienna

Cities and urban areas and their environment with complexity and high actor diversity are specific subjects to look at. Therefore, it is necessary to adapt and translate the transition process and the MLP-framework to this specific context and look at the diversity of drivers influential in this shift (Geels, 2002; Næss & Vogel, 2012). Hence, this study proposes cities and the urban trends in their own place-pound MLP in order to analyse urban sustainability transitions. The original terms for the three levels of the MLP framework are as already described above macro is the *landscape*, meso is the *regime*, and micro is the *niche*. These terms are reframed and adapted based on the research within this study. Figure 2 shows what is included in the different levels for this case study. Based on the literature review and implemented actions, each level consists of different horizontal interactions. The landscape-level consists of the laws and rules given by the EU and Austria, but the main focus is on Vienna and its regulations. The regime-level consists of the different institutions and their actors working on the topic of green spaces and the inclusion of pollinators. Additionally, the niche-level consists of niche-innovations translated into various diverse experimentations within Vienna guided by different actors. Figure 2 is an example of how the different levels interact vertically and horizontally. The focus is on the regime-level and the actors' work embedded in this level.

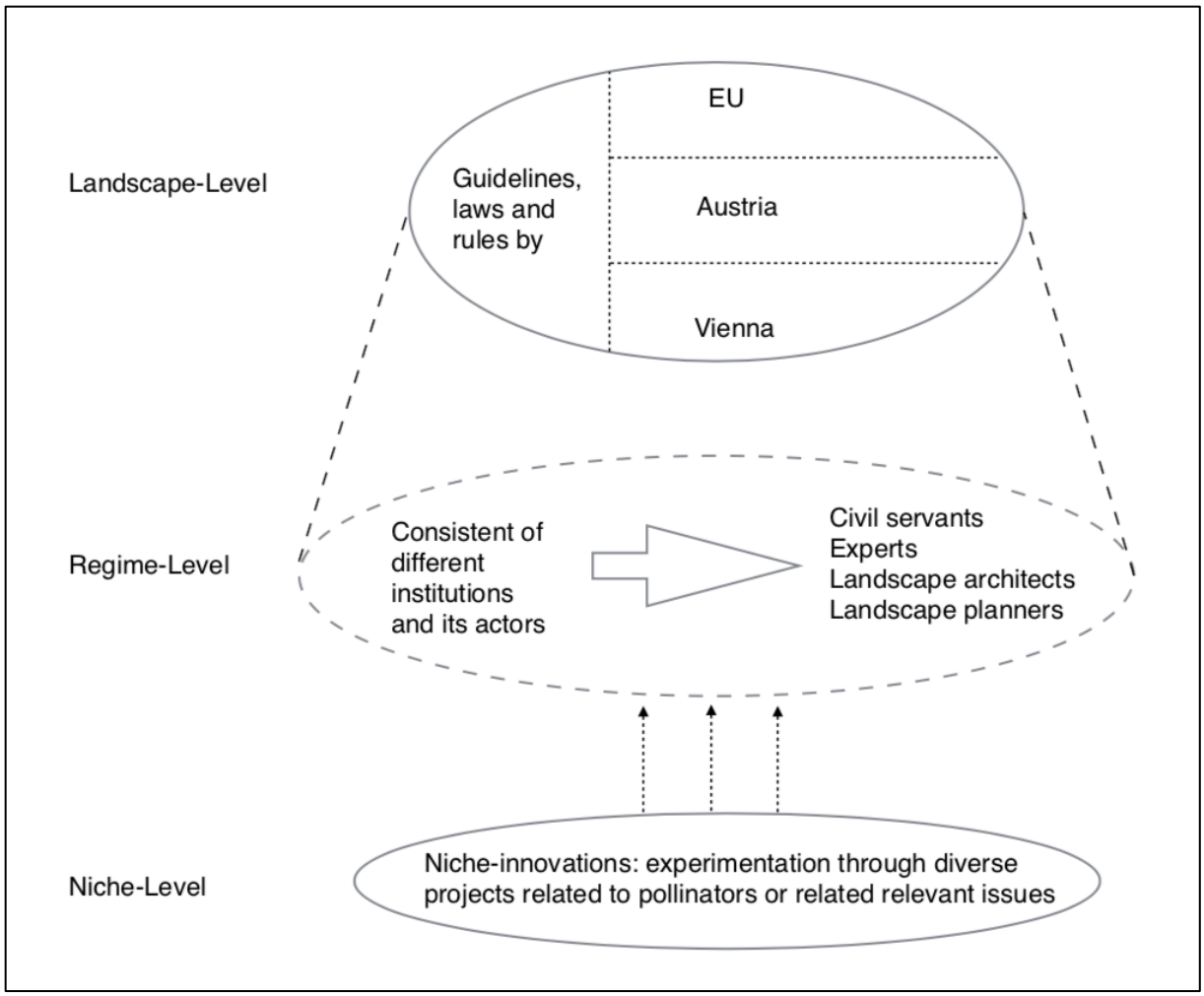

Figure 2. Framing of the case through the use of MLP. Figure adapted from Fig. 3 in Geels (2002)

This figure illustrates the relevant variables necessary for introducing the MLP for the case. The landscape-level contains the rules and guidelines of the EU, Austria, and Vienna. The regime consists of the different actors included in the study. Finally, the niche consists of innovations that have the chance to drive the transition forwards, translated into various experimentations.

2.4 Transition pathways

There are different ways transitions can emerge, explained through diverse multi-level exchanges and distinction in when (timing) and how (nature) interactions can happen (Geels et al., 2016; Geels & Schot, 2007). Additionally, there is the possibility of mixing the different transition pathway approaches (Geels et al., 2016). To answer criticism about the nature of transitions and the MLP and its focus on bottom-up, niche-driven bias, these four pathways on how transitions may occur were introduced and were further discussed (Geels et al., 2016; Geels & Schot, 2007). There was further a

conceptualization of how transitions can shift between the different pathways introduced (Geels et al., 2016).

2.4.1 Regime transformation

Regime actors are acting according to the landscape's pressures by adjusting to the influence from above. The role of outsiders (outside the regime-level) is crucial because they can have additional knowledge and further criticize specific actions taken by the regime-level and further influence the following steps. Nevertheless, criticism (by the outsiders) and pressure (by the landscape) do not instantly make regime actors replace their development and actions. This last motivation for a shift in their activities is influenced by social-institutional dynamics, which means that actors are directly debating within different social groups about rules. Through technical modification, a shift within the regime happens, meaning that new regimes grow out of old ones through adjusting and reorienting their actions and activities. External knowledge or even niche-innovations can complement these new applications at the regime-level and its actors (Geels & Schot, 2007).

This pathway is adjusted by Geels et al. (2016), stating to include that changes can also occur within the regime-level actors because they themself reorient towards niche-innovations and do not necessarily have to remain in the existing regime and its rules. In the case of transitioning to a pollinator-friendly Vienna, this could imply that regime actors are changing their practices due to external pressures (even outside the landscape-level) to adjust and act accordingly to those pressures.

2.4.2 De-alignment and re-alignment

The regime is beginning to crumble through landscape pressures, which creates significant shocks in the system. The regime even starts falling apart (de-aligns), creating a lot of open space for various niche-innovations to emerge. However, outsiders or a few regime actors mainly carry out these niche-innovations. Furthermore, this leads to multiple niche-innovations that create uncertainty and various directions where general rules are missing. After this period of experimentation and struggle for resources and interests, a niche-innovation gains momentum and takes over the leading role, leading to a re-alignment and re-institutionalization of a new regime (Geels et al., 2016; Geels & Schot, 2007). In the case of Vienna, this could include how the regime-level is applying the rules given by the landscape to include more green spaces due to cooling and run-off effects.

2.4.3 Technological substitution

Radical niche-innovations exist already but cannot penetrate the regime-level because it is very stable. Regime actors see minor problems within their level as a quick fix and pay little attention to niche-innovations. This regime-level system can only change by pressure from the landscape-level or a specific shock even outside the landscape-level. Ultimately, this pressure or shock leads to great tension at the regime-level, providing an opportunity for niche-innovations to gain momentum (Geels & Schot, 2007). Geels et al. (2016) further mention that implementing this radical niche-innovation can happen in two ways: niche-innovations are expanded to fit the existing rules and institutions within the regime, or the rules and institutions in the current regime are changed to fit the niche-innovations. In the case of Vienna, this could include how regime actors react to the external shocks and how niche-innovations are included in the regimes' practices to act to the given pressures by these shocks.

2.4.4 Regime configuration

Radical innovations emerge in niches and are slowly incorporated into the existing regime because of similar structures and practices. These innovations aim not to change the whole regime-level and its structures. From there, the niche-innovations can further trigger learning processes. Something that starts as a substitution or partial substitution at the regime-level can lead to knock-on effects. This is a pattern where new and old actors work together, which means it is more about building alliances than overthrowing each other. This pathway is essential for connecting multiple regime actors (in my case, e.g., housing, public areas, and private areas), where various innovations cause transitions within the regime (Geels & Schot, 2007). In the case of Vienna, this would correspond to how the local practitioners are further expanding their practices from past niche-innovations to make them better suitable and how they learn from those experiences to make current niche-innovations applicable to their practices to successfully incorporate them.

However, it is also possible that transitions are shifting within the above-introduced pathways, and the order of shifts is likely to be non-linear (Geels & Schot, 2007). Furthermore, it is essential to focus not only on pressures from the landscape-level but also on shifts between actors and their struggles and how they adapt to rules and institutions (Geels et al., 2016). By analysing actors, institutions, projects, and strategies, it can be shown how struggles and conflicts led to shifts between transition pathways and ultimately towards a successful transition (Geels, 2002; Geels et al., 2016).

3 Methodology

This section aims to provide a summary of the processes through which this thesis was conducted. It presents the case study design and research philosophy and further a case introduction (3.1), the data collection methods (3.2 and 3.3.), and how the data was further analysed (3.4).

3.1 Methodological considerations

3.1.1 Case study design and epistemological and ontological perspectives

A qualitative case study design was adopted for this research, with the city of Vienna being the representative case. This research design enables an in-depth investigation of the challenges and strategies within the case and its actors. The underlying epistemological perspective takes an interpretivist view, implicating that humans create meaning themselves (Saunders et al., 2019). Furthermore, interpretivist research aims to create insights and explanations of different contexts by considering what is meaningful to the research participants (interviewees, in this case) (Saunders et al., 2019). The ontological perspective takes a constructionist stance, meaning that the social world is viewed as a product of individuals (Bryman, 2012; Saunders et al., 2019). Different social realities are constructed and experienced by the distinction in meaning-making shaped by people's backgrounds, cultures, and circumstances (Saunders et al., 2019). Through these perspectives, the study intents to gain a deeper understanding of the general struggles of actors within the regime-level (Bryman, 2012).

3.1.2 Vienna as the case

Vienna was chosen as the case study because it is a prime example of how urban planning in a densely built environment can positively impact pollinators. Vienna is the capital city, the biggest city, and the most populated city in Austria. After some research, it was evident that a few strong actors have made many efforts to include spaces for pollinators. Additionally, the Smart City Strategy (SCS), updated in 2022, was adopted by the Viennese city council and is based on all of the SDGs of the UN Agenda 2030, committed to global, European, and national targets. The main goal of the SCS is to realize Vienna's growth potential, focusing on adapting environmentally friendly public spaces and providing enough green spaces, thus also benefiting pollinators (Smart City, 2022).

Vienna is known for its improved planning with citizens' well-being at its focus and its high number of green spaces. This mirrors Vienna's ranking as the most liveable city worldwide in 2018 and 2019 and the greenest city worldwide in 2020 (Best Cities, 2020; Mercer, 2019). This is further reflected in the SCS, which is committed to providing its citizens with the highest quality of life and safety. Social

inclusion (taking into account the needs of all residents) is one of the three goals, along with resource conservation and innovation. Well-being in public spaces depends largely on the urban climatic conditions in the urban environment.

Another big target of the SCS is to secure the green space share of Vienna at more than 50%. The (perceived) temperature of densely built-up areas can be reduced efficiently and environmentally friendly through greenery (Fu et al., 2022; Lee et al., 2015). This issue is addressed in Vienna's urban development plan 2025 (STEP 2025) for public spaces and green and open spaces (STEP 2025, 2015, 2018). These concepts require a multi-layered approach, as many different aspects, demands, and responsibilities come into play. The STEP 2025 concepts fit directly into Vienna's SCS, which - looking far beyond STEP 2025 - sets the framework for Vienna's targeted development until 2050. The city's green and open spaces perform essential functions for the urban climate. However, it also comes into play in the water balance. These areas help ensure water can percolate where it falls as precipitation, thus contributing to flooding protection. Therefore, green spaces, unsealed areas, and green roofs are essential because they play a fundamental role in the (rain) water balance (Kolasa-Więcek & Suszanowicz, 2021; Lee et al., 2015).

3.2 Literature Review

Literature searches continuously accompanied the entire research process in LUB search, Scopus, and other academic literature identified through snowball search. Through iteratively examining the material, I was able to gain a preliminary understanding. Part of case studies as a research design is, to begin with, a comprehensive literature review (Yin, 2009). This process was done by online searches in the above-mentioned search engines using keywords. After screening the titles, 65 articles were deemed relevant. I then concentrated mainly on the abstracts and the discussion sections to get an overview of the research done within the field to further narrow down the focus of the study. During later steps I elaborated on these ideas that supported my claims by relevant literature.

3.3 Data Collection

I chose to conduct semi-structured interviews as my main source of information, and I also evaluated relevant official documents because a component of the study methodology for case studies is that two or more sources of information should be used for data gathering (Creswell, & Poth, 2018; Yin, 2009). The official documents I screened for additional information were used to understand certain decisions, rules, and laws the interviewed actors must follow. I focused on official documents published by the EU on pollinator conservation strategies. Additionally, Austrian and Viennese official

documentation mainly included strategic planning and nature conservation (See Appendix 1 and 2 for a complete list of official documents). While official documents provide insights and facts relating to the formal processes, they do not reveal how planning unfolds in practice and not what the implied barriers of implementation are. Therefore, as the central element of my research, I collected qualitative data via semi-structured interviews. The selection of interviewees aimed to incorporate views from various actors in the Viennese urban scene. Speaking with people who have worked on these projects provides in-depth knowledge about the entire planning, development and implementation processes. The actors I engaged with were the following: civil servants from different departments, 1) where the work is either planning-related or 2) related to green space maintenance, residential buildings, and its surrounding areas and environmental protection, 3) landscape architects and planners, 4) experts working on pollinator-related projects (See Table 1). Given the different sectors they are employed in, they have different reasons and different rules and agendas for implementing specific strategies for pollinator conservation.

Table 1. List of interviewees and inclusion of necessary information. (Own creation)

Number of respondents	Description	More detailed description based on the distinction mentioned in the text
R1	Expert	4
R2	Civil servant	2
R3	Landscape architect	3
R4	Landscape architect	3
R5	Civil servant	1
R6	Civil servant	2
R7	Civil servant	2
R8	Landscape planner	3
R9	Civil servant	1
R10	Landscape architect	3
R11	Expert	4

This table illustrates the relevant actors who have been interviewed for the study. The number of respondents is used in the analysis to distinguish who has said what during the interview process.

An interview guide informed by transition theory and the multi-level perspective framework was developed (See Appendix 3). Semi-structured interviews allowed interviewees to respond to standard questions while also allowing for new thoughts to emerge throughout the interviews (Yin, 2009).

This further generated an in-depth exploration and understanding of the case (Bryman, 2012). All interviews were recorded once permission from the respondents was obtained and were selectively transcribed. The names of the interviewees are anonymized and are instead characterized by order of the interviews (See Table1). To facilitate a systematic and effective analysis, extensive introductory parts and pleasantries of limited importance for answering the research questions were left out (Mayring, 2014).

3.4 Data Analysis

To examine the data that has been gathered, I used a qualitative content analysis approach, combining inductive and deductive coding approaches (Mayring, 2014). At the same time, the coding process involved getting familiar during the transcribing process of the interviews and further when the transcripts were reread. An inductive approach was followed for the official documents since the huge amount of information was easier to categorize by reading through the documents. As a result, this procedure demands the categorization of data based on what is considered significant and guided by the study's aim. By doing inductive coding, the aim of understanding the material without bias toward specific themes is implied (Mayring, 2014). Therefore, the official documents' coding was essential to better understand what has been done and in which directions Vienna is planning to go in the following years. For the interview transcripts, a mix of inductive and deductive coding was used. Since the interviews mainly followed the themes addressed by the interview guide, these were also the main codes. Thus, the initial coding for the interviews was guided through the theory and framework I am using. Additionally, codes were introduced when new themes emerged and were deemed relevant for the analysis. The data analysis was facilitated by NVIVO, a coding program that allows the researcher to identify and evaluate data methodically and systematically. As the language used for the interviews was German, and a lot of the official documents were also available in German, the whole analysis was done in German. Parts that were deemed relevant for the thesis were translated into English. As a tool for analysis, the underlying theoretical perspectives, MLP and urban sustainability transitions, were used to work with the data in a structured and guided way. The aim was to identify patterns in how the information can be analysed and visualized through the MLP framework and the different transition pathways.

4 Analysis

This section describes developments that have furthered or hindered the transition toward pollination-friendly urban planning at the three levels of the MLP: *Landscape, Regime, and Niche*. The landscape-level analysis consists of the overall rules, guidelines, and plans informed by the screening of the official documents (4.1). The regime- and niche-level analysis consists of the information gained through the interviews (4.2. and 4.3). Finally, to sum up the analysis, I introduce a transition pathway suited for the case of pollinator inclusion within Vienna (4.4).

4.1 Landscape-Level

The EU biodiversity strategy aims to stop biodiversity loss and the degradation of ecosystem services in the EU by 2030 (European Union, 2021). Furthermore, an EU pollinators initiative was introduced. The initiative consists of three main priorities: (i) enhancing knowledge of pollinator decline, its causalities and impacts, (ii) tackling the causes of pollinator decline, (iii) and raising awareness, engaging society-at-large, and promoting alliances. In addition, more specific actions were disclosed, which led to the publication of information campaigns on how to contribute to the pollinator initiative (European Commission, 2018). Additionally, there were even guidelines for urban actors collected and developed to show them how to execute specific strategies (Wilk et al., 2019). Further, there was a how-to-guide for citizens released to display informed information on how to make changes within their surroundings (IEEP, 2020). The different documents show what can be done by whom and how their goals can be achieved. However, no laws or regulations have to be followed by the actors in the different member states.

Furthermore, there are no national strategies for pollinators available in Austria. Moreover, through the Austrian Biodiversity Strategy 2020+, no targets for wild pollinators as an overarching goal are set (Environment Agency Austria, 2014). The main focus of the strategy is on natural and semi-natural areas. Furthermore, the focus on practical measures is on honeybees and their expansion of adapted livestock breeds. However, efforts for pollinators from a general perspective are not mentioned. Therefore, no laws and regulations which have to be followed by actors in the federal states are presented.

The greening agenda of Vienna's Smart City Strategy concentrates on strategic and impact-based implementation (Smart City, 2022). The focus is on planting large street trees and caring for and maintaining existing trees and green areas. Furthermore, the emphasis is on site-appropriate and diverse planting designs to enhance biodiversity. Additionally, there is a focus on the greening of buildings through vertical and roof greening. The greening of flat roofs is already written in the law,

meaning that new buildings must have a green roof to a certain degree. However, currently, there are no prescribing measures on what kind of green needs to be implemented. The promotion of facade greening is made attractive through subsidies but is further planned to become enforced in the following years. The SCS strategy also mentions that the microclimate improvement could be strengthened by anchoring the proof of implementing micro climatically effective measures (e.g., facade greening, roof greening, tree planting) for new buildings in the building code. Urban green and open spaces are habitats for numerous animal and plant species and contribute to promoting biodiversity and the protection of ecosystems. Therefore, preserving these habitats needs to be ensured, which is an essential task of green and open space planning.

4.2 Regime-Level

The regime-level analysis is organized into three separate sections that deal with one of the three defined themes based on the research questions: 1) barriers, 2) communication, and 3) perception and change in acceptance informed by the interviews.

4.2.1 Barriers regime actors have to face

Densely built area

One of the most significant concerns within the urban area is that there is not enough space, mainly because Vienna is so densely built. The demanding requirements prescribe spaces for children in different age groups, for young people, recreation spaces, play spaces, bicycle parking, water infiltration, etc. The demands for people are so great that there is little space left to implement areas for pollinators. This leads to not being able to include enough green spaces since there are only a few opportunities to make areas available. The regulations must be followed and are therefore prioritized in planning decisions. Other space and resource-related issues are sidewalks and their given width. Again, many rules have to be followed, which makes it impossible in some cases to include specific areas dedicated to pollinators (R4, R5, R8, R9).

Call for stricter regulations

The zoning- and land-use plan in Vienna is particularly important in guiding urban development, which was mentioned as another challenge when implementing pollinator-friendly spaces. Zoning is an urban planning concept in which municipality or government institutions divide the land into zones. The zoning and land-use plans define what can be developed where and how. Housing, economic districts, green spaces, and agricultural use are just some of the possibilities (Pamer, 2019).

Nevertheless, the zoning cannot specify what kind of green space needs to be implemented. However, the green space's purpose and quality can be clarified in the subsequent procedures (e.g., quality catalogue). These quality catalogues, developed by the actors working on these projects, allow to include pollinators explicitly in the objectives. The more precisely it is already incorporated in those early stages of planning processes, the better it is because it is still understandable years later.

"Commitment increases with concreteness." (R5)

These subsequent procedures are Vienna's district planning and zoning tools to describe goals for projects supporting pollinators in a binding manner. Currently, there are no consequences if measures agreed upon before are not included in the end. However, legal anchoring, obligation, or compensation payments should be realized if specific standards are not met. This issue was especially mentioned by the actors who actively face these challenges in their daily work life, such as landscape architects and planners and some civil servants whose work is planning-related (R3, R4, R8, R9). Such legal measures could be coupled with subsidies to make specific actions more attractive. However, compensation payments and subsidies are already implemented for the greening of roofs and walls.

Furthermore, due to the changes mentioned above in the Viennese building code, green roofs are now mandatory for flat roofs, and vertical greening will also be required for new buildings in the next few years. This is desired because the issue of incorporating green areas is made easier in the first place. However, this is also beneficial to the implementation of spaces for pollinators (R3, R4, R5, R8, R9).

Lack of acceptance

All interviewees said that acceptance and willingness are other significant barriers to incorporating projects and green spaces specifically for pollinators. Part of the acceptance barriers are costs, aesthetics, and health risks.

First of all, the cost factor of bringing such projects into implementation in the first place is a big challenge and a constant source of resistance from actors included in the discussion of project implementation. Primarily since the greening of buildings, for example, results in additional costs in construction and renovation. Furthermore, resistance from the local population is increasingly encountered in residential housing areas when attempts to implement the greening of buildings retroactively or when different management strategies rather than short lawns are introduced. Reasons for this resistance are direct costs because maintenance and care of these procedures have to be paid through the residents' utilities. Generally, greening and pollination projects are not always

supported because of fear of follow-up costs for maintaining these areas (R3). However, this fear is irrational because asphalted areas, for instance, also entail follow-up costs. Nevertheless, costs for asphalted areas are accepted and established, but maintenance costs for green spaces and removal of cuttings often result in fear of incalculable costs (R3). Therefore, educational work is essential because city dwellers must first learn to deal with green spaces with diverse management practices. After all, such areas do not correspond to the residents' perception of cleanliness (R1, R3, R4, R6, R8, R9).

The perception of cleanliness is linked to another essential aspect of acceptance: aesthetics. Green areas must always have certain representativeness (R3). If these areas are handled too extensively, it is often perceived as untidy and neglected. Especially since extensively maintained areas often become weedy and brown, which is considered unkempt, messy, and displeasing to look at. Some of the interviewees mentioned that they sometimes have to face complaints of residents' displeasure with these 'untidy' areas (R1, R2, R6, R7). In general, it is challenging to create a beautiful flowering area that is extensively maintained. Areas that are in the process of being redesigned and implementation processes are not accepted at all, as these areas are often not seen as beautiful. Therefore, in all projects, it is necessary to start early to share the planning ideas of areas and their goal to ensure acceptance (R1). This is often an issue because some areas need a particular aesthetic attached to people's minds because they always looked that way. Therefore, it is crucial to balance the management of green areas within the urban environment to ensure that there is something for everyone (R1, R2, R3, R4, R6, R7, R8).

Furthermore, since Vienna is so densely built, conflicts around urban spaces can arise. However, it was mentioned during the interviews that this can already be tackled during the planning phase (R8). For instance, it is best to avoid flowering plants and meadows near playgrounds because people are afraid that their children will be stung by insects (R8).

This fear further links with the struggles when promoting pollinating insects. Residents, especially in office and residential buildings, often reject those measures (e.g., the greening of buildings) because they do not want insects within the buildings. This discussion is repeatedly fuelled by topics such as allergies and fear of certain species (R1, R2, R8, R9).

Maintenance issues

Another challenge is the maintenance of such sites. Maintenance of pollinator-friendly areas can be inadequate because the knowledge of how to maintain these areas is not always available (R4). Therefore, these challenges result in a non-diverse planting agenda to avoid wrong maintenance practices. More intensive maintenance is necessary for flowering areas to develop correctly in the early

implementation stages. In addition, greater mowing and time expenditure applies to extensively maintained areas, which results in supplementary cleaning costs. However, since these areas are usually mowed only once or twice a year, costs can be saved. Since financing is often a challenge, extensively maintained areas speak to the advantage of the approval of such projects. However, it is necessary to state that it is highly dependent on where these areas are located. For example, another barrier in very densely built-up areas is that the equipment cannot access those areas easily. In Vienna, bigger parks can be presented as positive examples of extensive maintained areas. In parks, there is enough space to implement spaces for pollinators while at the same time having enough space for the urban population and their wishes and requirements on what a public park needs to offer.

An important factor turned out to be whether people still have space for their children to play or engage in recreational activities. Hence, the acceptance by the residents for spaces explicitly for pollinators and biodiversity reasons in public parks is much higher than in residential housing areas or smaller urban green spaces since there is generally a better balance between what can be used for humans and for other species (R1, R2, R4, R6).

Meanwhile, the overall focus of projects by the civil servants whose work is planning-related has not been on the systematic promotion of pollinators but serves as a companion function. Their focus is on implementing green spaces due to the given benefits of the greenery, such as colling and water run-off effects. The target is to optimize green spaces and insert new green spaces with the main focus on finding the optimal plants for the particular site. Overall, plant selection must always be site-appropriate and resistant due to the changing climate. The reason for the lack of pollinator spaces is too little know-how on how to support them within the urban environment best and which plant diversity benefits pollinators. Nevertheless, there was great interest in plants that can withstand the urban climate and benefit pollinators simultaneously (R5, R9).

On the other hand, landscape architects and planners focus on how to best include pollinators in the early planning stages. Efforts are made to pay special attention to which plants are used to create areas for pollinators by adopting native and regional seed mixes. Furthermore, these actors have repeatedly used Animal-Aided-Design, promoting animals specifically in urban areas (Hauck & Weisser, 2017). This urban design approach creates an environment precisely planned for a few specific species to provide food and nesting opportunities. Nevertheless, these actors still accepted that more could and must be explicitly done to protect species. As a result, they are already trying in the planning phase to use plants that can be used by many different pollinators and not only by some specific species. Their next steps are to get more involved with plants that benefit pollinators, rethink plant lists, and use wildflowers and shrubs more intelligently. In general, approaching projects with more diversity makes a big

difference without much effort (R3, R4). For example, green roofs work rather well in densely developed areas because providing specific structures, including dead wood and native seeds, can create valuable islands or biotopes that will not bother anyone (R3). It is crucial to start implementing green areas for pollinators from the outer districts, connected to bigger, open, and more extensive green areas and closer to the countryside (R6, R7). For example, pollinators do not benefit if only green areas in the inner districts are offered but no spaces between the outer districts and their bigger green areas. Therefore, deliberately created ecological steppingstones must be well distributed to benefit pollinators (R3, R4, R6, R7, R8, R10).

4.2.2 Communication

The communication of pollinators is challenging because it is essential on which species are being used as flagship species for projects or new maintenance strategies. These flagship species strongly influence people's support and offer the opportunity to change acceptance and raise awareness. Therefore, species considered positive, such as (honey)bees, bumblebees or butterflies, are often used to publicize such projects. Another way such projects are displayed is through biodiversity efforts as an umbrella topic.

For the interviewees working with planning, the added value of insects and pollinators is usually only communicated as a secondary factor (R3, R4, R5, R8). The focus in the argumentation for greened areas often lies in the water infiltration capacity because this can be made more attractive, primarily through cost savings. The advantages of pollinator-friendly areas are directly communicated in projects with schools or kindergartens because these areas can be used for educational and experimental knowledge sharing. However, even if the communication focuses only on the flagship species, the actual strategies support pollinators in total:

> “I prefer it to be more general because we do not just want to promote the lovely butterflies or the nice wild bees, but there are also beetles, and every animal has its function in the ecosystem.” (R8)

Nevertheless, the main focus is on honeybees rather than wild bees or wild pollinators since this is currently a hype topic. This focus on the honeybee needs to be tackled for nature conservation, which is a target by a few interviewees (R1, R2, R6, R11). Additionally, it is currently a trend to put beehives on roofs within the inner-city area. Nevertheless, beekeeping is not supporting biodiversity (Geldmann & González-Varo, 2018). However, it is usually accepted once this is communicated with the population. The main challenges are beekeepers (R6). Even if it is clarified that beekeeping does not

serve nature conservation and is a threat to other pollinators, they disagree on that topic. Therefore, it is currently the subject of discussion with the environmental agency to prescribe a minimum radius for specific areas where honeybee hives are not allowed. Furthermore, it was also mentioned that if people at least maintain their green spaces around the hive diversely, it subsequently benefits wild pollinators (R6).

4.2.3 Perception and change in acceptance

All of the interviewees agreed on a positive trend in acceptance during the last years. The so-called Krefeld Study explained this greater acceptance and uptake of the insect and pollinator topic by other actors outside the regime-level (Hallmann et al., 2017). The media courageously took up this peer-reviewed article published in 2017 and communicated the topic very broadly and diversely. The Krefeld study was a breakthrough because the insect topic has never been received in such a way and was certainly a trigger for a change in awareness (R2).

One of the landscape architects explained that the clean, English lawn was still demanded a few years ago (R4). Meanwhile, it is tolerated if areas are also sown with flowers because it is necessary to offer such areas due to insect mortality. There was much negative feedback in the past years, particularly on extensively managed land. Especially in the beginning, when these areas were not yet fully implemented. However, a change in acceptance can also be seen here. Even flower meadows initially seen as unfavourable were accepted after explaining their benefits and importance to the local residents. As a result, some of these areas have recently become very popular because insects can be observed there (R1).

Additionally, there is an increasing demand for areas close to nature in the case of participation projects mentioned by landscape architects and planners (R3, R4, R8, R10). However, the main challenges are areas close to residential housing due to the aforementioned reasons. However, closeness to nature is accepted and tolerated better in public places (R10). In general, the desire for more greenery within the city has become very significant in recent years. This can be seen particularly in families with children. This change in awareness was explained by the increased media coverage of this insect mortality and the intensification of agriculture (R8). Media coverage and documentaries about the decline of insects were also further reasons for the change in acceptance and that urban areas can contribute to species conservation (R11). Additionally, the Fridays for Future movement brought climate change and environmental issues into focus and is another reason for more awareness and acceptance (R1).

Lastly, the COVID-19 pandemic has increased the awareness of the benefits of green spaces. Green spaces near the residential location were perceived positively, especially during the lockdown period (R9). These are influencing factors that have changed the understanding of Vienna's urban population of more green areas and the acceptance and awareness of beneficial spaces for pollinators (See Table 2).

Table 2. Barriers and difficulties towards a successful transition. (Own creation)

Barriers and difficulties		Civil servants - planning-related (1)	Civil servants - maintenance related (2)	Landscape architects and planners (3)	Experts (4)
Densely built area		X		X	
No regulation in zoning plans		X		X	
Maintenance issues		X	X	X	
Acceptance					
	Costs	X	X	X	X
	Health risks	X	X	X	X
	Aesthetics		X	X	X

This table serves as a summary of the mentioned challenges, divided accordingly by the different professions of the interviewees.

4.3 Niche-Level

Niche-innovations can be seen as experimentation efforts and are projects that focus on pollinators and the creation of areas for pollinators. These projects are mainly managed by the regime actors, by a network of several regime actors, or in cooperation with actors outside the regime-level and other institutions. For example, several regime actors are involved in a project that deals with the maintenance measures in different areas (R1, R2, R7). It investigates what influence these various maintenance measures have on the costs, how well it generally grows and functions, and concerning the biodiversity and species abundance. Another project within a university in Vienna and civil servants is looking at wild bees and butterflies in vertical green spaces. The aim is to investigate whether plant diversity in vertical green spaces favours pollinator diversity (R2, R11). In addition, many efforts are made to make pupils (6-10 years old) attentive early through a playful illustration of the pollinator-

and insect crisis. One of these projects focuses on butterflies (R1). Another one has a general focus on urban diversity to bring children closer to the animals in the city (R1). Here, measures are taken directly in the schoolyard to show what can be done. Additionally, a project deals with showing the difference between honeybees and wild bees (R6). Finally, there is a project with a general focus on insect-friendly, climate-friendly green spaces in the city. Ready-made seed mixtures, which can be bought in the supermarket, are examined to determine which benefit insects and pollinators. Moreover, there is an attempt to build a real network between the various city departments and allotment gardeners, citizens, the federal government, etc. The aim is to create a network and get informed advice for insect-friendly management practices of green spaces in times of climate change. Furthermore, there is a project in cooperation with the city of Bratislava that aims to raise awareness for the preservation of biodiversity (R2). There is much information on how residents can plant certain areas to benefit biodiversity.

4.4 Transition Pathway Determination

Within Vienna, sustainability and sustainable development have been widespread in policy and practice throughout the last years. Thus, the transition to a more sustainable society is already underway. Several external factors (even outside the landscape) have created a sense of urgency for change in the existing regime. The threats of climate change, biodiversity loss, and the insect crisis have resulted in a change in what a few local actors were focusing on in their routines. Due to these external factors, the effectiveness of their activities was called into question, and further a focus on environmentally friendly practices in the urban environment. The external shocks created great tension within the regime, which has allowed niche-innovations to gain momentum (Geels & Schot, 2007). At the same time, there was a period of uncertainty about which management strategies were solving specific problems, which has led to experimentation with different approaches (Geels & Schot, 2007). Past niche-innovations have been slowly adopted into the regime to solve problems, such as requiring and supporting more green spaces to solve the temperature and water runoff issues. They are successfully implemented at the regime-level, and it is continuously worked on to provide a better process and quality of those. Hence, it is clear that regime actors are driving this ongoing process and were also the driving forces in the past. They began to experiment with alternative solutions to the existing problems and started questioning specific strategies (Geels & Schot, 2007). This shows that changes can also occur within the regime-level actors because they reorient towards niche-innovations and do not necessarily have to remain in the existing regime and its rules (Geels et al., 2016). However, ultimately, the basic regime structures have remained. This information indicates that Vienna followed a mixture between a technological substitution and a de-alignment and re-alignment pathway in the

past years, followed by a regime transformation. It currently embodies the regime reconfiguration pathway. New and old regime actors work together and build alliances to adopt niche-innovations into the regime (Geels & Schot, 2007; see Figure 3). Within this pathway, the connection of multiple regime actors is necessary because transitions are caused by numerous changes within the whole regime (Geels & Schot, 2007). However, if enough innovations are adopted into the regime, new combinations between the innovations can further lead to structural changes within the regime. These new combinations are called knock-on effects, leading to other effects. The case in Vienna is a prime example of these effects because the actors are closely linked, and the niche-innovations consist of projects with a diverse combination of regime actors (Geels et al., 2016; Geels & Schot, 2007).

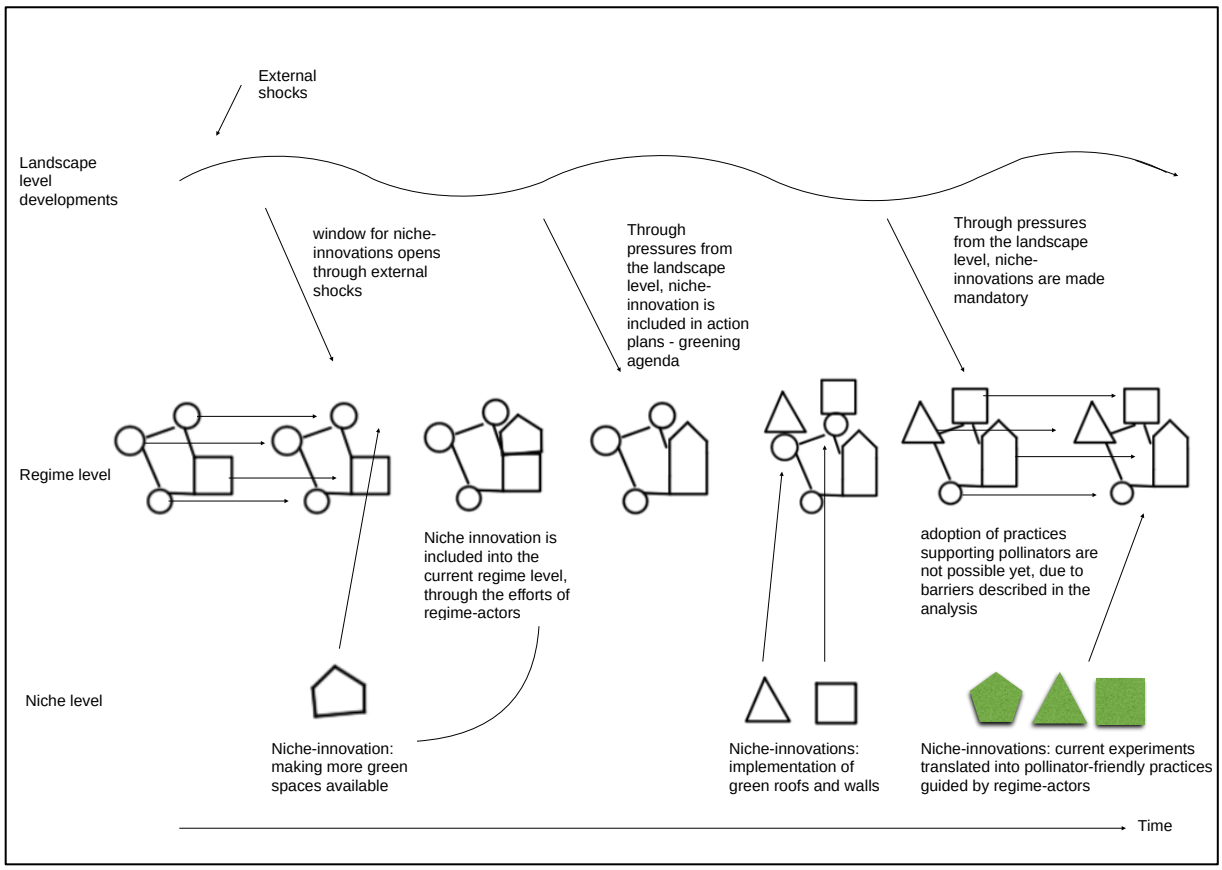

Figure 3. Vienna's Transition Pathway (Own creation)

This figure illustrates the transition pathway emerging within Vienna. It demonstrates what happened in the past years, exemplifying interventions from all three levels. Finally, the figure also shows where the transitions currently stand.

Even though the transition is already underway, actions toward the inclusion of pollinators within the practices of urban regime actors are not mainstream practices yet and can mainly be seen as niche-

innovations. However, Vienna's greening agenda and the efforts to make more green spaces available are paving the way towards a transition for pollinators in the urban environment. Since transitions are processes over an extended period, those steps were necessary to create opportunities for current niche-innovations to carry into the regime. Nevertheless, the transition of pollinator inclusion in Vienna is moving in the right direction. However, practices beneficial for pollinators are not yet fully embedded at the regime-level. Explanations of why the transition is not yet fully completed and the niche-innovations are not yet embedded into the regime are diverse. Some of them have already been mentioned, such as the general barriers of the actors to bringing such projects into implementation, communication, and the acceptance of the population, although this has improved remarkably. However, top-down intervention could further facilitate the transition.

5 Discussion

Based on the analysis in the former section, this section answers the research questions (5.1) and reflects on pathways forward for Vienna to successfully move the transition towards the inclusion of pollinators (5.2) before discussing the limitations (5.3) and recommendations and future research (5.4).

5.1 Key findings: Answering the research questions

This thesis answers the following questions: First, what are the difficulties and barriers to implementing pollinator-friendly spaces in urban areas (RQ 1)? Second, how is pollinator conservation communicated with residents (RQ 2)? Third, how has the perception regarding pollinators changed, and what reasons were given for this awareness change (RQ 3)?

To answer RQ 1, the data suggests that the main challenges are densely built areas, no regulations within zoning, acceptance, and maintenance issues (See Table 2). However, the analysis shows that some interviewees already work on many different projects to support pollinators despite the mentioned barriers. This indicates that a lot can be done if a few people are dedicated to a specific cause. Actors more closely associated with planning issues focus on integrating more green spaces, with different supporting approaches in mind (Animal Aided Design, supporting particular species, planting more flowering plants, on green roofs planting higher growing plants, including nesting areas, etc.). In addition, a few very dedicated civil servants are trying to provide as much as possible for pollinators in Vienna. This suggests that the collective impact and support of strong groups of actors within Vienna on pollinator conservation actions play a significant role in a successful transition.

Through the communication of pollinator benefits, these barriers can be counteracted. However, within communication, new issues arise, leading to the answer of RQ2. The analysis identifies that the primary way the pollinator topic has been communicated is by deciding on a few favoured species and using those as key species, such as (honey)bees, bumblebees, or butterflies. Additionally, the popularity of beekeeping within urban areas is increasing because people want to promote biodiversity and support pollinators (Geldmann & González-Varo, 2018). However, this does not benefit wild pollinators and causes problems for wild pollinators due to competition and lower food resource availability (Geldmann & González-Varo, 2018). This problem can be counteracted to a certain extent if the local green space around the beehive is planted and maintained accordingly and thus enhanced, which can ultimately also benefit wild pollinators (Baldock, 2020). One of the interviewees also mentioned that as long as people implement enough food sources and nesting sites for pollinators in total, beekeeping in the urban environment is not that harmful (R6). The honeybee, as flagship species, is crucial for the communication of pollinators and the insect crisis (Hall & Martins, 2020). However, this still ongoing focus needs to be tackled (Baldock, 2020).

Furthermore, Hall and Martins (2020) argue that many people have limited knowledge about the importance of wild pollinators. This statement was made evident during the data gathering process for this research. During the period to request for interviews, responses often looked like 'we are not working on any bee projects right now and might not be the right people to contact'. Therefore, it is crucial to raise awareness and make people better understand which species are pollinators rather than honeybees. However, it might be better to focus on a few favoured species when introducing and implementing new pollinator-friendly strategies. It might be the case that even though people do have an understanding of pollinators and their role, they still do not accept or support these strategies because they support the 'wrong' species. Reasons for not supporting this specific species can go from feelings of disgust to fear, but also due to allergies (Levé et al., 2019). Therefore, it is crucial how these implementations are being communicated to the citizens. Strategies may support many pollinator species, depending on what range of plants are being used, but it might be the best approach to focus on the benefits for popular species in communication efforts to gain more acceptance by the residents.

Finally, to answer RQ 3, the analysis identifies that people tolerate strategies more nowadays because awareness was raised through increased media coverage. Strategies for pollinators are mainly communicated through popular species as key species due to more significant acceptance reasons. The analysis made evident that the aesthetics of these spaces play a big part in their acceptance. Therefore, it is of particular importance to understand residents' perceptions (Turo & Gardiner, 2019). Areas extensively maintained are still considered controversial because they are not associated with a

common perception of cleanliness. Therefore, sites with shorter lawns without weeds continue to be considered more pleasing and are associated with more acceptance (Nassauer & Raskin, 2014). To appropriately coordinate green space design at the beginning of implementation efforts, green space designs must be adapted to meet the acceptance of the public (Turo & Gardiner, 2019).

Furthermore, it is crucial to design pollinator conservation strategies holistically and diversely because urban areas are highly heterogeneous and floral, and nesting resource availability can be highly dispersed (Baldock et al., 2019). Scattering these resources creates important key habitats, which was also described as very important during the interviews (Theodorou et al., 2016). By implementing spaces for pollinators, biodiversity can be enhanced, but the growing urban population can also benefit from those natural areas (Bellamy et al., 2017). In addition, these green spaces provide opportunities to engage with nature, experience natural processes first-hand, and give the chance to become more engaged with the issue of pollinators (Lepczyk et al., 2017).

5.2 The Way Forward: steps towards a successful transition

Progress can be seen in implementing more green spaces within the urban area of Vienna. This is mainly because of people's wishes for more green areas around the built area and because of the cooling effect and the water run-off benefits of these areas. Additionally, due to the growing importance of sustainable awareness, changes on the landscape-level are further pressuring the regime-level to implement new sustainable developments (Smith et al., 2010). However, current niche-innovations aiming for pollinator support are not yet implemented at the regime-level, and its practices are not the priority in green space implementation.

Within the regime configuration pathway, it is essential to focus on the pressures from the landscape-level and the struggles and shifts within the regime and its actors (Geels et al., 2016). Therefore, the primary focus is on the regime-level and its actors. This focus on the regime-level can show how it can lead to a successful transition (See Figure 4). Further, recommendations are introduced on how the landscape-level can support the regime-level towards the successful transition. These are ways in which the challenges and difficulties of the regime actors can be counteracted. Since the regime actors mainly drive the niche-innovations, the following steps toward a successful transition by the regime and the niche-level are discussed together.

5.2.1 Landscape

Vienna has developed a dedicated green infrastructure strategy which can be seen in the Smart City Strategy and STEP 2025 plans. However, in these documents, it is not included to maintain, qualify or

expand greenspaces specifically for pollinators. Therefore, first and foremost, pollinators in total should be implemented into the development strategies of Vienna but also Austria and the European Union. The current action plan's primary focus is on education through communication. However, more specified efforts need to be created. In designing and formulating such a strategy and action plan, all relevant sectors and actors need to be involved to ensure a strategy that all stakeholders can follow.

Regime actors ask for more structured and stricter rules from the landscape-level when implementing green spaces and additional green spaces for pollinators. Top-down guidelines and rules from the landscape-level influence the actions of other levels differently because structural force gradients are offered, making it easier for regime actors to act accordingly (Geels & Schot, 2007). The top-down approach makes it easier for actors who want to do more in this direction and makes it mandatory for actors who would not otherwise do anything for pollinators in urban areas. Possible rules could imply that the zoning plan already described more precisely what kind of green space needs to be implemented and that the greening of buildings should be more strictly defined.

Although the pace of action to mitigate global warming has increased in Vienna in recent years, it is not easy to please everyone in areas with many different opinions and expectations. Nonetheless, the window of opportunity created by the external pressures gives opportunities for stricter rules to support the inclusion of pollinators within the urban environment (See Figure 4).

5.2.2 Regime and Niche

There is a lack of communication between the different actors relevant to this transition. Therefore, local knowledge-sharing efforts should be made. However, one of the niche-innovations already aims to work on this issue. Additionally, there is a need within city departments to communicate certain strategies better. Even if specific strategic approaches have been very successful, there is an evident lack of expertise in specific units and a lack of knowledge sharing between the different actors. The analysis made a lack of knowledge in implementing areas that benefit pollinators apparent. This is mainly due to the lack of knowledge about which plants benefit pollinators and can also survive in urban areas. Due to the changing climate, the plants themselves need to be highly resilient to serve as tools for different pollinators. For example, the biodiversity department does a lot for pollinators. Still, other departments may be motivated to contribute more to green spaces and may want to include certain plants but do not know which ones benefit pollinators. By communicating with each other, there is a chance that more green spaces will end up supporting pollinators. It can also be helpful to

share the resources of plants that other departments are using or develop a new system for the plants they are already using.

Further, there is much information in certain official documents about the plants in use (e.g., for green walls). However, including pollinators on this list could be very helpful to other departments that are not as familiar with this particular topic. Since pollinator protection and conservation affects a wide range of sectors and their stakeholders, it is just as important to include all of them in this discussion. A successful transition can be easier through communication between the decisive and committed regime actors. Although this already works very well in some cases, the focus here is more on actors who also represent similar interests. If these ideas are even better communicated and discussed with outside actors, goals for pollinator conservation and protection goals can be achieved.

Additionally, given that due to the incorporation and construction of new green spaces are, first, on the development plan, and second, desired and supported by city residents, they could be made more attractive to pollinators through relatively simple interventions. However, citizen acceptance is not always there, and as previously mentioned, it also seems that often the knowledge is not there for other pollinators besides the honeybee (Hall & Martins, 2020). This issue could be countered by combining the installation of these pollinator-friendly areas with educational work. This allows residents to directly perceive the impact and influence of such interventions on pollinators. These educational efforts about pollinators can additionally promote acceptance of areas previously perceived as aesthetically unpleasing (Turo & Gardiner, 2019).

Through all of these efforts from regime actors and potential top-down regulations by the landscape, current niche-innovations can be incorporated easier into the regime-level and lead to a successful transition of pollinator inclusivity.

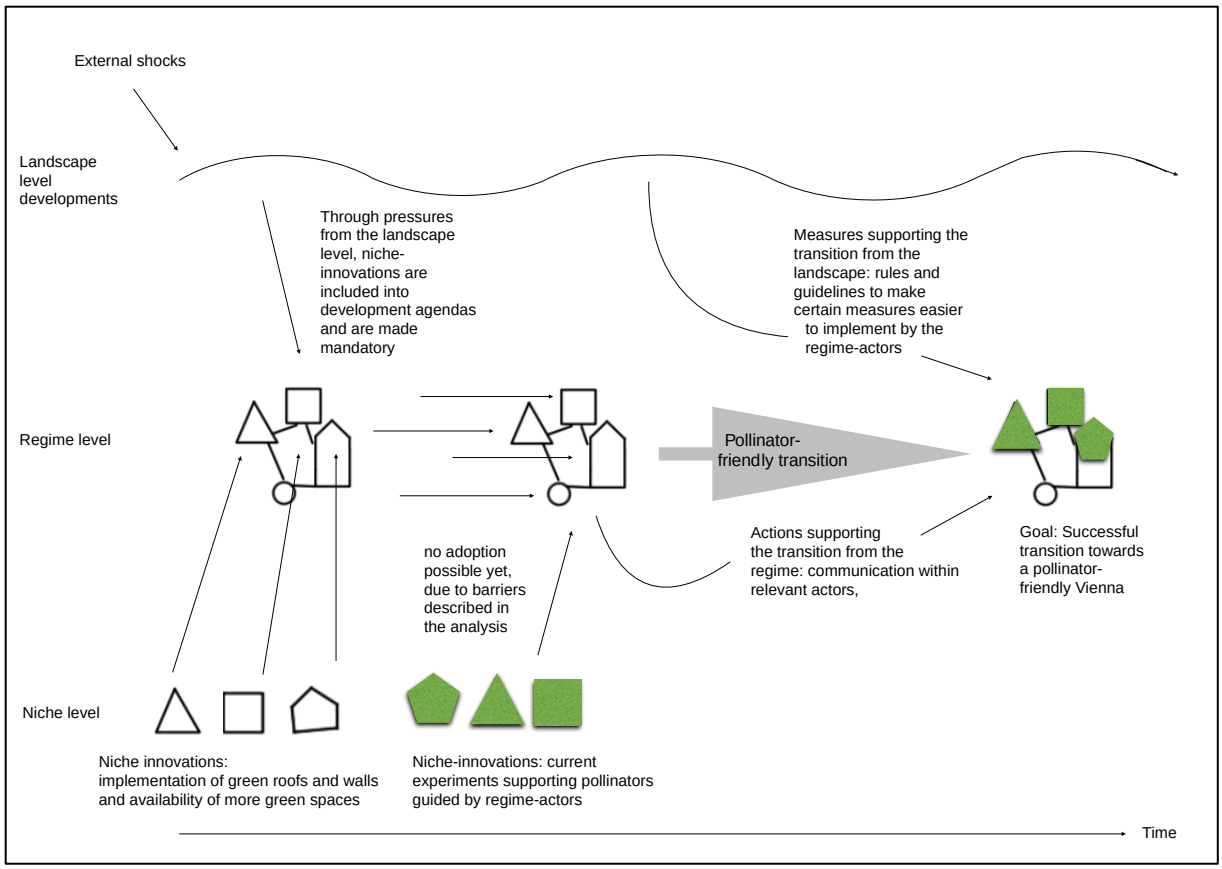

Figure 4. Vienna's steps toward a successful transition (Own creation)

This figure illustrates the necessary steps forward toward a successful transition to a pollinator-friendly Vienna.

5.3 Limitations

First, due to the ongoing COVID-19 crisis, all of the interviews were conducted online. This procedure has advantages and disadvantages, but the advantages outweigh the disadvantages in this study. No arrangements had to be made, and it was easy to bring people on board, which simplified the whole process given the geographical distance. Further, through conducting the interviews online, a straightforward way of recording and data collection is provided.

Second, the empirical base for the case study is limited, especially concerning insights gained from interviews. The interviews were primarily held with designated actors interested in the pollinator topic. Consequently, the insights gained are limited to an internal perspective of pollinator conservation and might not reflect and correspond to the hindrances in total. Nevertheless, this study gave insights into the struggles of very dedicated and interested actors. Unfortunately, the study itself did not yield the opportunity to include the perspective of the civil society. A better understanding and perspective of this topic could have been made by doing this. Furthermore, this is also a central concern of the MLP

framework, as there is a risk of creating a very exclusive arena in which it is not possible to include all the variables at play. Hence, ultimately not having the chance to capture the overall picture of a problem.

Additionally, it needs to be mentioned that I struggled with the incorporation of civil society as a total within the multi-level perspective framework. Therefore, this could be a potential improvement of the MLP framework to clarify where civil society can be integrated. Civil society can potentially and theoretically be part of every level; for example, civil society could be seen as a driving force within the landscape-level to pressure the regime-level towards a specific direction. However, civil society can also be seen as part of the regime-level and its institutions. Lastly, civil society is often seen as a framework component when introducing radical niche-innovations. Nevertheless, civil society and the ability of community-level action must be included in this discourse to ensure successful sustainable development or transitions. However, civil society's acceptance and perception of those novel interventions within the urban environment is essential, which was mentioned various times within this study. This issue was also already mentioned by Hargreaves et al. (2011), stating that community-level movement for sustainability is becoming increasingly acknowledged as an essential and potentially influential aspect of transitions. However, it has not yet been integrated into the MLP framework.

In conclusion, this study cannot be generalized to other cases because influential components were not included in this work. For instance, including citizens might have revealed more in-depth information on the acceptance of specific strategies, supporting Vienna's successful transition of the inclusion of pollinators.

5.4 Recommendations and future research

As already mentioned before, it is essential to understand that the focus of this work is on very selected actors. By identifying and understanding the potential and perspectives of these different actors, it was possible to better understand certain efforts and struggles. Nevertheless, it is necessary to include the opinion of the local population on this topic. This would be a possibility for future research. Thus, the focus could be on which measures are supported by the population and why. Therefore, if more knowledge about people's perceptions and acceptance was accessible, implementing pollinator-friendly areas could become part of mainstream practices. Furthermore, including these different values and residents' concerns can further benefit planning processes. Thus, at least the current barriers to aesthetics and acceptance could be reduced. Another motive for future research, which

would also target acceptance, is the favouritism of honeybees. It is unclear why honeybees are so accepted, which would be very valuable to identify for future projects.

6 Conclusion

This research aimed to identify the barriers local practitioners face when implementing spaces for pollinators within urban areas. To understand the dynamics of the transitions towards the inclusion of pollinators in cities, I conducted an in-depth case study based in Vienna. Using the multi-level perspective framework, the developments at the different levels contributing towards the successful transition were illustrated. Based on a qualitative analysis through interviews with actors involved in the discussion, it can be concluded that various factors need to be considered within cities to target a successful transition. By analysing barriers, communication patterns, and changes in acceptance, this thesis has shown how the discourse can directly support pollinators within the urban environment.

The results indicate that barriers range from densely built areas, no regulations within zoning, and acceptance to maintenance issues. Finally, the results suggest that urban stakeholder groups' collective impact on related actions can fundamentally support pollinators. By identifying the potential and interests of different actors, it is possible to enhance the uptake of conservation strategies within urban areas, where these practices are essential due to the intensification of the agricultural system.

The study provides evidence that strategies can complement and reinforce each other and shows how a combination of strong actors can lead to the implementation of pollinator-friendly practices. While the limited actor inclusion restricts the generalizability of the results, this approach provides new insight into the difficulties of implementing these strategies in Vienna. It remains to be seen whether urban planning in Vienna will support existing niche-innovations that can lead to more pollinator-friendly areas by pressuring and challenging current practices. Understanding the combined effects of urban niche-innovations across the city can also generally help achieve the sustainable development goals within Vienna.

This outcome is highly dependent on how current niche-innovations are received and perceived. Additionally, efforts to communicate the pollinator topic are other variables dependent on this transition. This reveals that although regimes are changing, niche-innovations are not challenging their basic structure since regime actors mainly guide them.

7 References

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8 Appendices

Appendix 1. Official documents by Austrian and Viennese Institutions

Document name (English or German)	Year	Organization
Wiener Parkleitbild 2021	2021	Wiener Stadtgärten
Wiener Wald- und Wiesen Charta	2020	Stadt Wien - Umweltschutz
STEP 2025 Grün - und Freiraum	2015	MA 18 Stadtentwicklung und Stadtplanung
Smart Klima City - Strategie Wien	2022	Magistrat der Stadt Wien
STEP 2025 Öffentlicher Raum	2018	MA 18 Stadtentwicklung und Stadtplanung
Naturschutzbericht 2020	2020	Stadt Wien - Umweltschutz (MA 22)
Leitfaden zum nachhaltigen Urbanen Platz	2011	Stadt Wien - Umweltschutz (MA 22)
Leitbild Grünräume Wien	2020	Magistrat der Stadt Wien
Leitfaden Fassadenbegrünung	2019	Stadt Wien - Umweltschutz (MA 22)
Dachbegrünung - Antworten auf häufige Fragen	2020	Stadt Wien - Umweltschutz (MA 22)
Biodiversity Strategy Austria 2020+	2014	Federal ministry of agriculture, forestry, environment and water management

Appendix 2. Official documents by the European Union

Document name (English)	Year	Organization
EU Pollinators Initiative - Commission Staff Working Document	2018	European Commission
EU Pollinators Initiative	2018	European Commission
Progress in the implementation of the EU Pollinators Initiative	2021	European Commission
EU Biodiversity Strategy for 2030	2021	European Commission
EU Pollinators Initiative - Member State Review: Austria	2019	IEEP - Institute for European Environmental Policy
Citizens for pollinator conservation: a practical guidance	2020	IEEP - Institute for European Environmental Policy
Managing invasive alien species to protect wild pollinators	2020	IUCN - International Union for Conservation of Nature
A guide for pollinator-friendly cities	2019	European Commission

Appendix 3. Interview guide informed by transition theory and by the MLP framework

Warm-up	How does your work relate to insect pollination/conservation? What are the main challenges to pollination conservation in a city like Vienna?
Communication	How does your work relate to insect pollination/conservation? What are the main challenges to pollination conservation in a city like Vienna?
Action and reaction	What are the actions/strategies that you have already implemented? What was the feedback/reaction on that by urban residents? (positive/negative/no feedback at all) Were there any specific actions you got very negative feedback on? Do you encounter difficulties implementing strategies (from above)? What insect species are you considering for your work, or are you working with?
Differences in perception	Are people more likely to support one species over another? Do you see a difference in perception? - e.g. bees/wasps/butterflies/bumblebees Do you encounter different perceptions between different groups of citizens? Are there any (other) examples of citizen-driven initiatives - or resistance - around pollination?
Changes over time	How do you think the perception or sense of urgency about insect pollination has changed in the last few years? Both when it comes to change in policies/rules (from above) and change in acceptance (from below)? Would you say it has increased, decreased, or remained the same? What do you think is driving this change?
Closure	What are future plans for the implementation of support for pollination strategies?