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Growing food in vacant spaces: the challenge of including urban agriculture initiatives in urban planning

A comparative case-study analysis of Athens, Barcelona, Brussels, Detroit and Leipzig

Louis Fontanot

Supervisor

Bernadett Kiss

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Tel: +46 – 46 222 02 00, Fax: +46 – 46 222 02 10, e-mail: iiiee@iiiee.lu.se.

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Abstract

Conventional urban planning doesn't fit anymore the complexity of new urban challenges (heat island effect, biodiversity loss, human health issues). Instead, alternative methods must coexist with existing strategies for municipalities to be more flexible to changes and stay innovative. This research advocates the use of vacant land in cities for urban agriculture. As a nature-based solution, vacant land presents multi-dimensional and multi-scaled benefits that can contribute to the sustainable development of cities while addressing local issues. Yet, urban gardens in vacant lots are not common in cities, which made the author wonder what may limit urban planners to adopt this strategy. Therefore, this research aims at identifying factors influencing municipalities to include the use of vacant spaces for urban agriculture in urban planning. Existing literature on the topic of vacant spaces, urban agriculture and urban planning were reviewed to help the author identify research gaps and find a relevant framework that could be used as the basis for the analysis of the five case-studies: Athens, Barcelona, Brussels, Detroit and Leipzig. The Nature Based Innovation System (NBIS) framework was used to analyse the secondary and tertiary data collected for each city under nine (sub)dimensions and compile factors that appears to influence urban planners' decision-making to use vacant space for urban agriculture. The findings highlight twenty factors of influence: accessibility to human labour, capacity to adapt, capacity to collaborate, citizen participation in decision-making, commitment level of land users, contextual factors, funding opportunities, governing style, hierarchical position, knowledge-sharing, land accessibility, land ownership, local needs, paradigm between own beliefs and attitude, perception of sustainability, perception of UA projects, perception of vacant spaces, quality of human interactions, sense of belonging, and urban challenges. The research observes that despite the good functioning of the framework to analyse the results and identify factors of influence, the revised NBIS is not adapted to answer entirely the two research questions. This is explained by the lack of empirical data collected and the overall research gap in understanding how land vacancy is managed in the European cities selected in this thesis.

Keywords: vacant space, urban agriculture, urban planning, public participation, bottom-up initiatives, nature-based solutions

Executive Summary

Problem definition

Biodiversity loss, heat island effect, human health risks, segregation…those are only few of the new forms of urban challenges recognised and faced by local authorities. The responsibility in addressing these local challenges are to the cities, which are advocated to readjust their land management in adequacy to new types of threats. Conventional urban planning is not fitted anymore, and innovative alternative solutions should be adopted. Nature-based solutions are one strategy that answer the complexity of new urban challenges. More particularly urban agriculture, which appears to provide multi-dimensional and multi-scaled benefits contributing to the sustainable development of cities (e.g. ecosystem services, citizen engagement, biodiversity enhancement, food security…). This solution requires available lands to function, which urban vacant spaces seem to represent. However, land vacancy appears to not always be part of traditional urban planning (Mc Phearson 2012).

Most research on vacant lands are based on cities in the USA and mainly focuses on the types of use, their potential benefits, and as a consequence of shrinking cities (Bowman and Pagano 2004, Németh and Langhorst 2014). There is a knowledge gap in identifying the necessary steps to lead land vacancy into urban planning. Similarly, the current body of research on urban agriculture is mostly interested in the potential and benefits of this practice (Dorst et al. 2019, Lin et al. 2015). Thus, there is a research gap in defining how urban agriculture is processed into urban planning measures and what enables its adoption (Van der Jagt et al. 2017).

Aim and research questions

Thus, this study aims at identifying factors influencing municipalities to include the use of vacant spaces for urban agriculture projects in their urban planning. It investigates how urban agriculture projects and vacant spaces made their way to urban strategies, as well as generating recommendation for future. This was possible by posing two research questions:

RQ1: *How land vacancy becomes part of cities' urban planning?*

RQ2: *How urban agriculture initiatives in vacant spaces become part of the urban planning?*

Methodology and analytical framework

A multiple-case study methodology approach was chosen to answer the RQs. It focuses on five cities where UA has existed in vacant spaces: Athens, Barcelona, Brussels, Detroit and Leipzig. The data used for these cases were based on data available online and internal reports from the NATURVATION project. For the cross analysis of the case studies the Nature-Based Innovation System (NBIS) framework was chosen. This framework aims at identifying enabling and constraining factors to the good functioning of a nature-based innovations, which appeared to fit the aim of this research at identifying factors of influence. The framework was revised and adapted to better correspond to the focus of this research.

Findings

Based on the literature review and the cross case-study analysis the author identified twenty factors influencing municipalities to consider and include urban agriculture projects in vacant spaces in the urban planning: accessibility to human labour, capacity to adapt, capacity to collaborate, citizen participation in decision-making, commitment level of land users, contextual factors, funding opportunities, governing style, hierarchical position, knowledge-sharing, land accessibility, land ownership, local needs, paradigm between own beliefs and attitude, perception of sustainability, perception of UA projects, perception of vacant spaces, quality of human interactions, sense of belonging, and urban challenges.

The author discusses the powerful impact that urban agriculture projects can have on people and justifies why vacant lands should be used for that strategy instead of others. Also, he briefly exposes the reader to the idea of successful urban agriculture initiatives and how it could be reached by identifying the main drivers and barriers influencing their development.

The critical reflexions made upon the research design method used highlight difficulties to identify in the case studies what specific event influenced urban planners to include UA in vacant spaces in the urban planning. Moreover, the lack of empirical data has been identified to be a major difficulty to answer both research questions.

Conclusion and recommendations

Considering the importance of urban planning in solving urban challenges growing in numbers and complexity, exploring new alternative of land use such as urban agriculture in vacant spaces is a relevant application of nature-based solution innovation. This thesis partially answered both research questions and elaborated a list of twenty factors that have influenced municipalities to include the use of vacant space for urban agriculture in their urban planning.

Future research is recommended to base their findings on empirical data collected from urban planners if their aim is to identify enabling and constraining factors to the adoption of UA on vacant space. The author advocates single case study method based on empirical data, in order to have qualitative findings that will contribute to fill the research gap and provide recommendations to urban planners of the studied city.

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Abbreviations

IIIEE International Institute for Industrial Environmental Economics

NBS Nature-based solutions

RQ Research question

UA Urban agriculture

1 Introduction

1.1 Background and significance

In the recent years, it came to the public attention that cities are confronted to a multitude of new, interlinked and complex urban challenges (UCLG 2012). Policymakers are called to take immediate action in adjusting their urban planning to address these local challenges such as biodiversity loss, heat island effect, human health risks, deeper social inequalities and higher natural disaster risks (European Commission 2015). Besides, the urban strategies employed by local authorities may have larger implications, as depicted in the last IPCC report (2019), which forecasts variances in the risk presented by climate change partly depending on how land management is handled over the next decades.

Cities are key players in limiting the local threats represented by the economic, social and environmental crises (Doll 2015, European Commission 2017). The decentralization of power has made local governments a central piece in strategic planning (UCLG 2012). With 80% of the European population and 89% of the Northern America population expected to live in cities by 2050 (European Commission 2015, United Nations 2019), municipalities must take responsibility in tackling these new types of challenges within the urban context (European Commission 2017). Therefore, conventional urban planning must adapt and develop new methods to mitigate complex multi-dimensional issues (IPCC 2019).

Recently, urban development has been approached to support the sustainable transition of cities (UCLG 2012). Nature-based solutions (NBS) are one type of application and strategy employed by municipalities to answer sustainability goals (European Commision 2015). It offers an alternative to traditional urban planning and provides a large range of benefits addressing sustainability-related challenges (Dorst *et al.* 2019, Nesshöver *et al.* 2017). Urban agriculture (UA) in the form of community gardens is one example of NBS that contribute to tackle urban challenges and answer the growing interest in innovative local solutions (Van der Jagt *et al.* 2017). However, this strategy relies on available land accessible to locals (Ferreira *et al.* 2018).

In response to the lack of disposable lands, local communities have started reclaiming lots and spaces that are vacant (Németh and Langhorst 2014). The use of vacant spaces for urban agriculture is common as it is perceived to be the most appropriate place in cities for these practices (Ferreira *et al.* 2018). Despite the demand for the rights over vacant space use, municipalities tend to neglect them and not have a strategy to utilize them more efficiently (Mc Phearson 2012). Instead, vacant spaces are kept unused in wait for a more permanent approach to land use (e.g. public facilities, private investments) (Németh and Langhorst 2014, O'Callaghan and Lawton 2015). But such strategy belongs to traditional ways of urban planning which are not fitted anymore to face today's and tomorrow's urban challenges.

Knowing that in order to limit climate change effects local authorities are requested immediate action on better land use (IPCC 2019), this research wonders what limits and drives municipalities to include the use of vacant spaces for urban agriculture in their urban planning.

1.2 Problem definition

Using vacant spaces for urban agriculture is a strategy that provides a multitude of benefits: increases food security, enhances biodiversity, brings social cohesion, promotes citizen engagement, provides ecosystem services, improves the image of the city (Dubeaux and Sabot 2018, Herbst and Herbst 2006, Németh and Langhorst 2014, O'Callaghan and Lawton 2015). As it belongs to the category of nature-based solution, this urban strategy is relevant to cities that aim to mitigate complex multi-sectorial and multi-dimensional challenges, to apply innovative urban strategic planning advocated by experts in policy-making , and to transition towards a more sustainable urban development (European Commission 2015).

Although urban agriculture is well recognized in urban planning literature for its potential and benefits (Dorst *et al.* 2019, Lin *et al.* 2015), the author's literature review shows a limited amount of research done to understand what influence local authorities in adopting (or not) urban agriculture as an urban planning strategy. It highlights the existing knowledge gap in identifying the turning-point moment when urban planners start considering UA to its actual realization in top-down measures. Similarly, there is a research gap in establishing the instruments necessary for municipalities to support the development, diffusion and use of urban gardening as an NBS (Van der Jagt *et al.* 2017). Thus, more in-depth research could help identifying the specific factors that have had influence on decision-makers to adopt UA.

As depicted in the literature review, land vacancy is a recent concept that has been studied mostly for the potential it holds as a solution to unused property (Dubeaux and Sabot 2018, Newman et al. 2018) and explored as a result of urban changes (Németh and Langhorst 2014; Newman et al. 2018; Pagano and Bowman 2000). However, there is a research gap in studying the conventional way of managing vacant spaces in cities and what influences urban planners to integrate (or not) land vacancy in cities' urban planning agendas. Moreover, the studies exploring the use of vacant spaces for UA are rich for shrinking cities in the USA (Newman et al. 2018), while European case-studies are fewer in the existing body of research and address other types of vacant spaces' use (Dubeaux and Sabot 2018, O'Callaghan and Lawton 2015).

Thus, there is a lack of research analysing UA and vacant spaces from the perspective of municipalities to try understanding what pushes urban planners to value and support the development of UA projects in vacant spaces.

1.3 Aim and research questions

The aim of this thesis is to identify factors influencing municipalities to integrate the use of vacant spaces for urban agriculture projects in their urban planning. Beside the exploratory dimension of this research interested in investigating existing urban agriculture initiatives that made their way to the urban planning, it is also intended to identify new research gap and generate recommendations for future research.

To achieve this goal, the two following research questions were posed:

RQ1: *How land vacancy becomes part of cities' urban planning?*

RQ2: *How urban agriculture initiatives in vacant spaces become part of the urban planning?*

The first research question (*RQ1*) poses the issue of land vacancy in cities. It explores the reasons behind the creation of urban vacant spaces, whether the city acknowledges urban

vacancy and the urban strategy in place to respond to it. In regard to the general aim of the thesis, the *RQ1* searches for factors that are pushing, or restraining, municipalities to set land vacancy in the urban planning agenda.

The second research question (*RQ2*) addresses the emergence of urban agriculture initiatives. It investigates the reasons behind the development of urban agriculture projects, whether it is planned in the urban strategies, the functioning of the governing system in place, as well as the challenges and facilitator to the mainstreaming of this practice in cities. In regard to the general aim of this thesis, the *RQ2* seeks factors that are driving, or discouraging, urban planners to support urban agriculture in vacant spaces.

1.4 Scope and limitations

The research has a primary focus to explore UA initiatives in vacant spaces and their place in urban planning. Therefore, it is necessary to provide the author's interpretations of these terminologies to comprehend the author's choices in the scoping of the thesis.

- **Vacant spaces** are parcels of lands that are unused, underused or abandoned in the city or peri-urban areas. The paper considers the association of the terms vacant/unused/underused/abandoned/free and space/lands/lots to express land vacancy (see Section 2.1). However, this study exludes rooftops as manifestation of available unused space.

- **Urban agriculture** represents any types of activities involved in growing food in a city or peri-urban areas. The paper considers urban gardening, urban farming and community gardening in cities as forms of UA (see Section 2.2).

- **Urban planning** defines the strategies used by communal authorities in the design and development of space use in the city and peri-urban areas. The paper considers urban strategy, urban policy, land management and urban governance to be closely related to urban planning (see Section 2.3).

This thesis is designed around case-study analysis to draw valuable conclusions and recommendations on the implications of UA development and land vacancy in urban planning. It investigates five cities choosen for the existence of UA projects that have taken place on vacant spaces.

The author limited his research to 5 case studies due to practical reasons such as time availability and data accessibility. The data collected is bounded to the time span during which it has been generated and now, meaning that the data found might not be accurate to the present reality as it hasn't been confirmed through a parallel empirical study (e.g. interviews of urban planners, UA project managers and locals). In fact, the results emerging from each case study are refered to a limited amount of existing literature based on available data from public online sources and the NATURVATION internal reports. Therefore, only few UA projects per city were considered in the analysis which may not be representative of today's city's urban planning context. Additional data could be included in the analytical table of results if the author, or future researchers, were to study new UA projects in the selected case studies or in any other cities. Yet, the analysis, discussion and conclusion chapters provide valuable insights to be used for future UA projects and urban planning decisions.

The above dimensions should be accounted by the readers when reviewing this research paper.

1.5 Ethical considerations

The research was conducted independently with the support of an academic supervisor and without external organization's fundings. Thus, nobody had an influence on the analysis and conclusions that were generated from the author's own mental capacities. The data used throughout the research helped to forge the author's views. Therefore, any works that contributed to the development of this thesis were carefully acknowledged to avoid plagiarism, as well as clear statement of ideas' and retrieved data's ownership. The thesis supervisor, who took part in the NATURVATION project, granted the author the permission to use data from the NATURVATION internal reports for the case studies of Athens, Barcelona and Leipzig. The empirical data retrieved from datasheets of those reports, based on interviews of several types of stakeholders participating in urban agriculture initiatives, is adequately referenced and the privacy of the respondents respected. The secrecy of these reports is protected in the personal password secured laptop of the author and will be permanently deleted after the thesis submission. Any other data used were publicly available. Moreover, the research design has been reviewed against the criteria for research requiring an ethics board review at Lund University and has been found to not require a statement from the ethics committee.

1.6 Audience

This research is primarly targetting urban planners and local UA initiatives. Municipalities can learn from the findings of this research as it presents strategies and challenges experienced by other cities in the development, diffusion and use of UA. The identification of enabling and constraining factors to UA in vacant spaces can benefit urban planners and citizens on how they approach such strategy in urban planning. Also, it can be used as an introduction to the concepts of vacant spaces and urban agriculture for anyone interested in new urban planning practices that answer multi-dimensional urban challenges (social, ecological, economic, political). Moreover, this work can be of interest for researchers in the field of urban agriculture, land management, urban planning and nature-based solutions. It provides interesting findings and recommendations on how future researches on the topic should be conducted in order to generate concrete solutions and "good practices" guidelines that are relevant to specific municipalities.

1.7 Disposition

Chapter 1 provides a relevant background to the research explaining what issues and knowledge gaps it addresses. The aim of this work and the associated research questions are defined, along with the reasoning behind the choosen scope. Then, it identifies the ethical considerations complied to and the targeted audience, and finally presents the outline to this thesis.

Chapter 2 analyses concepts found in existing researches that are relevant to answer the research questions and contribute to this thesis: vacant spaces, urban agriculture and urban planning. Each concept is presented by focusing on its definition and place in existing literature, as well as the benefits and limits it represents for urban planners and local communities.

Chapter 3 explains how the author initially intended to go with this research and what it ended up being. It justifies the choices made for the research design and methodology for data collection. It concludes on introducing the analytical framework used for data analysis.

Chapter 4 presents the findings from the five different case studies by going through each dimension and sub-dimension of the analytical framework before analysing them and deducting specific factors that influence the development, diffusion and use of vacant spaces for UA.

Chapter 5 compares the findings from the case studies to the literature review by discussing the value of using vacant spaces for urban agriculture rather than other types of use and the main drivers and barriers to the development of successful urban agriculture initiatives. Then, the author reflects on the RQs choices and the methodology used throughout this research.

Chapter 6 concludes the work by providing the key lessons to be made from this study and recommendations for future research on the topic.

2 Literature Review

This chapter aims at introducting the reader to the concepts of vacant spaces, urban agriculture and urban planning. It presents their implications towards one another and is implied to serve the purpose of this research by focusing on literature that can help answering the RQs.

2.1 Vacant spaces

2.1.1 Definition

Also found in the literature as "vacant land" and "vacant lot", the term of vacant space is generally defined as any type of land that is underutilized, unused or abandoned by humans for a certain period of time, which includes bare (or with natural grown vegetation) field, brownfield, greenfield, uncultivated land, derelict land, abandoned structures and recently razed surface (Bowman and Pagano 2004; Németh and Langhorst 2014; Pagano and Bowman 2000). However, this definition is not widely accepted and varies from one location to another (Bowman and Pagano 2004; Pagano and Bowman 2000). By instance, due to the risk of danger represented by abandoned structures, cities in the US consider the space to be vacant if it has been unoccupied from 60 to 120 days if not longer (Pagano and Bowman 2000).

Land vacancy is an inherent step to urban development (Németh and Langhorst 2014). As explained by Németh and Langhorst (2014), the creation of vacant spaces is a result of complex urban changes and processes experienced by cities. Deindustrialization and demographic changes create urban vacant lands (Németh and Langhorst 2014; Newman *et al.* 2018). Once a population relocates to a new area, it leaves previously used buildings and lots vacant. Moreover, the literature shows that land owners (either public or private entities) are often encouraged by market forces and local policies to speculate and hold on to their property (Németh and Langhorst 2014; O'Callaghan and Lawton 2015). Thus, available spaces are kept unused for an undetermined period of time. These phenomena contribute to the development of vacant spaces and creation of perforated cities.

2.1.2 Including vacant spaces in urban planning

Vacant lands are often not accounted in an average city's urban planning (Mc Phearson 2012). They tend to be neglected and more vulnerable to unwanted activities such as public littering, illegal squatting, trafficking, violence and crime (Dubeaux and Sabot 2018; Pagano and Bowman 2000; Sanches and Pellegrino 2016). It carries negative externalities that affects locals' feeling of security (Biasi 2017); sense of community and investments willingness in the area (Goldstein *et al.* 2001). For a long time, land vacancy was perceived as a burden and liability for urban planners, but the it has recently been studied as a resource for its potential by making use of that land as a temporary solution (Dubeaux and Sabot 2018, Németh and Langhorst 2014).

Most existing research explores vacant space use for their potential and associated benefits, which are the essence of urban planners' interests. They can be categorized in 3 interlinked branches: social, ecological and economic benefits (Anderson and Minor 2017). From the literature, it was possible to establish the following (non-exclusive) list of benefits resulting from vacant land use: **social benefits** such as to enhance social cohesion, empower individuals and communities, support vulnerable households, promote citizen engagement and educate locals (Dion 2016, Németh and Langhorst 2014, Stewart *et al.* 2019, Travers 2017); **ecological benefits** such as to provide ecological services, mitigate heat island effect, purify air, enhance

stormwater infiltration, remediate soil contamination, increase biodiversity, beautify the city, grow vegetables and fruits and contribute to the greening of the city (Dion 2016, Herbst and Herbst 2006, Németh and Langhorst 2014, Stewart *et al.* 2019, Travers 2017); **economic benefits** such as to generate value to a land/area, create jobs, help economic development, incubate innovative ideas and experimentations (Dion 2016, Dubeaux and Sabot 2018, Németh and Langhorst 2014, Pagano and Bowman 2000, Travers 2017); and **political benefits** such as to enhance the image of the city, support urban regeneration and involve locals in land management (Dion 2016, Dubeaux and Sabot 2018, Kobayashi and Ikaruga 2016, Németh and Langhorst 2014, O'Callaghan and Lawton 2015, Pagano and Bowman 2000, Travers 2017).

With medium-sized cities averaging 16.7% of vacant lands in the urban space (Newman *et al.* 2018), it has come to the interest of urban planners to include land vacancy in their urban strategies. Vacant spaces are utilized accordingly to the strategy adopted by locals and/or urban planners and were identified to be used for **community gardening** (Németh and Langhorst 2014; O'Callaghan and Lawton 2015; Stewart *et al.* 2019), **urban agriculture** (Dubeaux and Sabot 2018; Németh and Langhorst 2014; O'Callaghan and Lawton 2015; Travers 2017), **small business venture** (Kobayashi and Ikaruga 2016; Németh and Langhorst 2014; O'Callaghan and Lawton 2015), **political meeting** (Dubeaux and Sabot 2018; O'Callaghan and Lawton 2015), **socio-cultural events** (Kobayashi and Ikaruga 2016; O'Callaghan and Lawton 2015), **public projects** (Kobayashi and Ikaruga 2016; Travers 2017).

The literature shows that vacant spaces are mostly claimed by bottom-up initiatives willing to use that space for local projects. Németh and Langhorst (2014) studied the strategy of temporary use of vacant spaces, which is defined as a substitute to a preferred permanent option. This strategy leads to the emission of temporary use agreements, provided by land owners, granting land user access to that space for a determined period of time. Urban planners are also using similar strategy, as seen in the case of Chicago or Baltimore where the municipalities decided to facilitate the access to vacant land by locals for urban gardening projects (Anderson and Minor 2017). These urban planning approaches are mostly researched through case studies.

2.1.3 Barriers to vacant spaces use

Although vacant spaces use is recognized to have multiple benefits for the development of a city and the well-being of its inhabitants, it remains a concept facing a lot of barriers in order to make its way to urban planning. Firstly, vacant spaces are still undervalued in traditional urban planning. They are by nature unwanted lands based on their location, akward shapes and difficulty to be used efficiently (Pagano and Bowman 2000). Hence, the low willingness of municipalities to invest in it and make it available to locals (Goldstein *et al.* 2001). Secondly, municipalities are limited in addressing both land vacancy and local initiatives. The inventory of available vacant spaces represents an important cost for the communality and is not a common practice in conventional urban planning (Pagano and Bowman 2000). Moreover, they lack administrative capacity to adapt to spontaneous local demand (Németh and Langhorst 2014). Thirdly, land accessibility is disputed among various stakeholders with different interests. Land owners decision-making is influenced by economic factors, which often result in speculation on lands letting them vacant for future more desirable permanent mean (Németh and Langhorst 2014, O'Callaghan and Lawton 2015). In the case of land users granted access through the temporary use scheme, they face the risk of losing the space anytime based on land owners' decisions (Németh and Langhorst 2014). Therefore, land ownership

influences the possibilities to establish local projects on vacant spaces as well as having repercussion on their survival (Anderson and Minor 2017, Németh and Langhorst 2014).

2.2 Urban agriculture

2.2.1 Perception of urban agriculture

Scholars, urban planners and citizens have showed a recent growing interest in urban agriculture practices (Mansfield and Mendes 2012). The concept of urban agriculture is studied as part of urban strategies and sustainable transition of cities. Kontothanasis (2017) investigates UA as an alternative food network (AFN), which focuses on new sustainable modes of getting access to food. It addresses social equity and takes part in the sustainable food transition efforts of a city. Moreover, the concept of nature-based solutions (NBS) has received a lot of coverage among scholar and policy-makers in the recent years. The European Commission (2015), which promoted research on NBS, define nature-based solutions as local innovations that focus on tackling urban challenges such as climate change, air pollution, loss of natural habitats, human health. Urban agriculture is one type of innovation that fits under the NBS denomination (Dorst *et al.* 2019, European Commission 2015, Nesshöver *et al.* 2017).

Urban agriculture is approached for the numerous urban challenges it addresses and the benefits it generates simultaneously (Dorst *et al.* 2019, Lin *et al.* 2015). It can answer land vacancy as UA often takes place on vacant space where it seems to be the most appropriate for scholar and urban planners (Ferreira *et al.* 2018). Also, it provides ecosystem services such as regulating air and water quality, enhance biodiversity, limit urban heat island effects, improve stormwater infiltration (Ferreira *et al.* 2018, Lin *et al.* 2015). Additionally, it benefits locals, especially taking part in community gardens (Drake and Lawson 2014), by providing ecological education, benefitting health and well-being, increasing food security, enhancing social cohesion and citizens engagement (Alaimo *et al.* 2010, Drake and Lawson 2014, Lin *et al.* 2015, Stewart *et al.* 2019).

2.2.2 Barriers to the development of urban agriculture

Despite the mentioned benefits that should justify the diffusion of UA in cities, there are still numerous limits imposed by conventional urban planning processes. The main issue faced by citizens willing to farm in their city is the lack of available and accessible land (Ferreira *et al.* 2018). It is recognized by researchers, based on empirical findings, that in order to meet the local demand for UA in cities, spaces must be created (Roth *et al.* 2015). It shows the incapacity of municipalities to integrate new types of food network in their urban planning (Ferreira *et al.* 2018, Horst and Gwinn 2018). There is a tendency for land speculation and conflict over land use, making land access challenging for locals (Horst and Gwinn 2018, O'Callaghan and Lawton 2015, Roth *et al.* 2015). Becker and Von der Wall (2018) identified in an empirical study 9 different types of barriers faced by urban communities limiting them in developing UA projects: finance, space, organizational structure, obtaining water, externally caused damage, soil quality, communication, interpersonal issues and participation.

2.3 Urban planning

Urban planning is recognized to take part in the sustainable urban development of cities (European Commission 2013). The 7th Environment Action Programme (2013) called cities to integrate sustainability goals in their urban startegies, including land use. Thus, the interest of cities to use NBS as an urban planning response to address new urban challenges in the context of sustainability (European Commission 2015, Gulsrud *et al.* 2018). However, new practices that often emerge from bottom-up initiatives, such as urban agriculture, are confronted to traditional urban planning processes that have not the tools to integrate these practices to urban policies (Ferreira *et al.* 2018, Horst and Gwinn 2018, Pagano and Bowman 2000). Prové *et al.* (2016) explains that municipalities lack of adaptability to new strategies that come with more complex implications as it involves stakeholders' interactions at multi-levels, demands new types of governance more flexible, and takes part under the sustainability dimensions (social, ecological and economic). UA initiatives experience it as a lack of support (Ferreira *et al.* 2018) and continuity to the sustainable urban objectives advocated by the European Commission and fixed by the municipalities.

To avoid the risk of cutting out the establishment and diffusion of UA, scholars have been providing policy recommendations to urban planners. Azunre *et al.* (2019) ensures that UA can't work efficiently and in the long-term if there are not included in the city's urban planning. Municipalities are advised to take the responsibility of making lands more accessible for local UA initiatives and maintain adequate support throughout the development of the gardens (Ferreira *et al.* 2018, Roth *et al.* 2015). Another strategy is to revisit zoning regulations already existing and adapt it to urban agriculture lots as a method to secure land and protect UA initiatives (Azunre *et al.* 2019, Horst and Gwinn 2018). Finally, it is advised to municipalities authorities to understand the connection between stakeholders that are specific to the local context (Prové *et al.* 2016) and improve the link between stakeholders through multi-scaled cooperation (Manganelli and Moulaert 2019, Prové *et al.* 2016).

3 Methodology and analytical framework

This chapter presents and justify the methods used to conduct this research. It first explains the initial research plan and ideas, followed by the finalised research design choice. Then, it goes through the methods used for data collection and finally present the analytical framework selected for the elaboration of the findings in this thesis.

3.1 COVID-19 context

In light of the recent public health crisis, happening throughout the thesis work, several aspects of the research design had to be changed accordingly.

Initially, the thesis was based on a comparative analysis of 3 case studies: Detroit, Todmorden and Leipzig. These cities were pre-selected for the existence of successful bottom-up initiatives using vacant lots for urban agriculture projects that made their way to the urban strategy. The aim of that research was to establish factors that have influenced municipalities to incorporate bottom-up urban agriculture initiatives in their urban planning and deduct best practices for cities and local initiatives willing to use vacant spaces for urban agriculture. Due to lack of qualitative data online on this topic for the cases of Todmorden and Leipzig, it was excpected from the author to collect empirical data through interviews with urban planners, project managers and locals. However, the circumstances of the COVID-19 limited the possibility to conduct in-depth research through on-site visits and find potential interviewees available and willing to collaborate. Several other cities were considered but had to be dropped due to lack of available information online: Chicago, Dublin, Ghent, Lund, and Malmö. Overall, the following changes had to be made:

- Collect empirical data from online sources due to complexity of the interviewing process
- Abandon the case of Todmorden due to lack of online available data
- Expand the number of case studies because of the two points above

3.2 Research design

The purpose of this research was defined after conducting a pre-study that focused on exploring the concept of land vacancy in the context of urban planning. It developed the author's interest in the strategy of using vacant spaces for gardening and growing food, while enhancing his curiosity in trying to understand what has leverage on urban planners' decisions to include vacant spaces and urban agriculture in municipalities' agenda. To clarify and determine the strategy that would be used to process this research, the author decided to investigate further existing studies through a literature review. This step was necessary to define the concepts of urban agriculture, urban planning, land vacancy and how they interact with one another. It helped validating the research gaps from the pre-study and refining the research questions. Lastly, it contributed to identify an analytical framework that could be adapted to the aims of this research and find case studies fitting the revised analytical framework.

The thesis has followed a case study methodology in order to answer both research questions. Often, this method is used to explain causal link and answer "how" and "why" questions (Yin 2009). Schramm (1971) justifies choosing case study research design as a mean to deliver answers to "Why a decision was taken?", "How was it implemented?" and "What was the result of that decision?". This study follows such approach as it tries to identify factors of influence

that may explain why and how municipalities decide to adopt urban agriculture projects in vacant spaces as part of their urban planning.

Considering the primary objective of capturing various factors influencing urban planners' decisions, a multiple-case study approach seemed the most appropriate. Yin (2009) claims this method helps to gather a set of results that could be replicated to other cases. Also, it provides more legitimacy to the analytical conclusions made in comparison to a unique case-study. Hence, the decision to analyse five different cities in a comparative manner to draw meaningful conclusions. This pre-condition justifies the relevance of the findings and recommendations provided to future research. Athens, Barcelona, Brussels, Detroit and Leipzig were choosen as the cities to be explored and analysed to answer our research questions.

The research process was carried out through the following steps:

I. Pre-study focusing on gathering knowledge about vacant spaces and urban planning.
II. Defining research gaps and preliminary research questions
III. Investigating existing literature on the use of vacant spaces for UA as an urban strategy
IV. Choosing and adapting an existing analytical framework to the thesis (see Section 3.4)
V. Selecting the case studies based on data availability to suit the analytical framework and filling the associated matrix of results (see Appendix II)

3.3 Methods for data collection

Due to the limitation of obtaining access to qualitative data from interviewing actors involved with UA initiatives and vacant space management (see Section 3.1), the research focuses essentially on data collected from online sources and internal research from the *NATURVATION* project made available by my thesis supervisor exclusively for the purpose of this thesis. The multitude of evidence, through a triangulation method, contribute to the credibility and validity of the findings generated (Cohen *et al.* 2011, pp 197). Yet, this thesis uses exclusively secondary and tertiary sources of data.

The five case studies selected have been studied through different angles. The three NATURVATION case studies (Athens, Barcelona and Leipzig) investigate UA as an NBS that may be used by municipalities to address environmental, social and economic issues in these cities, while taking a step further in the urban sustainable transition. The case of Brussels-Capital Region was studied empirically to identify the different types of governance tensions existing an organization promoting urban agriculture and localized food production. Lastly, Detroit is a well-known and appreciated case in the field of UA. The collected literature for that case has mostly been focusing on the local history, motivations, perceptions and implementation process of UA as an urban strategy.

The *NATURVATION* project was established and funded under the European Union's Horizon 2020 Research and Innovation programme. This thesis uses findings from the case studies of Athens, Barcelona and Leipzig which are exploring urban gardening initiatives on vacant spaces as a nature-based solution to help the transition of cities towards sustainability (Naturvation 2020). Each of the case study working papers are based on primary data collected through a multitude of interviews with urban planners, project managers, locals, NGO and organisations involved with UA projects. That empirical data was retrieved from these

interviews, present in *NATURVATION*'s case-study datasheets to be published, and quoted in the table of results and/or analysis only when they appear to contribute to answer the RQs.

The data retrieved online served the writing of the literature review and the compilation of results for the case studies of Brussels and Detroit. It also helped to complete the three other cases on the current urban strategy in place (e.g. cities and UA organisations official websites). Science Direct and Google Scholar were the online search tools used to find relevant papers for the literature review and the selection of the case studies. The creation of the study database, recommended by Yin (2009), was made possible by following the next steps:

I. Establishment of key words and terminologies in order to retrieve papers somewhat relevant to the literature review: '*vacant space*', '*vacant lot*', '*vacant land*', '*urban agriculture*', '*urban gardening*', '*community garden*', '*urban planning*', '*urban policy*', '*bottom-up initiatives*', '*public engagement*'.
II. Criterias of relevance for pre-selection of papers (based on reading title and abstract): offers knowledge on a combination of different terminologies (e.g. vacant space in the context of urban planning), case study analysis, bring a critical view to the terminologies, links to other terminologies (e.g. urban regeneration, nature-based solution, etc…), introduces a theoretical or analytical framework.
III. Scan through more than sixty pre-selected papers and take notes for future redaction.
IV. Identification of an **analytical framework** (see Appendix I) that have the potential to help guide this research and provide a baseline on how the RQs will be explored and answered.
V. Adaptation of the original framework to the limitations and aims of the thesis by testing it with findings from the *NATURVATION* case studies of cities where UA projects exists in vacant spaces.
VI. Finding and deciding on other case-study papers available online with enough data that it could fit the analytical framework in addition to the *NATURVATION* papers.
VII. Compilation of a matrix of results (see Appendix II).

3.4 Framework and methods for data analysis

The thesis follows a linear-analytical structure that explore, describe and explain the research topic (Yin 2009). As mentioned in the section 3.2, a comparative analysis of qualitative data from case studies seemed the most suited to observe local urban strategies for UA in vacant spaces and generalize from these findings. Yin (2009) highlights the importance of pattern matching to perform cross-case synthesis. Therefore, it was judged necessary to construct a table in order to analyse the data collected.

Once the research questions established, the next step was to select an analytical framework to help identifying data collection criterias and position this paper on how it will process that data to answer the RQs.

The literature review showed that urban agriculture is one type of nature-based intervention among a multitude of other innovations (Dorst *et al.* 2019; Nesshöver *et al.* 2017). NBS are approached as an urban strategy for the sustainability principles they provide to conventional urban planning (Gulsrud *et al.* 2018) and associated benefits generated from such innovations (Dorst *et al.* 2019). Hence, the interest and decision in using the **Nature-Based Innovation**

System (NBIS) framework (Van der Jagt *et al.* 2019) for this research. This framework is based on the Technological Innovation System (TIS) that focuses on the structural components (actors, institutions, technological factors) and dynamic elements (e.g. knowledge, support) contributing to "*the development, diffusion and use of new technology and, thus, the performance of the innovation system*" (Bergek *et al.* 2008). It is used by policymakers to identify factors influencing technological innovation. Similarly, the NBIS framework helps identifying "*enabling and constraining factors for a well-functioning NBIS*" (Van der Jagt *et al.* 2019). It uses 8 dimensions and 15 subdimensions to illustrate the type of factors that has an influence in the development, diffusion and use of nature-based innovation in a city (see Appendix I). In the case of UA projects, such framework would provide similar functions and help to identify factors facilitating the adoption of this NBS in the urban planning of the studied cities. Furthermore, the cross-analysis would give a directive line, based on the characteristic depicted by the existing case studies, on the recommendations to make for the mainstreaming of this NBS in traditional urban planning.

The NBIS framework had to be revisited by the author in order to fit the conditions (e.g. data availability, limited time) and aim of this research, as well as providing the right approach to answer both research questions. Thus, several dimensions from the original framework were dismissed, renamed, or rearranged. The final version of the analytical framework (see below Table 3.1) takes the form of a table and was completed in Excel to regroup the results from the 5 case studies (see Appendix II). Because the results from the case studies were established and based on the analytical framework's dimensions and sub-dimensions, it was decided to compute both results and analysis together in the Chapter 4.

Table 3-1 Analytical Framework to identify factors influencing UA in vacant spaces

Dimension	Sub-dimension	Focus and guiding questions in relation to the RQs
Place-based factors		**City context in relation to UA and vacant spaces** **RQ1**: What generated vacant spaces? **RQ2**: What are the reasons behind UA initiatives?
Discourse and Vision	**Goals and targets**	**City's development goals that include UA and vacant spaces** **RQ1 and RQ2**: What direction is taken by the municipality to meet its wider urban objectives?
	Place of UA and vacant spaces	**Perception of UA and vacant spaces** **RQ1 and RQ2**: What pushes locals and urban planners to be interested about UA and vacant space use?
Urban planning and policies		**Strategies implemented by urban planners** **RQ1**: What policies exists to answer land vacancy? **RQ2**: What urban strategy resulted from UA initiatives?
Governance system	**Actors involved**	**People and organisation involved with UA initiatives** **RQ2**: Which actors' presence has been necessary to the development of UA projects?
	Leadership	**Actors pushing UA and level of power hold in decision-making** **RQ1**: What is the involvement level of the municipality in the management of vacant spaces **RQ2**: What type of governing style allows the UA initiatives to develop and get to urban planning?
	Public participation	**Level of participation of citizens in decision-making** **RQ2**: How far locals are included in UA and urban planning?
Resources	**Financial and material**	**Umbrella of resources available for UA projects** **RQ2**: What financial and material resources were used by the UA project?
	Human capital and knowledge	**Set of necessary human skills in UA projects** **RQ2**: What types of knowledge and abilities are necessary to the development and maintenance of UA projects?

Source: by author (revision of the "*Overview of the dimensions and associated subcategories of the Nature-Based Innovation System (NBIS) framework*" (Van der Jagt *et al.* 2019))

4 Result and analysis

This chapter presents the results from the five case studies before analyzing them and deducting specific factors that influence the development, diffusion and use of vacant spaces for UA. Firstly, the author shares his interpretation of what each (sub-)dimension entails in the context of this research. Then, the data collected of each case studies are presented in tables referring to a dimension or sub-dimension from the analytical framework. For the reader's convenience, the sources to the result tables are listed at the end of the recapitulative table of result (Appendix II). The analysis of the results is done by comparing each case study to one another and to their relations with the framework itself in order to find patterns or interesting discovery that helps answering the guiding questions (see Table 3.1) and identify factors influencing UA in vacant spaces.

4.1 Place-based factors

The author considers place-based factors to englobe characteristics that are context-specific to a city and creates its conditions. Van der Jagt et al. (2019) define it as structural factors bounded to a place and that shape a location's environment and identity. They can be of different orders: societal, cultural, historical, geographical, economical, political, structural. For instance, a city with a low amount of green areas may be more inclined to air pollution. Thus, they may represent boundaries and/or facilitators to the development of UA in vacant spaces.

Guiding questions used to fill the table of results: (**RQ1**) What generated vacant spaces? Is land vacancy common in the city? (**RQ2**) What are the reasons behind UA initiatives?

Table 4-1 Place-based factors identified in the case studies.

Athens
The Athens-Attica region counts 66 municipalities and totalizes around 3,750,000 inhabitants. Greece had its economic system deeply impacted by the financial crisis of 2007-2008. The budget allocated to the environmental sector got cut, which limited the support and development of green projects led by civil society in the Athens-Attica region. It resulted in the degradation and abandonment of public green spaces, mainly due to the lack of funds and associated poor maintenance. Also, the city is victim of the heat island effect and air pollution, which has been partially explained by the lack of green spaces. These issues were partially addressed by few municipalities through community garden strategy. The three urban gardens studied are based in the municipaly-owned vacant land of Agios Dimitrios and Marousi (located in the suburbs of Athens).
Barcelona
The city of Barcelona is known to be a compact city (1 620 343 inhabitants in 101.4km² in 2018) with a limited amount of publically owned vacant lots. Therefore, bottom-up initiatives claiming that urban space for innovative projects are confronted to traditional urban planning strategy involving the construction of public facilities (school, retiring home, hospital). "*Barcelona is a very small and very compact city. It is difficult to find free space. Urbanistically I think it has to be very complicated. But for small sites to be rescued, it could be like this, with small green interventions...*" (Naturvation 2020b, interviewee no. 6). "*What happens in Barcelona is that the struggle between legitimate interests of people who need housing, and who needs a lot of social housing, in order to bring the prices down, and solve a housing emergency, collides with the demand for more green, which clashes with the demand of more constructions and infrastructure. That is, this is an open debate*." (Naturvation 2020b, interviewee no. 1). The economic crisis and resulting austerity measures led to a budget restriction for the municipality on its construction projects and the abandonment of several spaces around the city. Decentralised initiatives took this opportunity to claim these lands as a solution to revitalize several districts, fill the lack of green areas, enhance social interactions and promote citizens participation in local activities. Overall, Barcelona is subject to an urban transition pushed by a growing amount of initiatives providing solutions to socio-environmental issues (e.g. slow food, local farmer market). The two urban gardening initiatives studied in Barcelona are the "Illa dels 3 horts" and the "Espai Germanetes".
Brussels

Brussels-Capital Region (BCR) regroups 19 Municipalities with a population of 1,208,542 inhabithants (BISA 2019). The region accounts 300 urban gardens (88ha), characterised as small land plots from 0.5ha to 1ha each, where urban agriculture practices happen. They are established in vacant spaces within housing zones, close to infrastructures or upon green areas. These urban agriculture projects have been started by the well-established peri-urban agriculture's coalition Boeren Bruxsel Paysans (BBP), pushed to mobilize against binding practices pressuring land use and advantaging conventional farming practices.
Detroit
Detroit (MI) is categorised as a shrinking city due to the deindustrialisation from the automobile sector. Population loss (from 951,000 to 670,000 between 2000 and 2019), high unemployment and low-income rates (38% of the population is living under the poverty line), and segregation of the African American community examplify challenges faced by the city. In regard to the demographic changes over the years, a multitude of properties and lands were let vacant (105,000 vacant lots representing 15,000 acres). In order to address the urban challenges represented by a perforated city, local initiatives (inspired by the potato gardens during the Depression) started planting and cultivating food on vacant lots. Today, the city accounts for more than 1,500 urban gardens and farms over 165 acres and became a symbol for urban agriculture enthusiasts.
Leipzig
Leipzig is a shrinking city. Its current population (587 857 inhabitants in 2018) is equivalent to the numbers of 1918 but spread over four times the land surface used at that time. Therefore, the city is prone to a large amount of vacant spaces. *"…We have a landscape transformation […] manifesting in the development from an energy landscape to a leisure and natural landscape."* (Naturvation 2020c, interviewee no. 20, City representative Leipzig) Leipzig East is characterized by a population with a high unemployment, social welfare support and number of migrants' rates. The area is lacking green spaces and subject to stigmatisation over socio-economic status of the population. As a response, bottom-up initiatives have risen to confront the city of Leipzig urban planning strategy on vacant plots. These pieces of land are reclaimed to enhance green areas in their neighbourhood and to be used as a space for social interactions and cohesion. The focus is on two bottom-up gardening initatives in Leipzig East area: Querbeet and Bunte Gärten.

Analysis: How place-based factors affects the integration of UA and land vacancy into urban planning?

The acknowledgment of place-based factors appears to be a prerequisite in advancing UA and land vacancy in municipalities agenda. The structural characteristics that shape the identity and history of a city act as a mold to how individuals are experiencing and responding to specific events. For instance, both Leipzig and Detroit are defined as shrinking cities experiencing major social challenges (e.g. inequalities, high unemployment rates) that require to be addressed. Authorities and locals became aware of that situation and decided to take action to mitigate the unwanted effects. Another example to illustrate this idea is the case of the Brussels Capital Region that is historically rich in traditional farming practices (monoculture on vast parcels of lands). The regulations in place protect these types of farmers giving little room for innovation and the development of UA in vacant spaces. Institutions appear to be bounded to to what they perceive as conventional and following cultural dogmas. Furthermore, the level of realisation and action in regard to land vacancy seems to depend on the share of vacant spaces existing in the urban landscape, and thus the conditions set by place-based factors. For example, the municipality of Detroit seems to integrate land vacancy in its Sustainable Action Agenda because of how much common they are in the city, in comparison to Brussels for instance.

Moreover, external threats that pressure the good functioning of a city and the well-being of its citizens hold a significant level of influence on locals and urban planners' decisions. The case of Athens and Barcelona exemplify well this phenomenon as economic crises have changed urban planning priorities, whether they decided to start focusing on new innovative alternatives to mitigate the effects of crisis or preferred to remain within their conventional boundaries of urban planning. Also, it shifted locals' perception of traditional urban strategy

efficacity and whether they want to undergo the side-effects of these crises passively or be proactive by establishing the dialogue and developing a bottom-up movement to influence decision-making.

Factors of influence: contextual factors (economic, political, cultural, natural, structural), urban challenges, capacity to adapt

4.2 Discourse and vision

On the same line with the definition of Van der Jagt et al. (2019), discourse and vision are perceived in this research as the beliefs and set objectives in term of sustainability and urban development that can influence the perception of NBS such as UA in vacant spaces.

4.2.1 Goals and targets

This sub-dimension regroups objectives and commitments set by the municipalities in term of urban development. Identifying the long-term goals employed by a city is necessary to analyse and understand how decision-makers value and engage in UA projects and land vacancy in the urban planning strategy.

Guiding questions used to fill the table of results: (**RQ1** and **RQ2**) What direction is the municipality taking to meet its wider urban objectives? Are there any goals related to UA and/or land vacancy?

Table 4-2 Goals and targets identified in the case studies.

Athens
Athens is taking part of the 100 Resilient Cities network which aims at enhancing the resilience of cities to crisis by 2030. Therefore, one of the main focus of Athens is to support vulnerable groups as well as enhancing social solidarity. Due to the effects of the economic crisis, municipalities in the region took the responsability to tackle social and environmental issues. The main goal being to change people's behaviour towards nature in the urban context. The two municipalities selected adopted urban allotment gardens as a solution to enhance urban food production and promote green behaviour and cohesion among citizens.
Barcelona
The City Council of Barcelona embraced the momentum generated by the rising local demand for neighboring green areas and the global call for city's responsibility in achieving sustaibility goals to adopt alternative urban planning methods based on citizens engagement. These community gardens were designed with the intention to be innovative by defying traditional urban planning strategies and by involving civil society groups in defining and managing urban space in their neighbourhood. "*This project arises with the intention and purpose of creating green spaces in the city, and to create a social garden in the city*." (Naturvation 2020b, interviewee no. 3).
Brussels
The Ministry of the Environment, Quality of Life and Agriculture of the BCR launched the 'Good Food Strategy' in 2015 as a plan for the region to transition towards sustainable food system. Urban agriculture and access to land are two essential aspects recognised by the Ministry to encourage innovation and inclusion to build a new food system. (e.g. urban and peri-urban agriculture will produce 30% of the unprocessed fruit and vegetables consummed locally by 2035; 30% of households will produce some of their own food by 2020) The BBP's coalition aims at facilitating the access to urban space for locals wishing to produce food in their neighbourhood and to protect peri-urban agriculture. Also, it acknowledges that regional and municipal practices are not in line with the goals set by the 'Good Food Strategy' and would require stronger support, vision and leadership from the governmental entities responsible to its achievement.

Detroit
One of the main objectives set by the Mayor of Detroit is to rebuild and strenghten the neighborhoods through citizen engagement and supporting policies. Urban land vacancy is a recognised issue by the City Council, leading to its inclusion in Detroit's Sustainability Action Agenda. From the 10 defined goals, two are directly concerning UA and vacant spaces: "increase access to healthy food, green spaces and recreational opportunities" and "transform vacant lots and structures into safe, productive, sustainable spaces" (Detroit Office of Sustainability 2019, p 27). The latter informs of clear targets concerning the development of vacant space within land management: reaching 24,500 (2024) and 36,500 (2029) of sold vacant side lots; and increase usable space for agricultural purposes to 300 (2024) and 500 (2029) acres.
Leipzig
The municipality of Leipzig, the state of Saxony, the Federal Republic of Germany and the EU share common goals in term of urban planning strategy such as: decreasing carbon emissions, revitalizing urban areas, enhance social cohesion and citizen participation by providing the space for it. These objectives align with the ones from the urban gardening initiatives. The greening of cities in Germany has been advocated by the Federal Ministry of the Environment pointing the importance of green spaces in cities. With the additional aim of giving a better image to disadvantaged quarters in the city, the municipality of Leipzig aims at regenerating post-industrial lands into urban green spaces as well as increasing its support to local green initiatives.

Analysis: To what extend urban development goals and targets set by authorities translate into the development of UA projects and management of vacant spaces?

Urban objectives and targets set the tone used by urban planners regarding the development of NBS such as UA. In the case studies, they provide the room for discussing UA as this strategy could contribute to the wider urban objectives of a city, region, or country. Setting sustainability goals opens the dialogue and incentivize stakeholders (e.g. civil society, city council representative) to follow a similar path and act towards the upper-level urban strategy direction. For instance, setting social goals such as enhancing social cohesion, citizen engagement, increase land accessibility and provide support to minorities and local initiatives first influences how stakeholders perceive these goals and urban challenges, and consequently how they act towards it. Detroit is a good example of a perforated city facing land vacancy issue, that set long-term goals to mitigate this challenge, and succeeding in integrating vacant spaces in the urban planning. However, set goals do not necesserly translate into local action to meet the target as showed by the incapacity of the BCR to enforce its "Good Food Strategy' to municipalities. It remains in the domain of advocacy and not considered a priority by other stakeholders. Furthermore, the dynamic is not always top-down with city-wide objectives translating into the development of UA projects, but can be the policy response to a larger demand from locals to meet specific needs. The interviews highlight the local demand for more green spaces in their neighborhood (Naturvation 2020a, 2020b, 2020c).

Factors of influence: perception of sustainability, local needs, urban challenges

4.2.2 Place of urban agriculture and vacant spaces

This sub-dimension looks at the different perception of UA and land vacancy that locals and urban planners may have. The place these concepts holds in people's judgment and values may have a strong impact on how they act on it.

Guiding questions used to fill the table of results: (**RQ1** and **RQ2**) What pushes locals and urban planners to be interested about UA and vacant space use? How do locals and urban planners perceive UA and land vacancy?

Table 4-3 Place of UA and vacant spaces identified in the case studies.

Athens
Historically, Athens has been home to social bottom-up movements claiming public unbuilt spaces for open public use and promoting the greening of the urban landscape. However, during the economic crisis unused public spaces were mostly covered for commercial means for the survival of small businesses. Urban agriculture in vacant spaces is perceived as an optimal solution by municipalities to beautify derelectic lands, enhancing social cohesion and inclusion, improve well-being, provide livelihood alternative and increase environmental awareness. Tangible benefits, such as food production and embelishment of the plot, appears to be the most significant concerns for both urban planners and local users. "*From this I cover our needs for vegetables in the house, and I also give to the social grocery, and to some friends. If I have a good production, more families will eat. We are five in my family and only one has a job, the rest we are unemployed*" (Naturvation 2020a, interviewee no. 19, Cultivator AD urban garden).
Barcelona
Locals perceive the vacancy of lots in their neighborhood as an opportunity for small-scaled initiatives over convential alternatives (e.g. recreational parks). With non-profit associations, they were mainly interested in the space provided by urban gardens to restore social and climate justice. Urban gardening in vacant spaces is seen for families to educate their children to healthy and sustainable practices, to generate green areas in their neighbourhood, as well as enhancing the feeling of belonging to a community gathering people from various socioeconomic backgrounds. "*The fact that there are orchards, there are flowers, and there is also a space where you can talk, this is all important for the issue of cohesion*." (Naturvation 2020b, interviewee no. 6). The urban gardening strategy was considered by the municipality for its expected associated social and environmental benefits: enhancing social interactions, generate positive externalities to the neighbourhood through ecosystem services, grow food locally, educate locals to sustainability-related topics.
Brussels
The perception of land availability and usability for urban agriculture is conflicting in the region. The regional planning doesn't legitimize urban agriculture as a type of land use. This argument is shared among most municipalities and landowners in the region, who are reluctant to support urban agriculture projects and provide land to locals. However, some municipalities (Anderlecht, Dilbeek and Sint Pieters Leeuw) were open to these experimental initiatives and the idea of using available space for urban agriculture.
Detroit
Vacant lots are recognised by the municipality as part of the identity of the city and a result of its history. Also, they are often associated to development opportunities and urban agriculture. The latter is perceived primarly as a way to reduce the negative impacts of shrinkage. Grassroots initiatives value their potential to address urban decay, "food deserts", and social injustice. The main excpected benefits are resistance to food, social and environmental injustice, empowerment of local black community, improving living standards of low-income households, and bringing cohesion within neighborhoods. These reclaimed parcels of lands hold a symbolic and political values among locals. Therefore, the vision from larger urban farms (e.g. Hantz Woodlands) are conflicting with the initial purposes instaured by local communities.
Leipzig

Vacant lots are considered in Leipzig to be a result of post-industrial demographic changes and became source of conflicts between self-organised civil society, private investors and the municipality. Both private and public landowners' decisions to rent/sell are drawn by the market forces and economic benefits over social and environmental outcomes.

Urban gardens are appreciated for the ecosystem services they provide to the neighborhood and city. In the East part of Leibzig, these initiatives were mostly considered for their social impacts by engaging locals in urban politics, giving space for social interactions and providing environmental awareness through educative activities.

However, activists and locals fear that greening strategies such as urban gardens in the area accentuate gentrification effect as the price of property may consequently rise, pushing households with lower incomes to relocate.

Analysis: How does the perception of vacant spaces and UA affects their realization?

Norms and beliefs have an immediate impact on the importance UA and vacant spaces represent for urban planners and locals. The most common finding is that vacant spaces are seen as opportunities by locals to answer urban challenges and match with the larger urban development objectives mentioned in the previous sub-dimension. The more these concepts are perceived as valuable, the more probability there will be discussed and implemented. Although established beliefs may result in change of attitude, it doesn't automatically translate into concrete actions as shown by the incapacity of the BCR to enforce regulations to meet the "Good Food Strategy". As shown through the Naturvation case studies, the shared enthusiasm of these initiatives may not be unanimous and have the risk to rise the price of property and taxation resulting in wider social inequalities. It can create resistance to UA strategy which may influence how it is design and implemented.

Once available lands are valued for the potential and profits it carries, stakeholders tend to desire that land which can cause conflicts of interests. Vacant lots are perceived for their economic value by their owners and tend to often be speculated on due to the larger property market forces. UA initiatives can go against public and private investment plans, integrated in conventional urban planning methods, and ultimately not be allocated for non-economically profitable projects. Thus, lands can be more difficult to access causing the freezing of UA development. Furthermore, in cities were land vacancy are not given attention and importance there is less chance that vacant spaces will be integrated in the land management agenda of these municipalities. In the contrary, such as in Detroit, locals and urban planners value vacant spaces considerably which resulted in its adoption within the urban strategy.

Factors of influence: perception of UA projects, perception of vacant spaces, paradigm between own beliefs and attitude

4.3 Urban planning and policies

Strategies and regulations implemented by authorities can provide incentive or facilitations to adopt NBS (Van der Jagt et al. 2019). Thus, the policies enforced by urban planners can play a role in how well UA initiatives develop and how vacant spaces are treated.

Guiding questions used to fill the table of results: (**RQ1**) What policies exists to answer land vacancy? (**RQ2**) What urban strategies pushed or resulted from UA initiatives?

Table 4-4 Urban planning and policies identified in the case studies.

Athens
Throughout the economic crisis, commercial activities were prioritized by several policies to function in public spaces. This strategy led to the diminishment of bottom-up initiatives involved in urban spaces. The municipalities of Agios Dimitrios and Marousi have been pioneer in the region in term of urban gardening policies, especially through the implementation of the "urban farming lots for organic cultivation" strategy. This successful urban planning strategy spread up across Greece and influenced other cities' local policies to adopt it as well. The municipality-led urban gardening initiatives were supported and included in a Public-Private partneship scheme under the strategic framework proposed by the Greek government from 2007 to 2013
Barcelona
The municipality of Barcelona shifted its urban strategy over the years, from prioritizing grey infrastructures for public facilities to putting grey amenities and bottom-up initiatives support forward in its urban planning agenda. Urban planners proposed the Pla Built scheme, a policy focusing on public engagement through urban gardening, as a nature-based solution to socio-environmental issues. It takes part of a larger set of measures promoting sustainability, participation and green solutions. The projects established based on that policy are designed to be temporary (1 to 3 years) and under civil society groups management. This policy only concerns urban vacant spaces owned by the municipality as there are no plan and political will to invest in private lands. Due to the popularity and success of these projects, the Pla Built policy has been revised in order to provide continuity to the urban gardening by ensuring the permanency of the land use for these communities. It has been decided by the municipality to support community management of 'citizen's heritage'.
Brussels
The BBP initiatives led to the development of temporary land lease agreements in the municipalities supporting urban agriculture projects. Under these contracts, the user has the right to dispose of the land for a limited time until the landowner decides otherwise. These agreements are often allowed for a symbolic amount of money, but on some cases (depending on landowner position towards urban agriculture) it is rented. On the other hand, established conventional farmers are protected by long term leases, which are limiting the emergence of new forms of farming practices and peri-urban agriculture.
Detroit
Detroit started tackling land vacancy within urban planning with the "Farm-A-Lot Program" (1975-2002), where gardening practices were taught for people to cultivate food on vacant lots. The municipality recognised the decline of Detroit and decided to reajust its urban strategy through "smart decline" policies. It built up a framework plan, Detroit Future City, by planning for improving the quality of life of locals adapted to its current population numbers. Detroit City Planning Commission (CPC) established the Urban Agriculture Ordinance (UAO) providing legality to urban agriculture projects by officially coding zones as agricultural. The objectives were to give land security for informal (illegal) farming and set agriculture standards in the urban context. The city sells lots from inoccupied properties for 200-300$. Urban gardens play under Michigan's 'Right to Farm' act recognising that lands rezoned for agricultural purposes cannot be retroffited to non-agricultural zoning. Moreover, they need to be conformed to the Generally Accepted Agricultural and Management Practices (GAAMPS) from the Michigan Department of Agriculture and Rural Development.
Leipzig

The municipality of Leipzig has dedicated offices (e.g. the Office of Green Space and Water) collaborating and taking care of including nature-based solutions in the urban planning strategies.

In the 1990s, the city adopted a "plot management system" with its associated plateform to register a plot in the database and temporary use agreements. This scheme aims at facilitating the negociation of privately-owned land's usage rights for local project supported by the municipality, such as Querbeet.
"We had to just look into the plot management system by the City's Office for Urban Green and Water, decided for a plot and then anything went relatively smoothly. This is no longer thinkable." (Naturvation 2020c, interviewee no. 7, Scientist).

On the other hand, the municipality has a low willingness in disposing the urban spaces it owns to bottom-up initiatives as it goes against its longer terms strategies of using urban space for economic growth.

The administration of Leipzig established "Thinking Leipzig Ahead", a project partly-included in the urban planning decision-making by involving citizens to participate in discussing the sustainable urban development of their city through workshops, surveys, events.

Analysis: Does urban strategies and regulations facilitate the use of vacant spaces for UA?

All the cases show that the establishment of urban policies helped immensely the establishment of urban gardens on previous vacant spaces. The most common strategies employed by urban planners is to lower the barrier of entrance to the utilization of available land. Thus, land accessibility appears again to be a crucial parameter for UA activities to occur. It is embodied by different schemes implemented with the goals of facilitating negociation over land use between land owners and potential future land users. Providing a space to register vacant spaces and regulating the process for temporary lease agreements is a short-cut that avoids conflictual situation and facilitate the exchange of information between various stakeholders that could represent a barrier to the development and diffusion of UA projects in more conventional urban settings. It is by encouraging the development of these practices and their success through urban planning that skeptical cities may decide to adopt UA and put the means.

Urban regulations exist also to frame the development of UA initiatives for the municipality to have more control on how urban gardens are processed. It can be positive and designed to help the development of urban gardens on vacant spaces as shown in the case studies. The case of Detroit illustrates well the need for the local government to have a grasp on these unformal activities present in the urban landscape and legalise them to ensure land security and gardening practices in line with other regional regulations. It has direct impact on the legitimization and perenity of these projects, supporting the development of this strategy in the long run. However, other urban regulation may enter in conflict with the development or good functioning of UA (e.g. zoning regulations, policies encouraging land speculation). Urban planning variances from one locality to another may be explained by place-based factors, adaptability of policy-makers to alternative practices and whether UA has been perceived or experienced as a success.

Factors of influence: perception of UA projects, perception of vacant spaces, capacity to adapt, land ownership

4.4 Governance system

The types of stakeholders involved in a system way, how they interact with one another and how the power is shared can play a major impact in the development and success of NBS (Van der Jagt et al. 2019). Therefore, it is essential to understand the governance system adopted in the several UA projects. Exploring such dimension can help understanding the dynamic and the type of management style in place, and ultimately provide specific factors that may have pushed or restrain the adoption, development and diffusion of UA in vacant spaces.

4.4.1 Actors involved

This sub-dimension identifies the different types of stakeholders that have been involved, either partially or entirely, throughout the process of developing UA projects.

Guiding questions used to fill the table of results: (**RQ2**) Which actors' presence has been necessary to the development of UA projects?

Table 4-5 Actors involved identified in the case studies.

Athens
City councils, vulnerable local citizens, landscape company (Ecoscapes), private tobacco company (Japan Tobacco International), the European Commission, volunteers. "*We do not usually work with public bodies but from time to time, as in this case, partnerships are formed - and this has been increasing lately. A private company, JTI, who wanted to grant an action with a social character, has approached us for this urban garden project. We talked to an agronomist working with us and used to work in the Municipality of Marousi. So it happened.*" (Naturvation 2020a, interviewee no. 18, Project coordinator Ecoscapes).
Barcelona
City council, self-organised civil society (families, association of neighbours), a non-profit cooperative (TARPUNA: supports urban agriculture for social inclusion of communities risking exclusion).
Brussels
Municipalities' representatives, Ministry of the Environment, the Boeren Bruxsel Paysans (BBP) coalition, bottom-up organisations (Terre en Vue: facilitates land accessibility for urban agriculture; CREDAL: supports credit for small and local entrepreneurial projects), association (Début des Haricots: promote sustainable urban agriculture and local food networks), land owners, conventional farmers, and new small-scaled farmers.
Detroit
Detroit City Planning Commission (CPC), City Council, UA organisations, Wayne State University, grassroots initiatives and associations, gardeners and farmers, local communities
Leipzig
City Administration (office for Urban Green and Water, urban quarter managers), state legislation, EU, Federal Ministry of the Environment, NGOs, self-organised civil society, locals

Analysis: What type of stakeholders had major impact on the development of UA?

It's difficult to make generalities by comparing the different case studies and assuming one type of stakeholder has had larger influence on the development of an UA project. The interactions between stakeholders are complex and context-specific. However, it appears that the actors in position of making decision that can enable the development process of UA are ultimately the person having the most influence on the realization of these projects. That is the case in Athens, Barcelona, Detroit and Leipzig, where one or several members of the city councils were enthusiasts to the idea of having urban gardens in vacant spaces. Despite the leverage they hold, most of the cases show that it is locals and grassroot initiatives that started

the movement and opening the debate on UA in their respective city. Also, urban gardens could not function without locals willing to allocate time to their development and maintenance, which are core in creating the expected benefits from UA activites. Overall, it is difficult to evaluate the level of impact and influence of each stakeholder on UA adoption based on these results as there are not quantified in the present research.

Factors of influence: hierarchical position, perception of UA projects, perception of vacant spaces, capacity to adapt, accessibility to human labour

4.4.2 Leadership

Studied as "agency" in the original framework (Van der Jagt et al. 2019), the authors define it to be the various actions taken by stakeholders that had influence in the development of NBS. This research takes the same stance and tries to capture moments of initiative, proactiveness, responsiveness and advocacy that had a crucial impact in rising a solution or issue (e.g. lack of green spaces) and turning it into an established project or regulation. Moreover, it aims at understanding the management and governing style in place for both vacant spaces and UA projects.

Guiding questions used to fill the table of results: (**RQ1**) What is the involvement level of the municipality in the management of vacant spaces? (**RQ2**) What type of governing style allows the UA initiatives to develop and get to urban planning? Who opened the dialogue to UA projects in vacant spaces and how?

Table 4-6 Leadership identified in the case studies.

Athens
For both cases, the urban agriculture strategy initiated from representant of their municipality supporting the idea of locals growing and consumming fruit and vegetables in urban spaces. The role and functions of the urban gardens are set by the municipalities themselves. The regulation shifted to be more flexible and transparent by engaging a committee of representatives that would not only include members of the municipality (e.g. inclusion of social workers and landscaping company in Marousi). "*There is no internal governing structure in the garden, in the form of a formalized assembly or cooperative. We had a general meeting which was pushed by me, every two months in 2017.*" (NATURVATION 2020a, interviewee no. 16, Urban garden representative of the city council AD). In Marousi, a landscape company (Ecoscapes) is responsible for the design and maintenance of one of the gardens. Agronomists were also involved in the project by providing gardening practices recommendations to the users. Funders of these projects, such as the EU commission and the private tobbaco company (JTI) have leverage on the decision-making happening at the local level.
Barcelona
The municipality takes a step back in the governance of the vacant spaces provided to civil society under the Pla Buits scheme. In fact, it mostly collects data from these urban gardens as a method to assess the success of its policy (e.g. accounting the amount of people participating, quantity of activities organized). However, the temporary dimension of these projects defines a certain power hold by urban planners once they decide to start construction projects on the occupied public spaces. Due to the citizen-centric dimension of the Pla Buits policy, the urban gardens are essentially managed by the protagonists using it. "*Well, in the Pla Buits those who are involved are mostly entities that are already formed and active in the neighborhoods, such Neighborhood Associations or other types of groups, which are already self-managed, what they do is to apply to manage the space.*" (Naturvation 2020b, interviewee coded GR). In Illa dels 3 Horts, the social cooperative TARPUNA took a leading role in developing the urban garden. After few years of activity, the leadership of the gardens were transfered to an association of families in order to give continuity and ensure its maintenance by guaranteeing public participation.

In Espai Germanetes, the development and management were made possible by self-organized groups of people mostly living around the urban garden.
Brussels
The BBP initiated the urban agriculture movement and local food networks in the Brussels-Capital Region. The coalition is composed of grass-root organizations, state agents and other organization supporting bottom-up initiatives. Such collaboration pushed its different actors to express in one voice their leadership and proactive stance in the field of urban agriculture and land use. Still, municipalities and landowners appear to hold the most significant power in term of final decision-making. They tend to not support alternative food systems and speculate on the value of their land. This conflict of interest with the BBP is a barrier to the development and implementation of small-scale agriculture projects in the region. State institutions are criticized to lack of leadership, political capacity and commitment to have organizations and institutions collaborating to expend local urban agriculture across the region. Despite having the Ministry of the Environment within the BBP, it doesn't disable institutional barriers for land accessibility.
Detroit
Detroit is home to numerous bottom-up urban agriculture initiatives that started the development of informal gardens on vacant lots. They involve non-profit, community-based and UA organisations that are managing activities on vacant lands and coordinating with other stakeholders (e.g. soup kitchen, restaurants). Large UA organisations (e.g. Detroit Black Community Food Security Network, Greening of Detroit, Urban Farming) appear to have the most knowledge and overall governing power. Large entrepreneurial urban farms, such as Hantz Woodlands taking place in 1,500 lots over 144 acres, had leverage on the municipality's regulation over land management. It pushed the officialisation of the Urban Agriculture Ordinance (UAO) to set standards for commercial agriculture and community gardening. The municipality gets mostly engaged in large urban agriculture projects expecting to result in economic benefits and jobs creation. However, the legitimization of vacant lands and urban agriculture policies was made possible by the support from CPC board members to establish the Urban Agriculture Workgroup to write the UAO. The collaborative work included non-profit organisations, State Universities, municipality's offices and communities.
Leipzig
The gardening projects are entirely managed by the group of locals who established them. For Querbeet, the function and activities taking place on these vacant lots are decided among the collective of land users. Such managing freedom was made possible by temporarily renting a vacant land owned by the municipality. On the other hand, in the case of Bunter Gärten, land users must comply to specific rules set by private landowners (e.g. limited amount of cultural activities). *„The word of environment protection measures, note from the authors] spread in a quarter and the people came to my boss and asked him about it and he was open for it."* and *"district mayor who was […] very pragmatic and wanted to change something, too."* (Naturvation 2020c, interviewee no. 3, City representative Leipzig) Representatives of the city of Leipzig were enthusiasts to the bottom-up movement asking for measures ensuring the protection of the environment (Naturvation 2020c, The municipality is more or less involved with the projects depending on their profiles (e.g. scale, location, activities). Nonetheless, they are integrated to some degrees on the urban planning strategies through "Thinking Leipzig Ahead". In light of parallel urban objectives for demographic and economic growths, the city of Leipzig prioritizes the construction of public facilities (school, childcare) and investments of private businesses on urban vacant lands. While private owners have decided at several time to sell temporarily used plots, leading to relocation of the gardening initiative. *"We already had to move once as there was a kindergarten to be built […] Of course we understood this. […] Then we have been on the new plot in the Neustädter Straße for only 1,5 years as our landlord threatened to sell the plot. This is still up-to-date. And we had decided in a plenum that we do not want to support the landlord in staying on the plot until the price for it has risen and he could make even more money with it. So we want to move earlier than we have to. But it is much more difficult to find a new plot than it was 6 years ago."* (Naturvation 2020c, interviewee no. 7, Scientist)

Analysis: To what extend leadership has an impact on the governance and development of UA in vacant spaces?

As exposed in the previous sub-dimension, various actors have proven their ability to initiate and advocate UA projects. The cases show a mixture of bottom-up and top-down led initiatives. Their influence power depends on their hierarchical position in the urban planning decision-making, the knowledge they own on the topic of UA and persuasion skills to have these initiatives integrate the urban strategy and become established projects. Sometimes it only takes one powerful person to convince as shown through the interviews in Leipzig (Naturvation 2020c). Stakeholders in position to make decisions were enthusiasts to the development of urban gardens by locals which enabled the process of designing and implementing different gardening projects in vacant spaces. On the other hand, low political capacity of higher public instance to influence municipalities to adapt their urban planning to new methods of urban planning can represent a major obstacle to lower the entrance barriers to UA projects and protect available lands. Thus, proactive and adaptable behaviors are essential characteristics of leaders required to diffuse these practices and intergrate them in urban planning.

The distribution of power and leverage among stakeholders within each UA project appears to have repercussion on the success of the urban gardens. Firstly, there is the common issue of land ownership that is recurrent in the case studies. Land beneficiaries must comply to diverse rules set by the land owners which can be limiting in the development of UA projects. The main drawback of this type of approach is its structure around temporary contracts which gives leverage to land owners on when they want to terminate the activities of UA initiatives taking place on they lands. Such uncertainty on the lifetime of a project can be a demotivator to start an urban garden in the first place. Secondly, the municipalities' involvement rate varies from one project to another and shows mixed feedbacks. On one hand, there are projects led by urban planners were activities are defined and integrate specific goals set by public authorities that are the conditions of the project's existance. On the other hand, there are self-governed initiatives that have more freedom in defining their roles but have less support from municipalities and are more reliant on their own public participation. The former seems more stable but less profitable, while the latter is experienced by locals to be more resource consuming but more enjoyable which can be explained by their higher level of engagement and genuine interest. Therefore, the type of leadership and governance style adopted in urban gardens have influence on the success and sustainability of these projects.

Factors of influence: land ownership, citizen participation in decision-making, governing style, capacity to adapt

4.4.3 Public participation

Public engagement in decision-making appears to be important in the acceptance and legitimization of NBS by locals (Van der Jagt et al. 2019). To that extend, this sub-dimension looks at the level of involvement from locals in the decision-making of urban strategies involving UA. It focuses on understanding whether the participation of locals contributed to the development and diffusion of UA practices.

Guiding questions used to fill the table of results: (**RQ2**) How far locals are included in UA projects' decisions? What has been the outcome of this inclusion/exclusion?

Table 4-7 Public participation identified in the case studies.

Athens
To some extend, these initiatives were pushed by bottom-up pressure in the Athen-Attica region. Ultimately, it led to the respective municipalities taking action and organising themselves to govern the urban gardening initiatives. The participation of citizens within such urban strategy is defined by the activities done in the garden (maintenance and management), the dialogue with the city council to establish the elligibility criteria and choose the beneficiaries, and the common agreed decision to modify the rules applying to these initiatives. Not all beneficiaries are taking good care of their lots, but the mix of vulnerable and non-vulnerable families contributes in the collaboration of both groups and motivational value that dynamic brings (Naturvation 2020a, interviewee no. 18, Project coordinator Ecoscapes).
Barcelona
As these projects pivot around public participation, the rate of engaged members in the activities of the urban gardens takes a crucial place in their success. For example, the lack of long-time commitment of members throughout the development of the garden in Illa dels 3 Horts, from plantation and maintenance to harvesting, led to poor observable results. To solve this issue, several families took over the cultivable lots and organised themselves to guarantee a high rate of participation. "*When we first presented the project, it was the most valued of all, because it had a lot of entities. But later this did not translate into participation. And when each entity goes its own way, has its own struggle, and not doing one thing in common, things don't work. It took a long time for things to start in terms of maintained participation*." (Naturvation 2020b, interviewee no. 5). Self-governed urban spaces appeared to empower members of the project and provide unity to a community and neighbourhood.
Brussels
The ambitions of the BBP's coalition to provide locals with available land for small scaled urban agriculture make it that citizens are directly involved in the maintenance of these lands. The BBP is constitued of bottom-up organisations regrouping people willing to plan, develop and farm lands allocated. To some extend, citizens are involved in the discussions and decisions made by the coalition.
Detroit
The mainstreaming of urban agriculture in vacant spaces takes it source from public participation and engaged citizenry to grow food in neighborhoods. Communities initiated the development of this trend and took the associated responsibilities (e.g. land tenure, respecting GAAMPS). The bottom-up initiatives function for the most part autonomously, meaning the municipality has low involvement in the functioning of the urban garden and farms. This leaves locals with larger freedom but more dependency on public engagement in the projects. Citizens participated in designing the UAO, top-down response to the growing demand for UA, through community meetings held in public spaces.
Leipzig

Leipzig has a rich history in citizen participation on urban planning decision-making. Urban planners have recognised the importance of public engagement from an early stage in the urban planning processes and its role in the success of urban policy. Top-down (e.g. plan, survey) and bottom-up (e.g. feedbacks) streams of information regarding urban planning are coordinated by communal representatives if not handled to consultancy bodies. "Thinking Leipzig Ahead" hold an important role in that exchange. In the two cases, locals initiated the urban gardening discussion with the municipality and urban quarter representative. The ideas were discussed, evaluated and integrated in the urban strategy. Throughout the development of the project, public participation was maintained while authorities representing the municipality engaged with locals in less formal processes.

Analysis: How does public participation affect the development of UA?

First and foremost, the findings show that public participation is inherent to UA iniatives as human labour is required to plant, cultivate and maintain urban gardens. The success of urban gardening implicates high level of citizen engagement in gardening practices. As the interviews highlights, poor participation rate leads to poorer outcomes (lower economic, environmental and social benefits) (Naturvation 2020a, 2020c). The profits offered by UA must be achieved as they represent the keystone to urban planner's interest in these initiatives. Hence the necessity of public participation to ensure the sustainability of these projects and avoid the waste of the initial inputs to their development.

The findings identify that cooperation between different stakeholders has led to municipalities supporting UA. The case of the BBP coalition exemplify that partnering different actors offers more leverage in the advocacy for UA in vacant spaces. In Detroit, experts and organizations in UA have collaborated to legitimate the practice of UA and therefore contributed in shaping urban planners' opinions. Finally, the participation of citizens in decision-making has been a major dimension in facilitating local authorities to understand what local communities demand to be put in the urban planning's Agenda. Providing locals with a space to discuss and take part in the urban strategy decisions (e.g. "Thinking Leipzig Ahead") contributed in the legimitization of the resulted urban policy and avoid potential future resistance to UA projects and use of vacant spaces.

Factors of influence: accessibility to human labour, commitment level of land users, citizen participation in decision-making, capacity to collaborate

4.5 Resources

Whether financial, material or human capital, resources are essential in the good development and maintenance of NBS (Van der Jagt et al. 2019). They can represent an incentive (e.g. funds) or a barrier to entrance (e.g. lack of human labour) as well in UA projects and rehabilitation of vacant spaces. This dimension identifies the various resources used by UA projects and the importance they hold in the survival of these initiatives.

4.5.1 Financial and material

This sub-dimension looks at the umbrella of financial and material resources experienced in the featured UA projects. It aims at finding the resources inherent to these types of initiatives and necessary to their success.

Guiding questions used to fill the table of results: (**RQ2**) What financial and material resources were used by the UA project? Which ones are vital to initiate and guarantee the sustainability of UA projects?

Table 4-8 Financial and material resources identified in the case studies.

Athens
The cultivated lands were made available by the municipality, as well as the tools and access to water (well or water tank collecting rainwater). All initiatives were funded by public finance (municipality and EU support) which contributed in the investment of gardening materials, seed and payment of the agronomists. In the case of Marousi, private funds from JTI contributed in the establishment and expansion of the project. "*We (cultivators) built the fence and we brought the soil. Everything with our own money. The city only pays for the water, whenever they provide it to us. Well, they also separated the plots, and they brought us plants the first day at the opening. Oh, and the gave us rubbish bins and a small warehouse…"* (Naturvation 2020a, interviewee no. 20, Cultivator Marousi)
Barcelona
The municipality offers financial fundings for which the urban gardens projects may apply to. Basic needs for the daily maintenance of the gardens, such as water and electricity supply, are automatically povided by the municipality. "*Each group takes care of the seeds, the staff and all of this is organized by themselves, it is independent. We work with Fundació Àmbit Prevenció, they pay us for the social work we do. Then, through the City council, they bring us the compost, the humus, once a year... and they give us this subsidy (1000 euros).*" (Naturvation 2020b, interviewee no. 3). Other fundings schemes are flexible and different from one project to another depending on how finances are managed. In Illa del 3 Horts, members involved contribute financially to the treasury of the project while other might offer voluntary work.
Brussels
The BBP peri-urban agriculture projects were supported by fundings from the Ministry of the Environment, part of a governmental funding program for the transition of food systems (before the 'Good Food Startegy'). The European Regional Development Funds also helped the BBP to carry on its experimental projects. Despite the financial support these initiatives benefit from, it can't be implemented if the access to underused/vacant lands is not guaranteed. Often, agricultural lands are rented by established conventional farmers with historical and unlimited land use rights. It represents a major entrance barrier for new farmers willing to experiment growing food locally.
Detroit

Vacant urban spaces have low entrance barriers, meaning it is simple for anyone to claim a parcel of land and start growing food. However, getting property rights through land acquisition is more challenging. Turning vacant buildings into brownfields ready to host agricultural plots is costly for the municipality. In 2020, 4million$ were invested by the city and partners to maintain 192 vacant lots and grow crops in some of them. Urban farms/gardens development and maintenance rely on voluntary work and self-funding (e.g. selling production to Eastern Market or soup kitchen), mostly because there exist no consistant funding opportunities from the municipality. On the other hand, growers find support in UA organisations providing seeds and advices which avoids potential costs.
Leipzig
Projects belonging to the NBS category or contributing for urban renewal and creation of green spaces in the city may apply for a multitude of funding schemes. They are communicated by city representatives and offered by the Federal State, the State of Saxony, the EU, Banks for Reconstruction (special loans contract for green projects) or the city itself. These formal funding schemes requires a lot of efforts from organisations led by locals to gather required informations. *"wherever possible […] tried to receive funding from public schemes, and otherwise via donations and voluntary work"* (Naturvation 2020c, interviewee no. 5, NGO representative). Small-scaled projects such as Querbeet and Bunte Gärten were able to apply and receive several of these fundings, while providing the development of their activity through voluntary work and donations.

Analysis: What financial and material resources are essential to the development and maintenance of urban gardens?

Land accessibility was identified in the findings to be an undeniable resource as available space define the base of UA initiatives. It is understood that urban gardeners cannot operate without cultivable soil surface. Unused land access must be secured or locals willing to farm lots may be confronted to a competitive demand also willing to have access to that parcel of land. Therefore, urban planners supporting these initiatives can develop policies to facilitate the obtention of urban vacant lots.

The availability and accessibility of fundings or financial means are crucial to initiate a gardening activity in a vacant land. Financial resources help land users to develop their idea into a concrete project, whether it is to get access to a land, to purchase the resources necessary to grow food (e.g. water access, seeds, gardening tools), or to improve the quality of the activity for a more successful entreprise. Not having access to such funds can put off anyone who desired to start the reallocation of a vacant land into an urban garden. On the other hand, the existence of any funds can create an incentive for people and influence them in developing an UA project.

Factors of influence: land accessibility, funding opportunity

4.5.2 Human capital and knowledge

Having access to a specific set of skills and knowledge appears to be necessary to the good establishment and maintenance of NBS (Van der Jagt et al. 2019). They can be manageurial abilities but also technical expertise and human capacity to guarantee the success and viability of an UA project. Identifying them would help understanding the recipe to successful urban gardens and resources that are undeniably profound in the survivability of UA initiatives.

Guiding questions used to fill the table of results: (**RQ2**) What types of knowledge and abilities are necessary to initiate and maintain an urban garden successfully?

Table 4-9 Human capital and knowledge identified in the case studies.

Athens
Professional expertise, through the form of agronomists and landscapers (Ecoscapes), provided gardening and management services to help the good development and maintenance of the gardens. Good cultivation practices were also shared among beneficiaries and between gardens based on their experiences (both successes and failures), and information collected from online sources. Several skills were established by the committee to be key features that would translate to a successful community garden and part of the elligibility criteria to become a beneficiary: responsibility, commitment, behaviour within the community, good gardening practices, knowledge exchange potential. The continuous support of volunteers, municipality and between beneficiaries was also seen as a key component in the good functioning of the urban gardens. "*In our case, we see as factors of success that there was a good information campaign, that volunteers were mobilised and that we managed to attract sponsors to provide seeds, soil, etc., and also the exchange of information with other municipal gardens*" (Naturvation 2020a, interviewee no. 15, Social worker urban garden Marousi).
Barcelona
The lack of knowledge in agriculture techniques and practices among users was experienced as a barrier in the good development of the urban gardens and will postpone expected benefits from the activity. Motivation among urban garden's users is a significant factor in the perenniality of the project. In fact, land users perceived social interaction, task repartition and overall experience in a shared space to contribute to the feeling of belonging to a community. That sensation is a resource in ensuring the continuous participation of their members, thus labour force to cultivate the land.
Brussels
The BBP hold essential skills to enhance the use of vacant spaces for urban agriculture. The main components are communication and negociation with municipalities, local authorities and landowners to identify available lots and arrange its use by local and small-scale farmers. Terre en Vue developed a GIS database where potential available lands are mapped. Also, the organisation is involved in mediating the elaboration of land use contract that are beneficial for both landowners and local users.
Detroit
UA initiatives are reliant on volunteers and continuous labour force availability. The high interest and involvement from locals is explained by a genuine sense of community among African American citizens and basic human needs (healthy food, job opportunities, social justice). The collaboration between UA initiatives and larger organisations appears to be a main component in the establishment and governance of urban farms/gardens. They mostly provide knowledge in term of agriculture techniques to volunteers but also generate public's attention (e.g. external communication, media coverage). The capacity of the movement to build momentum around urban agriculture topic led to municipal reaction and urban strategy adjustment through top-down measures.
Leipzig
Human labour, in the form of volunteers, appears to be a major resource in the good maintenance and survival of the gardens. Finding these temporary users were experienced by project managers to be challenging. While urban planners consider the dependance on volunteering work to be risky in the long run. *"We notice that the asylum surge has declined. Many who took part in the project – families, kids, individuals – do not live in Leipzig anymore. Many moved to other places after getting their residence title or others were deported. That is why we have a smaller number of people and I think we have to advertise a bit and await what will happen with the accommodations in the area. Some have been closed […] and some were decentralised – and that is difficult of course to get more people when the accommodation facilities are gone."* (Naturvation 2020c,

interviewee no. 5, NGO representative) Collaboration and knowledge-sharing with the municipality, NGOs and expert helped the local initiatives to get skilled in gardening practices, managing self-governed projects, and becoming more flexible to urban changes (e.g. using transportable beddings in case of relocation). Also, the hierarchy was perceived to be more horizontal and contribute to more engaged participation from both municipality and citizens.

Analysis: What knowledge and human skills are relevant for UA projects to functions well and be recognize by urban planners?

Because urban planning decision-making is done by few actors in position to make choices, it is important to recognize the weight of human interactions in the final decisions taken. Several human qualities can be deducted from the results as factors that may influence the recognition of UA in vacant spaces as a legitimate urban strategy: curiosity, open-mindness, adaptability, environmental consciousness, negociation and communication skills. UA initatives must be convincing when exposed to stakeholders holding leverage in the decision-making (e.g. land owners). These interactions can also take the form of collaboration and partnership between various stakeholders through the form of knowledge-sharing. It helps building stronger relations which ultimately can help the development of UA projects and better maintenance approaches.

As mentioned previously, labour force and volunteering are inherent in the urban gardening maintenance of the studied UA projects. Therefore, it is crucial that locals are motivated to put time and stay engaged in the project to ensure the sustainability of the initiative. An important matter is the capacity of the project to reach locals that have an interest in becoming members or volunteers. Then, it is observed that the sense of community is crucial in retaining labour force to stay interested and involved in the project. Hence, the importance of micro-managing social interactions happening in the garden and be aware of potential conflicts within the project. Again, abilities to communicate, mediate and motivate are shown to be effective in the good functioning of urban gardens.

Factors of influence: knowledge-sharing, capacity to collaborate, accessibility to human labour, quality of human interactions, sense of belonging

5 Discussion

In this chapter, the findings from the five case studies are compared to the literature review in order to highlight and discuss a couple of interesting points: the value of using vacant spaces for urban agriculture rather than other types of use, and the main drivers and barriers to the development of successful urban agriculture initiatives. Then, the author reflects on both RQs choices before reflecting on the methodology used throughout this research.

5.1 Comparing the findings to the literature review

5.1.1 How urban agriculture established in vacant spaces differs from other activities established in vacant spaces?

Urban agriculture offers an umbrella of benefits that can mitigate urban challenges experienced by a city (Dorst *et al.* 2019, Lin *et al.* 2015). The case studies have proven that reality by dispensing a multitude of social, environmental and economic benefits that were expected from using vacant space for urban agriculture initiatives. They align with larger urban goals and targets set by public authorities that tries to answer issues presented by place-based factors. Yet, the case studies mostly highlight the impact that urban agriculture set in vacant spaces has on people. Being involved in community gardens benefits locals (Drake and Lawson 2014) and has also a strong positive effect on those taking part in these initiatives. The empirical data retrieved from the interviews of the municipal urban gardens in Athens show the dedication and appreciation locals have to share a space and experience the activities together (Naturvation 2020a, interviewee no. 16, Urban garden representative of the city council):

"*The fact that we are here, I will dare to say, that we are a community, is because we also organize social events, we have fun, we co-exist, we chat, we give solutions.*"

"We are holding public events, we have received awards. We are among the few in the country that still operate because we love it".

There appears to be something powerful about social interactions and growing food. The case of the urban farms in Detroit exemplifies well the deep societal and political dimension these initiatives have. O'Callaghan and Lawton (2015) investigated the impact of temporary initiatives in vacant spaces and it appears that there is a risk for initiatives set under a traditional model of urban planning to be more shallow with less impact on society as they tend to be relying less on innovative solutions. That's the case of temporary cultural events in vacant spaces that are existing to promote the image and identify of the city. On the other hand, bottom-up urban agriculture movements taking their roots in social and food justice carry an empowering vision that can defy the rules set by conventional urban planning processes. It had so much success among locals that it influenced the municipality to adapt and take measures to coordinate this practice. It contradicts Azunre *et al.* (2019) position that defends UA can't be efficient in the long-term if it is not part of the urban planning. As showed in the findings, UA in Detroit was an independent local practice until recently. This is an illustration of a successful urban agriculture story that made its way to the urban planning.

5.1.2 What are the main drivers and barriers to the development of successful urban agriculture initiatives?

Based on the case of Detroit, successful urban agriculture initiatives could be described as UA projects from which resulted a multitude of cross-sectorial benefits, influenced decision-makers to support it and to accompany it in its development, and created a rising movement of new local initiatives in the same city or elsewhere. At the scale of an urban garden, success is presented differently (Naturvation 2020a, interviewee no. 15, Social worker urban garden Marousi):

> *"In our case, we see as factors of success that there was a good information campaign, that volunteers were mobilised and that we managed to attract sponsors to provide seeds, soil, etc., and also the exchange of information with other municipal gardens"*

However, as seen in the literature, there is a multitude of barriers that prevent urban agriculture initiatives to be initiated, developed and sustained. The most important obstacle is the lack of accessible and available land (Ferreira et al. 2018). All case studies experienced that barrier, whether it is conflict of interests over land use because of land ownership (Anderson and Minor 2017, Németh and Langhorst 2014, O'Callaghan and Lawton 2015) or the lacking capacity of municipalities to secure lands (Ferreira et al. 2018, Goldstein *et al.* 2001). Another barrier that has been recurrent in the analysis of the case studies is the perception of urban agriculture and vacant spaces by locals and urban planners. It appears that the initial thought from urban planners to consider urban agriculture in the municipal strategies is strongly impacted by how they value these types of innovant alternatives to conventional urban planning. Pagano and Bowman (2000) showed that municipalities are limited in their capacity of adapting to new methods of planning urban spaces. However, the cases studies have shown that municipalities have been able to adapt to the local demand.

On the other hand, collaboration seems the most important factor to develop successful urban agriculture projects. The literature showed that local authorities are advised to strengthen the connexion between stakeholders involve in these activities (Manganelli and Moulaert 2019, Prové *et al.* 2016). In their own way, the five case studies highlight the power emerging from organised group of agents aiming to similar objectives. Also, knowledge-sharing and transparency is an essential aspect to these partnerships as the values materialized within these projects are transported through human interactions and can ultimately lead to a snow-ball effect if well communicated.

5.2 Critical reflection on the research design choices

5.2.1 Critical reflection on the RQ1

RQ1: *How land vacancy becomes part of cities' urban planning?*

The RQ1 seems to have been partially answered and did help to the general aim of the thesis. Several explanations come to mind.

- The case studies choosen, except for Detroit and Leipzig, have not been explored in the literature with the focus on urban vacant space management. On the other hand, the case of Detroit seems rich in publicly available data that looks at how land vacancy

is experienced and addressed. As land vacancy is quite a niche topic, only empirical data retrieved by the author from urban planners in the studied cases would have better helped answering the RQ. Also, it highlights the lack of studies done on that aspect of vacant spaces and could be interpreted as a low level of concern by municipalities to address land vacancy.

- The analytical framework is destinated to NBS while the literature review only looked at the use of vacant space for UA essentially. Therefore, the analysis couldn't capture the whole essence of vacant spaces within each (sub-) dimension as it only explored one type of vacant land use.

- However, as expressed above, the findings lack data on land vacancy and how it is approached by urban planners. To better answer the RQ1, interviews of urban planners should have been conducted.

5.2.2 Critical reflection on the RQ2

RQ2: *How urban agriculture initiatives in vacant spaces become part of the urban planning?*

The RQ2 seem to have tackle some of the aspects that were expected, but not all of them. Several explanations come to mind.

- By the question formulation "how" it was expected to discover "when" UA projects on vacant spaces become part of the urban planning to be able to pit-point the moment that a belief change into an attitude and action.

- The findings reflect a blurry line between top-down and bottom-up initiatives. It is difficult to deduct from the case studies at what point urban planners started realizing UA and decided to include it in the urban planning. Due to the lack of available data on that matter, it appears that only empirical study based on interviews of urban planners could answer it.

- The case studies are overlooking how urban gardens are managed, rather than explaining the mechanisms behind enabling its inclusion in urban strategies.

5.2.3 Critical reflection on the methodology used

The research questions could clearly benefit from an empirical approach to the case studies. In fact, it appears that the findings retrieved are not going enough in depth to answer RQ1 and RQ2. In order to define factors influencing urban planners' behavior, empirical data must be collected directly from these urban planners to guarantee authenticity of the findings. Although, it was the initial intent and research design (see Section 3.1).

Moreover, this research might omit existing papers relevant to the topic and case-study specific that could have contributed to the analysis. Thus, some case studies are going less in depth and contribute only partially to this research. It shows that some cities have been more studied than others, for example the case of Detroit. This lack of data reflects a knowledge gap,

especially on European cities, in the study of vacant spaces to urban planning. It also points that the urban planning decision-making has been under-researched in the field of urban agriculture.

It would be difficult to make generalization from the case studies findings as most urban planning decision are context specific and cannot be expected to develop in the same way in another city. Prové *et al.* (2016) defends that context specific factors shape enabling and constraining factors to UA, and therefore should not be detached from one another.

6 Conclusions and recommendations

6.1 Key lessons

The responsabilities of cities to adapt their urban land management to incorporate sustainability values have recently been reiterated and advocated by the European Commission (2017). New urban strategies, such as nature-based solutions, need to be adopted by municipalities in order to answer more complex urban challenges. Using vacant spaces for urban agriculture projects is one application of NBS and it is the one that has been explored in this thesis.

The research questions investigated how land vacancy becomes part of cities' urban planning (RQ1) and how urban agriculture initiatives in vacant spaces become part of the urban planning (RQ2). Although partially answered, the two research questions contributed to the aim of the thesis which has been to identify factors influencing municipalities to include the use of vacant spaces for urban agriculture projects in urban planning. The appropriation of the Nature-Based Innovation System (NBIS) framework, that serves to identify factors enabling and constraining nature-based innovation, helped to cross analyse five case studies where UA has taken part in urban planning. Compairing these findings to a literature review, which introduced the concepts of vacant spaces, urban agriculture and urban planning and how they interact with one another, helped to identify twenty factors that influenced municipalities in their decision-making over UA in vacant spaces.

The findings conclude to the elaboration of twenty factors that influence urban planners' decision-making in considering and including urban agriculture in vacant spaces in the urban planning strategies: accessibility to human labour, capacity to adapt, capacity to collaborate, citizen participation in decision-making, commitment level of land users, contextual factors, funding opportunities, governing style, hierarchical position, knowledge-sharing, land accessibility, land ownership, local needs, paradigm between own beliefs and attitude, perception of sustainability, perception of UA projects, perception of vacant spaces, quality of human interactions, sense of belonging, and urban challenges.

All these factors appear to have an important role in the decision-making process of urban planners. Therefore, they affect the capacity of cities to address land vacancy and enable UA projects within their urban planning.

6.2 Recommendations for future research

The existing literature mostly focuses on land vacancy for its types of use, potential it holds, and consequences of shrinking cities in the USA. Also, urban agriculture has been lacking research that helps understanding how it is processed in urban planning. The case-study analysis and findings contributed in addressing the research gaps by trying to define factors enabling and constraining the mechanisms inherent to urban planning in the field of UA in vacant spaces.

Considering the context specificity character of the case-study, it is recommended to do research on this topic based on a unique case study method. Such research design should be mostly focusing on create new empirical data based on interviews of urban planners and locals participating to UA projects on vacant spaces. Following this method will guarantee insightful

findings that could contribute to identify a multitude of drivers and barriers influencing urban planners to set vacant spaces and UA in the urban planning Agenda.

Also, in general more empirical research should be done on the topic of vacant spaces in Europe. The goal of this type of research would be to identify how vacant spaces are handled in Europe, how it differs from one city to another and what are the parameters that influence these changes. Land vacancy is an issue and opportunity that should be addressed with more in-depth researches based on empirical data, especially in European cities.

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Appendix I – NBIS framework

Overview of the dimensions and associated subcategories of the Nature-Based Innovation System (NBIS) framework.

Dimension	Dimension subcategory	Description
Agency	*Leadership and power*	People and organizations in the stakeholder landscape taking up leading roles to support NBS development, e.g. champions, mayoral leadership, frontrunners
	Commitment	Long-term support of NBS development by individuals and/or organizations is key to scaling of NBS
Discourse and vision		Framing NBS as an approach to urban reinvention addressing multiple locally relevant sustainability challenges in order to strengthen actor networks around NBS
Legislation and policies		The development of legislation, regulations, policies and strategies supportive of NBS or dissuading competing alternatives
Governance structure		Processes of governing that involve a broad range of stakeholders across horizontal and vertical scales, and across different sectors, domains and disciplines, with a diffusion of responsibilities and power
Collaborative arrangements	*Networks and partnerships*	Learning and experimentation with NBS relies on the development of formal and informal coalitions between individuals or organizations, and attempts to strengthen and diversify these by boundary spanners and intermediaries
	Participation	Processes of involving and engaging citizens in the planning, development and maintenance of NBS contributes to experimentation and the integration of local knowledge and place-based factors in NBS development
Learning	*Education and training*	Actors and organizations engaging in a process of active learning, with a view on increasing confidence and capacity around NBS development and scaling
	Research	Knowledge production in relevant areas such as assessment of ecosystem services and environmental governance, and developing a science-policy interface, contribute to effective value delivery of NBS
	Experimentation	Testing or piloting local-level projects or governance arrangements aimed at nature-based innovation contributes to learning about how to effectively design and implement NBS
	Monitoring and evaluation	Systematically assessing outputs, outcomes and impacts of NBS is crucial to ensure ongoing alignment with place-based factors
Resources	*Knowledge and human capital*	The availability of explicit knowledge concerning e.g. technical implementation of NBS, values of NBS, established governance structures and tacit knowledge on socio-ecological systems, as well as skills to e.g. create and manage NBS and engage in partnership working contribute to the effectiveness of NBS delivery
	Financial factors	The availability of funding, financial incentives or market demand for the development of NBS
	Technologies	The availability of technologies supporting NBS development, implementation and knowledge management
Place-based factors	*Built environment*	Adapting to urban (infra)structures, amenities and their distribution influences the capacity for NBS development and scaling
	Natural processes and endowments	Responding to local soil conditions, local flora and fauna, climatic conditions etc. in the planning, design and maintenance of NBS
	Societal conditions and dynamics	Aligning NBS with population dynamics and socio-economic change across space by involved actors
	Cultural frames of reference	Aligning NBS with broadly shared (i.e. societal) practices, norms and attitudes in order to improve the use and uptake

***Source**: Table retrieved from Van der Jagt, A.P.N., Raven, R., Dorst, H., Runhaar, H. 2019. Nature-based innovation systems. Environmental Innovation and Societal Transitions (35), June 2020, pp 206.*

Appendix II – Recapitulative table of the findings from the case studies

Dimension	Sub-dimension	Athens	Barcelona	Brussels	Detroit	Leipzig
Place-based factors		The Athens-Attica region counts 66 municipalities and totalizes around 3,750,000 inhabitants. Greece had its economic system deeply impacted by the financial crisis of 2007-2008. The budget allocated to the environmental sector got cut, which limited the support and development of green projects led by civil society in the Athens-Attica region. It resulted in the degradation and abandonment of public green spaces, mainly due to the lack of funds and associated poor maintenance. Also, the city is victim of the heat island effect and air pollution, which has been partially explained by the lack of green spaces. These issues were partially addressed by few municipalities through community garden strategy. The three urban gardens studied are based in the municipaly-owned vacant land of Agios Dimitrios and Marousi (located in the suburbs of Athens).	The city of Barcelona is known to be a compact city (1 620 343 inhabitants in 101.4km² in 2018) with a limited amount of publically owned vacant lots. Therefore, bottom-up initiatives claiming that urban space for innovative projects are confronted to traditional urban planning strategy involving the construction of public facilities (school, retiring home, hospital). "*Barcelona is a very small and very compact city. It is difficult to find free space. Urbanistically I think it has to be very complicated. But for small sites to be rescued, it could be like this, with small green interventions...*" (Naturvation 2020b, interviewee no. 6). "*What happens in Barcelona is that the struggle between legitimate interests of people who need housing, and who needs a lot of social housing, in order to bring the prices down, and solve a housing emergency, collides with the demand for more green, which clashes with the demand of more constructions and infrastructure. That is, this is an open debate.*" (Naturvation 2020b, interviewee no. 1). The economic crisis and resulting austerity measures led to a budget restriction for the municipality on its construction projects and the abandonment of several spaces around the city. Decentralised	Brussels-Capital Region (BCR) regroups 19 Municipalities with a population of 1,208,542 inhabitants (BISA 2019). The region accounts 300 urban gardens (88ha), characterised as small land plots from 0.5ha to 1ha each, where urban agriculture practices happen. They are established in vacant spaces within housing zones, close to infrastructures or upon green areas. These urban agriculture projects have been started by the well-established peri-urban agriculture's coalition Boeren Bruxsel Paysans (BBP), pushed to mobilize against binding practices pressuring land use.	Detroit (MI) is categorised as a shrinking city due to the deindustrialisation from the automobile sector. Population loss (from 951,000 to 670,000 between 2000 and 2019), high unemployment and low-income rates (38% of the population is living under the poverty line), and segregation of the African American community exemplify challenges faced by the city. In regard to the demographic changes over the years, a multitude of properties and lands were let vacant (105,000 vacant lots representing 15,000 acres). In order to address the urban challenges represented by a perforated city, local initiatives (inspired by the potato gardens during the Depression) started planting and cultivating food on vacant lots. Today, the city accounts for more than 1,500 urban gardens and farms over 165 acres and became a symbol for urban agriculture enthusiasts.	Leipzig is a shrinking city. Its current population (587 857 inhabitants in 2018) is equivalent to the numbers of 1918 but spread over four times the land surface used at that time. Therefore, the city is prone to a large amount of vacant spaces. *"…We have a landscape transformation […] manifesting in the development from an energy landscape to a leisure and natural landscape."* (Naturvation 2020c, interviewee no. 20, City representative Leipzig) Leipzig East is characterized by a population with a high unemployment, social welfare support and number of migrants' rates. The area is lacking green spaces and subject to stigmatisation over socio-economic status of the population. As a response, bottom-up initiatives have risen to confront the city of Leipzig urban planning strategy on vacant plots. These pieces of land are reclaimed to enhance green areas in their neighbourhood and to be used as a space for social interactions and cohesion. The focus is on two bottom-up gardening initatives in Leipzig East area: Querbeet and Bunte Gärten.

			initiatives took this opportunity to claim these lands as a solution to revitalize several districts, fill the lack of green areas, enhance social interactions and promote citizens participation in local activities. Overall, Barcelona is subject to an urban transition pushed by a growing amount of initiatives providing solutions to socio-environmental issues (e.g. slow food, local farmer market). The two urban gardening initiatives studied in Barcelona are the "Illa dels 3 horts" and the "Espai Germanetes".			
Discourse and vision	Goals and targets	Athens is taking part of the 100 Resilient Cities network which aims at enhancing the resilience of cities to crisis by 2030. Therefore, one of the main focus of Athens is to support vulnerable groups as well as enhancing social solidarity. Due to the effects of the economic crisis, municipalities in the region took the responsibility to tackle social and environmental issues. The main goal being to change people's behaviour towards nature in the urban context. The two municipalities selected adopted urban allotment gardens as a solution to enhance urban food production and promote green behaviour and cohesion among citizens.	The City Council of Barcelona embraced the momentum generated by the rising local demand for neighboring green areas and the global call for city's responsibility in achieving sustainability goals to adopt alternative urban planning methods based on citizens engagement. These community gardens were designed with the intention to be innovative by defying traditional urban planning strategies and by involving civil society groups in defining and managing urban space in their neighbourhood. "*This project arises with the intention and purpose of creating green spaces in the city, and to create a social garden in the city*." (Naturvation 2020b, interviewee no. 3).	The Ministry of the Environment, Quality of Life and Agriculture of the BCR launched the 'Good Food Strategy' in 2015 as a plan for the region to transition towards sustainable food system. Urban agriculture and access to land are two essential aspects recognised by the Ministry to encourage innovation and inclusion to build a new food system. (e.g. urban and peri-urban agriculture will produce 30% of the unprocessed fruit and vegetables consumed locally by 2035; 30% of households will produce some of their own food by 2020) The BBP's coalition aims at facilitating the access to urban space for locals wishing to produce food in their neighbourhood and to protect peri-urban agriculture. Also, it acknowledges that regional and	One of the main objectives set by the Mayor of Detroit is to rebuild and strengthen the neighbourhoods through citizen engagement and supporting policies. Urban land vacancy is a recognised issue by the City Council, leading to its inclusion in Detroit's Sustainability Action Agenda. From the 10 defined goals, two are directly concerning UA and vacant spaces: "increase access to healthy food, green spaces and recreational opportunities" and "transform vacant lots and structures into safe, productive, sustainable spaces" (Detroit Office of Sustainability 2019, p 27). The latter informs of clear targets concerning the development of vacant space within land management: reaching 24,500 (2024) and 36,500 (2029) of sold vacant side lots; and increase usable space for agricultural purposes to 300 (2024) and 500 (2029) acres.	The municipality of Leipzig, the state of Saxony, the Federal Republic of Germany and the EU share common goals in term of urban planning strategy such as: decreasing carbon emissions, revitalizing urban areas, enhance social cohesion and citizen participation by providing the space for it. These objectives align with the ones from the urban gardening initiatives. The greening of cities in Germany has been advocated by the Federal Ministry of the Environment pointing the importance of green spaces in cities. With the additional aim of giving a better image to disadvantaged quarters in the city, the municipality of Leipzig aims at regenerating post-industrial lands into urban green spaces as well as increasing its support to local green initiatives.

				municipal practices are not in line with the goals set by the 'Good Food Strategy' and would require stronger support, vision and leadership from the governmental entities responsible to its achievement.		
	Place of UA and VS	Historically, Athens has been home to social bottom-up movements claiming public unbuilt spaces for open public use and promoting the greening of the urban landscape. However, during the economic crisis unused public spaces were mostly covered for commercial means for the survival of small businesses. Urban agriculture in vacant spaces is perceived as an optimal solution by municipalities to beautify derelectic lands, enhancing social cohesion and inclusion, improve well-being, provide livelihood alternative and increase environmental awareness. Tangible benefits, such as food production and embelishment of the plot, appears to be the most significant concerns for both urban planners and local users. "*From this I cover our needs for vegetables in the house, and I also give to the social grocery, and to some friends. If I have a good production, more families will eat. We are five in my family and only one has a job, the rest we are unemployed*" (Naturvation 2020a, interviewee no. 19, Cultivator AD urban garden).	Locals perceive the vacancy of lots in their neighborhood as an opportunity for small-scaled initiatives over convential alternatives (e.g. recreational parks). With non-profit associations, they were mainly interested in the space provided by urban gardens to restore social and climate justice. Urban gardening in vacant spaces is seen for families to educate their children to healthy and sustainable practices, to generate green areas in their neighbourhood, as well as enhancing the feeling of belonging to a community gathering people from various socioeconomic backgrounds. "*The fact that there are orchards, there are flowers, and there is also a space where you can talk, this is all important for the issue of cohesion.*" (Naturvation 2020b, interviewee no. 6). The urban gardening strategy was considered by the municipality for its expected associated social and environmental benefits: enhancing social interactions, generate positive externalities to the neighbourhood through ecosystem services, grow food locally, educate locals to sustainability-related topics.	The perception of land availability and usability for urban agriculture is conflicting in the region. The regional planning doesn't legitimize urban agriculture as a type of land use. This argument is shared among most municipalities and landowners in the region, who are reluctant to support urban agriculture projects and provide land to locals. However, some municipalities (Anderlecht, Dilbeek and Sint Pieters Leeuw) were open to these experimental initiatives and the idea of using available space for urban agriculture.	Vacant lots are recognised by the municipality as part of the identity of the city and a result of its history. Also, they are often associated to development opportunities and urban agriculture. The latter is perceived primarily as a way to reduce the negative impacts of shrinkage. Grassroots initiatives value their potential to address urban decay, "food deserts", and social injustice. The main expected benefits are resistance to food, social and environmental injustice, empowerment of local black community, improving living standards of low-income households, and bringing cohesion within neighbourhoods. These reclaimed parcels of lands hold a symbolic and political values among locals. Therefore, the vision from larger urban farms (e.g. Hantz Woodlands) are conflicting with the initial purposes instituted by local communities.	Vacant lots are considered in Leipzig to be a result of post-industrial demographic changes and became source of conflicts between self-organised civil society, private investors and the municipality. Both private and public landowners' decisions to rent/sell are drawn by the market forces and economic benefits over social and environmental outcomes. Urban gardens are appreciated for the ecosystem services they provide to the neighbourhood and city. In the East part of Leipzig, these initiatives were mostly considered for their social impacts by engaging locals in urban politics, giving space for social interactions and providing environmental awareness through educative activities. However, activists and locals fear that greening strategies such as urban gardens in the area accentuate gentrification effect as the price of property may consequently rise, pushing households with lower incomes to relocate.
Urban planning and policies		Throughout the economic crisis, commercial activities were prioritized	The municipality of Barcelona shifted its urban strategy over the years, from	The BBP initiatives led to the development of temporary land	Detroit started tackling land vacancy within urban planning with the "Farm-A-Lot	The municipality of Leipzig has dedicated offices (e.g. the Office of

		by several policies to function in public spaces. This strategy led to the diminishment of bottom-up initiatives involved in urban spaces. The municipalities of Agios Dimitrios and Marousi have been pioneer in the region in term of urban gardening policies, especially through the implementation of the "urban farming lots for organic cultivation" strategy. This successful urban planning strategy spread up across Greece and influenced other cities' local policies to adopt it as well. The municipality-led urban gardening initiatives were supported and included in a Public-Private partnership scheme under the strategic framework proposed by the Greek government from 2007 to 2013	prioritizing grey infrastructures for public facilities to putting grey amenities and bottom-up initiatives support forward in its urban planning agenda. Urban planners proposed the Pla Built scheme, a policy focusing on public engagement through urban gardening, as a nature-based solution to socio-environmental issues. It takes part of a larger set of measures promoting sustainability, participation and green solutions. The projects established based on that policy are designed to be temporary (1 to 3 years) and under civil society groups management. This policy only concerns urban vacant spaces owned by the municipality as there are no plan and political will to invest in private lands. Due to the popularity and success of these projects, the Pla Built policy has been revised in order to provide continuity to the urban gardening by ensuring the permanency of the land use for these communities. It has been decided by the municipality to support community management of 'citizen's heritage'.	lease agreements in the municipalities supporting urban agriculture projects. Under these contracts, the user has the right to dispose of the land for a limited time until the landowner decides otherwise. These agreements are often allowed for a symbolic amount of money, but on some cases (depending on landowner position towards urban agriculture) it is rented. On the other hand, established conventional farmers are protected by long term leases, which are limiting the emergence of new forms of farming practices and peri-urban agriculture.	Program" (1975-2002), where gardening practices were taught for people to cultivate food on vacant lots. The municipality recognised the decline of Detroit and decided to readjust its urban strategy through "smart decline" policies. It built up a framework plan, Detroit Future City, by planning for improving the quality of life of locals adapted to its current population numbers. Detroit City Planning Commission (CPC) established the Urban Agriculture Ordinance (UAO) providing legality to urban agriculture projects by officially coding zones as agricultural. The objectives were to give land security for informal (illegal) farming and set agriculture standards in the urban context. The city sells lots from unoccupied properties for 200-300$. Urban gardens play under Michigan's 'Right to Farm' act recognising that lands rezoned for agricultural purposes cannot be retrofitted to non-agricultural zoning. Moreover, they need to be conformed to the Generally Accepted Agricultural and Management Practices (GAAMPS) from the Michigan Department of Agriculture and Rural Development.	Green Space and Water) collaborating and taking care of including nature-based solutions in the urban planning strategies. In the 1990s, the city adopted a "plot management system" with its associated plateform to register a plot in the database and temporary use agreements. This scheme aims at facilitating the negociation of privately-owned land's usage rights for local project supported by the municipality, such as Querbeet. *"We had to just look into the plot management system by the City's Office for Urban Green and Water, decided for a plot and then anything went relatively smoothly. This is no longer thinkable."* (Naturvation 2020c, interviewee no. 7, Scientist). On the other hand, the municipality has a low willingness in disposing the urban spaces it owns to bottom-up initiatives as it goes against its longer terms strategies of using urban space for economic growth. The administration of Leipzig established "Thinking Leipzig Ahead", a project partly-included in the urban planning decision-making by involving citizens to participate in discussing the sustainable urban development of their city through workshops, surveys, events.
Governance system	Actors involved	City councils, vulnerable local citizens, landscape company (Ecoscapes), private tobacco company (Japan Tobacco International), the European Commission, volunteers. "*We do not usually work with public bodies but from time to time, as in this case,*	City council, self-organised civil society (families, association of neighbours), a non-profit cooperative (TARPUNA: supports urban agriculture for social inclusion of communities risking exclusion).	Municipalities' representatives, Ministry of the Environment, the Boeren Bruxsel Paysans (BBP) coalition, bottom-up organisations (Terre en Vue: facilitates land accessibility for urban agriculture; CREDAL: supports credit for small and local entrepreneurial	Detroit City Planning Commission (CPC), City Council, UA organisations, Wayne State University, grassroots initiatives and associations, gardeners and farmers, local communities	City Administration (office for Urban Green and Water, urban quarter managers), state legislation, EU, Federal Ministry of the Environment, NGOs, self-organised civil society, locals

		partnerships are formed - and this has been increasing lately. A private company, JTI, who wanted to grant an action with a social character, has approached us for this urban garden project. We talked to an agronomist working with us and used to work in the Municipality of Marousi. So it happened." (Naturvation 2020a, interviewee no. 18, Project coordinator Ecoscapes).		projects), association (Début des Haricots: promote sustainable urban agriculture and local food networks), land owners, conventional farmers, and new small-scaled farmers.		
	Leadership	For both cases, the urban agriculture strategy initiated from representant of their municipality supporting the idea of locals growing and consumming fruit and vegetables in urban spaces. The role and functions of the urban gardens are set by the municipalities themselves. The regulation shifted to be more flexible and transparent by engaging a committee of representatives that would not only include members of the municipality (e.g. inclusion of social workers and landscaping company in Marousi). "*There is no internal governing structure in the garden, in the form of a formalized assembly or cooperative. We had a general meeting which was pushed by me, every two months in 2017.*" (NATURVATION 2020a, interviewee no. 16, Urban garden representative of the city council AD). In Marousi, a landscape company (Ecoscapes) is responsible for the design and maintenance of one of the gardens. Agronomists were also involved in the project by providing gardening practices recommendations to the users. Funders of these projects, such as the EU commission and the private	The municipality takes a step back in the governance of the vacant spaces provided to civil society under the Pla Buits scheme. In fact, it mostly collects data from these urban gardens as a method to assess the success of its policy (e.g. accounting the amount of people participating, quantity of activities organized). However, the temporary dimension of these projects defines a certain power hold by urban planners once they decide to start construction projects on the occupied public spaces. Due to the citizen-centric dimension of the Pla Buits policy, the urban gardens are essentially managed by the protagonists using it. "*Well, in the Pla Buits those who are involved are mostly entities that are already formed and active in the neighborhoods, such Neighborhood Associations or other types of groups, which are already self-managed, what they do is to apply to manage the space.*" (Naturvation 2020b, interviewee coded GR). In Illa dels 3 Horts, the social cooperative TARPUNA took a leading role in developing the urban garden. After few years of activity, the leadership of the gardens were	The BBP initiated the urban agriculture movement and local food networks in the Brussels-Capital Region. The coalition is composed of grass-root organizations, state agents and other organization supporting bottom-up initiatives. Such collaboration pushed its different actors to express in one voice their leadership and proactive stance in the field of urban agriculture and land use. Still, municipalities and landowners appear to hold the most significant power in term of final decision-making. They tend to not support alternative food systems and speculate on the value of their land. This conflict of interest with the BBP is a barrier to the development and implementation of small-scale agriculture projects in the region. State institutions are criticized to lack of leadership, political capacity and commitment to have organizations and institutions collaborating to expend local urban agriculture across the region. Despite having the	Detroit is home to numerous bottom-up urban agriculture initiatives that started the development of informal gardens on vacant lots. They involve non-profit, community-based and UA organisations that are managing activities on vacant lands and coordinating with other stakeholders (e.g. soup kitchen, restaurants). Large UA organisations (e.g. Detroit Black Community Food Security Network, Greening of Detroit, Urban Farming) appears to have the most knowledge and overall governing power. Large entrepreneurial urban farms, such as Hantz Woodlands taking place in 1,500 lots over 144 acres, had leverage on the municipality's regulation over land management. It pushed the officialization of the Urban Agriculture Ordinance (UAO) to set standards for commercial agriculture and community gardening. The municipality gets mostly engaged in large urban agriculture projects expecting to result in economic benefits and jobs creation. However, the legitimization of vacant lands and urban agriculture policies was made possible by the support from CPC board members to establish the Urban Agriculture Workgroup to write the UAO. The collaborative work included non-profit	The gardening projects are entirely managed by the group of locals who established them. For Querbeet, the function and activities taking place on these vacant lots are decided among the collective of land users. Such managing freedom was made possible by temporarily renting a vacant land owned by the municipality. On the other hand, in the case of Bunter Gärten, land users must comply to specific rules set by private landowners (e.g. limited amount of cultural activities). *„The word [of environment protection measures, note from the authors] spread in a quarter and the people came to my boss and asked him about it and he was open for it."* and *"district mayor who was […] very pragmatic and wanted to change something, too."* (Naturvation 2020c, interviewee no. 3, City representative Leipzig) Representatives of the city of Leipzig were enthusiasts to the bottom-up movement asking for measures ensuring the protection of the environment (Naturvation 2020c, The municipality is more or less involved with the projects depending on their profiles (e.g. scale, location, activities). Nonetheless, they are

		tobbaco company (JTI) have leverage on the decision-making happening at the local level.	transfered to an association of families in order to give continuity and ensure its maintenance by guaranteeing public participation. In Espai Germanetes, the development and management were made possible by self-organized groups of people mostly living around the urban garden.	Ministry of the Environment within the BBP, it doesn't disable institutional barriers for land accessibility.	organisations, State Universities, municipality's offices and communities.	integrated to some degrees on the urban planning strategies through "Thinking Leipzig Ahead". In light of parallel urban objectives for demographic and economic growths, the city of Leipzig prioritizes the construction of public facilities (school, childcare) and investments of private businesses on urban vacant lands. While private owners have decided at several time to sell temporarily used plots, leading to relocation of the gardening initiative. *"We already had to move once as there was a kindergarten to be built […] Of course we understood this. […] Then we have been on the new plot in the Neustädter Straße for only 1,5 years as our landlord threatened to sell the plot. This is still up-to-date. And we had decided in a plenum that we do not want to support the landlord in staying on the plot until the price for it has risen and he could make even more money with it. So we want to move earlier than we have to. But it is much more difficult to find a new plot than it was 6 years ago."* (Naturvation 2020c, interviewee no. 7, Scientist)
	Public participation	To some extend, these initiatives were pushed by bottom-up pressure in the Athen-Attica region. Ultimately, it led to the respective municipalities taking action and organising themselves to govern the urban gardening initiatives. The participation of citizens within such urban strategy is defined by the activities done in the garden (maintenance and management), the dialogue with the city council to establish the elligibility criteria and	As these projects pivot around public participation, the rate of engaged members in the activities of the urban gardens takes a crucial place in their success. For example, the lack of long-time commitment of members throughout the development of the garden in Illa dels 3 Horts, from plantation and maintenance to harvesting, led to poor observable results. To solve this issue, several families took over the cultivable lots	The ambitions of the BBP's coalition to provide locals with available land for small scaled urban agriculture make it that citizens are directly involved in the maintenance of these lands. The BBP is constituted of bottom-up organisations regrouping people willing to plan, develop and farm lands allocated. To some extent, citizens are	The mainstreaming of urban agriculture in vacant spaces takes it source from public participation and engaged citizenry to grow food in neighbourhoods. Communities initiated the development of this trend and take the associated responsibilities (e.g. land tenure, respecting GAAMPS). The bottom-up initiatives function for the most part autonomously, meaning the municipality has low involvement in the functioning of the urban garden and farms. This leaves locals with larger freedom but	Leipzig has a rich history in citizen participation on urban planning decision-making. Urban planners have recognised the importance of public engagement from an early stage in the urban planning processes and its role in the success of urban policy. Top-down (e.g. plan, survey) and bottom-up (e.g. feedbacks) streams of information regarding urban planning are coordinated by communal representatives if not handled to consultancy bodies. "Thinking Leipzig

		choose the beneficiaries, and the common agreed decision to modify the rules applying to these initiatives. Not all beneficiaries are taking good care of their lots, but the mix of vulnerable and non-vulnerable families contributes in the collaboration of both groups and motivational value that dynamic brings (Naturvation 2020a, interviewee no. 18, Project coordinator Ecoscapes).	and organised themselves to guarantee a high rate of participation. "*When we first presented the project, it was the most valued of all, because it had a lot of entities. But later this did not translate into participation. And when each entity goes its own way, has its own struggle, and not doing one thing in common, things don't work. It took a long time for things to start in terms of maintained participation.*" (Naturvation 2020b, interviewee no. 5). Self-governed urban spaces appeared to empower members of the project and provide unity to a community and neighbourhood.	involved in the discussions and decisions made by the coalition.	more dependency on public engagement in the projects. Citizens participated in designing the UAO, top-down response to the growing demand for UA, through community meetings held in public spaces.	Ahead" hold an important role in that exchange. In the two cases, locals initiated the urban gardening discussion with the municipality and urban quarter representative. The ideas were discussed, evaluated and integrated in the urban strategy. Throughout the development of the project, public participation was maintained while authorities representing the municipality engaged with locals in less formal processes.
Resources	Financial and material	The cultivated lands were made available by the municipality, as well as the tools and access to water (well or water tank collecting rainwater). All initiatives were funded by public finance (municipality and EU support) which contributed in the investment of gardening materials, seed and payment of the agronomists. In the case of Marousi, private funds from JTI contributed in the establishment and expansion of the project. "*We (cultivators) built the fence and we brought the soil. Everything with our own money. The city only pays for the water, whenever they provide it to us. Well, they also separated the plots, and they brought us plants the first day at the opening. Oh, and the gave us rubbish bins and a small warehouse…*" (Naturvation 2020a, interviewee no. 20, Cultivator Marousi)	The municipality offers financial fundings for which the urban gardens projects may apply to. Basic needs for the daily maintenance of the gardens, such as water and electricity supply, are automatically povided by the municipality. "*Each group takes care of the seeds, the staff and all of this is organized by themselves, it is independent. We work with Fundació Àmbit Prevenció, they pay us for the social work we do. Then, through the City council, they bring us the compost, the humus, once a year... and they give us this subsidy (1000 euros).*" (Naturvation 2020b, interviewee no. 3). Other fundings schemes are flexible and different from one project to another depending on how finances are managed. In Illa del 3 Horts, members involved contribute financially to the treasury of the project while other might offer voluntary work.	The BBP peri-urban agriculture projects were supported by funding from the Ministry of the Environment, part of a governmental funding program for the transition of food systems (before the 'Good Food Strategy'). The European Regional Development Funds also helped the BBP to carry on its experimental projects. Despite the financial support these initiatives benefit from, it can't be implemented if the access to underused/vacant lands is not guaranteed. Often, agricultural lands are rented by established conventional farmers with historical and unlimited land use rights. It represents a major entrance barrier for new farmers willing to experiment growing food locally.	Vacant urban spaces have low entrance barriers, meaning it is simple for anyone to claim a parcel of land and start growing food. However, getting property rights through land acquisition is more challenging. Turning vacant buildings into brownfields ready to host agricultural plots is costly for the municipality. In 2020, 4million$ were invested by the city and partners to maintain 192 vacant lots and grow crops in some of them. Urban farms/gardens development and maintenance rely on voluntary work and self-funding (e.g. selling production to Eastern Market or soup kitchen), mostly because there exist no consistent funding opportunities from the municipality. On the other hand, growers find support in UA organisations providing seeds and advices which avoids potential costs.	Projects belonging to the NBS category or contributing for urban renewal and creation of green spaces in the city may apply for a multitude of funding schemes. They are communicated by city representatives and offered by the Federal State, the State of Saxony, the EU, Banks for Reconstruction (special loans contract for green projects) or the city itself. These formal funding schemes requires a lot of efforts from organisations led by locals to gather required informations. *"wherever possible […] tried to receive funding from public schemes, and otherwise via donations and voluntary work"* (Naturvation 2020c, interviewee no. 5, NGO representative). Small-scaled projects such as Querbeet and Bunte Gärten were able to apply and receive several of these fundings, while providing the development of their activity through voluntary work and donations.

	Human capital and knowledge	Professional expertise, through the form of agronomists and landscapers (Ecoscapes), provided gardening and management services to help the good development and maintenance of the gardens. Good cultivation practices were also shared among beneficiaries and between gardens based on their experiences (both successes and failures), and information collected from online sources. Several skills were established by the committee to be key features that would translate to a successful community garden and part of the elligibility criteria to become a beneficiary: responsibility, commitment, behaviour within the community, good gardening practices, knowledge exchange potential. The continuous support of volunteers, municipality and between beneficiaries was also seen as a key component in the good functioning of the urban gardens. "*In our case, we see as factors of success that there was a good information campaign, that volunteers were mobilised and that we managed to attract sponsors to provide seeds, soil, etc., and also the exchange of information with other municipal gardens*" (Naturvation 2020a, interviewee no. 15, Social worker urban garden Marousi).	The lack of knowledge in agriculture techniques and practices among users was experienced as a barrier in the good development of the urban gardens and will postpone expected benefits from the activity. Motivation among urban garden's users is a significant factor in the perenniality of the project. In fact, land users perceived social interaction, task repartition and overall experience in a shared space to contribute to the feeling of belonging to a community. That sensation is a resource in ensuring the continuous participation of their members, thus labour force to cultivate the land.	The BBP hold essential skills to enhance the use of vacant spaces for urban agriculture. The main components are communication and negotiation with municipalities, local authorities and landowners to identify available lots and arrange its use by local and small-scale farmers. Terre en Vue developed a GIS database where potential available lands are mapped. Also, the organisation is involved in mediating the elaboration of land use contract that are beneficial for both landowners and local users.	UA initiatives are reliant on volunteers and continuous labour force availability. The high interest and involvement from locals is explained by a genuine sense of community among African American citizens and basic human needs (healthy food, job opportunities, social justice). The collaboration between UA initiatives and larger organisations appears to be a main component in the establishment and governance of urban farms/gardens. They mostly provide knowledge in term of agriculture techniques to volunteers but also generate public's attention (e.g. external communication, media coverage). The capacity of the movement to build momentum around urban agriculture topic led to municipal reaction and urban strategy adjustment through top-down measures.	Human labour, in the form of volunteers, appears to be a major resource in the good maintenance and survival of the gardens. Finding these temporary users were experienced by project managers to be challenging. While urban planners consider the dependance on volunteering work to be risky in the long run. *"We notice that the asylum surge has declined. Many who took part in the project – families, kids, individuals – do not live in Leipzig anymore. Many moved to other places after getting their residence title or others were deported. That is why we have a smaller number of people and I think we have to advertise a bit and await what will happen with the accommodations in the area. Some have been closed […] and some were decentralised – and that is difficult of course to get more people when the accommodation facilities are gone."* (Naturvation 2020c, interviewee no. 5, NGO representative) Collaboration and knowledge-sharing with the municipality, NGOs and expert helped the local initiatives to get skilled in gardening practices, managing self-governed projects, and becoming more flexible to urban changes (e.g. using transportable beddings in case of relocation). Also, the hierarchy was perceived to be more horizontal and contribute to more engaged participation from both municipality and citizens.
References		**Kotsila (2018)** Partalidou and Anthopoulou (2019) **Naturvation (2020a)**	**Kotsila (2017)** **Naturvation (2020b)**	Brussels Environment (2015) Manganelli and Moulaert (2019)	Colasanti *et al.* (2013) Detroit Office of Sustainability (2019) Giorda (2013) Mogk *et al.* (2010) Paddeu (2017)	Florentin (2013) Naturvation (2017c) **Naturvation (2020c)** **Werner *et al.* (2017)**