

How can urban gardening address social sustainability?

Nature-based solution case studies in Lille, Brussels and Paris

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Abstract

Nowadays, European cities contain more than 70% of the population of the continent and are still growing. This growth tends to put pressure on the challenges that urban areas are already facing. The range of these challenges is wide, such challenges being social, environmental and economical. Air pollution, health issues, increasing heat, integration, social exclusion, loneliness or mobility problems illustrate such diversity. Urban community gardening as a Nature-based Solution (NbS) could contribute to solve some of these challenges making cities greener and gathering people around common objectives. Nevertheless, despite the solutions they provide, urban community gardens often face challenges such as lack of funds or no field. The aim of this thesis is first to examine the drivers and barriers that a project of urban gardening can face during its creation and maintenance through three case studies in Lille, Brussels and Paris. Second, it is to explore social implications of these case studies to gain a better understanding of the solutions they can bring. This study mainly answers to such questions through interviews of garden participants and managers. The used criteria for such evaluation are inspired by literature and the EKLIPSE framework. The creation and maintenance of urban gardening projects seem to often depend on the involvement of public authorities, which provides funds and space. The implications of the projects have shown to be diverse depending on their objectives. Nevertheless, education and sensitization to gardening and sustainability appeared to be among the main implications.

Keywords: Nature-based Solutions, urban community garden, social impacts, barriers and drivers

Executive Summary

Problem Definition

Nowadays, European cities contain more than 70% of the population of the continent and are expected to reach 80% by 2050 (European Commission, 2016). This growth tends to put pressure on the challenges that urban areas are already facing. The nature of these challenges is diverse being environmental, economical or social. They are for example air pollution, increasing heat, social exclusion or loneliness. To counter these issues, cities and other actors have suggested or developed various solutions such as developing social insertion, education or planting trees (le monde politique, 2018; urbanization effects, 2009).

The diversity of these challenges led several cities to turn to Nature-based solutions (NbS). NbS are actions inspired by nature offering multifunctional solutions to help societies addressing social, environmental and economical problems (Nesshöver, 2017). As a NbS, urban community gardens (CG) represent thus a possible answer to these diverse issues. They regulate water, improve air circulation and cooling through shading and plant transpiration. Moreover, they create opportunities for recreation and leisure promoting well-being and health. Urban gardens also constitute a sense of place, social cohesion and cultural identity (Cabral et al., 2017).

Nevertheless, there are multiple challenges associated with the functioning of CGs or NbS such as a lack of funds, of motivation or space (Goddard et al., 2012; Sanchez, 2017). There is also a lack of policy action and research on community garden as a nature-based solution (Van der Jagt et al., 2017). To understand the role of CG in an urban infrastructure, their related benefits and performances in addressing urban challenges, there is a need to better understand these challenges. Such understanding can be developed through the examination of drivers and barriers that CG projects face. This could then contribute to create better support systems for urban gardening. There is also a need to understand how the impacts of a CG project are related to these barriers and drivers. This study explores social implication of the projects too. This thesis therefore uses the next research questions as guidance:

1. Explore the barriers and drivers of the implementation and maintenance of urban gardening projects
2. Gain more understanding of the social implications of urban gardening projects

Methodology

The research is based on a case-based approach. It used interviews completed with literature review and observations for data collection. For the analysis, the used criteria have been inspired by literature review about other urban CG as NbS and the EKLIPSE framework. The EKLIPSE framework is a methodological tool to evaluate NbS initiatives through certain methods and a set of indicators (Sanchez, 2017; Raymond et al., 2017). On the one hand, the selected criteria from EKLIPSE were based on their feasibility due to the size of the projects, the limitations and the scope. On the other hand, criteria selected from the literature review are criteria that were discovered in previous researches concerning NbS and urban CG.

Key findings

The drivers and barriers in the maintenance and implementation of the projects showed to be diversified in function of the nature of the projects. In general funds and a field seem to be the key elements for an urban CG to work. Collaboration with the municipality can represent significant drivers or barriers because the public authorities can provide these. Nevertheless, it is also possible for a project to work without collaborating with them. Municipalities can be serious drivers as they can be serious barriers. In the three cases, the projects depends on municipal urban plans. Socio-cultural elements have shown to generally be significant drivers. The motivation of managers and participants played an essential role in the creation and maintenance of the projects. There were indeed no major barrier, showing a significant willingness from urban dwellers to participate and create such projects. Issues on the field and the structure or the organisation of the projects have revealed to be often related, field issues being the consequences of a lack of structure highlighting the importance of the organisation of the projects.

Regarding the implications, each project has multiple impacts depending on their objectives. All the projects have shown to sensitize children to gardening and sustainability by welcoming schools. They also improve the well-being of their participants reducing their stress and making them feel better. The project of Lille emphasizes the garden as part of an exhibition to sensitize the public. Its members have individual trays to garden, they do not have to be committed or socially integrated in the project as in the case of Brussels. Nevertheless, thanks to organised workshops, they have this possibility. This project emphasizes then sensitization and education of the public through an exhibition but also the social integration of its participants. The case in Brussels in the collective garden emphasizes the creations of bonds between participants from the neighbourhood working in common parcels and having the possibility to be involved in the decisions of the project. The project then stresses the social integration of its members. In Paris, the project aims to develop an economic model with a new product cultivated in urban area. This means new challenges. The project managers try to mix both social and economic objectives. This makes such project complex, having diversified activities by producing microgreens (young shoots) and selling them, promoting social insertion and working with schools and volunteers at the same time. The project thus emphasizes social diversity through social insertion at the same time as developing a viable economic model.

Conclusions

As NbS, urban CG projects have a high potential to contribute to solve challenges in European cities. Besides the multidimensional benefits they bring, the possibility for the projects to choose different objectives allows them to adapt to specific issues. Indeed, the discovered implications have shown that such solutions vary in function of the nature and objectives of the project. Education and sensitisation were the main common social implications and often part of their priorities. The research on the barriers and drivers has revealed that urban CG projects can be ephemeral and fragile depending on municipal decisions. A reinforcement of the coordination between public authorities and gardening projects could increase the potential of urban CG to solve European urban challenges.

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Abbreviations

- NbS: Nature-based Solution
- CG: Community Garden
- IUCN: International Union for Conservation of Nature
- MRES: Maison Régionale de l'Environnement et des Solidarités
- RSE: Responsabilité Sociale des Entreprises

1 Introduction

Nowadays, cities are facing multiple economical, environmental and social difficulties such as jeopardized water resource provisions, enhanced disaster risks, climate change and diminishing urban biodiversity (cities 2017; Eggermont et al. 2015). These problems have amplified the impact on city dwellers. These issues are significant because there are around 75% of EU population living in cities (Review of Economic Valuation of Nature-based Solutions in Urban Areas 2017). The evolution of population in Europe will likely be slower than in the rest of the world. Nevertheless, the share of the population living in urban areas is projected to rise to over 80 % by 2050 (Urban Europe, 2017).

European cities are facing multiple challenges in various aspects. At the socioeconomic level, the fast urbanisation of the last fifty years has created zones gathering people with modest revenues. This led to an exclusion of these people in a situation of poverty. In France, this is a significant issue with young unemployed and unqualified people. Such situation is also leading to an increase of insecurity (Le monde politique, 2018). At the social level, there is a significant part of the population facing loneliness (Le monde politique, 2018; What are the Urban Challenges of European City Makers, 2018). Besides being a social issue, loneliness can also impair health by raising levels of inflammation and stress hormones making it a serious issue (Brody, 2017). Another problem related to exclusion and loneliness is the lack of public space. Public spaces allow to bring people together, to build social networks (What are the Urban Challenges of European City Makers, 2018). European cities also increasingly face problems caused by transport and traffic causing congestions, accidents and pollution (European Commission, 2018). On an environmental level, urbanisation also leads to pollution of the air and the increase of the risk of flooding. Pollution of the air has a significant impact on human health (urbanization effects, 2009).

To counter such problems, multiple solutions have been undertaken. In France, to face the issue of certain social exclusions, associations help people in need by providing them food. Cities have also taken measures to promote solutions to the problem of exclusion; social insertion, struggle against violence and crime, etc. Afterwards, they have emphasized education, employment and opening-up of these zones. Nevertheless, the results of these actions were not convincing because the problem remained (Le monde politique, 2018). Regarding loneliness, online platforms constituting places where social initiatives gather people can be a solution. Another solution could be urban community gardens bringing citizens together (What are the Urban Challenges of European City Makers, 2018). Concerning environmental challenges and joining the idea of community gardens (CG), the solution could involve planting trees and including the care of green spaces as essential to urban planning (urbanization effects, 2009). In addition the concept of Nature-based-solution (NbS) has been more and more employed to partially solve these issues in European cities. Such solutions allow to improve environmental quality and contribute to economic activities and social-well being in the same time. These solutions are for example green roofs, city parks or rain gardens (About naturvation, 2017). Nature-based solutions are then actions inspired by nature offering multifunctional solutions to help societies addressing social, environmental and economical problems (Nesshöver, 2017). For example a parc can constitute a NbS by being a leisure space but also a green space improving the environment and regulating the heat of the city. These solutions are more than just traditional biodiversity management and conservation principles, they “re-focus” the debate on humans by integrating societal factors as poverty alleviation, socio-economic development, human well-being and governance principles (Eggermont et al. 2015).

1.1 Problem Definition

As a NbS, urban CG can contribute to solve these problems. Besides providing food, urban gardens offer multiple benefits. They can regulate water, improve air circulation and cooling through shading and plant transpiration. Moreover, they create opportunities for recreation and leisure promoting well-being and health. Urban gardens also constitute a sense of place, social cohesion and cultural identity (Cabral et al., 2017). Benefits associated with urban gardening include then healthy lifestyle, increased level of biodiversity and even business opportunities (Van der Jagt et al., 2017).

However, the benefits associated with CG are not always easily measurable, for example biodiversity, which is hard to accurately evaluate. There are multiple challenges associated with the functioning of CGs such as a lack of funds, of motivation or space (Goddard et al., 2012; Sanchez, 2017). These often do not support CGs as interconnected sites of species diversity (Beilin and Hunter, 2011). There is also a lack of policy action and research on community garden as a nature-based solution (Van der Jagt et al., 2017). In order to better understand the role of CG in an urban infrastructure, their related benefits and performance in addressing urban challenges, there is a need for more researches in the field of urban gardening. There is such need for CG as nature-based solution, more specifically, examining what challenges urban garden projects face and what drives their implementation. Gaining understanding on these issues through the drivers and barriers faced by CG projects could then contribute to create better support systems developed for urban gardening. This study therefore aims to contribute to better decision-bases with more knowledge on the possible impacts, drivers and barriers of CG projects.

1.2 Aim and research questions

There is then a need to understand the challenges CG projects are facing. To understand how to support these projects would contribute to overcome the challenges but also to understand what are the drivers of their implementation. This would allow to develop a system supporting them. There is also a need to understand how the impacts of a project are related to these barriers and drivers. This study explores implications of the projects too.

Therefore, the aim of this research is to gain more understanding on community gardening as a NbS to promote such practice in cities.

The research questions:

1. Explore the barriers and drivers of the implementation and maintenance of urban gardening projects
2. Gain more understanding of the social implications of urban gardening projects

The general aim of this research is to explain how to contribute to the promotion of projects involving gardening in French speaking cities. As explained previously, gardening can offer various benefits depending on the nature of the project. To implement and improve them would contribute to bring various benefits to the city and its participating citizens.

More specifically, this thesis aims to explore environmental and social solutions through community gardening in Lille, Brussels and Brussels. The aim is to sensitize the reader to the concept of CG in urban areas as a NbS, to show that a CG represents a significant mean to face urban issues. Such sensitization could contribute to create more awareness and incentives to develop more CGs. Indeed, for example this thesis could also contribute to create an

evidence base for decision-making supporting innovation. This means that this study has various goals for various audiences.

1.3 Scope

For now the project of Naturvation exploring NbS in Europe lacks researches in French speaking urban areas. Naturvation is a project funded by the European Commission and involving 14 institutions across Europe. It seeks to develop the understanding on what NbS can achieve in cities (About Naturvation, 2017). This thesis therefore explores how gardening projects have emerged and are maintained in three French-speaking cities; Lille, Brussels and Paris. It explores three different cases because such projects are unique and can bring different answers. These cities have been selected for various reasons. First they share approximately the same meteorological conditions. The gardens could then contain the same type of plants sharing similar ecosystems. Being approximately in the same region, they also share a similar culture. Second, they all have a different size, from a small (Lille), to medium (Brussels) to large city (Paris). This could then possibly provide descriptions of different existing dynamics into such initiatives depending on the size of the city they are in.

In these cities, this research focuses on urban gardening projects that offer multidimensional benefits to stick to the NbS definition. Moreover, this study attempts to select projects in function of the solutions they offer. Indeed, the projects are selected if they provide solutions to these specific problems or are in accordance with the goals of the municipality. For example, if Brussels has social integration issues, a project aiming to integrate people is selected. In addition, the selected projects are generally in the agglomerations because these areas usually offer more space than city centers. Therefore, the size of the projects can be larger generally leading to more significant impacts too.

Concerning the first research question about drivers and barriers during the implementation and maintenance of the projects, this study considers the implementation phase as a period between the set up and the first months of activity of the project. The rest of the lifetime of the projects is taken into account through the maintenance phase.

Regarding the second research question about the implications of the projects, due to a limit of time and means, this study mainly focuses on social perspectives. It explores the impacts of the projects on their participants and on the city. Nevertheless, it also provides an overview of environmental and economical benefits that the projects offer. These benefits are directly part of the projects and sometimes intertwined with social benefits. For example social insertion linking economic and social aspects. It is therefore necessary to address such benefits to provide an overview and a better understanding about the implications of the projects.

1.4 Limitations

Due to a limit of time and means, it was not possible to examine all the impacts of the initiatives. This limited the number of indicators provided by EKLIPSE that could be used to measure the impacts of the projects. In addition, interviews were made with managers and participants of the projects but not with collaborative actors such as other organisations or municipalities. There is no opinion or local policies from the public authorities. This study is then project-oriented.

During the data collection process, the answers of the interviewees were not always clear. In this case, other members of the initiative were interviewed or researches in link with the provided explanations have been undertaken. Therefore, triangulation allowed to verify the transmitted information.

Furthermore, the selection of cases was done in function of the scope, nevertheless, limitations also played a role. Receiving no response from certain projects to examine their case, other projects had to be selected.

Because of the scope, the generalization of the results is not possible. This study cannot be considered as truly representative of urban CGs in this region as it offers a selective light on specific projects. Indeed, each city effectively experiences a large variety of projects, which are significantly different from each other by objectives, types of actors, sizes, impacts, drivers and barriers.

1.5 Audience

The target audience for this study can be everybody who aims to conduct such similar project of gardening. Nevertheless, it can be more specifically policy makers, researchers working in the scope of NbS. Indeed this thesis intends to help them understand why and how they can contribute to the implementation of such gardening projects. This would first contribute to bring a new image of the use of urban gardens as NbS in cities. Therefore, it would also contribute to enhance the solutions that such projects bring to cities.

Furthermore, this work sticks to the goals of the project of naturvation. Indeed, the EU commission Naturvation project first aims to release the potential of NbS for sustainable urban development in an internationally and transdisciplinary approach to advance assessment approaches. Another goal is to identify the most promising business/finance, participations and governance models and how to face the systemic conditions that generally limit their use to enable systemic integration (European Commission, 2017). It is then also addressed to people interested in the Naturvation project.

1.6 Disposition

Chapter 1 describes the main issues European urban areas are facing and explains why there is a need of urban gardening as a NbS to contribute to solve these. It continues by providing a theoretical background and other concepts related to urban gardening and NbS. Afterwards, the chapter also provides an overview of the limitations, the targeted audience and the general framework of this thesis.

Chapter 2 presents the literature review of this research. Beginning with the theoretical background about NbS. Second, it presents the benefits of CG as a NbS found in the literature. Third, the chapter describes some concepts related to NbS and gardening such as permaculture or guerrilla gardening. The goal of this description is to show that gardens can have different impacts depending on how they are managed.

In chapter 3, the methodology is developed. It comprises the method for data collection, data analysis and criteria to understand the selection of the cases study.

Chapter 4 describes the main findings. First it offers an overview of the project and the host city. Second, this chapter describes significant elements that happened during the implementation and maintenance of the projects. Third, it presents the different impacts the projects have on their city.

The chapter 5 contains the discussion and the analysis of the he findings. First, the implications of the projects are compared and discussed. Second, the principal drivers and barriers for the implementation and the maintenance of the projects are also discussed and analysed. Third, the results are compared with the literature about the same subject.

In chapter 6, the main conclusions are developed. The principal findings are first summarized in relation with the research questions. Second, the chapter also summarizes the main comparisons between the projects and the conclusions driven from them. Finally, suggestions for further researches are given.

2 Literature Review

2.1 Definitions and theoretical background

To be able to examine different cases of NbS, it is first important to define the concept of NbS. The EU Commission (2018) defines NbS as:

“Solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience. Such solutions bring more, and more diverse, nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions”.

Various definitions of NbS exist (Cohen-Shacham et al., 2016, p. 5). In its definition, the International Union for Conservation of Nature (IUCN) emphasizes more the need for a restored or well-managed ecosystem at the centre of any NbS. By comparison, the definition of the Commission underlines solutions that not only use nature but also that are supported and inspired by nature.

There is a need for a definitional framework for NbS. Such framework contains three elements: the aim of NbS, its definition and its principles. These components enable a set of standards to be developed for NbS (Cohen-Shacham et al., 2016).

First, the aim of NbS is to address societal challenges such as disaster risk, climate change, human health, social and economic development. Second, there are eight principles of NbS (Cohen-Shacham et al., p. 6, 2016):

1. comprise nature conservation norms;
2. can be realized in an integrated approach with other solutions or alone to societal challenges;
3. are characterized by site-specific cultural and natural contexts including local, traditional and scientific knowledge;
4. generate societal benefits in a fair way, promoting large participation and transparency
5. support cultural and biological diversity and contribute to make ecosystems evolving over time
6. are developed at a landscape scale
7. address and identify the trade-offs between future options for the production of the full range of ecosystems services and a few direct economic benefits for development
8. are part of the design of policies and measures to tackle a certain challenge

This definitional framework made by the IUCN will be used because it is more accurate and complete than the Commission's definition, which can lead to different interpretations and then a lack of clarity. In the analysis, each project is checked to be in accordance with these principles in the results of the analysis.

2.2 Community Gardening as a NbS

2.2.1 Benefits of urban gardening as NbS

This thesis will examine gardening as a NbS for various reasons. First, the popularity of gardening in urban areas is increasing. This is notably due to the social benefits it brings in urban contexts (Veen, 2015). Gardening indeed contributes to quality of life, adequate occupational and social functioning, healthy lifestyles and absence of psychopathology (Norris *et al.*, 2008). Citizens are increasingly aware of such benefits through relaxation, healthy food provision, recreational opportunities, community building and connecting with nature (Birky and Strom, 2013; Voigt *et al.*, 2015). Furthermore, the increased popularity of urban gardening can be explained as a counter-movement to challenge the globalisation of food supply chains and reclaim the commons (McClintock, 2014).

Furthermore, involvement in urban gardening combined with learning about local ecosystems enables sustainable urban life-styles and develops environmental values (Colding and Barthel, 2013; Lawrence, 2006). This leads then to indirectly improve biodiversity and deliver ecosystem services (Krasny and Tidball, 2009a). Urban gardening is linked to increased levels of biodiversity in landscapes (Andersson *et al.*, 2007). Indeed, the establishment of various green areas contribute to the creation of heterogeneity on a landscape level. Therefore, diversified gardens would develop biodiversity.

From an economical perspective, urban gardening also offers advantages. On the one hand, urban gardening has been described as a reaction to cuts in public expenditures on social services such as green space maintenance and provision. Institutional actors are more looking at engaging volunteers and community groups to compensate to such reaction in greenspace governance (Jessop, 2002; Rosol 2010; Roy, 2011). On the other hand, it can be a source of revenue for the gardeners who can sell their products to local markets or restaurants. Third, besides offering a business opportunity to sell and exchange products, gardening can constitute as another business opportunity to produce compost from the collection of organic wastes in agro industries and vegetable market. Last, urban gardening is also an opportunity for young persons to improve their agricultural, food processing and environmental skills and in future careers (Glavan *et al.*, 2016). In addition, NbS are promoted as 'research and innovation'. Gardening as a NbS would then contribute to deliver a vision of an innovative green economy in the EU (Nesshöver *et al.*, 2016). Identifying examples of innovative governance to promote the uptake and the success of community gardening as a NbS would therefore be relevant (Van der Jagt *et al.*, 2017).

2.2.2 Different visions of gardening

There are diverse gardening concepts with multidimensional aspects such as organic gardening, permaculture, guerilla gardening, etc. Describing such concepts allows to provide examples of different visions of gardening leading to different impacts. For example, permaculture contributes more to biodiversity than traditional way of gardening (Abrahams, 2017).

Mollison (1991) describes permaculture as:

"a philosophy of working with, rather than against nature; of protracted and thoughtful observation rather than protracted and thoughtless labour; and of looking at plants and animals in all their functions, rather than treating any area as a single product system".

Permaculture is a holistic design approach based on ecological principles. The goal of these principles is to generate more sustainable human settlements. The term permaculture refers to permanent agriculture, characterizing an alternative agricultural system sustainable on the long term. As the reflexion about such concept evolved and broadened, the meaning of permaculture has included other activities than agriculture which are social too. Such approach is therefore focused on creating and maintaining consciously designed landscapes, social systems that mimic natural processes and communities (Hanson et al., 2013).

Urban gardening can be associated in certain cases to green activism in the urban planning. Guerrilla gardening is a general term characterized by actors occupying space to grow plants without permission (McKay, 2011). It is also a global movement apparent in every country from China to USA and Africa, which involves people from all ages and social classes (Reynolds 2008). This part shows that there can be many forms of urban gardening leading to different impacts. The significance of the contribution of gardening depends on what kind of gardening is used.

3 Research Design and Methods

The research design is mainly qualitative, exploring the cases in a holistic manner. This work is based on three case studies in three different French-speaking cities. The selection of projects has been based on different criteria; first, they have to develop NbS. Therefore their actions should correspond to the definition of NbS such as having multidimensional aims as it is explained in the theoretical background of the concept of Naturvation. They should then not only focus on food production. Each case is chosen corresponding to the issues related to the city where it is located. For example if Brussels has great problems of social integration, this thesis will examine a project of CG aiming to socially integrate people. Furthermore, in Brussels and Lille, several demands in different projects had to be made due to a lack of response from the first projects approached.

3.1 Methods for data creation and collection

The data is essentially collected through interviews and partly literature review. Moreover, some data is collected based on observations made on the field. Such observations are essentially descriptive. They are made about objective aspects such as the arrangement of the garden.

3.1.1 Literature analysis

For the theoretical part such as the literature review, the data collection is based on academic literature. Details and complementary data are also collected from the websites of the initiatives of the cases. Information collected on websites serve to complete and confirm information collected through interviews.

3.1.2 Interviews of project participants

The cases are mainly examined through interviews. There are two different types of interviewees and interviews to answer to the two research questions. The first kind of interview targets the participants in order to evaluate their perception of their project impacts. The results of these interviews are mainly quantitative being illustrated through graphs. Most of the questions in this interview are based on criteria provided in the EKLIPSE framework.

3.1.3 Interviews of project organisers

The interview addressing the project organisers allows to respond to the first and second research question to examine the drivers and barriers in the creation and maintenance of the project. On the one hand, concerning the first research question about the drivers and barriers, the interview is semi-structured with a set of topics to be addressed such as financial or organisational aspects. The questions from the semi-structured interviews were based on barriers and drivers for urban gardening in the literature. Knowing potential barriers and drivers leads to develop adapted questions for interviews.. On the other hand, there are accurate questions inspired by criteria from the EKLIPSE framework to get answers to the second research question about the impacts of the projects. These are for example asking if the project covers contaminated land or what is the surface area. This interview have been mainly used for organisers. Nevertheless, some participants who were in the project for a long time were questioned with this too.

3.1.4 Methods for data analysis

Drivers and barriers in the case of CG and NbS have been examined in the literature to evaluate which barriers and drivers exist for projects. This allows to identify the main existing barriers and drivers in these fields to know what to expect in community gardening as NbS in Lille, Brussels and Paris. In Goddard et al. (2012), barriers and drivers in community gardening are characterized by personal motivation, the education of children, financial incentive, community initiatives, neighbourhood scale drivers and social norms. On their side, the use of NbS mainly depends on the political willingness of authorities and financial resources (Faivre et al., 2017; Sanchez, 2017). Physical space, public participation, knowledge and education also played a role (Sanchez). Therefore, the main characteristics that constitute the barriers and drivers of the use of CG as a NbS can be regrouped under the involvement of public authorities, funding, physical space, socio-cultural elements, practical and organisational aspects such as the structure of the project. It is important to take into account that these aspects are intertwined and can influence each other. For example, more political commitment can lead to an increase in the funding of the project. These perspectives therefore structure the part of the findings and allow comparisons of the findings with the literature in the analysis.

To respond to the second research question aiming to evaluate the impact of the initiatives, this thesis partially uses the EKLIPSE framework. This framework is a methodological tool allowing to evaluate NbS initiatives thanks to methods and a set of indicators it provides. Through an impact evaluation framework, the aim of EKLIPSE activity is to guide the development, the design, the implementation and the assessment of NbS demonstration project in urban areas. The structure of EKLIPSE is organised in five steps; first, it presents ten challenges such as air quality or social justice and social cohesion. Second, potential NbS to face such challenges are given. Third, the framework describes potential impacts of the

action of these NbS. Fourth, indicators are provided to evaluate such impacts. And fifth, a method is presented to measure these indicators (Sanchez, 2017; Raymond et al., 2017). Nevertheless, the structure of this thesis is not parallel to the EKLIPSE framework. Indeed, this thesis first explores NbS in projects to see what challenges they address. On the opposite, EKLIPSE begins with the challenges and secondly addresses NbS. This is why specific challenges corresponding to CGs have been selected.

The challenges corresponding to the goals of the project and which are possible to measure are then selected. For example, if the project aims for social integration through gardening, the challenge eight, ‘social justice and social cohesion’ will be chosen. Through these challenges, EKLIPSE provides a set of indicators allowing to accurately measure certain social, environmental and economical impacts. All the indicators provided by EKLIPSE cannot possibly be measured due to a limit of time and resources but also different scale measurements. The scale of measurement is different because this thesis focuses on local projects while EKLIPSE also addresses larger scales such as regions or entire cities. Therefore, only adapted indicators have been selected. Concerning the social perspective, the challenge seven, eight and nine have been chosen: “participatory planning and governance”, “Social Justice and Social Cohesion” and “Public Health and Well-being”. About the environmental angle, this thesis uses the challenges four and six: “Urban Regeneration” and “Green Space Management”. The challenge ten called “Potential for economic opportunities and green jobs” has been selected regarding the economical perspective. The questions in the interview therefore sticks to the indicators provided by EKLIPSE in these challenges that can possibly be measured. The selected criteria from EKLIPSE are then based on their feasibility due to the size of the projects, the limitations and the scope.

As the data corresponding to the EKLIPSE indicators has to be collected differently, distinguishable interviews on participants and organisers are the main sources of data. Observations and literature about the organisations complete the data collection to answer to this research question.

4 Findings

4.1 Lille: “La ferme urbaine de la Gare Saint-Sauveur”

Lille is a city of more than 230 000 inhabitants located in the North-East of France, not far from the Belgian border. It has a concentrated agglomeration. Including its agglomeration, the city counts more than a million inhabitants. With its past of a rich and industrial economy, Lille has mainly nowadays a vocation as administrative capital and as supplier of public or private services in the surrounding activities. It is also characterized by important rail, road, fluvial and aerial links (Larousse, Lille, 2018). The municipality of Lille has several main political directions: social affairs and education, citizen life and proximity animation, culture, quality and development of the city, human resources and finances (Organigramme de la Ville de Lille, 2018). The gardening project in Lille corresponds well to these directions.

4.1.1 The project

The urban farm of Saint-Sauveur has been implemented in 2015 by the association of Lille3000. It offers to the public a spacious off-ground garden in the center of the city. This garden is part of a collaborative project involving the municipality of Lille and the Maison Régionale de l'Environnement et des Solidarités (MRES), other associations and volunteer gardeners. The main goals of Lille3000 in the urban farm is to sensitize people, to create a dynamic place where the people meet and garden. It also aims to develop pedagogy about gardening.

The urban farm is composed of around 300 trays (Gare de Saint Sauveur, 2018). The majority of them are individual trays and a smaller part of them is collective. The garden is situated along a building, which is a former train station. It has been transformed into a place to expose contemporary art. On the other side of the garden there is a wildland constituted of young trees and wild herbs. The project covers around 60 ares.



Figure 1: La ferme urbaine de Saint-Sauveur, April 2018

4.1.2 Implementation and maintenance of the project

4.1.2.1 Involvement of public authorities

To begin with, the field belonging to the municipality was lent to the association of Lille3000, which allowed the implementation of the project (Demangeat 2018, personal communication).

Lille3000, the organisation which implemented the project received such help from the city hall because Lille3000 indirectly represents the municipality as an art programme. For this reason Lille3000 receives significant supports from the municipality for the project of urban farm. Indeed, the association is not a citizen initiative, it is half subsidised by the town. They also have many private partners such as EDF, Auchan Retail or LEGO (Partenaires, 2018).

Nevertheless, there are concerns about the future of the urban farm due to plans of the public authorities. The city has urban housing plans to build in the wildland around the project making its future uncertain. The organisation Lille3000 do not have the power to decide what will happen there because the field belongs to the municipality and because Lille3000 is a cultural program promoted by the city (Demangeat).

4.1.2.2 Funding and physical space

Regarding the financing of the project, everything has been financed by Lille3000. Lille3000 is an association created in 2004 following Lille nominated European cultural capital that year. At this time thanks to a willingness to maintain such cultural impulse, there were great investments from the municipality in this organisation. These investments allowed to continue to organise contemporary art exhibitions in Saint-Sauveur or at the Tri-postal (Demangeat).

4.1.2.3 Socio-cultural motivation

The urban farm has been created in 2015 on the occasion of the contemporary art exhibition of the city of Detroit. Detroit is famous for its citizens initiatives to “revegetate” the city and especially cultivate vegetables in social, cultural and environmental dimensions. The idea of the urban farm inspired by such message conveyed by the exhibition was to recreate a link between the people and the land. The project was not necessarily supposed to last for a long period. If it did not work it could have not continued after the end of 2015. In 2018, it is then the fourth year of the garden (Demangeat).

To increase public awareness, it has been ‘branching’ of the urban farm composed of trays with plants in school streets and different places in Lille. These trays came back afterwards in the farm (Demangeat).

The urban farm also works in collaboration with the MRES, a solidarity and environmental association. The MRES, situated far from the garden, supports many associations around environmental and social issues. This association offers workshops in the garden with always different speakers adherents to the MRES (Demangeat).

4.1.2.4 Logistic and field aspects

The wooden infrastructures in the middle of the garden allows to gather people in the shadows in the afternoon and is equipped with lights for the evening. Such infrastructure allows the organisation to organise various workshops and activities such as cooking courses, learning about compost or making vegetable dye. The diversity of activities also attracts people who are not necessarily into gardening (Demangeat).

Except from the wood structure, there is not much shadow on the garden. When the weather is warm and the sun out, the place can become very hot. The farm had difficulties for watering the trays. Therefore, a rainwater collection system was set up. In addition, an irrigation system was built. Nevertheless, it could not be directly used due to some leakings. A revision of the system is planned to be done in 2018 (Demangeat).

4.1.2.5 Structure and organisational aspects

There is a team of employees in charge of the art exhibitions taking care of the administration, registrations and reservations. On the other hand, Demangeat takes physically care of the garden. This makes the role of the actors clear in the management of the garden, avoiding any misunderstanding (Demangeat).

Because the project depends on the exhibitions, the access to the garden is only at the same time as the exhibition visit hours. This means from Wednesday to Sunday, from noon to half past six pm. Therefore, the participants have restricted access limiting the activity in the garden. This is why generally there are more participants coming during the week-end (Demangeat).

4.1.3 Impacts of the project

4.1.3.1 Social impact

On the social aspect, the urban farm is mainly visited by three different types of public; schools, visitors of the exhibition and the participants. Everything is always free for all of them including the visit of the exhibition.

The schools generally come and visit the exhibition too, they participate to workshops and once they are in the garden, classes are divided in two and visit the garden separately. Each half of class spends around half an hour there. The children receive an educational booklet and bags containing diverse seeds that they have to recognise. Demangeat, who is in charge of the urban farm also eventually provides them advices how to make a garden at their school. In addition, there are trays reserved to schools. The classes come then sometimes back to replant the seeds they collected some months earlier (Demangeat).

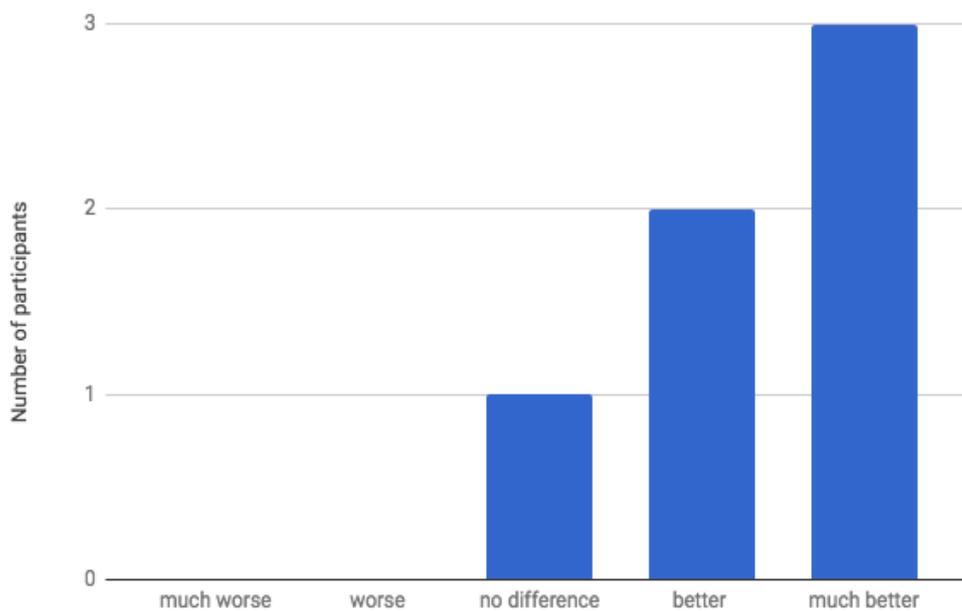
The visitors often come to take a look at the garden after visiting the exhibition. At the exit of the exhibition, the visitors can also receive a bag of seeds. For example, with the exhibition about Cuba, visitors received seeds around the theme of Cuba. These seeds are not originally from Cuba but they are linked with cuban food being colorful. There were for example seeds of yellow beetroot, chili and other uncommon varieties. Each visitor receives one variety of seeds and has to register to a list in exchange. This allows the urban farm to keep in touch with the visitors. Afterwards, the visitors can come back in May to plant these seeds in the collective trays or they can keep the seeds and plant them at their home or garden. As for

schoolchildren, Demangeat also provides them advices depending on the means of the people, for example, if they have a garden or a balcony (Demangeat).

In addition, there are organised events in the urban farm creating meeting opportunities between the public and garden participants. For example, in September, there was an event where soups and dishes were made and distributed to the public. The soup and the dish are mainly cooked with vegetables collected from the collective part of the garden. Certain Wednesdays or Sundays evenings, there are speakers coming to organise workshops. Such workshops are about diverse subjects like planting, building trays with recycled elements or window farming. The events and visits allow then a sensitization and a socialisation of the people through the urban farm. These events are open to everybody (Demangeat). There are regularly interactions between the visitors of the museum and the participants. The visitors often behave in the garden like if they were in the exhibition, they are curious, they ask questions to the participants taking care of their trays. Nevertheless, it is generally a one time relation but this could possibly seed ideas in the mind of the visitors (participant X, personal communication, 2018).

There are around a hundred participants called ‘volunteer gardeners’. Each has generally between one and three trays. Typically each tray is about 1 m². They take care of these individually. Nevertheless, sometimes certain people stop coming back so the manager, Demangeat has to make a turnover and reattribute such trays to new people. To become volunteer gardener and have trays, the people do not have to pay anything, they must subscribe to a waiting list. The priority is given to most ancient demands. The people generally subscribing are aware of the garden by word of mouth (Demangeat).

Figure 2: Impact of the garden on the mood of the participants in the urban farm in Lille

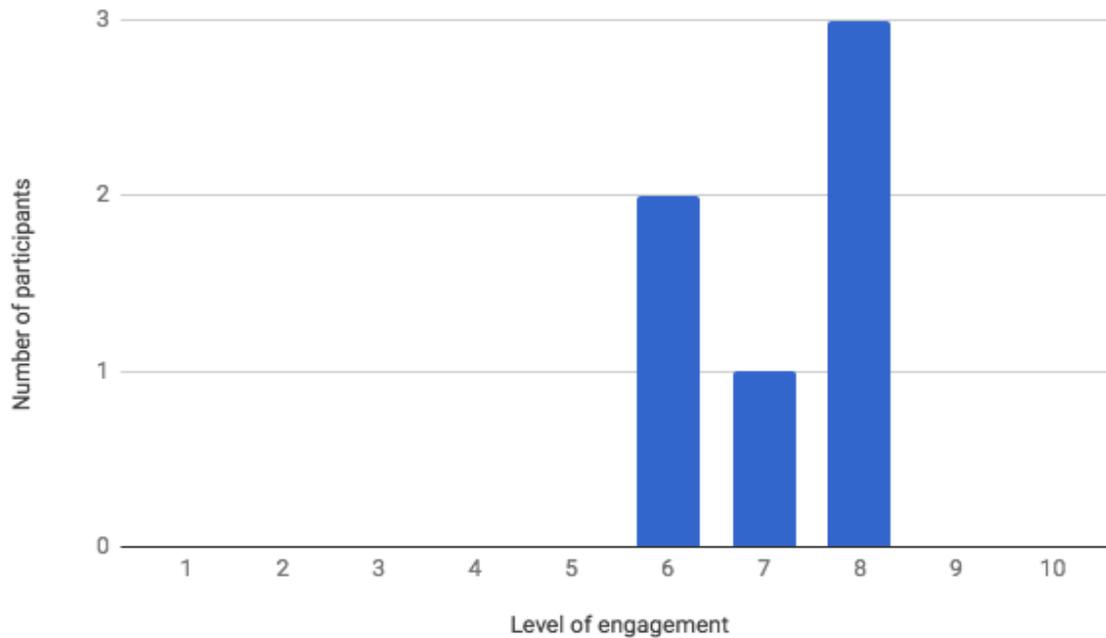


Source: own elaboration

As figures 2 and A1 show, the garden in Lille has direct positive impacts on the mental health of the participants making them feel better and reducing their stress. Only one person on six answered that gardening does not make a difference on its mood and stress. On figure 2, the

majority therefore receives a positive impact from gardening and half of them even expressed that gardening make them feel much better.

Figure 3: Evaluation of the engagement of participants into the project in the case of Lille



Source: own elaboration

In addition, the figures 3 and A2 illustrate that the garden does not only have a positive impact on the mental health but also promotes and develop social integration and engagement. On figure 3, it is noticeable that all the participants are significantly engaged in the project, the lowest engagement evaluation being six on ten. Moreover, half of the participants evaluated their engagement of eight on ten, showing a deep engagement. On the other hand, the figure A2 shows that most participants feel deeply integrated into the project. Such elements suggest a significant involvement or motivation of the participants.

Furthermore, as shows the figure A3 about the feeling of the participants on their learning about ecosystem and biodiversity, only one participant on six expresses that she/he does not know if she/he learned something. Half of the questioned persons responded they strongly feel that they learn much about such environmental aspects.

4.1.3.2 Environmental impact

On an environmental perspective, there are rainwater collectors on some roofs and cisterns to conserve this water. They have been set up to facilitate the watering of the garden. This allowed to have water nearby the trays. It also significantly reduced tap water consumption because there was no rainwater collection before (Demangeat). Such rainwater collection also mitigates risks of floods. In addition, the members cultures are organic and do not use pesticides on their plants.

4.1.3.3 Economical impact

Regarding the economical impact, there are two jobs created for the management of the urban farm in relation with the exhibition. The employees are paid by Lille3000. The employees manage the site and welcome the visitors there. They also attribute the trays to the members and take care of the collective trays. Moreover, due to difficulty of watering, there has been a call for projects with architecture schools to create an irrigation structure. A watering system has then been implemented (Demangeat).

4.2 Brussels: “La ferme du Chant des Cailles”

The project is situated in Watermael-Boitsfort, a commune of around 25 000 inhabitants located in the South-East of the agglomeration of Brussels (Larousse, Watermael-Boitsfort, 2018). Brussels counts around 1 100 000 inhabitants. As Lille, the economy of Brussels is dominated by services (Economy of Brussels, 2018). The commune of Watermael-Boitsfort has 28 different political axis; among them, social action, sustainable development, youth, housing, etc (Note d’orientation et plan de gestion, 2018). CG can then constitute a significant tool to reach such objectives. To be noted here, Watermael-Boitsfort is located alongside the “Forêt de Soignes”, one of the largest natural areas around Brussels. Watermael-Boitsfort has a long history of integrating nature in their architectural projects after WWI with the creation of different “garden cities” (“Cités Jardins”) emphasizing the importance of vegetation among the buildings with many gardens, trees, hays, paths through common gardens, etc (Eggericx and Hanosset, 2003).

4.2.1 The project

The gardens in the farm of the ‘Chant des Cailles’ appeared in 2012 and were created by a cooperative of tenants called ‘le logis’ (Le logis SCL, 2018). The project is qualified as an eco-participative project. On an historical backnote, “le Logis” is one of the “Cités Jardins” created between the two world wars (Eggericx and Hanosset). Besides producing organic food the project also aims to enhance the exchange of knowledge and garden experimentations through a collective garden and a market garden. The collective garden also aims to develop the sense of community.

The site is divided in several parts. One part is characterized by the collective garden. Another part of the garden is occupied by a ‘professional’ garden, the market garden. there are there three employees growing vegetables that the members can come pick in exchange of an annual contribution. In the rest of the gardens there are animals such as sheeps and chicken, a compost area and flower cultures. Approximately in the centre of the gardens, there are wood structures, benches and a trunk of tools for the people to gather together there. The collective garden covers around 40 ares and the market garden 80.

The site of ‘le Chant des Cailles’ is covered by various projects such as a breeding project, a collective garden, a sustainable neighbourhood project or a market garden (La Ferme du Chant des Cailles, 2018). This thesis only covers the project of collective garden and market garden because it focuses on gardens and not breeding.



Figure 4: Le Chant des Cailles, April 2018

4.2.2 Implementation and maintenance of the project

4.2.2.1 Involvement of public authorities

The 'Jardin Collectif du Chant de Caille' is not directly related to any political authority and does not aim to have such links (Interviewee 2, 2018, personal communication).

As it is explained in their website, the project met some pressures from the municipality of Brussel, which aimed to build between 70 and 80 accommodations on the site of 'le Chant des Cailles' (Saule, 2018). The concentration of inhabitations around the gardens is increasing and the society of accommodation of Brussels-capital (SLRB) aims to create around 140 accommodations in the fields close to the project. This would mean more pressure on the gardens and less trees around. The municipality aims to create social accommodations in the area. However Brussels being a complex entity, there is apparently no significant defence of the green spaces (Interviewee 4, personal communication, 2018).

Nevertheless, in 2017, the Brussels Region suspended the building project. Given the scale and the development of the farm of Chant des Cailles, the entity of Brussels Region has

decided to undertake a moratorium about these planned buildings. This also allowed to wait for the conclusions of the study called Saule. Saule is the abbreviation for Symbiosis, Agriculture, Urban, Accommodation and Ecosystem. It aims to rethink the relation between urban agriculture and housing. It also intends to show the benefits of urban agriculture such as citizen dynamics, pedagogy or opportunity for employment. The Saule study regroups the farm of 'le Chant des Cailles' but also researchers, specialists in social information, citizens and others (Saule, 2018).

4.2.2.2 Funding and physical space

Concerning the sources of funding, each participant has to pay an annual fee of ten euros for the collective garden. This fee finances everything there. It allows for example to pay for the shared tools. The project did not receive much financial aid from the municipality. They received them only once because they occupied a part of a parcel, which was considered as contaminated land. Indeed, an old machine had been abandoned there. With the rain and the rust, the soils had been contaminated. For the market garden, it is the financial participation of the clients, which finances the project. The client has to pay between 7,5 and ten euros for a week or between 295 and 400 euros for the year to get enough for their spendings and to pay the cultivators. For this contribution, the clients are allowed to collect a weekly allowed limited amount of vegetables (Commercialisation, 2018).

4.2.2.3 Socio-cultural motivation

Before the field became an urban garden it was used for agriculture. Before the creation of the project, the field was left fallow for a period of two years (La Ferme du Chant des Cailles, 2018). A part of the inhabitants living around the site held then a meeting to decide what action to take concerning the field and if they could do it by themselves. They were inspired by the same kind of project, which existed over 80 years ago in the same place. The goal at this time was to create an inclusive and participatory garden. To do so they designed different parcels dividing them in same size surface area. There was one part for the collective garden, another for the 'professional' garden, one for the animal, etc (Interviewee 2, personal communication, 2018).

In general they did not meet any significant issues in the maintenance of the project. However, they had some minor issues. The first one seems linked to the difficult decision making process in a very collective environment. During the sessions when the members met to discuss the decisions to take, some people used to speak to chat with each other instead of talking about the project. The meeting then often finished around midnight or one AM. There were many talks for small decisions. For example, when they discussed the charter some people argued much about special terms to include in it. Some people thought it was important. Moreover, disputes occurred between a few members. The organisers had then to sometimes stand up to stop certain people. Some members apparently criticized others behind their back by mails. The organisers did not accept such behaviour and this is why two people had to leave the project. If they had an issue they should have directly mentioned it. Second, sometimes the new participants are not motivated enough or have different visions than the one of the collective garden. Certain participants sometimes want to do their own parcel, which do not meet the collective aspect of the project. Therefore the organisers must sometimes set the rules straight back. Third, the project met sometimes significant differences of level of engagement from the participants in the project. To have a minimum of presence

from the less engaged participants, they had to ask them to come at least once a month (Interviewee 2, personal communication, 2018).

4.2.2.4 Logistic and field aspects

At the creation there was no concrete structure of the functioning of the garden. Parcels were then first created. During this time, participants were coming with their own tools with various goals in mind and an anarchic development. This resulted in a need to restructure the project (Interviewee 2).

4.2.2.5 Structure and organisational aspects

All the projects on 'le Chant des Cailles' are handled by the cooperative of 'le Logis' which has created an association to manage them (La Ferme du Chant des Cailles, 2018). The restructuring of the project cited above led its organisers to create a charter. Once per month, they met to discuss the charter and modifications in the organisation of the project at the collective house. For example, concerning the tools they decided to build a wood cabin with common tools (Interviewee 2).

The field already belonged to the cooperative of 'le Logis', which made the project easier to launch. There was no need for authorisation. Indeed, this cooperative already existed before the gardens (Interviewee 2).

During the launch of the collective garden, the project was open to everybody. Nevertheless, due to a too high number of people willing to participate they had to restrain the membership of the project; only the local people living 1.5 kilometre around could then join. This means only the people from the communes of Watermael-Boitsfort and Auderghem can join it (Interviewee 2).

4.2.3 Impacts of the project

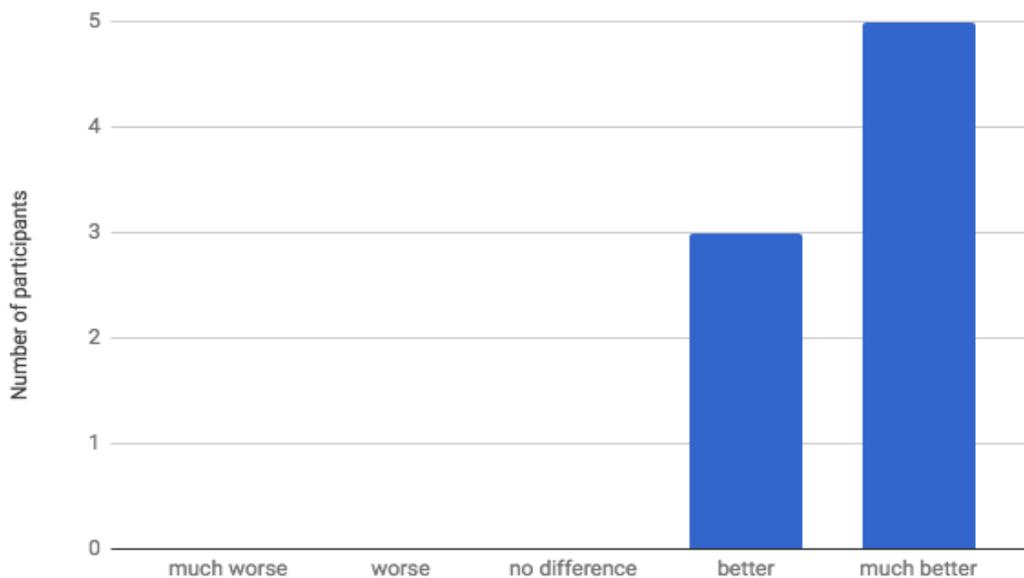
4.2.3.1 Social impacts

The collective garden of 'le Chant des Cailles' undertakes several social goals. First, it aims to integrate its participants, to create social bonds, which had a little bit weakened in the cooperative of 'le Logis'. The cooperative was not dynamic as it was at its creation with less participation of its members (Interviewee 2). 'Le logis' is a cooperative of tenants of houses in the neighbourhood of Watermael-Boitsfort (Le logis SCL, 2018). Thanks to this project, all participants know each other well (Interviewee 2).

Besides having its participants feeling better and integrating the project, they also welcome schools and disabled people. They work in collaboration with a school of children with Down’s syndrome. These children came for a day and built together wood constructions such as benches from wood pallets. The project also works with schools to sensitize children to gardens. Classes from the neighbourhood come during school time with their teachers to take care of a specific area of the garden. This area is attributed to them (Interviewee 2).

Moreover, the project of the ‘Chant des Cailles’ allows offering a more egalitarian access to green spaces because it is open to all citizens of Watermael-Boitsfort and Auderghem for a contribution of ten euros per year, which is affordable. This was illustrated by a great diversity of participants, with various ages and origins. They also had the goal to be able to welcome people with reduced mobility by setting up elevated trays with soils inside (Interviewee 2).

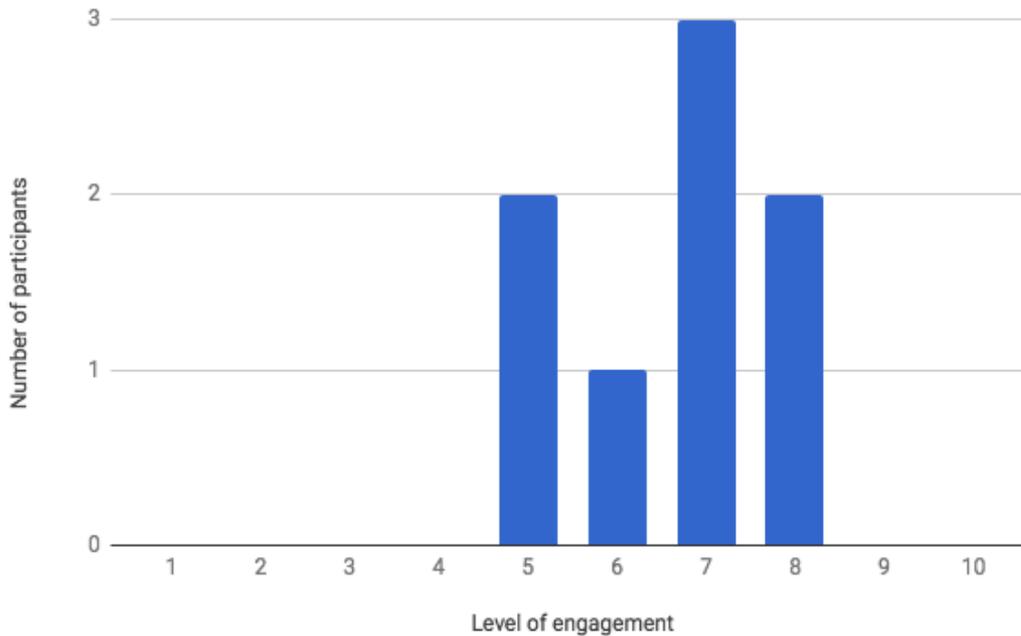
Figure 5: Impact of the garden on the mood of the participants in Le Chant des Cailles



Source: own elaboration

Regarding the perception of the participants of the impact of the collective garden on their mental health, all the participants think that it makes them feel better and reduces the stress they can have. The figure 5 shows that project makes most of them feel much better. In addition, the figure B1 illustrates that three fourth of the questioned participants totally agree that participating in the project reduce their stress.

Figure 6: Evaluation of the engagement of participants into the project in Le Chant des Cailles



Source: own elaboration

The figure 6 highlights that the majority of interviewed participants feel significantly engaged in the project being between seven and eight on a scale of ten. The figure B2 also shows that the majority feels deeply integrated into the project with half of them rating their integration up to eight on ten. The association of these two figures suggest that the involvement of the participants in the project is serious.

Furthermore, the figure B3 shows that all the questioned participants have learned something about the ecosystem and biodiversity. More than the half of them totally agree that they have learned a lot about these environmental elements.

4.2.3.2 Environmental impacts

The project covered a small part of contaminated land. They do not grow vegetables there but there are trees. The contamination was due to an abandoned machine, which rusted there. The issue of the contaminated land solved itself with time (Interviewee 2).

Some students from Gembloux University studying agronomy came to analyze the soils. They later provided the participants with the results of the soil analyses which were not a concern (Interviewee 2).

In addition, the project mainly grows local species of plants. There is a significant biodiversity among them. Everything is organic; they do not use any pesticide (Interviewee 2).

4.2.3.3 Economical impacts

The project created three jobs through the market garden. There are three full time employees working in the market garden. People can pay an annual fee and come to get a

certain amount of vegetable per week that they pick in this garden. Such garden is economically viable (Interviewee 2).

4.3 Paris, “le Paysan Urbain”

The project in Paris is situated in Romainville. Romainville is a part of the department of Seine-Saint-Denis in the North-East of the Parisian agglomeration. Romainville counts around 26 000 inhabitants (Larousse, Romainville, 2018). With its agglomeration, Paris counts more than ten million inhabitants. As Brussels and Lille, the sector of services is significant, the tourism sector being the first source of revenue for the city. As a great metropolis, great contrast of poverty and wealth exist. Paris faces issues of gentrification, forcing poorer population to move to the agglomeration (Larousse, Paris, 2018). Before 2000, Romainville enjoyed economic impacts from the pharmaceutical industry present there. When pharmaceutical companies left, there was a local economical crisis. After this, the municipality attempted to revitalise the commune. To do so, they for example built new flats and houses. (Romainville : grandir sans s’emballer - Objectif Grand Paris, 2017). The main aspects that the municipality of Romainville emphasizes are education, economy, citizen initiatives, living conditions, solidarity and health and occupation for the free time. It also plans to build big projects such as in Zac de l’horloge where there is ‘le Paysan Urbain’ (Zac de l’horloge, 2018). The project of ‘Le Paysan Urbain’ seems to be in accordance with the objectives of the municipality to revitalise the neighbourhood.

4.3.1 Project

‘Le Paysan Urbain’ has been implemented in 2015 by a small team of people who met via a gardener network. ‘Le Paysan Urbain’ is a pilot project aiming to balance economical and teaching activities. On the one hand the main objective of ‘le paysan urbain’ is to develop a model of urban agriculture, which would be economically viable and that would create jobs (Munier, personal communication, 2018). On the other hand the project promotes social values by doing social insertion and pedagogical activities (Lacroix, personal communication, 2018).

As economic activity, the project sells microgreens to restaurants and individuals (Interviewee 5, personal communication, 2018). Microgreens are “edible plants used in food preparation for their appealing flavours and colours. They are grown beyond the point of harvest of sprouted seeds, and normally include the cotyledons and first true leaves” (Wright, abstract, 2018). The model of this association has been created and imagined on the site where it has been implemented. The main idea of such organisation is to be able to duplicate such model elsewhere. Therefore, the organisers considered that even after three years after its implementation, the project still needed to be restructured (Lacroix).

Such idea of duplication was not imagined for no reason; due to agreements made with the municipality and the planning authority, the project is ephemeral. It will end its activity on the field where they are situated at the end of 2018. Nevertheless, the organisers plan to move, transform and divide the project in two locations. These two locations would still be located in Paris; one in Charonne and another in Bondy. On the one hand, the project in Bondy would be a larger economical project called the A3S. This would be implemented in association with other actors of urban farming and alimentary transformation in a research institute. This institute called ‘Institut de Recherches pour le Développement’ (IRD) mainly works on North-South projects. There, many agronomists are working on problems in Southern countries. The goal of the project there would be to develop new solutions with researchers

and enrich the learning path, which is a part of the initial model of the project of 'le Paysan Urbain'. On the other hand, the project Charonne would be more like a company with an economic model developed in 'le Paysan Urbain'. The goal there is to develop a viable economic model selling microgreens (Munier).

The project of 'le Paysan Urbain' occupies a surface of 30 ares with three greenhouses, a poultry house, multiple trays for gardening and several small precast buildings serving as office, locker room, germination room or as place for the tools. The greenhouses cover 320 square meters (Lacroix). Two of the greenhouses serve for the growing of the microgreens, the other one is for the sprouts of the vegetables that are going to be planted in the trays outside. There is also an aquaponic installation into the last greenhouse.



Figure 7: Le Paysan Urbain, April 2018

4.3.2 Implementation and maintenance of the project

4.3.2.1 Involvement of public authorities

An agreement with the municipality and with an approved developer of the departement 93, of Seine-Saint-Denis allowed 'le Paysan Urbain' to set up the project on the field where they are and to be subsidised. The developer, Séquano immobilier, and the municipality made a call for proposals of projects of an ephemeral occupation on the plain of the Ourcq, which is a valley formed by the Ourcq river (Munier). The occupation is ephemeral because Séquano immobilier aims to build a commercial center on the site afterwards (Zac de l'horloge Romainville, 2018). It is in this framework that 'le Paysan Urbain' profited of financing that allowed to pay for most of the investments. They received 130 000 euros for two years (Munier; Lacroix). 'Le Paysan Urbain' maintained good relations with the municipality of Romainville. In 2015, the municipality was engaged at the environmental level and in favour of experimental projects of urban agriculture. This greatly contributed to make the project more known and trustable for future participants and clients. This contract with the municipality of Romainville is not the only help the project got. They also received subventions from Est Ensemble (Munier). Est Ensemble is a public territorial establishment

composed by an intercommunal structure. It aims to implement metropolitan action to improve the quality of life of its inhabitants by reducing inequalities, developing a socially and economically sustainable urban model (Est Ensemble devient Territoire du Grand Paris, 2016). The project received grants from Est Ensemble by submitting files. A budget is allocated in function of the criteria they fulfil on professional or social insertion. For example, they received funds because they have a structure of economic activity insertion, they are open to the public and organise school workshops. These funds allowed them to buy material for cultivation and to hire one person responsible for this (Lacroix).

Furthermore, the project met challenges concerning its future relocation in Charonne, more in the center of Paris. The organisers of 'le Paysan Urbain' had an agreement with the municipality to settle there on a certain space. Nevertheless, a political association made an appeal against their building permit. Therefore, without any guarantee from the municipality, it became harder to convince the private investors they found earlier. This was highly stressful and complicated for the organisers (Munier, 2018).

4.3.2.2 Funding and physical space

The project receives a bit less than 70 percent of its revenues from subventions, the 30 percent coming from the sale of microgreens and the financial participation of the adherents (Lacroix, 2018). Between 2015 and 2018, most of the needed funds for the project came from public subventions and foundations. Nevertheless, for the future of the project Charonne, the organisers aimed to make it profitable as a company. This means that they would not receive as much public subventions as before. Therefore, finding private investors contributed to ensure the future of the project elsewhere. However, this changing of model was difficult (Munier, 2018).

4.3.2.3 Socio-cultural motivation

G. Munier initiated this project with an associate he met via the Cocagne network, which gathers 120 producers of organic fruit and vegetables in the countryside surrounding of cities. The main aim of this framework is to create social insertion. This network gathers more than 3000 people working in these gardens. Munier knew the concept of microgreens that he had discovered on the West coast of the U.S. . He also saw that these microgreens were increasingly popular at the level of the consumers (Munier).

Concerning the volunteering, there are volunteers coming every Thursday morning. They generally work more in the garden than the greenhouses but they also sometimes contribute to the process of production of microgreens. For example they work on the compost. In case of need of people to help, they call for help on social networks. There are generally always some people coming. More volunteers come when the weather begins to be more warm, which is a good thing because there is not much to do during winter (Lacroix).

4.3.2.4 Logistic and field aspects

Regarding the commercial perspective of the project, there are three main challenges. First, the microgreens is a new product on the market, which is not well known by the public. Therefore, they had to increase the product public image to be able to develop the sales. They then needed initial investments for this (Munier). Moreover, the project itself needed to

increase its exposure to reach its social and economical objectives. Nobody was in charge of developing such exposure, which is necessary (Lacroix). Second, microgreens is a very fresh product, fragile and hard to conserve. This posed challenges of logistics and conservation. Third, the organisers of the project decided to develop the cultivation of the microgreens through a design brief which seemed to be virtuous to them. This means no use of artificial lighting or hydropony for the production of microgreens. However, it involves more complications than the agriculture of microgreens indoors and in hydropony with a constant temperature and hydrometry the whole year. Therefore, in their greenhouses, the managers have to adapt to the seasons and variations of temperature and light (Munier).

Certain parts of the process in the production of microgreens have been improved. For example, a germination chamber has been built, making the germination of microgreen faster. Moreover, a zone for compost has been set in place (Lacroix).

4.3.2.5 Structure and organisational aspects

Most of volunteers there come via 'Bénénova', a platform offering time of volunteering for any subscribed person to any type of association. The platform connects volunteers to associations. These volunteers do not have to be 'adherents' to take part in the project, they can come to participate but do not have to come back. Their volunteering time do not engage them to anything in the project either. Indeed, the goal of 'Bénénova' is only to link associations and potential volunteers for punctual actions. This allows the volunteers to discover various projects without having to be committed to one. Such volunteering system was implemented because the organisers realised that 'engaged' volunteering do not always work well. The people do not especially have time to be deeply engaged in a project. On the one hand, this system allows the association to welcome many different people and receive a helping hand. On the other hand, these people do not always come back but at least discover the project and its site increasing its exposure to the public (Lacroix). In addition to the volunteers, there are forty adherents financially supporting the association (Interviewee 5).

Furthermore, the collaboration between 'le Paysan Urbain' and other actors played a positive role for the association. To make the compost, they worked with the project of 'les alchimistes' who makes compost in urban area. This project participated to the part of the process of the improvement of the compost in the microgreens production. Another association set up a beehive in the middle of the chicken coop of the project. 'Le Paysan Urbain' also worked with 'AgroParisTech' to develop an evaluation tool of production in urban agriculture. 'AgroParisTech' is an institute of technology for life, food and environmental sciences, they developed such evaluation tool and tested it in 'le Paysan Urbain'. They aimed to test such tool on different urban farms. Therefore, all of these collaborations enriched the project of different competences (Lacroix).

In the management of the model, concerning the product and its sale, there is a lack of means to structure the project. This slows down its development (Munier, 2018). In April 2018, the managers were still not sure if their model was viable. There was still much to do to make it this way (Lacroix; Munier). They had to constantly restructure the project by evaluating what was achievable and what was not. They had to maintain the production but also ensure its development by improving the technical process of production. At the same time they also had to offer animation. In July 2016, there was only one greenhouse and the trays for gardening. In April 2017, there were two more greenhouses and a chicken coop (Lacroix).

In the project there are around forty adherents who do not come more often than volunteers. Some issues appeared regarding the organisation of the structure. The distinction between the

volunteers and the adherents is blurred. On the one hand, the volunteers are people generally coming during every Thursday morning. They take care of the outside garden and help a bit for the production of microgreens. On the other hand, the adherents are people who paid an annual membership fee. They receive offers from the project and certain actions are made for them. For example, on a Saturday, the organisers and some volunteers prepared some pesto with what they had in the garden. This pesto was then sent to the adherents to thank them for their support. Adherents are also registered in the newsletter and receive all the news from 'le Paysan Urbain'. There were therefore few distinctions between volunteers and adherents. The organisers aimed to work on this distinction, perhaps by reserving a privileged space on the site for the adherents, to send them microgreens every months or to initiate learning sessions for them (Interviewee 5).

4.3.3 Impacts of the project

Figure 8: Le paysan Urbain



Source: Projet, Une première micro-ferme à Romainville (2016)

This figure illustrates the diversity of activity that 'le Paysan Urbain' undertakes and the various positive impacts it has. Indeed, the figure summarizes the different functions of the project. For example, there is the environmental function through recycling and rainwater collection, the pedagogical through the development of cultivation techniques or the economic function with the sale of microgreens.

4.3.3.1 Social impacts

Regarding the social perspective of the project, it first aims to develop the pedagogy and sensitization around urban gardening. They are convinced that there is a significant stake to sensitize the young generations to issues related to sustainable development such as recycling, the fight against wasting, composting, biodiversity in cities, etc. There is a need to educate citizens and an urban farm constitutes a great support to participate to such education (Munier, 2018). This is why they undertake many actions to welcome young people. Two times per week, there are activities organised for the children from kindergartens and primary schools. These activities happen after classes around half past three. The schools of Romainville, Angevin and Cachin participate to this program. Some classes of each school come at least once a week, almost all of them come on the site except the school of Cachin, which is too far. Therefore, the animators of the project have to visit them but it is less interesting because they have less means to work with the children there (Interviewee 5). For the classes coming to the site, there is an area reserved to them for planting.

Furthermore, there are punctual visits of high school classes. Some classes with their teacher contacted the project in the framework of certain objectives. For example, students that have the course of 'Sciences and earth life' want to discover aspects of sustainable development in a professional immersion. In 2018, the organisers have set up a pedagogical booklet. Having diverse kind of visitors, the organisers have also indexed different type of learning offers adapted to the public (Interviewee 5).

Moreover, 'le Paysan Urbain' organises team building activities for companies. In the framework of the Social Responsibility of companies (RSE), companies have interests to undertake such initiatives. Therefore, the team building activities there are organized around the theme of sustainable development, gardening or waste management (Interviewee 5).

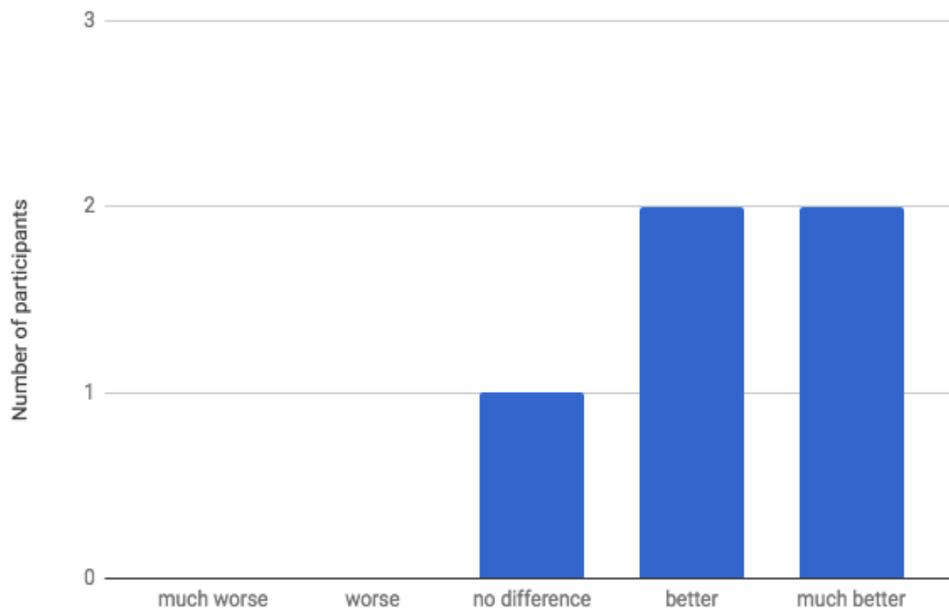
The project has no specific offer for university students. Nevertheless, there are often students who are interested about it for researches about subjects of urban farming related to insertion, production or commercialisation (Lacroix). There are about one or two university students visiting the project each week. The organisers tell them to come during the Thursday morning in the same time as the volunteers. This allows the organisers not to have to repeat and present the project too often and to spare time. It also allows these students to discover the project from a volunteer perspective before asking questions and after having participated in the gardening activities (Interviewee 5).

By comparison with a more spacious farm outside of Paris where they receive up to 300 visitors each week during the summer, the structure of 'le Paysan Urbain' is relatively small for its capacity to welcome visitors. They receive two groups of around fifteen children coming after school and approximately ten volunteers every Thursday. Nevertheless, the pedagogical perspective is being developed and improved (interviewee 5).

In terms of diversity, nutritional culture in the scope of sustainable development remains mainly accessible to people with a certain cultural capital. Many people coming to the project are already sensitized to challenges of sustainable development, most of them are then young adults from a relatively wealthy class. Nevertheless, the project was implemented in a popular neighbourhood. There are therefore children and association from the neighbourhood regularly passing (Interviewee 5). Regarding the microgreens, it also remain a product more accessible to wealthy people at solidary grocery or in chic restaurants. 'Le Paysan Urbain'

offers a more egalitarian access. It is open to the public with opening times but also a living space which aim is to revitalise the neighbourhood. The neighbourhood is a former industrial zone where there was not much activity (Lacroix).

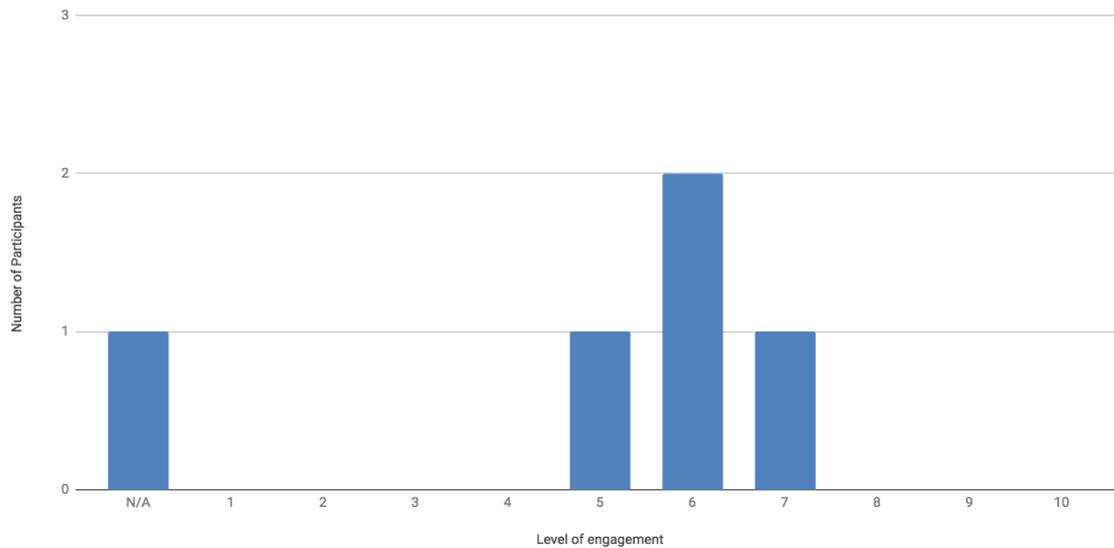
Figure 9: Impact of the garden on the mood of the participants in Le Paysan Urbain



Source: own elaboration

As figures 9 and C1 show, the garden in Paris has direct positive impact on the mental health of the participants by reducing their stress and making them feel better. On the figure 9, only one participant responded that gardening in the project did not make a difference on its mood. The figure C1 highlights that all of the questioned participants feel that participating to the project reduced their stress.

Figure 10: Evaluation of the engagement of participants into the project in the case of Paris



Source: own elaboration

The figure 10 shows that the majority of participants estimated that their engagement is six or less on a scale to ten. Moreover, one participant did not answer to the question. On the figure C2 concerning the feeling of social integration, the result is approximately the same with most of respondent evaluating their integration to 6 on ten. The results of these figures emphasize a moderate involvement of the participants.

In addition, the figure C3 illustrates that only one participant did not learn something about the ecosystem and the biodiversity. The rest expressed to have learn about these element by participating in the project.

4.3.3.2 Environmental impacts

The respect of the local flora represents an important matter to the organisers. This is why they have kept a part of the space in a state of wild land to show the ordinary biodiversity of such land. The goal is to conserve and highlight such biodiversity to the public (Lacroix).

The land occupied by the project is contaminated. It is hard to find a non-polluted field in Paris. Therefore, they had to grow almost all the plants out of the ground in trays. The idea behind this is to show that everything is removable because the project is ephemeral. In addition, the trays used for the garden are mostly coming from reused pallets (Lacroix).

4.3.3.3 Economical impacts

Regarding the economical perspective, the project hires young people doing civil service or students for small internships. There are also third year pupils from high school who have to do one week of traineeship. The project often welcomes one of theses students who takes care of the pedagogical part. This provides formations valid for professional insertion (Interviewee 5).

The project represents a structure for professional insertion, as microgreens do not require high qualifications and is open to plenty of different profiles. Insertion by economic activity allows to hire people who did not have a job for a long time and who do not especially have qualifications. Moreover, microgreens require much manual labor. The project represents then a springboard from a professional and social perspective. The insertion consists of six months contracts, which are renewable up to two years. After these two years, the person can not stay in the structure of the project anymore. Such professional formation can be included in a CV linked with market gardening but also plumbing, electricity, delivery or something else. The project does not aim to specialise the people in the cultivation of microgreens because it does not exist in the agribusiness. To develop new competences is a part of their model. They want to develop more and more tools to make it a specificity of the project (Lacroix). The diversity of jobs highlights such statement; cultivation agent, technical supervisor, marketing manager, site manager, etc (Interviewee 5).

5 Analysis and discussion

5.1 Analysis: the barriers and the drivers

5.1.1 Barriers and drivers in the establishment of the projects

Table 1: Drivers in the implementation of the projects

	Drivers	Lille	Brussels	Paris
Establishment phase	Political	Involvement of public authorities	*	Involvement of public authorities
	Financial	Indirectly financed by public authorities and private partners	Financed by contributions from the participants	Financed by public authorities through a call of tenders
	Social/Cultural	Created as a part of a contemporary exhibition	-Objective to revive the neighbourhood -Great implication of the founders in the project -Project founded by the managers	-Founders of the project met through a gardener network -Great implication of the founders in the project -Project founded by the managers
	Logistical	*	-Creation of parcels -Installation of a trunk of tools for the participants	*
	Location	Provided by the municipality	Provided by the cooperative of le logis	Provided by the developer of the commune and the municipality
	Organisational	Organisation behind the exhibition already existed before the creation of the garden	-organisation already existed before the creation of the garden -Creation of a charter setting the objectives	Restructuration of the structure to develop communication and improve the production of microgreens

* No particular driver

Source: own elaboration

Table 2: Barriers in the implementation of the projects

	Barriers	Lille	Brussels	Paris
Establishment phase	Political	*	*	*
	Financial	*	*	*
	Social/Cultural	*	*	*
	Logistical		-No physical organisation of the garden -Participants had to bring their own tools	Barriers in the process of production of microgreens
	Location	*	*	*
	Organisational	*	Lack of organisation concerning the objectives of the project	*

* No particular barrier

Source: own elaboration

5.1.1.1 Involvement of public authorities

During the implementation of the projects, the involvement of political authorities has played a significant role in two cases, Lille and Paris. In Lille, it lent the field for the project and mainly financed the cultural organisation that implemented the garden. In the case of Paris, they received funds from the municipality thanks to the call for tenders but also by promoting social insertion. In both cases, the implementation of such structures of projects would not have been possible without the intervention of local authorities. In contrast with the cases of Paris and Lille, the case of Brussels was not implemented thanks to the municipality. This shows that depending on the structure and the objectives of the project, the intervention of the local authority can be essential for the creation of such project. In the cases in Lille and Paris, the involvement of the municipalities has then been a major driver for the implementation of the projects.

5.1.1.2 Funding and Physical space

As it has been explained above, the cases of Lille and Paris profited from an external funding of the municipality. In Lille, a cultural programme called Lille3000 promoted by the municipality of Lille and with the contribution of private partners received funds to implement the urban farm. The case of Paris varies from this. Funds were allocated to the

creation of the project after that it won the call for tenders. The field that could occupy the project was lent by the city developer for a period from 2015 to 2018. The reason behind this

is that the developer would build a commercial center on this field afterwards. The funding and the allocated field in the case in Brussels for the implementation was also different. The funding directly came from the financial participation of its members. In addition, the field already belonged to the neighbourhood cooperative, which implemented the project. This part shows that there can be various sources of funding for a project of urban gardening, which constitute important drivers for their creation.

5.1.1.3 Socio-cultural motivation

Social and cultural motivations have also been significant drivers for the establishment of the three projects. In Lille, the garden being a part of a contemporary art exhibition made it as a cultural activity, the goal being to recreate a link between the people and the land. On the other hand, the motivation for implementation in Brussels and Paris was more social than cultural. In Brussels, the founders of the project met through a meeting held for the people in the neighbourhood. The people had the objective to revive the neighbourhood by gathering people around a collective garden. Instead of Paris and Lille, which had significant help from the municipality, the motivation of these people was the main driver for the creation of the project. In Paris, the Cocagne network allowed the founders to meet to create the structure of their project. This network has been a significant driver to gather a competent team of people aiming at such creation. In the gardens in Paris and Brussels, the founders are also member of the managing team of the projects. This is different in Lille. In Lille, the project was created by Lille3000 and the garden is managed by employees. This shows that the founders in Brussels and Paris are more directly implicated in the projects. It highlights then that the motivation of the managers can be an essential driver for the creation of a CG.

5.1.1.4 Logistic and aspects on the field

Regarding practical setting up of the projects, the case of Lille did not meet any barrier. The project was well thought upstream (Demangeat, 2018). In Brussels, the organisation of the garden met some barriers. For example, they had to create the parcels and members brought their own tools, which made gardening more complicated for them. The project in Brussels installed a chest of common tools for its participants. This way, they did not have to bring their own. This is a driver because it facilitated the access to gardening to the participants. The lack of parcels and common tools highlights a lack of organisation and cooperation not only on the field but also in the structure of the project, which led to an improvement of these with common tools and attributed parcels. In Paris, the practical barriers in the establishment mainly concerned the sale and the production of microgreens which were not well known from the public, hard to conserve and to grow with varying conditions. As in Brussels, this led to a restructuration and adaptation first in the production and logistic phases to conserve and distribute microgreens. Second, it also led to a restructuration at the organisational level to improve communication to make the product more known. The cases of Brussels and Paris show that practical and organisational aspects can be significantly intertwined.

5.1.1.5 Structure and organisational aspect

The case of Lille did not meet specific barrier concerning the organisational aspect of the project. One reason explaining this would be that the organisation of Lille3000 already existed before the creation of the urban farm. Moreover, they had enough funds for it. In Brussels, in response to the field barriers that the organisation met, the members created a charter to standardize the functioning of the garden with rules. This charter constituted a significant driver leading to what the project has become; a collective garden. Another driver was the cooperative of 'le logis', which provided the field and existed before the garden. This cooperative handles the project and contributed to create a core of members managing the gardens (La Ferme du Chant des Cailles, 2018). The cooperative was a significant driver at the organisational level because it provided a structure to the organisation. In Paris, the lack of visibility for the sale of microgreens and the need to make the production of microgreens efficient led the organisers to restructure the model of the project.

5.1.2 Barriers and drivers in the maintenance of the projects

Table 3: Drivers in the maintenance of the projects

	Drivers	Lille	Brussels	Paris
Maintenance phase	Political	Involvement of public authorities	*	Involvement of public authorities
	Financial	Financed by public authorities	-Collective garden: contribution from the participants -Market garden: benefits of the sale of vegetables	Financed by: -public authorities -benefits from the sale of microgreens
	Social/Cultural	-Collaboration with other social and environmental associations -The success of the project among the public allowed it to continue -Participants represent the essence of the project -campaign to make know the project -Popularity of the project	Participants represent the essence of the project	-Participants contributing to the garden and to the production of microgreens -Collaboration with other organisations -Popularity of the project
	Logistical	-Installation of a rainwater collection system -Installation of a wood structure	*	Improvement of the process of production of microgreens
	Location	*	*	*
	Organisational	Team of employees with specific roles	*	Diversification of activities

* No particular driver

Source: own elaboration

Table 4: Barriers in the maintenance of the projects

	Barriers	Lille	Brussels	Paris
Maintenance phase	Political	Plans of the municipality to build on the field occupied by the garden	Plans of the municipality to build on the field occupied by the garden	Blocage of the future of the project by a political association
	Financial	*	*	*
	Social/Cultural	*	-Tensions among the participants -Lack of engagement and divergent visions from certain participants	*
	Logistical	Lack of shadow on the site	Too many people willing to join the project at its beginning	*
	Location	*	*	*
	Organisational	Only opened at the same time as the exhibition	*	-Blurred distinction between adherents and volunteers -Lack of funds to restructure the project

* No particular barrier

Source: own elaboration

5.1.2.1 Involvement of public authorities

At the urban farm in Lille, the municipality plays a major role by financing Lille3000 every year. It is similar in Paris, where more than the half the spendings are covered by subventions. In this case, the public authorities are a great driver in the maintenance of the project. Nevertheless, they can also become a significant barrier. In the three cases, the public authorities constitutes barriers due to their plan to build on the field occupied by the gardens. Such plans vary depending on each garden. In Lille, the municipality plans to replace the wildland surrounding the urban farm by housing leaving the future of the project uncertain. The field belonging to the city, it would be easy for the municipality to build there too.

In Brussels, the municipality pressures the project by planning to build many inhabitations around or partially on the gardens. Nevertheless, such plans are suspended and the field belongs to the cooperative of le logis making harder for the municipality to build on it.

In Paris the issue is more complex. ‘Le Paysan Urbain’ was not threatened by the plans to build there because they knew that their occupation was ephemeral. The project has then to find another place to move to. One municipality had accepted for them to come to relocate their project at the beginning but later the municipality opposition party refused them the permit of establishment. This point emphasizes the major role that the public authorities can play as driver or barrier. They have a strong influence on the maintenance of such urban gardening project even if the project like in Brussels is not directly related to them. Clearly the success of urban community gardens can be highly depending on the support of the local authorities at least not be a barrier to the project and best also as part of the drivers.

5.1.2.2 Funding and Physical space

As for their establishment, the cases of Lille and Paris are mostly financed by the same public funds as for their creation. In addition, in Paris, the sale of microgreens represent around 30% of their revenues. In Brussels, as for its implementation, the project is more independent. The collective garden also functions thanks to the financial participation of its members, the market garden with the sale of its vegetables. All of these sources of funds represent significant drivers.

5.1.2.3 Socio-cultural motivation

In Lille, the success of the urban farm among the public is a significant driver. It allowed it to remain after the year 2015. Some actions contributed to this success such as the ‘the branches’, trays in various part of the city, and the collaboration with the MRES, an environmental and solidarity association. These actions helped the farm to be more visible to the public but also to make it more dynamic, with more interactions between the members and visitors through organised workshops.

The project in Brussels met more minor barriers at the social level. There were some tensions among the members of the collective garden, which led of the departure of two members. In addition, the lack of motivation or divergence of visions from certain participants led the organisers to set the rule straight back. A lack of engagement led also the organisers to ask the participants to come at least once a month.

The popularity of the projects in Lille and Brussels have contributed to allow them to continue to exist. In Brussels, this is highlighted by the Saule project stopping plans of the municipality to build on the field for a while. In the case in Lille, the project was supposed to stand only for one year but continued to exist thanks to its popularity. This emphasizes the popularity of a project as a significant driver.

The project in Paris does not meet such barriers because its volunteers are most of the time different each week and moderately engaged in the project. These volunteers represent a minor driver because they contribute in a limited way to the garden and partially to the process of production of microgreens. Nevertheless, in the case in Brussels and Lille, the participants are the essence of the collective garden, it would not exist without their presence. In comparison with the case in Paris, ‘le Paysan Urbain’ could exist without them but it would be more difficult for its organisers and the social part of the project would be greatly reduced. This reveals a significant difference between the two types of organisation. In addition, collaboration between ‘le Paysan Urbain’ and other associations and organisations is a driver. It allowed to develop the social aspect of the project making it more dynamic by diversifying its activities such as composting or taking care of a beehive. This also leads to develop

knowledge in the cultivation of the garden and microgreens. Last, it provides more visibility for the project, which aimed to be more known from the public.

5.1.2.4 Logistical aspects

Concerning practical aspects, there is not enough shadow in the project in Lille. This a barrier for the cultivation of the garden, which needs to be regularly watered if the weather is hot. It is also a barrier for the visitors and participants who would not want to stay too long there due to high temperatures. Nevertheless, to remediate to such issue for the watering, a rainwater collection system has been implemented. It allows to water the garden more easily with water tanks close to cultivation areas. A watering system has also been implemented but did not directly work. On the other hand, for the participants and visitors, there is a wood structure with a roof, benches and tables offering a place in the shadow to rest and gather. These solutions to the lack of shadow represent minor drivers improving the project. The case in Brussels did not meet any particular barrier or driver concerning the maintenance of practical aspects on the field.

In Paris, the improvement of the process of production represents a minor driver making the project more viable. This part shows that in general, the logistic and practical part did not represent major barriers or drivers essential to the project. These are mainly secondary elements, such barriers requiring a reorganisation of the structure of the project or moderate changes on the field.

5.1.2.5 Structure and organisational aspect

A driver in the organisation of the management of the urban farm in Lille is the structure of the team taking care of it; two persons taking physically care of the garden and other employees in charge of the exhibition taking also care of the administration of the garden. Nevertheless, the project being part of an exhibition can be a barrier too. Indeed, this means that the garden is only accessible at the opening time of the exhibition. This limits the access for participants and visitors to take care of the garden and meet.

The project of the collective garden in Brussels met a different barrier concerning its organisation. Having too many people willing to join, they had to restrain the membership to only the people living 1,5 kilometer around.

'Le Paysan Urbain' met different barriers in its maintenance. First, there was a blurred distinction between the volunteers coming every Thursday and the adherents paying a financial participation to the project. The organisers aimed then to develop such distinction. The ideas were to reserve a space of the garden for the adherents or to regularly send them microgreens. Second, there was a lack of means to structure the project. Having economical objectives, the project needed to constantly restructure itself to be viable by evaluating what can be done or not. This represents a serious challenge because even in April 2018, the organisers were still not sure if their project was economically viable.

The drivers and barriers of each project have been diverse in this part, showing that the structure of each organisation was different. This also highlights that each structure therefore meets self-contained drivers and barriers.

5.2 Analysis and comparisons of the Impacts of the projects

5.2.1 Social

The three cases have common and divergent objectives resulting in various impacts. There are many common social objectives that the three projects aim for. Among these various goals, there were three main categories; sensitization and education, the integration of participants, how the project addresses social diversity and how the project affects the well-being of their participants.

5.2.1.1 Sensitization and education

In the three cases the projects welcome classes to sensitize children. There are workshops organised and the children have the opportunity to learn more about urban gardening. In all the cases there are planting areas reserved for the schools. However, in Lille and Brussels, the pupils mainly learn about gardening and plants while in Paris, the organisers also aim to sensitize the children in a greater perspective of sustainability, including actions like recycling or sensitization to biodiversity in the cities.

Another difference is the regularity of the visits of the students. In Lille, visits of classes are based on irregular basis, in Brussels they come when they want and in Paris, they come on a regular basis once a week. This also shows that each project is differently organised. In both Paris and Lille the garden is only accessible according to a schedule while in Brussels the garden is always open. Moreover, on their side, some projects have specific goals too. In the collective garden of 'le Chant des Cailles' (Brussels), they welcome schools of disabled children. In 'Le Paysan Urbain' (Paris), they work with students of all ages from kindergarten to university.

Besides schools, the projects welcome other kind of visitors. They are all open to any visitor who wishes to see how they work and look like. In Lille, the visitors are mainly people going to the contemporary art exhibition. In Brussels, everybody has access to the garden at any time. 'Le Paysan Urbain' is also open to visitors but aims more to make them active. They organise team building activities for companies and most of the visitors are also volunteers who come there one or a few time.

In addition, the figures A3, B3 and C3 show that in each case, more than the majority of questioned participants have learned something about the ecosystem and biodiversity. This highlights that all the cases teach and sensitize their participants to these environmental aspects.

5.2.1.2 Integration of participants

Regarding the integration of participants, each project is significantly different. On the one hand, 'le Paysan Urbain' works around a small core of people having specific roles in the organisation, it does not especially aim to deeply integrate its volunteers. As it is explained above, most of volunteers come more as visitors than members of the organisation. This allows to sensitize many people to the project but also to have a constant influx of volunteers. In addition, the core of people working there know each other well and is efficient to reach their pedagogic and economic goals.

On the other hand, the urban farm in Lille offers events such as workshops to the participants. These events allow them to socialise. Nevertheless, the participants do not have to be deeply engaged in the association, they only have to come times to times to take care of their trays. In addition, the participants do not have much to say in the decision-making of the project, which are taken by Lille3000 and the municipality.

It is also a different system in Brussels, the participants are more integrated for diverse reasons; First, they have to be active in the garden by coming there at least once a month. Second, they have the possibility to take decisions concerning the project by taking part to discussions concerning its future. Third, there are less members in this project, which allow them to know each other more than in the other projects. Indeed, there are about 60 members in Brussels versus more than a hundred in Lille and cannot be compared with Paris. Fourth, everything in the project is financed by its members. Therefore, the collective garden of 'le Chant des Cailles' leaves more opportunities for its members to participate in the decision-making.

The difference of the willingness of integration between the cases in Lille and Brussels on one side and Paris on the other is also highlighted by the comparison of results illustrated in the figures showing the engagement and the integration of the participants. In Lille and Brussels, most of the participants are deeply engaged and integrated while in Paris, the involvement of the participants is moderate. Such difference illustrates well the impacts of the difference in the objectives of the projects.

5.2.1.3 Social diversity

Concerning the social diversity aspect of the organisations, in Lille and Paris, they are open to everybody while in Brussels it is restricted only to the people living 1,5 kilometers around the project. Nevertheless, this restriction does not prevent social diversity in the project because there is a social diversity of people living there. On the opposite, in Paris, the organisers aim to develop social integration through formations. This helps people without jobs or qualifications who could come from poor background to be formed and possibly find a job afterwards.

5.2.1.4 Well-being of participants

In each case, the figures about the relation between the mood, the stress and the participation have shown that such participation improves the well-being of the participants. On the one hand, a great majority of them expressed that gardening in the project makes them feel better. On the other hand, being part of these project reduces the stress of such large majority. Therefore, all the cases have a positive impact on the mental health of their members, reducing their stress and making them feel better.

5.2.2 Environmental

The production of local healthy food ensures a short circuit between producer and consumer, which by itself reduces pollution of transportation which would be needed to buy such vegetables elsewhere. Also all cultures are grown organically without pesticides or chemicals which preserves the environment.

Besides, all the projects contribute to the environment in their own way. In all the projects there is a significant diversity of local plants. They do not use any pesticide in their garden. Concerning the biodiversity, the urban farm in Lille has plants on trays on a contaminated ground covered of cobblestones. This adds more species which were not there before. It therefore directly contributes to the diversity.

On the other hand, in Brussels, the garden is directly in the ground and is not contaminated. At its creation, the garden replaced unoccupied wild lands. The project did not then contribute to develop the local diversity which was probably more developed when the site was wild. Nevertheless, it could prevent the building of housing on the field, which would be worst for this ecosystem. There is then still a contribution of the project for the ecosystem.

In Paris, the project covers contaminated land and plants are in trays. At its implementation, these trays also replaced unoccupied wild land. Therefore, the project did not either contribute to the local ecosystem. Nevertheless, the organisers are sensitive to this, they kept a part of the garden wild to teach about urban biodiversity. Concerning the trays in Paris, they have been built with recycled wood, which contributes to the environment because it prevented to buy new wood limiting the cutting of trees.

The projects in Lille and Paris collect rainwater to irrigate the gardens. This has two positive consequences for the environment. First, it reduces the consumption of tap water, which was significant before the implementation of such system. Second, intercepting rainwater reduces the risk of floods in urban area (Sanchez, 2017).

5.2.3 Economical

All the projects create jobs with remunerated people. However, they all do it differently and for diverse reasons. In Lille, there are two persons employed by Lille3000 a cultural organisation. These persons are in charge of welcoming the visitors and managing the garden. In Brussels, the three employed persons cultivate vegetables that the people who have paid for can come to pick up. They are paid by this financial participation. It is also different in Paris where the core of organisers are mainly interns or employed. They are paid thanks to funds received from subventions and revenues from the sales of microgreens. They have various roles within the organisation; responsible for marketing and management, deputy head, technical supervisor, etc. This highlights a more complex structure than the two other organisations.

At the opposite of the organisations in Lille and Brussels, le Paysan Urbain also indirectly creates job by forming people through social insertion. They offer various competencies such as plumbery or electricity that the person can learn. On the other hand, every project collaborates with universities for researches; Lille with an architecture university for an irrigation system, Brussels with an agriculture department to analyse the soils and Paris with various associations including one developed by a college of agriculture to grow food in Southern countries. Such collaboration leads to a development of knowledge and constitutes field formation for students.

5.3 Comparison of the results with the literature

5.3.1 Drivers and Barriers

The literature review has identified various drivers and barriers to NbS or CG. Regarding CG, there were personal motivation, education of children, financial incentives, community initiatives and neighbourhood scale norms (Goddard et al., 2012). For the NbS, there was the political willingness of authorities, financial resources, physical space, public participation, knowledge and education (Faivre et al., 2017; Sanchez, 2017). The sections of the analysis have confirmed that all of these drivers and barriers generally play a role in the implementation and maintenance of urban CG projects. Each case also shows that the identified types of drivers and barriers were existing at different intensities depending on the nature of the project.

5.3.2 Implication of the cases

This study confirms the elements found in the literature concerning the impacts of CG. As in the literature, all the cases have shown to be significantly popular in urban area thanks to social benefits (Veen, 2015; Norris et al., 2008). The cases indeed bring such social benefits such as making the participants feeling better, less stressed and well integrated in the project. They also highlight the popularity of CG because the cases rarely lacked of participants.

In addition, urban gardening combined with learning about ecosystems develop sustainable lifestyles and environmental values (Colding and Barthel, 2013; Lawrence, 2006). This indirectly improves biodiversity (Krasny and Tidball, 2009a). The cases in this thesis have also highlighted that a great majority of participants learned about ecosystems. This would then contribute to increase biodiversity and delivering ecosystem services (Andersson et al., 2007).

From an economical perspective, urban gardens are opportunities for municipalities to provides green spaces without paying for maintenance and provision, cutting then public expenditures (Jessop, 2002; Rosol 2010; Roy, 2011). Regarding this assumption, the cases have highlighted that there is still a need for funds for maintenance and implementation. Nevertheless, the action of volunteers being not remunerated show that for the same project with employees, expenditures would be higher. Furthermore, CG can be a source of revenues for their gardeners offering business opportunity and developing environmental and food processing skills (Glavan, 2016). The cases have confirmed this assumption, having various economic models and developing different skills.

5.3.3 The cases as NbS

All of these impacts highlight the importances of these initiatives by the benefits they brought to the cities and their inhabitants. Despite their great variations of impact, the definition and the impacts of the three projects have shown to be NbS by fulfilling the eight principles of the definition of NbS developed by IUCN;

First, they aim to conserve nature by having growing plants and avoiding to use pesticides.

Second, they offer approaches to societal challenges such as recycling, composting or improving life conditions of participants and visitors.

Third, there are site-specific cultural and natural context within local and scientific communities where knowledge is transmitted. This happens with the visits of schools but also with the collaboration with associations and universities.

Fourth, all the organisation generate societal benefits through the participation of citizens and being transparent. There are volunteers gardening in each case, which makes them feel good.

Fifth, the projects promote cultural and biological diversity by growing local plants, without pesticides to contribute to the evolution of the ecosystem over time. Sixth, they were also developed at landscape scales representing a significant size of space.

Seventh, the trade-offs between ecosystems services and economic benefits are addressed, the organisation cultivating plants but also creating jobs and formations.

Eighth, they are part of the design of policies or actions to tackle certain challenges. The case in Paris tackles socio economic issues such as unemployment or the lack of opportunities for formations for people with no specific competences. In Brussels, they tackle social issues such as loneliness or stress. In Lille, the project develops the awareness of plants and nature through gardening.

5.3.4 Summary of the analysis

The analysis shows that the objectives of each project have various impacts around them. By comparison, the project of Lille emphasizes the garden as part of an exhibition to sensitize the public. Its members have individual trays to garden, they do not have to be engaged or socially integrated in the project as in the case of Brussels. Nevertheless, thanks to organised workshops, they have the possibility to do so. By comparison with Brussels, they have less obligations and can be more individualistic by having for example their own trays.

In the case in Brussels the collective garden emphasizes a more community aspect with participants from the neighbourhood working in common parcels and having the possibility to be engaged in the decisions of the project. The members know each other well. On the other hand the market garden emphasizes a short cycle of consumption with seasonal organic vegetable but also an economic model as in the case in Paris. Nevertheless, these economic models are significantly different.

In Paris, the project aims to develop an economic model with a new product cultivated in urban area meaning new challenges. While the economic model from the market garden and the community aspect from the collective garden are kept separated in Brussels, in Paris they try to mix both social and economic objectives in one project. This makes such project complex, having diversified activities by producing microgreens and selling them, doing social insertion and working with schools and volunteers in the same time. This creates many different positive impacts. Nevertheless, such complexity also leads to more barriers at different level: logistic, structural or with the public authorities. In the opposite, the case in Lille is more simple and directly funded through an organisation linked to the municipality.

In this case, the project has met less barriers due to its organisation upstream and its simplicity. This does not prevent the project to have positive impacts especially at the sociocultural level but not diversified as in Paris. As the urban farm in Lille, the case in Brussels met a limited number of barriers because it already had an existing organisation before the creation of the project.

The comparison between the literature and the cases has allowed to confirm many findings in the literature. First, it confirmed main drivers and barriers identified by the literature but also showed that the intensity differs in function of the nature of the project. Second, the comparison validates many impacts provided by the literature. Nevertheless, this study illustrated a detailed diversity of impacts. Last, the comparison allowed to confirm that each cases are NbS according to the definition of IUCN.

6 Conclusion

6.1 Key lessons

As cities are growing, the seriousness of the issues they face grows too. The diversity of these issues also poses a problem. Indeed, they can be found in various sectors: social, economic or environmental. NbS can bring answers to some of these issues by being multidimensional and simultaneously providing ecosystem benefits and human well-being. The concept of community gardens can easily constitute NbS, being living spaces where gardeners create social bonds and grow plants. In addition, they can offer various other benefits depending on the objectives of such garden. The aim of this study was first to show the way of functioning of urban CG through drivers and barriers. Second it was to reveal the diversity of benefits that community gardens produce through their impacts on their participants and the city they are in. This would allow to gain more understanding on community gardening as a NbS.

The discovered drivers and barriers have emphasized how fragile these projects can be. It shows that the intervention of public authorities in their favour can be an essential driver allowing their creation providing subventions and a space. Nevertheless, it can also be a barrier putting an end to them. This shows that urban CG can become dependent on municipalities. Field and funds are often real challenges to acquire in a city and the municipality is the most probable actor which can offer these. Nevertheless the case in Brussels shows that even without help from the municipality, some (highly motivated) citizen organisations are also able to find a field and funds by themselves.

Concerning social and cultural motivations, there were no major barriers, showing a significant willingness from urban dwellers to participate and create such projects. Such motivation represents a significant driver for all the projects especially in Brussels where it is the main driver. Three kind of elements have been significant drivers in the implementation and maintenance of the projects. First, as the cases of Brussels and Paris have shown, the motivation of the managers was essential into the creation and the implementation of the projects. Second, the motivation of the participants was primordial for the existence of the projects as in the cases of Lille and Brussels. Without them, these projects would not have any sense. Third, the general popularity of the project has revealed to be a significant driver too. It contributed to allow the cases in Lille and Brussels to continue to exist.

Barriers and drivers have revealed to be more significant for the case with competitive economical aims than for the ones aiming mainly social and cultural goals. The case in Paris had indeed to be competitive and then to ensure production, transport and conservation of microgreens with limited costs. This involved the improvement of logistical and organisational aspects. It has also shown that issues on the field and the organisation of the project are often related, field issues being the consequences of a lack of structuration. Such challenges have revealed the importance for the projects to adapt and to correctly react to these barriers.

In Lille, much as in Brussels, organisations implementing the projects which were already existing before this action seemed to have met lesser barriers in structuration and therefore on the field. Likely their experience as an urban organisation allowed them to avoid specific barriers. In the case of Paris, the complexity and the multiple objectives and impacts that the organisation had to face represented other barriers which led to the need to adapt and constantly restructure the project.

This study confirms the diversity of solutions through the discovered impacts highlighting the importance of the implementation and maintenance of community gardening projects. Indeed as NbS, the cases of community garden have shown to be solutions for diverse issues. Besides providing healthy food on a short circle of consumption limiting the nefast impacts of alternative products with heavier environmental footprint, these gardens are unique with specific positive impacts.

Socially, they provide positive impacts to their participants but also around them. First they improve the well-being of their participants by reducing their stress and making them feel better. Second, each project integrates their participants differently from a moderate involvement in Paris to a deeper in Lille and Brussels with diverse organised activities and workshops. Third, all the organisations aim to sensitize the people about the importance of plants, sustainability and other social and environmental values. The collaboration with schools significantly emphasized this. By doing this, they also educate people about plants and sustainable elements. Fourth, the projects also promote diversity being open to everybody except in Brussels where only people living around can join the project. In Paris, they even go further by offering formations for people alienated from the workplace.

Environmentally, all the projects directly contribute to the environment by growing local plants without pesticides. Each projects also contribute to the environment through various measures. For example, in Paris and Lille, they collect rainwater reducing the consumption of tap water and mitigating risk of floods. In Paris and Brussels they recycled wood to build trays or benches. In addition, the participants learning about ecosystems indirectly contribute to improve biodiversity and deliver ecosystem services.

Economically, each organisation created different kinds of jobs through diverse economic models. In Lille, there is a model similar to a museum where the employees manage and organise the garden and are indirectly paid by the municipality. In Brussels, the market garden works more like a farm selling vegetables and is financed by its clients. In Paris, the model is complex employing people with various roles and paid partly by the benefits of the sale of microgreens and partly by subsidies.

As NbS, urban CG projects have a high potential to contribute to solve challenges in European cities. Besides the multidimensional benefits they bring, the possibility for the project to choose different objectives allow them to adapt to specific issues. A reinforcement of the coordination between public authorities and gardening projects could increase the potential of urban CG to solve the urban challenges they face.

6.2 Future research

Future research could be done in this field to cover the complexity of community garden projects as Nbs that has been shown in this thesis. The projects are often unique and could therefore bring other answers concerning the various impacts and drivers and barriers they can have. Therefore, the examination of other projects in the same cities could bring more detailed answers to these questions, they would allow to compare measures and action taken by the municipality. Regarding the significant role of public authorities in the maintenance and establishment of projects producing NbS, to examine these actions and their impacts would contribute to improve such actions. It would also contribute to help projects to build strong relations with municipalities.

This study was project-oriented, there was no interview of people working for municipalities. Such research from a different angle could highlight other relevant indications regarding

drivers and barriers in CG projects. It would also allow to gain more understanding on the motivation of municipalities to work with CG projects.

Other researches could be done to establish adapted standardized indicators to evaluate projects. To evaluate the projects, some indicators could be selected from the EKLIPSE framework. Nevertheless, there was a lack of indicators adapted to this research. First, these were not always adapted to the size of an urban garden project being between building or street scales. Second, many criteria were not possible to use because they require more time or means. Therefore, it would be beneficial to create an evaluation framework adapted to the size of a project but also divided in stages of analysis depending on the time and means for such research.

Bibliography

- About naturvation* (2017). *NATURVATION*. Retrieved 3 January 2018, from <https://naturvation.eu/about>
- Abrahams, J., Coupe, S., Sañudo-Fontaneda, L., & Schmutz, U. (2017). The Brookside Farm Wetland Ecosystem Treatment (WET) System: A Low-Energy Methodology for Sewage Purification, Biomass Production (Yield), Flood Resilience and Biodiversity Enhancement. *Sustainability*, 9(1), 147. doi:10.3390/su9010147
- Andersson, E., Barthel, S., Ahrné, K., (2007). Measuring social – ecological dynamics behind the generation of ecosystem services. *Ecol. Appl.* 17 (5), 1267–1278.
- Beilin, R., & Hunter, A. (2011). Co-constructing the sustainable city: how indicators help us “grow” more than just food in community gardens. *Local Environment*, 16(6), 523-538. doi:10.1080/13549839.2011.555393
- Birky, J., Strom, E., (2013). Urban perennials: how diversification has created a sustainable community garden movement in the United States. *Urban Geogr.* 34 (8), 1193–1216
- Brody, J. (2017). *The Surprising Effects of Loneliness on Health*. *Nytimes.com*. Retrieved 24 May 2018, from <https://www.nytimes.com/2017/12/11/well/mind/how-loneliness-affects-our-health.html>
- Cabral, I., Costa, S., Weiland, U., & Bonn, A. (2017). Urban Gardens as Multifunctional Nature-Based Solutions for Societal Goals in a Changing Climate. *Theory and Practice of Urban Sustainability Transitions*, 237-253. doi:10.1007/978-3-319-56091-5_14
- Cities*. (2017). *NATURVATION*. Retrieved 22 February 2018, from <https://naturvation.eu/cities>
- Cohen-Shacham, E., Walters, G., Janzen, C. and Maginnis, S. (eds.) (2016). *Nature-based Solutions to address global societal challenges*. Gland, Switzerland: IUCN. xiii + 97pp.
- Colding, J., Barthel, S., (2013). The potential of “Urban Green Commons” in the resilience building of cities. *Ecol. Econ.* 86, 156–166.
- Commercialisation – La Ferme du Chant des Cailles*. (2018). *Chantdescailles.be*. Retrieved 18 May 2018, from <http://www.chantdescailles.be/les-poles/les-maraichers/commercialisation/>
- Economy of Brussels, Belgium | Brussels.com*. (2018). *Brussels.com*. Retrieved 21 May 2018, from <https://www.brussels.com/v/economy/>
- Eggericx, L., & Hanosset, Y. (2003). Les cités-jardins, le logis et floréal. Bruxelles, Ville d’Art et d’Histoire, 34.
- Eggermont, H., Balian, E., Azevedo, J. M., Beumer, V., Brodin, T., Claudet, J., ... Le Roux, X. (2015). Nature-based Solutions: New Influence for Environmental Management and Research in Europe. *GALA - Ecological Perspectives for Science and Society*, 24(4), 243-248. doi:10.14512/gaia.24.4.9
- Est Ensemble devient Territoire du Grand Paris | Est Ensemble*. (2016). *Est-ensemble.fr*. Retrieved 11 May 2018, from <https://www.est-ensemble.fr/est-ensemble-devient-territoire-du-grand-paris>

European Commission : CORDIS : Projects and Results : Nature Based Urban Innovation. (2017). *Cordis.europa.eu*. Retrieved 22 February 2018, from https://cordis.europa.eu/project/rcn/206400_en.html

European Commission (2016). Policy topics: Nature-based Solutions. Retrieved from <https://ec.europa.eu/research/environment/index.cfm?pg=NbS>.

European Commission. (2018). *Mobility and Transport - Urban mobility*. Retrieved 31 May 2018, from https://ec.europa.eu/transport/themes/urban/urban_mobility_en

Faivre, N., Fritz, M., Freitas, T., De Boissezon, B., & Vandewoestijne, S. (2017). Nature-Based Solutions in the EU: Innovating with nature to address social, economic and environmental challenges. *Environmental Research*, 159, 509-518. doi:10.1016/j.envres.2017.08.032

Gare Saint Sauveur 2018 > ferme-urbaine. (2018). Retrieved 11 May 2018, from <http://www.lille3000.eu/gare-saint-sauveur/2018/ferme-urbaine>

Garmestani, A.S., M. H. Benson. (2013). A framework for resilience-based governance of socio-ecological systems. *Ecology and Society* 18/1: Article 9.

Glavan, M., Istenič, M.C., Cvejić, R., Pintar, M., (2016). Urban gardening: from cost avoidance to profit making—example from Ljubljana, Slovenia. In: Samer, M. (Ed.), *Urban Agriculture*. InTech, Rijeka, Croatia, pp. 23–42.

Hanson, Lorelei L., MES. (2013). Salem Press Encyclopedia, 2p.

Jessop, B., (2002). Liberalism, neoliberalism and urban governance: a state-theoretical perspective. *Antipode* 34 (3), 451–472.

Kabisch, N., Frantzeskaki, N., Pauleit, S., Naumann, S., Davis, M., Artmann, M., Haase, D., Knapp, S., Korn, H., Stadler, K., Zaunberger, K. and Bonn, A. (2016). Nature-based solutions to climate change mitigation and adaptation in urban areas: perspectives on indicators, knowledge gaps, barriers, and opportunities for action. *Ecology and Society* 21(2):39.

Krasny, M.E., Tidball, K.G., (2009a). Applying a resilience systems framework to urban environmental education. *Environ. Educ. Res.* 15 (4), 465–482.

Larousse, Lille (2018). Encyclopédie Larousse en ligne - Lille. Larousse.fr. Retrieved 21 May 2018, from <http://www.larousse.fr/encyclopedie/ville/Lille/129940>

Larousse, Paris. (2018). Encyclopédie Larousse en ligne - Paris. Larousse.fr. Retrieved 21 May 2018, from <http://www.larousse.fr/encyclopedie/ville/Paris/137068>

Larousse, Romainville. (2018). *Encyclopédie Larousse en ligne - Romainville*. Larousse.fr. Retrieved 21 May 2018, from http://www.larousse.fr/encyclopedie/ville/Romainville_93230/141390

Larousse, Watermael-Boitsfort, (2018). Encyclopédie Larousse en ligne - Watermael-Boitsfort en néerlandais Watermaal-Bosvoorde. Larousse.fr. Retrieved 21 May 2018, from <http://www.larousse.fr/encyclopedie/ville/Watermael-Boitsfort/149569> La Ferme du Chant des Cailles. (2018). Chantdescaillies.be. Retrieved 17 May 2018, from <http://www.chantdescaillies.be/le-projet/>

Lawrence, A., (2006). “No personal motive?” Volunteers, biodiversity, and the false dichotomies of participation. *Ethics, Place Environ.* 9 (3), 279–298.

Le Logis SCL | Société Immobilière de service public à Watermael Boitsfort. (2018). *Lelogis1170.be*. Retrieved 17 May 2018, from <http://www.lelogis1170.be/>

- Le monde politique (2018). *Le problème urbain | Le monde politique*. *Lemondepolitique.fr*. Retrieved 23 May 2018, from <http://www.lemondepolitique.fr/culture/probleme-urbain.html>
- Maes, J. and Jacobs, S. (2015). Nature-Based Solutions for Europe's Sustainable Development. *Conservation Letters* [online journal]
- McClintock, N., (2014). Radical, reformist, and garden-variety neoliberal: coming to terms with urban agriculture's contradictions. *Local Environ.* 19 (2), 147–171.
- McKay, G. (2011). *Radical gardening: Politics, idealism and rebellion in the garden*. London: Frances, Lincoln.
- Mittermeier, R A., Totten, M., Pennypacker, L.L., Boltz, F., Mittermeier, C.G., Midgley, G., Rodriguez, C.M., Prickett, G., Gascon, C., Seligmann, P.A. and Langrand, O. (2008). *Climate for Life*, Washington DC: Conservation International.
- Mollison, B. (1991). *Introduction to permaculture*. Tasmania, Australia: Tagari.
- Nature-Based Solutions | Environment - Research and Innovation - European Commission*. (2018). *Ec.europa.eu*. Retrieved 7 January 2018, from <https://ec.europa.eu/research/environment/index.cfm?pg=nbs>
- Nesshöver, C., et al., (2016). The science, policy and practice of nature-based solutions: an interdisciplinary perspective. *Sci. Total Environ.* 579, 1215–1227.
- Note d'orientation et plan de gestion — Watermael-Boitsfort - Watermaal-Bosvoorde*. (2018). *Watermael-boitsfort.be*. Retrieved 21 May 2018, from <http://www.watermael-boitsfort.be/fr/commune/vie-politique/conseil-communal/note-dorientation-et-plan-de-gestion>
- Norris, F.H., et al., (2008). Community resilience as a metaphor, theory, set of capacities, and strategy for disaster readiness. *Am. J. Community Psychol.* 41, 127–150.
- Organigramme de la Ville de Lille*. (2018). *Lille.fr*. Retrieved 21 May 2018, from <https://www.lille.fr/Votre-Mairie/La-mairie-de-Lille/Organigramme-de-la-Ville-de-Lille>
- Partenaires (2018). *lille3000*. *Lille3000.eu*. Retrieved 21 May 2018, from <http://www.lille3000.eu/portail/partenaires>
- Projet, Une première micro-ferme à Romainville* (2016). *Le Paysan Urbain*. Retrieved 15 May 2018, from <http://lepaysanurbain.fr/projet/>
- Romainville : grandir sans s'emballer - Objectif Grand Paris*. (2017). *Objectif Grand Paris*. Retrieved 21 May 2018, from <https://objectifgrandparis.fr/romainville-grandir-sembler/>
- Raymond, C.M., Berry, P., Breil, M., Nita, M.R., Kabisch, N., de Bel, M., Enzi, V., Frantzeskaki, N., Geneletti, D., Cardinaletti, M., Lovinger, L., Basnou, C., Monteiro, A., Robrecht, H., Sgrigna, G., Munari, L. and Calafapietra, C. (2017). *An Impact Evaluation Framework to Support Planning and Evaluation of Nature-based Solutions Projects*. Report prepared by the EKLIPSE Expert Working Group on Nature-based Solutions to Promote Climate Resilience in Urban Areas. Centre for Ecology & Hydrology, Wallingford, United Kingdom. Retrieved from http://www.eclipse-mechanism.eu/apps/Eclipse_data/website/EKLIPSE_Report1-NbS_FINAL_Complete-08022017_LowRes_4Web.pdf
- Review of Economic Valuation of Nature-based Solutions in Urban Areas. (2017). *Naturvation*.
- Reynolds, R. (2008). *On guerrilla gardening: A handbook for gardening without permission*. London: Bloomsbury.
- Rosol, M., (2010). Public participation in post-Fordist urban green space governance: the case of community gardens in Berlin. *Int. J. Urban Reg. Res.* 34 (3), 548–563.
- Roy, P., (2011). Non-profit and community-based green space production in Milwaukee: maintaining a counter-weight within neo-liberal urban environmental governance. *Space Policy* 15 (2), 87–105.
- SAULE – La Ferme du Chant des Cailles*. (2018). *Chantdescailles.be*. Retrieved 27 April 2018, from <http://www.chantdescailles.be/saule/>

Urbanization Effects. (2009). *Nationalgeographic.com*. Retrieved 23 May 2018, from <https://www.nationalgeographic.com/environment/habitats/urban-threats/>

Van der Jagt, A. P., Szaraz, L. R., Delshammar, T., Cvejić, R., Santos, A., Goodness, J., & Buijs, A. (2017). Cultivating nature-based solutions: The governance of communal urban gardens in the European Union. *Environmental Research*, 159, 264-275. doi:10.1016/j.envres.2017.08.013

Veen, E.J., (2015). Community gardens in urban areas: a critical reflection on the extent to which they strengthen social cohesion and provide alternative food. (Ph.D. Thesis) Wageningen University.

Voigt, A., et al., (2015). Environmental behaviour of urban allotment gardeners in Europe. In: Proceedings of the ECLAS 2015 Conference: Landscapes in Flux. Tartu, Estonia: Estonian University of Life Sciences, pp. 78–82.

What are the Urban Challenges of European City Makers?. (2018). *New Europe*. Retrieved 23 May 2018, from <https://citiesintransition.eu/cityreport/what-are-the-urban-challenges-of-european-city-makers>

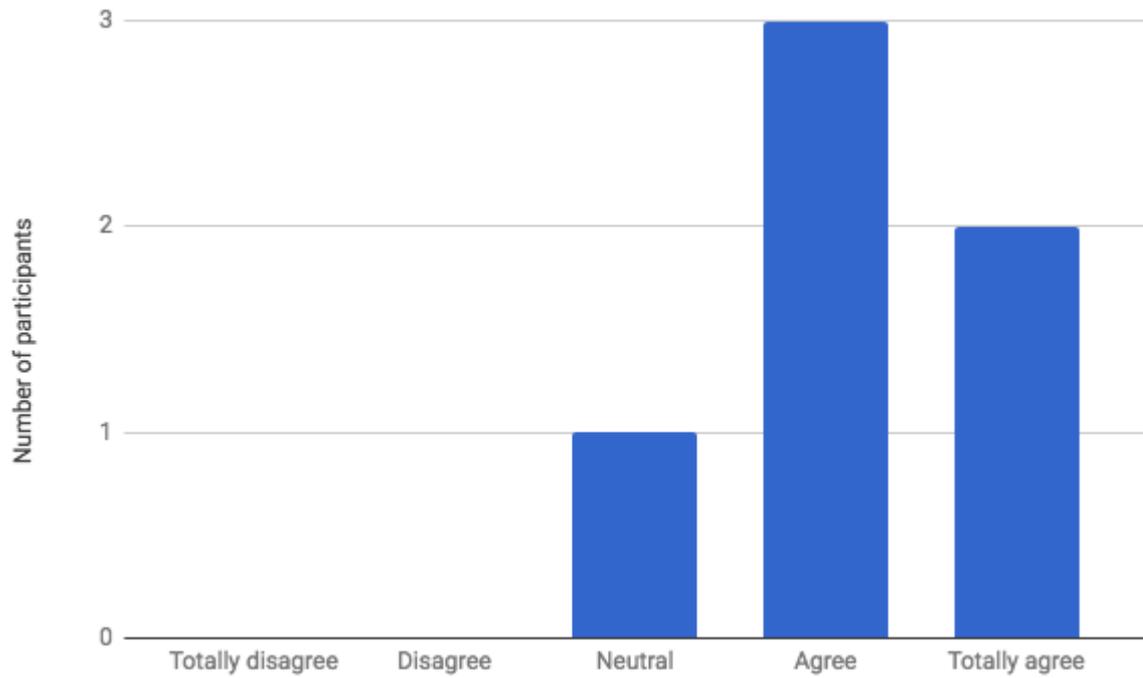
Wright, K. M., & Holden, N. J. (2018). Quantification and colonisation dynamics of *Escherichia coli* O157:H7 inoculation of microgreens species and plant growth substrates. *International Journal of Food Microbiology*, 273, 1-10. doi:10.1016/j.ijfoodmicro.2018.02.025

ZAC DE L'HORLOGE ROMAINVILLE - Promoteur spécialisé dans le commerce de centre-ville. (2018). Promoteur spécialisé dans le commerce de centre-ville. Retrieved 17 May 2018, from <http://www.fiminco.com/projets/zac-horloge-romainville/>

Zac de l'Horloge | Romainville. (2018). Ville-romainville.fr. Retrieved 21 May 2018, from <http://www.ville-romainville.fr/grands-projets/zac-de-lhorloge/zac-de-lhorloge>

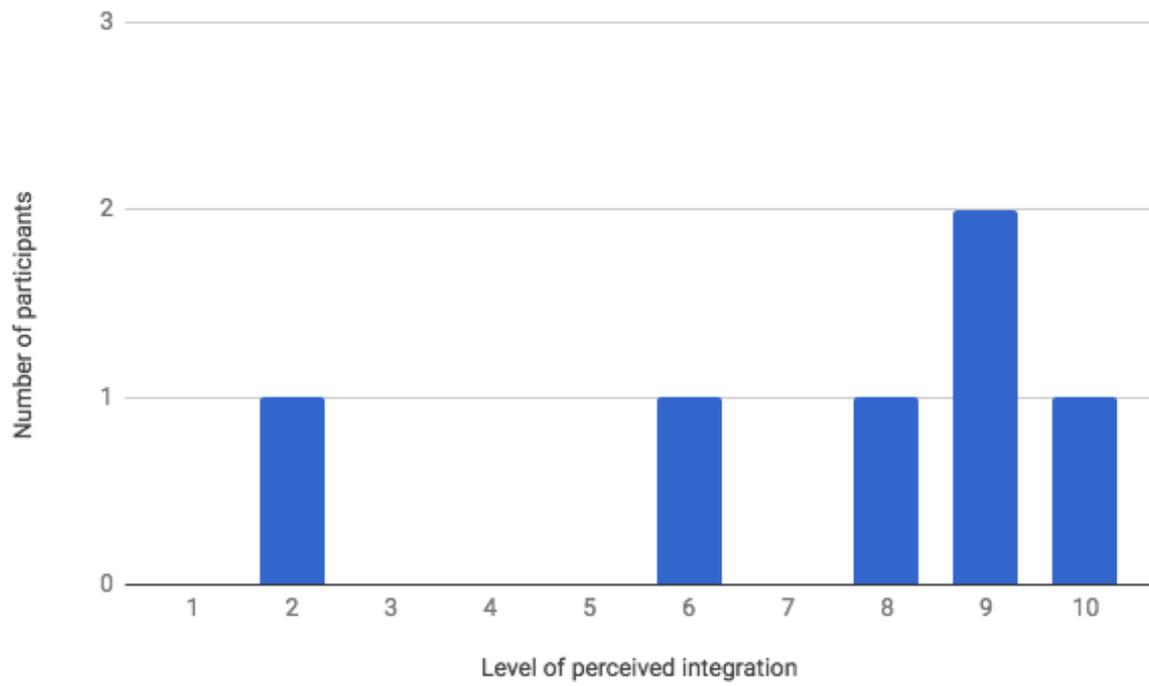
Appendix A. Figures from the case study in Lille

Figure A1: Impact of how the case study in Lille reduces the stress of its participants



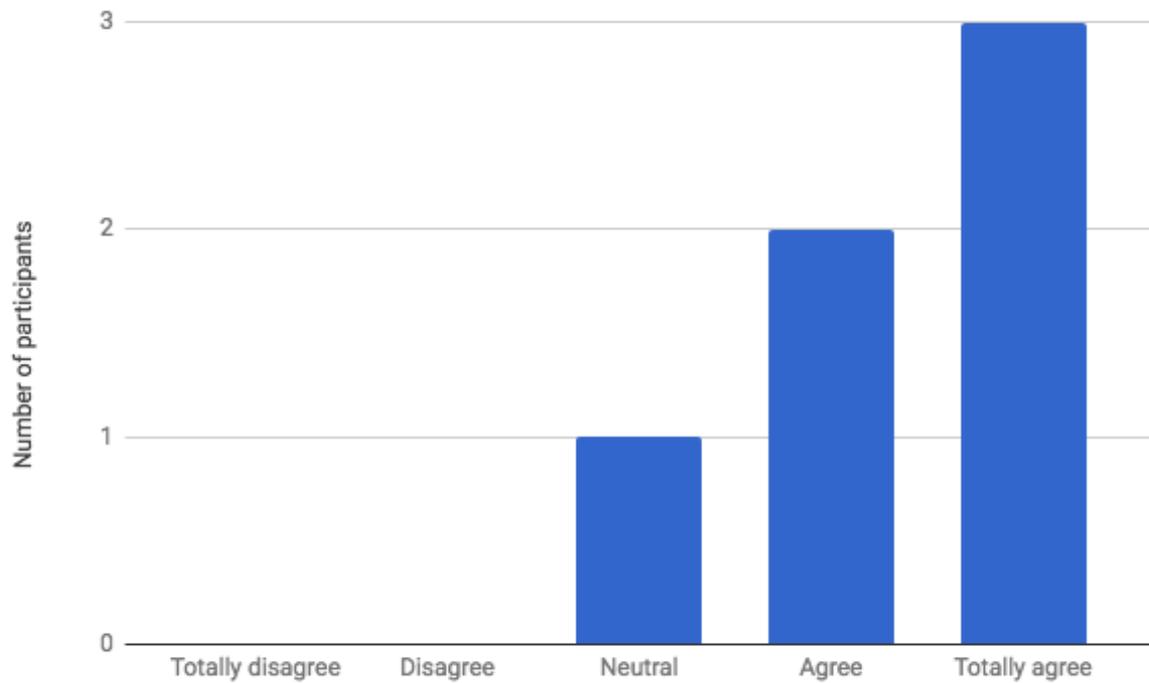
Source: own elaboration

Figure A2: Evaluation of the feeling of social integration of the participants in the case in the case in Lille



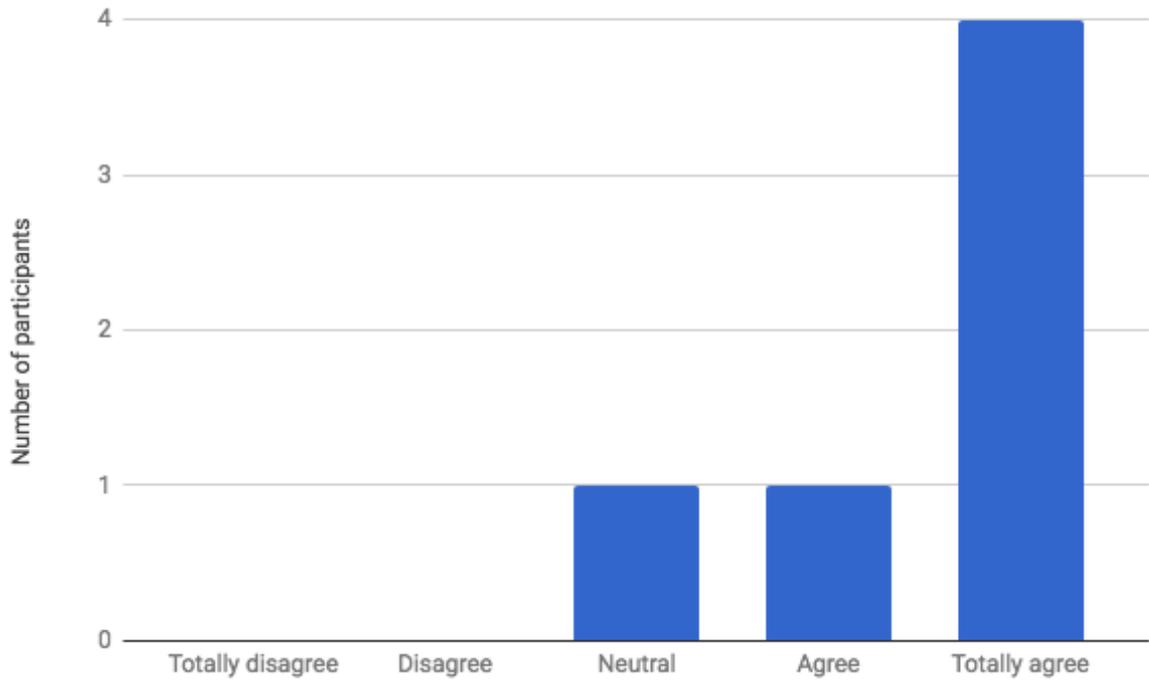
Source: own elaboration

Figure A3: Evaluation of the feeling of the participants in learning about the ecosystem and biodiversity from the project in the case in Lille



Source: own elaboration

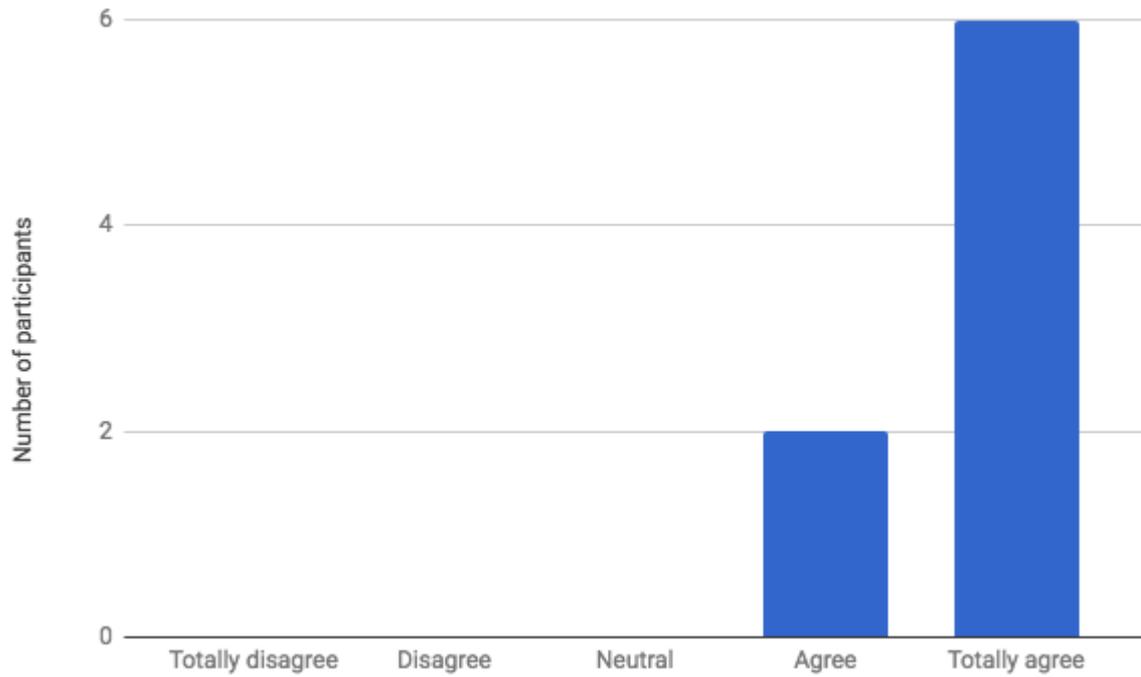
Figure A4: Evaluation of the feeling of the participants concerning the promotion of social values by the project in the case in Lille



Source: own elaboration

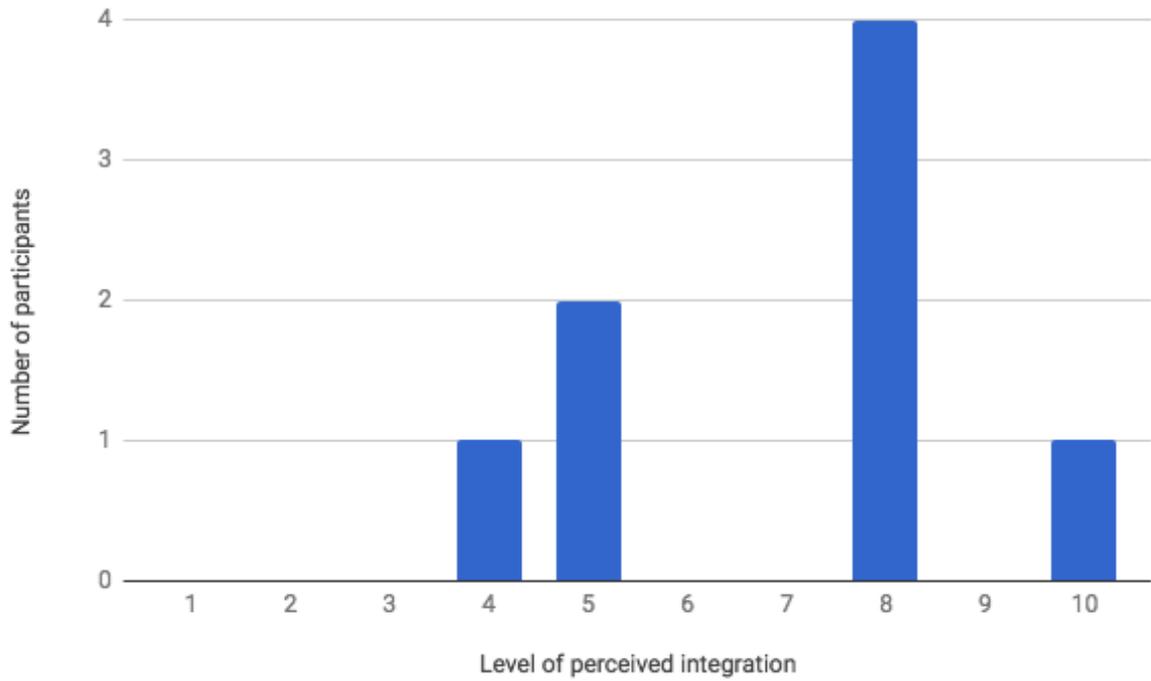
Appendix B. Figures from the case study in Brussels

Figure B1: Impact of how the case study in Brussels reduces the stress of its participants



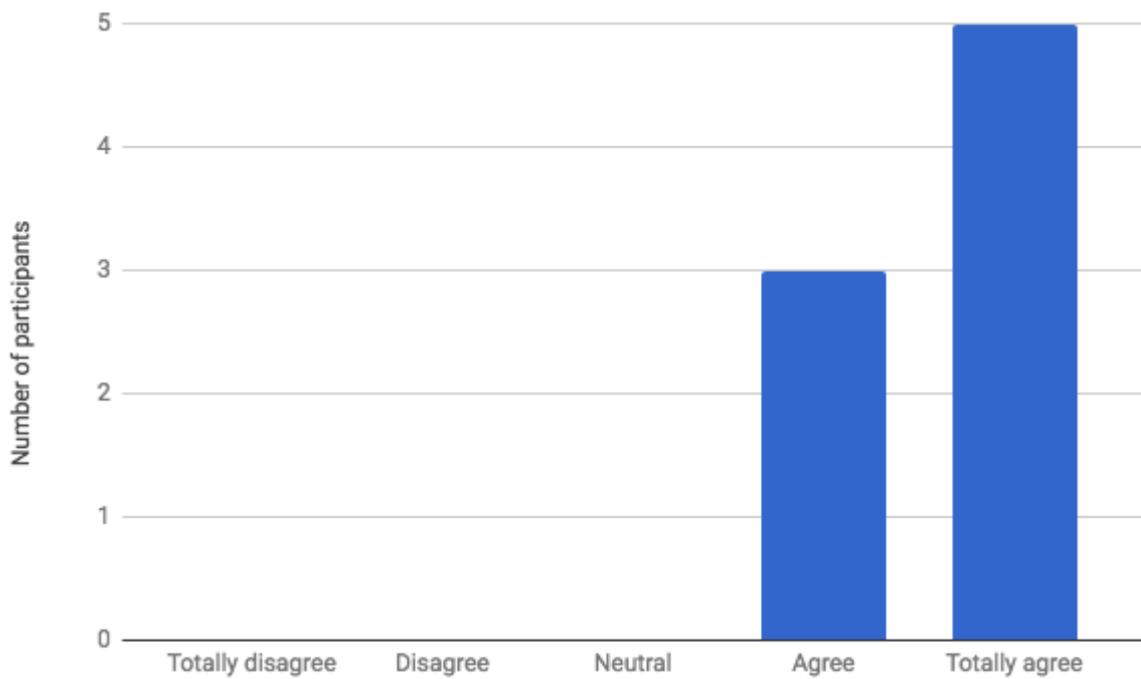
Source: own elaboration

Figure B2: Evaluation of the feeling of social integration of the participants in the case in Brussels



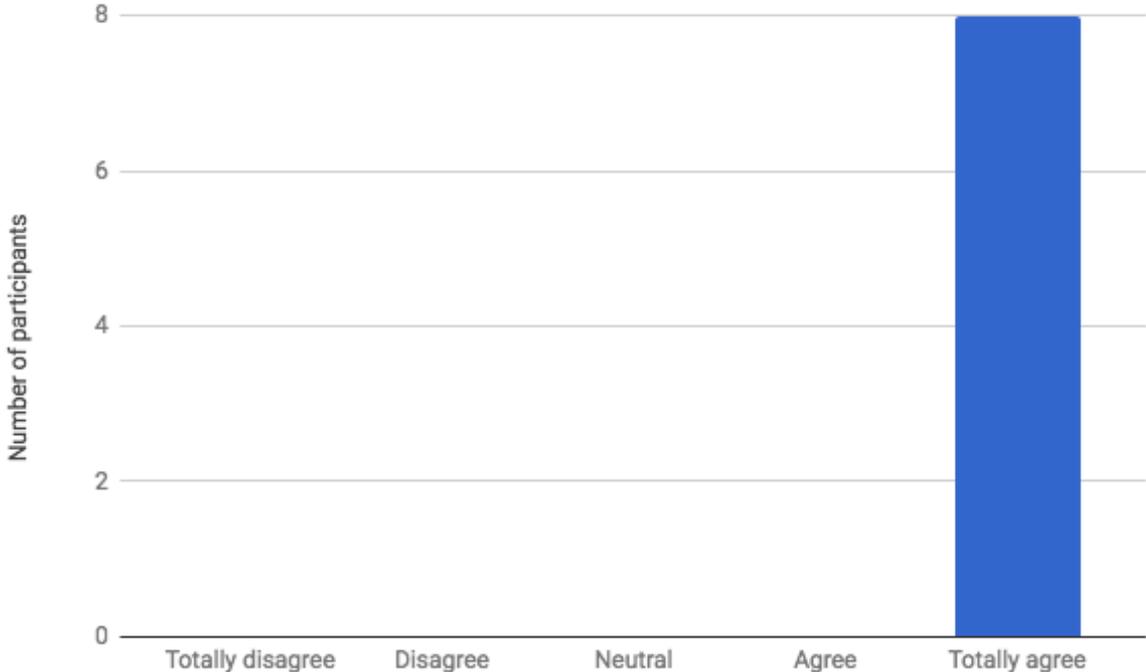
Source: own elaboration

Figure B3: Evaluation of the feeling of the participants in learning about the ecosystem and biodiversity from the project in the case in Brussels



Source: own elaboration

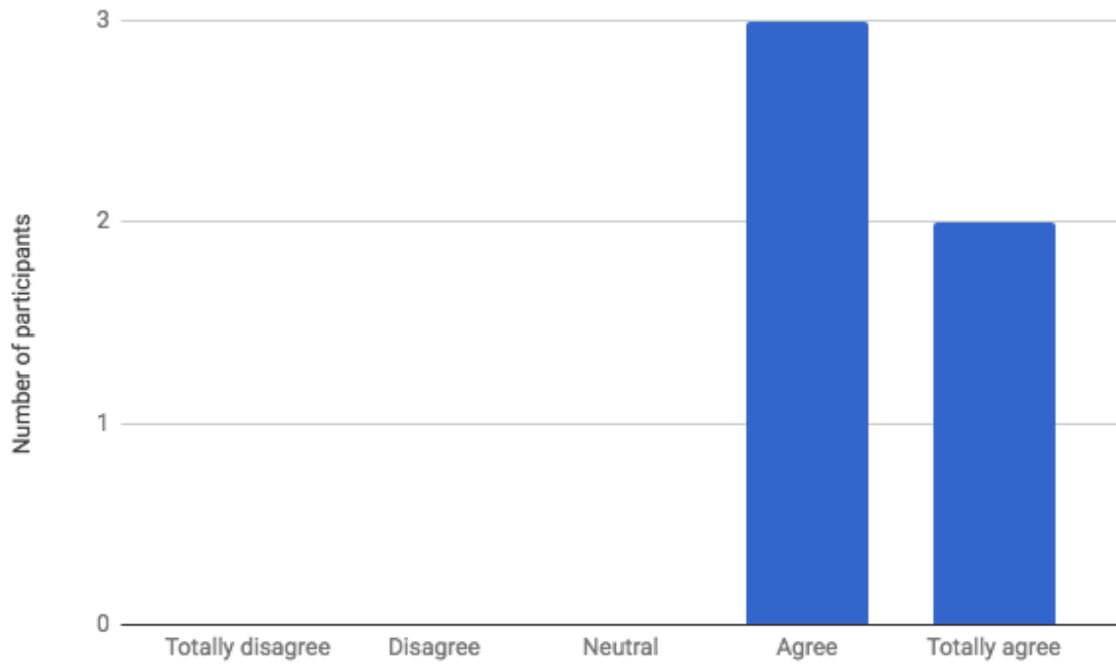
Figure B4: Evaluation of the feeling of the participants concerning the promotion of social values by the project in the case in Brussels



Source: own elaboration

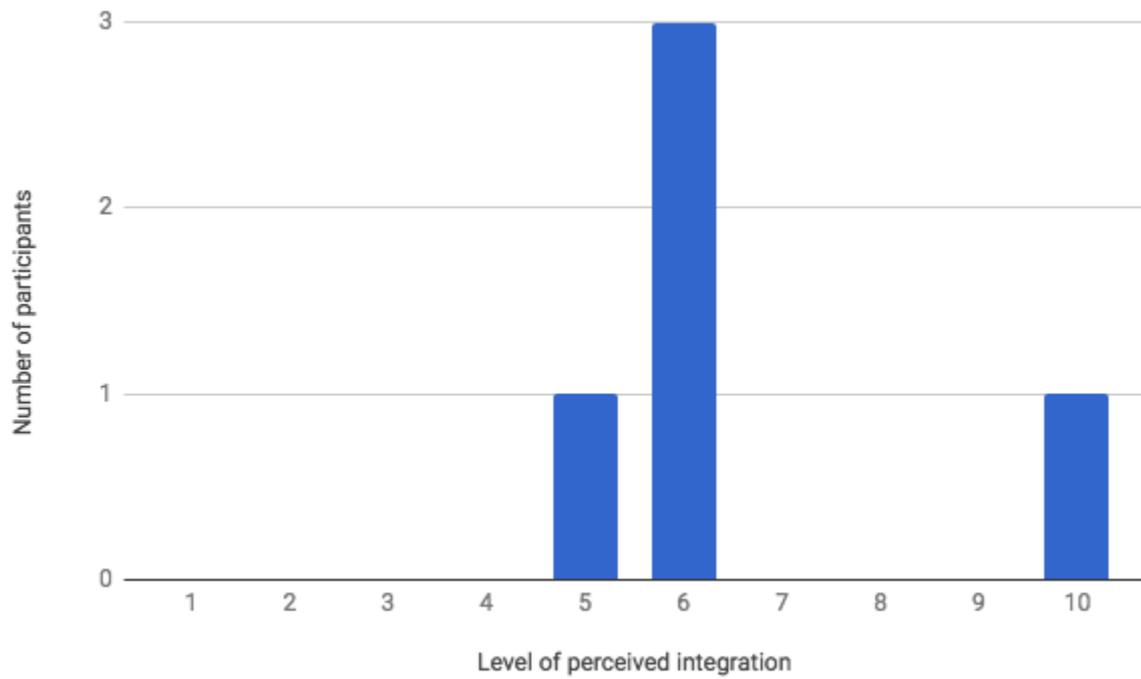
Appendix C. Figures from the case study in Paris

Figure C1: Impact of how the case study in Paris reduces the stress of its participants



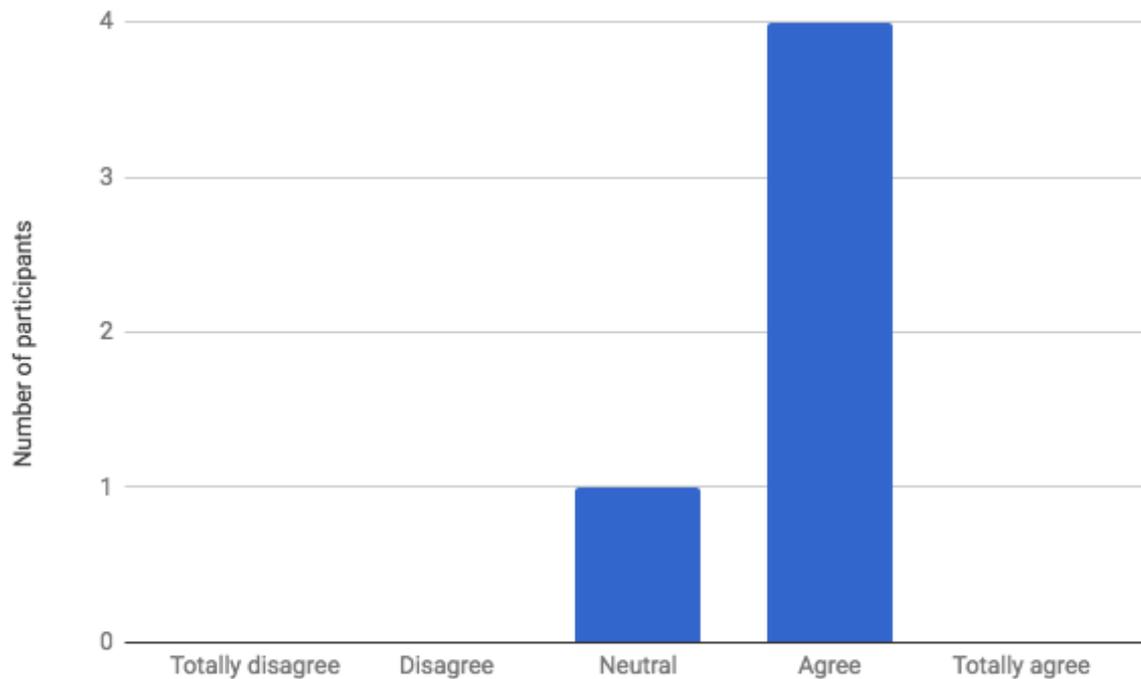
Source: own elaboration

Figure C2: Evaluation of the feeling of social integration of the participants in the case in Paris



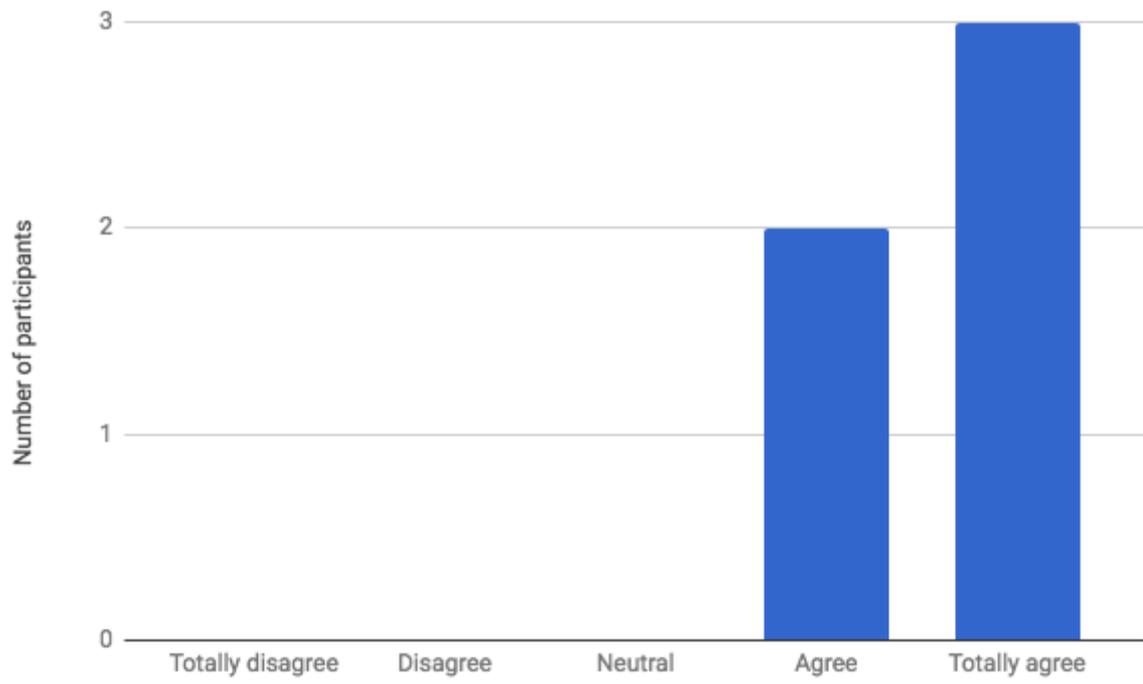
Source: own elaboration

Figure C3: Evaluation of the feeling of the participants in learning about the ecosystem and biodiversity from the project in the case in Paris



Source: own elaboration

Figure C4: Evaluation of the feeling of the participants concerning the promotion of social values by the project in the case in Paris



Source: own elaboration

Appendix D. List of the interview of organisers

#	Name	Organisation	Position	Date
1	Céline Demangeat	Ferme urbaine de la Gare Saint-Sauveur (Lille)	Manager	20th April and 6th May
2	Anonymous	Jardin Collectif du Chant des Cailles (Brussels)	Treasurer	15th April
3	Anonymous	Jardin Collectif du Chant des Cailles (Brussels)	Participant	15th April
4	Anonymous	Jardin Collectif du Chant des Cailles (Brussels)	Participant	15th April
5	Anonymous	Le Paysan Urbain (Paris)	Responsible of the welcome of volunteers	19th April
6	Pierre Lacroix	Le Paysan Urbain (Paris)	Manager of the site	19th April
7	Gérard Munier	Le Paysan Urbain (Paris)	Founder and associate	19th April

Appendix E. Interview guide

Interview E1: Interview for organisers

This interview is semi-structured. This means that the written question will be first asked. In the case there is a need for more details or a lack of information in certain questions, clarification or other adapted questions will be asked.

1. General information:

Name of the project:

Age of the project:

Goal of the project:

Name of the interviewee:

Role in the project:

2. Implementation of the project

2.1 What have been the main barriers in the implementation of the project?

-Financing

-Motivation (education, well-being, community aspects, ...)

-Political commitment of the local authorities (subsidies, willingness from them to help,...)

-Other (physical space, institutional structure, ...)

2.2 On the opposite, what have been the main drivers in the implementation of the project?

-Financing

-Motivation (education, well-being, community aspects, ...)

-Political commitment of the local authorities (subsidies, willingness from them to help,...)

-Other (physical space, institutional structure, ...)

3. Maintenance

3.1 What barriers or problems do you meet in in the maintenance of the project?

-Financing

-Motivation (education, well-being, community aspects, ...)

-Political commitment of the local authorities (subsidies, willingness from them to help,...)

-Other (physical space, institutional structure, ...)

3.2 Are there elements making the maintenance of the project easier?

-Financing

-Motivation (education, well-being, community aspects, ...)

-Political commitment of the local authorities (subsidies, willingness from them to help,...)

-Other (physical space, institutional structure, ...)

4. Impacts

4.1 Social impact

-How many active participants are there in the project?

- Do you think that this project offers a more equal access to green spaces?

4.2 Environmental impact

-Do your project respect indigenous vegetation? (local species, species richness)

-What is the surface area that is covered by your project?

-Does your project cover any contaminated land or land where plants could not grow before?

4.3 Economical impact

-Does your organisation receive subsidies or tax reduction (financial help)?

-Does your organisation contribute to create jobs?

Interview E2: Interview for participants

1. By comparison with my daily life, participating to this project, make you feel more:

Worst 1 2 3 4 5 Better

2. Do you have the feeling that participating to this project reduce the stress you can have

Disagree 1 2 3 4 5 Agree

3. On a scale from one to ten, how do you feel socially integrated in this organisation?

1 2 3 4 5 6 7 8 9 10

4. In the case of trouble, do you feel that you would be supported by the other members of the project:

Disagree 1 2 3 4 5 Agree

5. On a scale from one to ten, how do you evaluate your engagement in this project?

1 2 3 4 5 6 7 8 9 10

6. By participating to this project, do you have learned much about urban ecosystems, their functions and services?

Disagree 1 2 3 4 5 Agree

7. This project promotes social values for urban ecosystems (support for each other, friendship, family, ...)

Disagree 1 2 3 4 5 Agree

