The Socio-Environmental Impacts of Public Urban Orchards: A Montreal Case-Study

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Submitted: 08/2016
A thesis submitted to McGill University in partial fulfillment of the requirements of the degree of a Master of Science in Renewable Resources, Environment Option

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1 Abstract

The rapidly increasing urbanization of the world creates important environmental and social problems. By bringing the cultivation of food closer to where people live, urban agriculture could contribute to alleviating some of these, especially when involving the participation of the residents. Here the potential socio-environmental impacts of public urban orchards was studied, using as a case-study a public urban orchard planted in 2010 in Sainte-Anne-de-Bellevue on the island of Montreal (Quebec, Canada) by the city administration. The socio-environmental constructs evaluated were: place attachment, social capital, food and food system knowledge, and environmental knowledge. Observations of the users of the site were performed, and semi-directed interviews were conducted with eleven users of the bike path and two members of the city administration who have developed the project. The interviews with the users were analyzed using a mixed inductive and deductive qualitative approach. Evidence of positive impacts was found for place attachment, social capital, and food knowledge, while no evidence of impacts was found for food system and environmental knowledge. Impacts on social capital were seen for most of the social capital components studied, but not for bridging social capital. Impacts on place attachment appeared to take place in large part through an increased appreciation of the city administration, thereby also possibly increasing the trust in the administration (social capital). However, this effect appeared to be dependent on a level of maintenance of and communication about the orchard project perceived as adequate by the residents. Finally, the interviewees manifested a high level of interest in participating in maintenance or harvesting activities around the orchard, mainly for interaction with their community. Based on the results I suggest that implementing participatory activities and providing more information about the orchard, the food system and the environment could increase the impacts on the four constructs studied, and I propose other potential means through which urban agriculture could impact socio-environmental sustainability, namely through improving quality of life and reducing urban sprawl. Though further research is needed to evaluate the extent to which the results are transferable to other contexts, this study should be of interest to city administrations seeking cost efficient means of positively contributing to socio-environmental sustainability and to the individual wellbeing of their residents, as well as to researchers interested in the relationship between urban planning and socio-environmental sustainability.

2 Résumé

L'urbanisation croissante du monde cause d'importants problèmes environnementaux et sociaux. L'agriculture urbaine, en amenant la production de la nourriture en contact avec les lieux dans lesquels les gens vivent, a le potentiel de remédier à certains d'entre eux, en particulier lorsqu'elle implique les résidents. Cette recherche a exploré les impacts socio-environnementaux potentiels des vergers publics urbains à travers une étude de cas impliquant un verger public urbain qui a été planté en 2010 le long d'une piste cyclable à Sainte-Anne-de-Bellevue sur l'île de Montréal (Québec, Canada), par l'administration de la ville. Les constructions théoriques socio-environnementales évaluées étaient: l'attachement au lieu, le capital social, la connaissance sur la nourriture et le système alimentaire, ainsi que la connaissance environnementale. Des observations des usagers du site et des entrevues semi-dirigées avec deux membres de l'administration de la ville qui ont développé le projet, ainsi qu'avec onze usagers de la piste cyclable, ont été effectuées. Les entrevues avec les usagers ont été analysées à l'aide d'une approche qualitative mixte, déductive et inductive. Des signes d'impacts positifs ont été observés pour l'attachement au lieu, le capital social et la connaissance alimentaire, cependant aucun signe d'impacts n'a été observé pour la connaissance du système alimentaire et la connaissance environnementale. Des impacts ont été observés sur la plupart des composantes du capital social étudiées, mais non pour le capital social de pontage. Les impacts sur l'attachement au lieu semblaient prendre place principalement par le biais d'une appréciation accrue de l'administration de la ville, et donc potentiellement d'une hausse de la confiance en l'administration (et donc du capital social). L'appréciation de l'administration toutefois semble dépendre d'un entretien et d'une communication sur le projet perçus comme adéquats par les résidents. Enfin, les interviewés ont manifesté un grand intérêt dans la participation à des activités d'entretien ou de récolte, principalement afin d'interagir avec leur communauté. À partir des résultats je suggère que d'implémenter des activités participatives ainsi que de fournir plus d'information sur le verger, le système alimentaire et l'environnement pourrait accroître substantiellement les impacts sur les quatre constructions étudiées, et propose d'autres moyens par lesquels l'agriculture urbaine pourrait favoriser la durabilité environnementale, soit d'améliorer la qualité de vie et de prévenir l'expansion urbaine. Bien que d'autres études soient nécessaires afin d'évaluer à quel degré ces résultats sont applicables à d'autres contextes, cette étude devrait être d'intérêt pour les administrations de villes qui recherchent des moyens peu coûteux de favoriser le bien-être de leurs résidents et la durabilité socio-environnementale, ainsi

que pour les chercheurs qui étudient la relation entre l'aménagement urbain et la durabilité socio-environnementale.

3 Acknowledgements

I warmly thank my co-supervisor Prof. Kevin Manaugh for his guidance, availability and enthusiasm, and my supervisor Prof. Peter Brown for his guidance and encouragements. I am greatly indebted to Dr. Paula Bush for her help with the qualitative and participatory aspects of the research. Thanks to Prof. Tom Naylor for pointing me to the topic of urban agriculture, to Prof. Elena Bennett for her guidance and being part of my supervisory committee, and to Prof. Eric Duchemin, Prof. Nicolas Kosoy, Nikolaos Gryspolakis and my friend Dr. Cécile Aenisaenslin for their precious help with the development of the research proposal. I also thank the McGill University Department of Natural Resources for its financial assistance, and all the participants to this research for giving some of their time to share their impressions. Special thanks to my family and friends for their support, and without whom none of this would make sense.

4 Preface

I came to environmental sociology[1] somewhat indirectly. After an undergraduate degree in Biochemistry, pursued in the hope of one day developing more environmentally friendly products, I then went for a PhD in genetics out of a love for DNA. However, upon completing it I realized that I disagreed with the fundamental premise of genetics (of DNA being a code for the organism), thus I decided to not continue on that road. I am also probably more interested in people than in molecules, though I am grateful for having worked with molecules, which I believe has trained me to think about people from a biological perspective, and thus, to my sense, a less judgmental one than before.

I then went to travel and work on organic farms in Europe. This initiated my questioning on the social factors that shape environmental behavior. I went to Germany and France, hoping to find the cultural reasons why Germany is environmentally, or so it seemed to me, more advanced than France is. Through these travels I experientially realized how complex culture is (such that, for example, the culture of an administration is not necessarily the culture of its members), and especially so for culture pertaining to environmental issues, interwoven as it is with various psychological, historical and geographical drivers and constraints.

Following these travels I initiated a PhD in Philosophy to pursue further my concerns regarding the premises of genetics and the functioning of science. Though I prematurely aborted this project for various reasons, I hope that this philosophy training gave me a good foundation for my current redirection towards the social sciences.

As of my interest in urban agriculture and public produce: I grew up in a suburb of Montreal, Quebec, and the place appeared to me as composed of not much more than neatly trimmed lawns, that is to say, utterly dead. But I also did not like the cities of the industrialized countries that I visited: they had too many cars and too few natural elements and, I felt, their work and leisure activities did not involve the senses and creativity in a fulfilling way. Where I had felt the happiest as a child had been my grandmother's farm in a tiny village in the north of France. Thus I long thought that I wanted to live my adult life in the countryside. But through my travels and

[1] For an introduction to the field see for example (Mayerfeld Bell and Ashwood 2015).

experiences on organic farms, I realized that cities allow for social interactions that the countryside does not as easily provide. So if we seek social interactions in the city, and green in the country, why not mix the two, and create green, food-producing cities? I then learned that urban agriculture could also serve to reduce the environmental impacts of food production. With it thus, I was joining several of my concerns and interests. However, its social impacts will not be achieved if urban agriculture only remains available to the few who have the money, or knowledge, or connections. (In Montreal, community gardens are scarce and their waiting lists are long.) Public produce thus seemed to be an interesting means of increasing access to the sources of our food, and the health and joy that these can provide.

I wrote this thesis for anyone interested in green and productive cities, and/or in biologically and socially rich, fair, healthy and exciting lives. Though the case-study was performed in a developed country in North America, I hope that the findings are to some extent relevant for any city.

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Montreal
June 16 2016

5 Introduction

"There is a need to reconnect our urban and non-urban environments through a reinvigorated urbanism that fully embraces the notion of healthy environments. Urban land should be fed and, in turn, should nourish the urban condition. It should not only feed us, but clothe us, house us and fuel our mobility with goods, services and agriculture. It should complement and provide beauty and meaning to our time spent walking to school, socializing at friends' houses, going to the library, the store or the park. It should not be sustained as our term 'sustainability' would imply; it should be 'enriched' so that the benefits of the natural world can be felt by all, regardless of age, race, class or creed. In doing so, we can ensure that our children are not confused about where their food comes from. They will know that apples don't just come from boxes in stores; they are grown in schoolyards, backyards, streets, and unique non-urban, natural places that nourish the urban environment" (Knight and Riggs 2010, p. 125).

5.1 Rationale: The potential of urban agriculture to relieve environmental and social problems arising from urbanization

Urbanization

The world is increasingly urbanized. From 29% in 1950, the proportion of urbanized population reached 51% in 2011, and is projected to reach 69% in 2050 (Bloom 2011). Between 2000 and 2030, the total urban area is expected to triple, and the urban populations to nearly double (Secretariat of the Convention on Biological Diversity 2012). Though this process is usually associated with greater access to resources for the newcomers (Nauman, VanLandingham, and Anglewicz 2016), it also results in an array of environmental and social issues. As we will see below, urban agriculture, by reconnecting people with food producing landscapes, and thereby reducing the "metabolic", "social", and "individual rifts" introduced by the separation of living and food producing spaces, constitutes a promising tool for addressing some of these (McClintock 2010).

Urban agriculture

Urban agriculture consists in the agricultural production of plants and animals for food and other uses within the limits of a city. It is characterized by a spatial, economic, political, material and energetic integration of food production within the urban system (Mougeot 2000; N. McClintock 2010; McClintock 2011). It is usually intensive (Mougeot 2000) and focuses on perishable and high-

value products that can be grown in confined spaces, such as green vegetables, fruits, mushrooms, herbs, fresh milk, eggs, poultry and pork, and fish (De Zeeuw, Van Veenhuizen, and Dubbeling 2011). In 2008 the FAO estimated that about 15% of the world's food is produced through urban agriculture, though most of it is taking place in developing countries (Clark and Nicholas 2013).

Developing countries have always had substantial recourse to the practice, both for personal consumption and for sale, and often against the authorities' will (De Zeeuw, Van Veenhuizen, and Dubbeling 2011; Zezza and Tasciotti 2010). In developed countries it was common until industrialization, but at that time a clear delineation between urban and rural areas emerged and green urban spaces became devoted to purely recreational purposes (Elmqvist et al. 2013).

In the past two decades however, interest in urban agriculture has been rapidly increasing across the world on the part of residents, administrations, businesses and researchers. This is displayed by the sprouting of community or allotment gardens (about 3 million in Europe (Barthel, Folke, and Colding 2010)), businesses, citizen-led community programs, changes in regulations and zoning ordinances (Goldstein et al. 2011; Tornaghi 2014; Cockrall-King 2012), and public consultations as in Montreal (Office de Consultation Publique de Montréal 2012). To explain this emerging interest, the official and the scientific literatures provide several reasons (e.g. (Tornaghi 2014; Office de Consultation Publique de Montréal 2012), including, in the case of urban agriculture performed by residents for non-commercial purposes: improved personal wellbeing, community bonding, food security and nutrition, and reconnecting city residents to food and nature. Today, several international organizations promote urban agriculture as a means of enhancing resilience, such as the U.S. Department of Agriculture, the FAO, the World Bank and the European Union (Clark and Nicholas 2013).

Different types

Urban agriculture can be performed in many different ways, depending on the type of space used (e.g. rooftop versus ground), the type of ownership (e.g. private, shared, public), and whether it is for commercial purposes or not (Tornaghi 2014). Non-commercial types include: community gardens in which residents use and share a publicly available space provided by the city; guerilla gardening in which residents illegally use public spaces (e.g. Crane, Viswanathan, and Whitelaw 2013); and public produce, in which produce is freely accessible to the public and growing in public spaces or in places perceived as public, such as hospitals and corporate plazas (Nordahl 2014).

Environmental benefits

The environmental benefits provided by a reintegration of food producing and living areas via urban agriculture include 1) a reduction of greenhouse gas emissions from food transportation (only from producing and consuming food locally, the United Kingdom could reduce its carbon dioxide emissions by 22 %, twice the amount the UK has committed to in the Kyoto protocol (Grewal and Grewal 2012)); 2) reintroduction of human labor and skills into food production, which currently must be replaced by environmentally costly food types, and technologies and modes of production such as herbicides and pesticides, mechanization, and the monoculture production system (Satterthwaite, McGranahan, and Tacoli 2010); 3) making the recycling of water and organic matter back into the food chain less energy and logistically intensive (the current low level of recycling of organic matter disrupts nutrient loops, causing pollution and various ecological impacts such as the eutrophication of water bodies (Metson 2014), while organic city waste constitutes a valuable input for agriculture (Jayet and Petel 2015)); 4) a reduction of the agricultural pressure on deforestation, with its accompanying impacts on biodiversity and climate (under the current main food production methods, the need for more arable lands to satisfy the growing population is estimated to one billion more hectares by 2050 (Pirard and Belna 2012)); 5) in the urban environment itself, the enhancement of the vegetation cover would help to improve the micro-climate, control water flows and limit the impacts of flooding and landslides (De Zeeuw, Van Veenhuizen, and Dubbeling 2011).

Potential yield

For substantial environmental benefits to ensue from urban agriculture, it must be able to generate a substantial proportion of the food consumed by city residents. An analysis performed for the city of Cleveland (USA) suggests that this is the case, at least for typical North American cities (Grewal and Grewal 2012). However, shifting the site of food production in a significant way from countryside to city might necessitate changes in lifestyle (to reintroduce food producing activities in the lives of a greater proportion of the population), building style (to make rooftops productive (Grewal and Grewal 2012)), and diet (to shift towards crops that are more land and energy efficient than grains are, such as productive trees (Satterthwaite, McGranahan, and Tacoli 2010; Molnar et al. 2013; Vinceti et al. 2013; Clark and Nicholas 2013; Nordahl 2014; Kulak, Graves, and Chatterton 2013)).

Social benefits

Physical health. Though developed countries now experience high levels of material comfort, lifestyle-related diseases have become a major public health concern, exemplified by strokes and ischaemic heart disease being the two leading causes of death in 2012, affecting a proportion of the population 2.5 times greater than in low-income countries, and 3.5 times greater than AIDS in low-income countries ("WHO | The Top 10 Causes of Death" 2016). Urban agriculture, especially when performed by the residents themselves, has the potential to help alleviate these issues by increasing access to nutrient-rich foods such as fruits and vegetables - indeed, access to healthy food is insufficient even in developed countries like the USA (McClintock, Okvat, and Brown 2012). If performed with organic methods (as is usually the case), it can also increase access to organic foods, shown to contain on average meaningfully higher levels of antioxidants and lower levels of pesticides and the heavy metal cadmium (Barański et al. 2014).

Mental health. Though lack of mental wellbeing is an issue in developed and developing countries alike, with suicide being globally the 15th leading cause of death in 2012 and the second leading cause among the 15 to 29 year olds ("WHO | Suicide Data" 2016), there is some evidence that rates of mental illness increase with population density, and disruption social capital was suggested as one of the underlying cause of this relationship (Mckenzie 2008). Indeed greater social capital was found in several studies in developed countries to be associated with lower suicide rates, higher self-reported health, and better mental health (Smith and Kawachi 2014; Kunst et al. 2013; Okamoto et al. 2012; Congdon 2011; Langille et al. 2011; Poortinga 2012). Place attachment (that is, attachment to the living environment, rather than to people) is also disrupted by urbanization, especially through rural to urban migration (Nauman, VanLandingham, and Anglewicz 2016), and also suggested to be important for mental wellbeing (Jack 2010). Types of urban agriculture that actively involve the residents on a non-commercial basis could help to alleviate these issues. Indeed, though longitudinal studies are needed to show a causal relationship, gardening activities were found to be associated with reduced stress, greater mental health, higher consumption of fruits and vegetables and levels of exercise (Litt et al. 2015; Andel et al. 2008; van den Berg et al. 2010; Brown and Jameton 2000; Sodano 2012). Gardening activities involving interaction with other residents, such as community gardening, were found to impact social capital and place attachment (see section 6), which in turn can be important components of socio-environmental sustainability (see section 6). Other socio-environmental benefits of such types of urban agriculture include: producing engaged communities (Crane et al. 2013); making the economy less sensitive to lack of employment and thus reducing the need for economic growth with its associated

environmental impacts (Antal 2014; Southworth 2006); promoting the 'Homo psychologicus' state of mind over the 'Homo economicus', and thus a higher interest in environmental issues (Jager et al. 2000; Müller 2012; Edwards 2011); and contributing to the material and social resilience of cities (Colding and Barthel 2013; Barthel and Isendahl 2013), as displayed by the Victory Gardens in the Allied nations during the first and second world wars (McClintock 2010; Cockrall-King 2012).

Risks

Risks associated with urban agriculture are mainly health related and it is unclear whether they are greater for urban than for rural agriculture. These risks can arise from the practice itself or from urban pollution. Practice-related risks include the inadequate management of livestock or use of agrochemicals, and require appropriate regulations and enforcement to be managed; several countries have initiated major programs to facilitate the development of safe urban agriculture (De Zeeuw, Van Veenhuizen, and Dubbeling 2011). Pollution-related risks are mostly due to heavy metals and synthetic organic compounds found in the soil or dust of most cities and originating from industries and car traffic (McClintock 2011; Ajmone-Marsan and Biasioli 2010). However, soil is also polluted in rural areas of both developed and developing countries, due to industry emissions, disposal of effluents, mining, energy and fuel production, application of pesticides and fertilizers, and sewage irrigation - sometimes rendering the soils improper for cultivation, as in China (McClintock 2011; Purakayastha and Chhonkar 2010; Wei and Yang 2010; Škrbić and Đurišić-Mladenović 2012; Purakayastha and Chhonkar 2010; Manz et al. 2001; Hernández et al. 2013). Few studies compared the levels of pollutants in urban and rural-grown crops, though two did so and found that fruits grown in Berlin (von Hoffen and Säumel 2014) and Copenhagen (Samsøe-Petersen et al. 2002) were in some cases less contaminated than their market equivalent, and that similar levels were found for urban and rural-grown vegetables (Samsøe-Petersen et al. 2002). Finally, soil pollution in cities is highly variable between sites (Škrbić and Đurišić-Mladenović 2012; McClintock 2011; Ajmone-Marsan and Biasioli 2010), and can be avoided in practice by testing the soil in the laboratory (Marier and Hubert 2012). Furthermore the impact of dust can be reduced by the presence of barriers between roads and the growing site (von Hoffen and Säumel 2014). Overall the current data does not preclude the development of urban agriculture (over rural agriculture) for health-related reasons, though further research is needed to better know how to minimize the impacts of pollution.

Why study socio-environmental impacts

Above we have seen why urban agriculture is a promising means of addressing some of the environmental and social issues arising from urbanization. However, certain types of urban agriculture will have greater impacts for certain issues than others. For example, more efficient production systems, which should provide greater environmental benefits, are presumably more likely to arise in commercial types of urban agriculture. However, as we have seen above, non-commercial types have social benefits that commercial types cannot provide. As the general interest in urban agriculture is rapidly rising, it is sometimes overseen that its benefits are not only economic and environmental, but also social (e.g. MIG, Inc. 2011) (Cook and Swyngedouw 2012; Slater 2001). It is therefore important to research the potential social benefits further, and to publicize them when found.

Why study public produce

Though several studies have looked at the social impacts of community gardens (see section 6), to my knowledge no research is available to date on the social impacts of public produce, though this type of urban agriculture has an interesting production potential since, at least in cities of the United States, the city itself is the largest landowner (Nordahl 2014). Public produce may also have socio-environmental impacts on a scale and of a kind that no other type of urban agriculture could provide, since presumably a larger proportion of the population can be in contact with it, similarly to what has been suggested for public access gardens in Berlin (Bendt, Barthel, and Colding 2013). However, it appears likely that the active engagement of the gardeners with plants and people is an important component of the socio-environmental benefits of non-commercial urban agriculture, and since public produce does not on its own necessarily involve the participation of the residents in the food production activity, the extent of the socio-environmental impacts that it would have is uncertain (though Nordahl (2014) claims that they exist). This research aims at beginning to shed light on this question.

Why study fruit trees

In terms of food production, fruit trees have several advantages over vegetables. They are perennial and thus save the effort of planting every year; do not require continuous maintenance such as weeding and watering; make use of aerial space; and provide yields per surface area several times greater than cereals (Monfreda, Ramankutty, and Foley 2008). Thus fruit trees have been an important component of several food production systems, as for the chestnut, oak, vines and olive trees in the Mediterranean region (Radkau 2008), and in European cities from the sixteenth to the

end of the nineteenth century (De Decker 2016). More recently, some researchers and urban planners have argued that fruit trees constitute a neglected but potentially important component of sustainable food systems (Molnar et al. 2013; Vinceti et al. 2013; Clark and Nicholas 2013; Nordahl 2014; McLain et al. 2012). Furthermore, for the city environment fruit trees are more apt at improving the microclimate, retaining and regenerating soil, managing storm waters run-off, providing a habitat for biodiversity (Clark and Nicholas 2013). They are also more easily amenable to a mixed use of spaces, which is important when space is limited but also good for building social capital (Paranagamage et al. 2010). Finally the fruits may be less likely to be contaminated by pollution - presumably because of the greater distance of the edible parts from the soil (von Hoffen and Säumel 2014; Samsøe-Petersen et al. 2002; Trapp and Legind 2011).

While fruit trees are frequently neglected as crops, the interest in fruit trees has rapidly increased in several cities across the world in recent years. This is displayed by grassroots movements involving activities such as fruit trees mapping and harvesting (37 such organizations were identified in 2013 in English speaking countries alone) (Clark and Nicholas 2013), and by city administrations planting fruit trees on their public grounds for residents to gather, as seen in Jakarta in Indonesia (Courrier International 2013), Zurich in Switzerland ("Obstbäume" 2015), Tampa in Florida, USA (Sheehan 2014), and, in Canada, Vancouver (Shore 2012b; Shore 2012a), Calgary (Cockrall-King 2012) and Sainte-Anne-de-Bellevue on the island of Montreal (Ville de Sainte Anne de Bellevue 2013). Several cities in North America also undertake the development of participatory management programs in which city residents are involved in voluntarily caring for public urban fruit trees (Vancouver Sun 2013; Cairns, Lois 2014; "Beacon Food Forest" 2015; "Urban Orchard Stewards" 2015; Nordahl 2014) (such programs are already well implanted for non-fruit trees in many cities ("Course Information" 2015; "TreeKeepers" 2015; "Become a Citizen Forester" 2015; "Citizen Forester Program" 2015; "TreePeople" 2015; "Minnesota Tree Care Advocate" 2015)).

However, though fruit trees have interesting biophysical properties and are increasingly popular in urban agriculture initiatives, I could not find urban agriculture research on their socio-environmental impacts, contrarily to vegetable gardens for which such research is extensive (see section 6). Thus I chose to focus this research on the socio-environmental impacts of public urban orchards.

Choice of constructs: seeking a holistic view

For the deductive component of the analysis (see section 7.4), I chose to look more specifically at the impacts on social capital (relationships between the members of a community that affect the health and capacity for action of that community), place attachment (relationship between the members of a community and their living place), and food and environmental knowledge (relationship with food, food system, and the environment at large), for the following reasons. First, as we will see in section 6, these four concepts are linked to environmental sustainability. Second, they relate to relationships between individuals and their surroundings at four scales which together are relatively comprehensive: the scale of the human beings with whom these individuals interact (social capital), the scale of the place in which these individuals live (place attachment), the scale of food and the food system in which they are embedded (food knowledge), and the scale of the global environment (environmental knowledge) (see Figure 1). (However, note that though social capital and place attachment also include the emotional component of the relationships, for the food and the environment scales I limited myself to the knowledge component of the relationship.) Third, though social capital and place attachment are usually studied separately[1] (Mihaylov and Perkins 2014), the objective of this research is to study them as an integrated whole and in conjunction with their relationship with the human-made environment, the food system, and the global environment. Indeed, arguably the overall state of a community is more predictive of that community's behavior than are any of the individual constituents of that state taken in isolation. This approach would be in line with that advocated by Manzo and Perkins (2006), which they term the 'ecological perspective':

> A cross-disciplinary analysis is essential to better understand the nature of people's relationships to place and to develop a more holistic view of how such relationships influence our experiences of place and the success of our communities. Such an approach—which we call an ecological perspective—would engage multiple levels of analysis (individual, group/organization, community/neighborhood, and city/region/society) and examine multiple environmental domains (i.e., the physical, social, political and economic aspects

[1] One exception being Zhu (2015), according to whom studies suggest two ways in which public space may facilitate resident participation: encouraging social involvement (i.e. via social capital), or by cultivating personal affection for the place (i.e. via place attachment). Also, significantly more attention is given to social capital than to place attachment in the literature.

of our communities; Perkins et al. 2004). By considering multiple domains and levels in one holistic context, a more complete understanding of neighborhood and community phenomena can emerge. This is critical for successful planning and community development efforts since community phenomena happen at all of these levels simultaneously." (Manzo & Perkins 2006, p. 336)

Though the present approach it is a step towards a more inclusive view, one must keep in mind that yet other factors which are not included in this study are also probably important to predict a community's behavior and capacity towards environmental sustainability, such as agency, the government, and the linkage between social capital and other capitals (individual or collective) (Newman and Dale 2005b; Dale 2014; Dale and Sparkes 2011; Dale and Newman 2010; Schuller 2007).

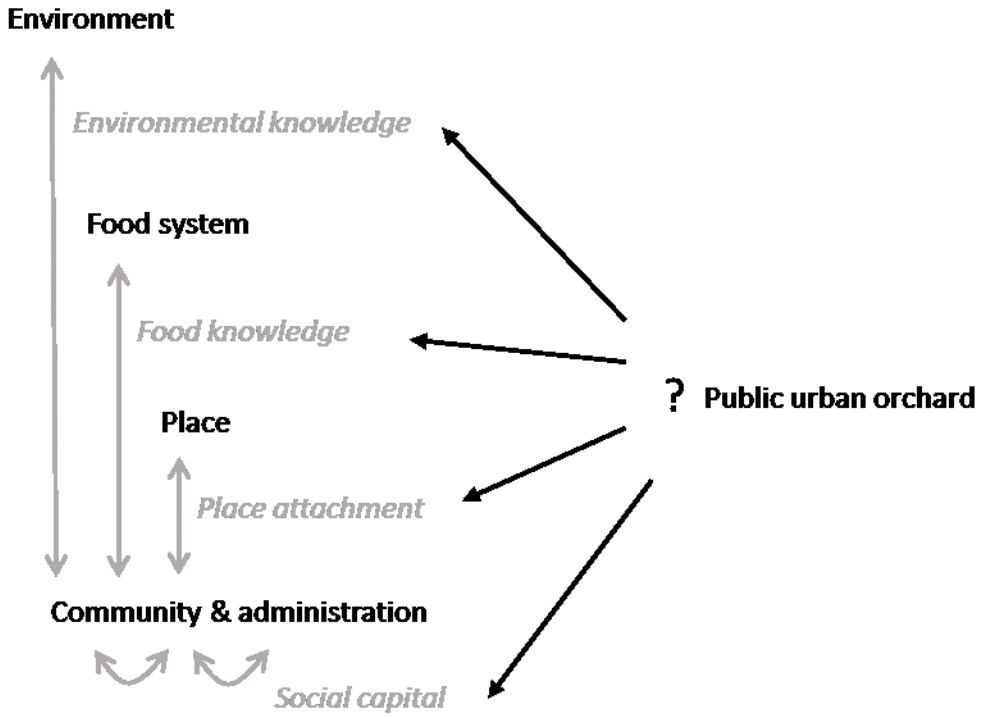

Figure 1. The four relationships under study and the main question of this research. In black are the entities under study, and in grey the relationships/constructs.

Focus on community level

Social capital and place attachment can occur at many geographical levels, such as that of the community, the province, or the country (Mihaylov and Perkins 2014). In this work I focus on the community level since this is the scale of the case-study used. At this level, social capital is

concerned with the relationships between the individuals in their community; place attachment with the relationship that the individuals have with their living place; while food and environmental knowledge concern the relationships that the residents of the community have with the food system and the global environment respectively.

5.2 Objectives

The relationships under study and the general question of this research are schematized in Figure 1: what are the impacts of public urban orchards on social capital, place attachment, food and environmental knowledge? In section 6 I will describe these constructs and the research pertaining to them in more detail.

My general research objective was to use the public urban orchard that has been planted along the bike path in Sainte-Anne-de-Bellevue (SADB) on the island of Montreal (Quebec, Canada) as study case (described in section 8) to evaluate the potential impacts of public urban orchards on place attachment, social capital, food knowledge, and environmental knowledge. This general objective was addressed through the following specific objectives.

1) Obtain background information on the history of the project and the motivations of the city administration for undertaking it. This objective will be addressed in the context section (section 8).

2) Identify the users' usage and perception of the site. How do the users currently use and perceive the bike path and the orchard? This objective will be addressed in the results sections 9.1, 9.2 and 9.3.

3) Assess the impacts of the public orchard in SADB on the constructs of interest. What impacts on the constructs under study are observed? This objective will be addressed in the results section 9.4.

4) Draw recommendations for the city administration of SADB and others. Based on the previous results, what recommendations can be drawn for the city administration of SADB if they wish to increase the impacts, and for other cities considering implementing such projects? This objective will be addressed in the discussion (section 10).

5.3 Significance

Knowledge gaps

Urban agriculture. According to Sonnino (2009), despite the large breadth of the urban agriculture research field, the data and insights are insufficient to help policy-makers address the most compelling questions that are emerging in relation to urban food provisioning and land-use planning. Indeed, "[…] the lack of comprehensive and comparative studies on urban agriculture makes it difficult to understand under what specific conditions this activity can deliver its alleged public health, social, economic and environmental benefits" (Sonnino 2009, p. 427-428). I hope that this research will contribute to improving our understanding of the conditions that can deliver the social benefits of urban agriculture.

Green spaces. In a multi- and interdisciplinary research on urban green spaces developed from deliberation among twenty-nine experts from various disciplines and European countries (James et al. 2009), important research questions that were identified as needing more attention included the following: "How does green space affect anti-social behaviour and community development generally?" and "How can urban green spaces be used for greater benefit in environmental education and in education more generally?" (p. 70). They add: "[…] whilst the general functions and benefits of green spaces are reasonably well understood, when looking to the future there is insufficient understanding of the following: how to plan, design and manage green space […]" (p.72). It is hoped that this research will help to contribute to filling these gaps in urban green space research.

Social capital. The concept of social capital has been increasingly studied and used in a large variety of fields within social science and official bodies such as the World Bank and the Organisation for Economic Co-operation and Development (Field 2008). Campbell et al. (2010) however argued, based on an empirical study performed in Ireland, that we need better practical knowledge of how social capital can be developed in order to incorporate it effectively into policy. This research seek to contribute to remediating to this lack, by researching practical means through which city administrations can increase social capital among their population.

Decision-making: Should cities plant fruit trees on their public spaces?

Advantages. We have seen earlier that: 1) there is a growing interest in urban agriculture on the part of city administrations and residents; 2) fruit trees have significant advantages compared to annual plants; and we will see in section 6 that 3) there is evidence that public green spaces and

community gardens have positive impacts on social capital, place attachment, community participation, and food and environmental knowledge, which all have been linked to environmental sustainability. Since public fruit trees may combine some of the advantages of both parks and community gardens, it appears that planting fruit trees on their public land could be a worthwhile way for cities to improve their socio-environmental sustainability.

Reluctance. However, though as we have seen some cities are undertaking projects to plant fruit trees on their public spaces, most cities are still reluctant to implement them (Nordahl 2014), as is Montreal (Réseau des Partenaires 2014). Why? In the first place, most cities do not allow foraging on public land (Cockrall-King 2012). Otherwise, practical concerns are frequently mentioned: 1) unharvested fruits falling on the ground and thereby causing littering, attraction of pests, liability costs in the case of slippage by the site users, and difficulty to mow; 2) the trees requiring more maintenance (disease-treatment, pruning); 3) and trees being smaller than non-fruit trees and thus contributing less to reducing the heat island effect and to improving air quality (Réseau des Partenaires 2014, personal conversation with an employee of the FruiTree Program in New York). However, these material costs should be weighed against the other social, environmental, and economic pros and cons of public urban fruit trees. But to incorporate the social impacts in the equation, a better understanding of them is required.

Research needed. Indeed, how a public orchard will impact a community is not obvious. Some features could make one doubt that the impacts will take place. First, a sensibility to the food producing aspect of the trees would have to be present within the community – its presence is likely to depend on the cultural context[1]. If absent, means of increasing it would be required. Second, public produce differs from community gardens in that it does not as directly engage people with the growing of food, as they are not responsible for planning and maintenance. On the other hand, fruit trees planted and maintained by a city administration might impact the community through other means. For example, trees have longer lifespans, so one might connect with them more; they provide fruits which taste is usually more appreciated than that of vegetables; they provide shade, comfort and a beautiful environment; and they can unite learning about food production together with the fun associated with a park, and thereby perhaps increase

1 I was recently told by a young Cambodian immigrant in Montreal that as a child he and his other immigrant friends took great pleasure in going out to harvest and eat fruits growing on public and private spaces in his neighborhood – but he never saw one of his native Montreal peers do the same.

the impact of that learning on pro-environmental behavior (Chawla 2009). Thus they might contribute through different means to social capital, place attachment and reconnection with the food system and the biosphere. However, whether this can actually take place must be empirically assessed.

For Montreal. Regarding policy in the city of Montreal, the results of the project could be informative for the current or future implementations of the 'Politique de l'arbre' of the city of Montreal (Ville de Montréal 2005) and of its 'Plan d'action canopée' (Direction des grands parcs et du verdissement 2012). It could also provide insights useful to the development of a comprehensive urban agriculture plan – development of such a plan was recommended by the public consultation held in 2012 (Office de Consultation Publique de Montréal 2012).

6 Literature Review

Here, for each of the four constructs used in the deductive component of the analysis (social capital, place attachment, food knowledge and environmental knowledge), I will present literature relating to 1) their description, 2) the impact that they can have on environmental sustainability, and 3) the impacts that place (the living environment) can have on them. For "place", I focus on the following three types of spaces: public spaces, green spaces, and community gardens. Indeed, public urban orchards are expected to combine features of these three types of spaces, and to my knowledge no research is available for public urban orchards per say.

6.1 Social capital

6.1.1 Description

Origins. Though popularized only in the past few decades, the concept of social capital was already embedded in the work of Emile Durkheim, a central figure in sociological thought of the 19th century, and in his interest into how ties between the people weave society. The term "social capital" proper was introduced around 1916 by Hanifan (Chang 2013) and became more widely used and discussed in the 1980s and 1990s with the work of Pierre Bourdieu, James Coleman and Robert Putnam. The concept of social capital then became widely known and referred to in the media and general public thanks to Putnam's book, *Bowling Alone*, published in 2000[1] (Field 2008).

Bourdieu, Coleman and Putnam took different perspectives of social capital. Bourdieu studied social capital from the point of view of power differences between social classes, and how social capital helped the privileged to maintain power and access to resources. Coleman worked from the point of view of rational action theory, and viewed social networks as an explanation for why people cooperate even though each individual would seek their own benefit (Field 2008). Both Bourdieu and Coleman viewed social capital as an outcome or benefit of social relations, though for Coleman social capital was grounded in the collectivity, and not in the individual (Chang 2013). For Putnam finally, social capital was tightly linked to social engagement, and he defined it as "features of social organization, such as trust, norms and networks, that can improve the efficiency of society by

[1] The book presented statistics associated with community participation in organized groups in America, arguing that these were in decline, and inferring that social capital in America was thus also in decline.

facilitating coordinated actions" (Field 2008, p. 34), that is, for him social capital is not an outcome, but a means (Chang 2013).

Since the work of these three authors, the concept of social capital has been increasingly studied and used in a large variety of fields within social science and within official bodies such as the World Bank and the Organisation for Economic Co-operation and Development (Field 2008). Several authors however emphasize the need for a better understanding of social capital in order to incorporate it effectively into policy. For example, Campbell et al. (2010) studied whether social capital could be useful as a policy concept in Northern Ireland, where a policy programme had promoted relationship building (within and across communities and between communities and statutory organizations), and they found that though the concept could be useful, practical knowledge of how this social capital could be developed remained to be established.

Definition. Today, though the term is widely used, how social capital should be defined is still debated (Field 2008). Pelling and High (2005) attribute the origin of the debates in the epistemological differences in the work of Bourdieu, Coleman and Putnam. Indeed, one reason for dispute concerns where social capital lies, i.e. at the individual (Bourdieu's view) or at the community level (Coleman and Putnam's view) (Adger 2003; Onyx, Osburn, and Bullen 2004). Adger (2003) resolves the dispute by saying that both should be viewed as components of social capital, and he labels the first 'quasi-private' social capital and the second 'public' social capital. Nevertheless, Putnam's definition of social capital provides a coherent set of elements that have been widely accepted as constituents of social capital (Pelling and High 2005)[1]. A consensus also appears to be emerging around the view that social capital includes the social networks that facilitate social action and that it is neither intrinsically good nor bad, but simply a "tool" that might be used or not and to various ends depending on the will of its users (Onyx, Osburn, and Bullen 2004)[2]. Finally, an important part of social capital research focuses on social networks and has become one of the few major branches of network research[3], and there is an ongoing controversy in

[1] This is the view taken here.
[2] *Idem*.
[3] Which also includes information networks such as the internet, technological networks such as water, transportation and energy systems, and biological networks as in ecology or molecular biology (Dempwolf and Lyles 2012).

the literature over whether social capital can be reduced to social networks or not (Woolcock 2004; Field 2008)[1].

Components. Though various subdivisions exist, all authors divide social capital into subcomponents, a typical subdivision being: social trust, social networks, social norms and values, and trust towards institutions (e.g. Jones et al. 2009). Mihaylov & Perkins (2013) also include sense of community, which is another important construct in social science research, urban planning and related fields, and generally defined as "cohesive feelings of membership or belongingness to a group, in particular the emotional connections or bonds among people based on a shared history, interests or concerns" (Xu, Perkins, and Chow 2010)[2]. A relationship between sense of community, neighboring, and participation in the community has been observed across countries and cultures (Xu, Perkins, and Chow 2010; Talò, Mannarini, and Rochira 2014).

6.1.2 Impact of social capital on environmental sustainability

Several authors have argued, on theoretical and empirical grounds, for a causal relationship between social capital and sustainability (Jones et al. 2009; Chang 2013). Several explanations or frameworks for this relationship have been proposed, but a consensus has not yet emerged (Schäpke and Omann 2013). Below I outline some of the empirical evidence found and explanations proposed.

Pro-environmental attitude. In a survey study performed in a rural community in Australia, Onyx et al. (2004) found a positive relationship between social capital and a positive attitude towards the environment, although other factors were also in play.

Participation in governance. Greater social capital might also encourage citizens to participate in environmental governance (Rydin and Pennington 2000). Public participation and deliberation, then, would broaden the range of interests and issues that need to be considered, thereby increasing the likelihood that the decision process takes into account all the risks at play. Moreover, repeated interactions build trust and shared understanding, enabling social learning and forming the foundation for mobilizing and self-organizing around innovative solutions (as suggested by Lebel et al. (2006), based on nine case-studies performed in various countries).

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[1] Here I will use the definition of social capital as "a potential for social action" (Paranagamage et al. 2014), without pronouncing myself on whether this can be reduced to networks or not.
[2] *Idem*.

Local initiatives: Social capital may help to foster local initiatives, which are viewed as essential for societal sustainability transitions (Selman 2001; Schäpke and Omann 2013).

Policy implementation: For Rydin and Holman (2004), social capital could help reducing barriers to the implementation of sustainable development policies by helping to address, within and/or between civil society and economic and governmental organizations: the lack of participation, the lack of will, the conflicts over the definition of sustainable development, the lack of resources and capacity, and the lack of cooperation. However, they warn that the potential of social capital must always be judged in relation to the severity of the problem it is seeking to address, and that social capital encompasses a variety of strategies that must be carefully selected based on the specific problem and context. Jones et al. (2009) split social capital into four components, namely social trust, social networks, social norms and values, and trust towards institutions, and for each component they demonstrate the way(s) in which they can contribute to an effective policy implementation. Social trust can encourage acceptance and compliance, reduce free-riding behaviors, and encourage participation in environmental groups. A higher density of social networks can improve the distribution of information (especially important for co-management frameworks), increase the means of participation, activation and cooperation, and in turn also help to increase the levels of trust. Social norms can favor the tendency to comply with environmental policies. Finally, institutional trust involves several different components that are deemed essential for acceptance of policies, such as the perceptions of the credibility of the rules or of the legitimacy of the decision-making process. The authors note further that each of the different types of policy instruments (command and control, market-based, voluntary or communicative) can be positively influenced by at least some of these social capital components.

Collective response: In case-studies performed in Southern Asia and the Caribbean, Adger et al. (Adger 2003; Adger et al. 2005) found that the capacities of these societies to cope with extremes in weather heavily depended on their ability to act collectively and that this was aided by social capital, as greater social capital allowed a more systematic interaction with market and state institutions to coordinate the response.

Choice of adaptation course: At a higher scale, Pelling and High (2005) argue that social capital can influence the quality of social adaptations. Indeed, these can be of several different types (such as reactive or anticipatory, spontaneous or planned, short-term or long-term, reinforcing or modifying of institutions). The choice that a given society makes between these different types of adaptations obviously will have an impact on its long-term resilience, and social capital (informal relations and

values) is a crucial factor influencing this choice. However, the authors emphasize the importance of further theoretical and empirical work to better understand its formation, operation and utility relative to social adaptations.

Importance of network bond types: From the social networks point of view, several authors agree that an appropriate balance between the different types of bonds is required in order for the social capital of a given society to contribute positively to its sustainability. Dale and Newman insist that intimate bonds (bonding ties) help to build trust, but on their own do not encourage people towards action and change, and that bridging ties, i.e. less intimate bonds based on utility between people from different spheres of society, are needed for the sharing of knowledge and the extension of resource access (Newman and Dale 2005a; 2005b; 2007). As an example of this, in a UK case-study, Wolf et al. (2010) studied the role of social networks on the response of the elderly to the heat wave risk. Their analysis suggested that bonding network links, which provide mutual trust and reinforcement, could make the elderly rely too much on their peers for a treat to which their peers can be of little help. In conjunction with missing information and a lack of other, more challenging types of network links, this could increase rather than reduce the vulnerability of the elderly. For Rydin and Holman (2004), for social capital to be particularly useful when considering policy for sustainable development, 'bracing' social capital should be also added to the typology. Indeed, whereas bonding social capital is only horizontal (between people of the same social group) and bridging social capital is only vertical (between people of different social groups), bracing social capital would refer to cross-sectoral, cross-scale, horizontal and vertical linkages that are involved in many partnerships and governance initiatives. Bodin et al. (2009) also warn that significant differences in management capacity are to be expected depending on structural differences between different networks.

Link to natural capital: Based on several case-studies performed in different regions of China, Chang (2013) proposes that the link between social capital and sustainability should be conceptualized as a bidirectional link between social capital and natural capital, and that these two capitals together can reduce the need for economic capital. Social capital can encourage local participation and cooperation (and vice-versa), which in turn can positively influence natural capital (as a public goods). In return, natural capital can encourage stability (for example, people are more likely to maintain residency in a region in which the natural environment is healthy), which in turn can positively influence local participation and thereby social capital (see Figure 2). Though his analysis

focuses on the community level, he suggests that further studies could examine how the community level dynamics link with regional, national and international level dynamics.

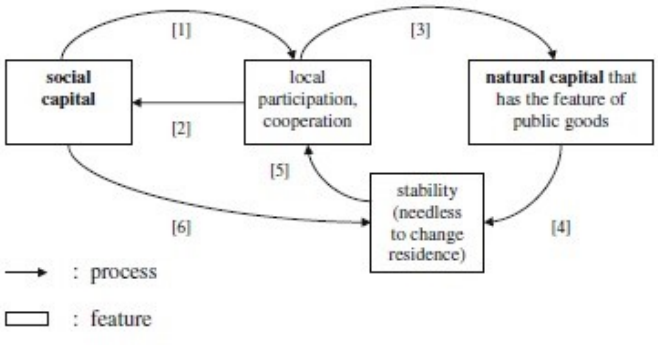

Figure 2. The relationship between social capital and sustainability as a relationship between social capital and natural capital (from Chang 2013).

6.1.3 Impact of place on social capital

Public spaces

Empirical evidence. Several empirical studies find a link between public spaces and social capital. Cattell et al. (2008) explored the relationship between public spaces and well-being and social relations using a literature review and qualitative research in a multi-ethnic area of East London, and based on their results argue that public spaces, among others, can sustain bonding ties or create bridging ties, and can influence tolerance and raise people's spirits. The authors call for policy approaches in which the social and therapeutic properties of a range of everyday spaces are more widely recognised and nurtured. Francis et al. (2012) found that the perceived quality of the public space in Perth, Australia (public open space, community centers, schools and shops) was positively associated with sense of community. Curley (2010) found a very strong positive relationship in Boston, USA, between the presence of neighborhood facilities and public spaces such as parks, libraries and recreation facilities, and social capital (as shared trust, norms and reciprocity) among neighbors. A survey conducted in a medium size town in Ireland in 2001 showed a positive correlation between the walkability of a neighborhood and the social capital of residents (Leyden 2003).

Design. Paranagamage et al. (2010) analyzed the social capital and urban design literatures, and from this suggested two key properties through which urban design can allow and facilitate the formation of social capital: 1) design to retain people in the area in the long term, and 2) provide

the potential for repeated interaction. Further, four themes and twelve attributes that facilitate these two key properties were identified: connectivity (movement structure, mixed use, local facilities), safety (ownership, natural surveillance, access and footpaths), character (context, public space, personalization), and diversity (life cycle needs, mixed tenure, and life style differences).

Internet age. Does the expansion of communication over the internet minimize the need of physical public space to build social networks? Kirby (2008) argued that this may be the case. However, Hampton et al. (2011), using a random survey administered to about 2500 adults in the United States, looked at the relationship between people's use of various internet communication technologies and the diversity of their social networks. They found that while a limited set of technologies did directly contribute to network diversity, many only contributed indirectly, by supporting participation in traditional settings such as neighborhoods, voluntary groups, religious institutions, and public spaces.

Protection. Despite the apparent important role of the physical urban space design in building social capital, this role is largely ignored in the planning literature (Paranagamage et al. 2014) and by the current legal mechanisms, at least in the United States (Foster 2006). According to Foster (2006), the urban commons has traditionally been viewed primarily as a highly privatized commons – an aggregation of individual property rights and land ownerships subject to market exchange. However, since social capital should be viewed as a common resource that deserves protection, the physical spaces that contribute to its making should also be protected. She further argues that these public commons, to be appropriately managed, should be cooperatively managed, because other options are too costly: centralized governance is financially costly for the government in times of financial strain, and privatization is costly to the community (Foster 2011).

Green spaces

Empirical evidence. Several empirical studies have looked at the relationship between green spaces and social interactions. Among the earliest, Coley et al. (1997) studied the relationship between the location of trees and the presence of youth and adults in semiprivate spaces in two Chicago public housing developments. They found that the greener the spaces, the larger and more diverse the groups of people they attracted. More recently, Peters (2010) studied five urban parks in the Netherlands and found evidence that the parks could foster social cohesion between ethnic groups, while park location and design could affect this impact. Kazmierczak (2013) studied the contribution of local parks to the development of social ties in three inner-city neighborhoods in Greater Manchester, UK. She found a positive relationship between the frequency and length of

visits to parks and number of friends and acquaintances, and various aspects of park quality were found to influence visits frequency and length, such as aesthetic quality and presence of facilities for activities. However, the character of the neighborhood was also an important factor affecting the number of social ties (Kaźmierczak 2013). Okvat & Zautra (2011) systematically reviewed the research on the impacts of contact with plants, and found several studies suggesting positive impacts on community well-being, looking either at social networks, multicultural relations, community organizing and empowerment, or crime reduction.

Community gardens

Gardeners' perceptions. Studies suggest that participants of community gardens perceive the building of social relationships as an important objective or outcome of their activity. Shinew et al. (2004) found that White and African American community gardeners in St-Louis, USA, on average agreed that the garden brought together the two racial groups. Teig et al. (2009) found that gardeners in Denver, USA, typically described the gardens as places to connect with people of different backgrounds and to build mutual trust. Moreover, from a systematic review of the English research literature on community gardens, it appears that social interactions, such as community building and cultural exchange, are among the most important motivations for community gardens gardeners, together with consuming fresh foods, improving health, and making or saving money, and before education, enhancing cultural and spiritual practices, accessing land, enjoying nature and environmental sustainability (Guitart et al. 2012). However, it could be argued that people who are less interested in socializing probably tend to garden less in community gardens, and more in private spaces. At least, community gardens appear to serve as an important means of socialization for those who are not against such interaction.

Impact. Slater (2001) studied the social impact of community gardens through the life histories of women involved in urban agriculture in Cape Town, South Africa. The author concluded that contrary to the prevailing urban agriculture paradigm which seeks to justify urban agriculture economically (financially and nutritionally), for these women performing urban agriculture was more a means of empowerment and of establishing social networks, and therefore that urban agriculture in this case had contributed to community development.

Limitations., Kingsley and Townsend (2006) found in a case-study performed in Melbourne, Australia, that though the community garden contributed to building social ties, however these did not necessarily extend beyond the garden. Indeed, other studies suggest that some factors are likely to influence the impact of community gardens on social capital building, such as: 1) the presence of

other activities such as neighborhood meetings was associated with a higher social capital perception in a survey study in Flint, USA (Alaimo et al. 2010); 2) the main reasons why different gardeners are brought together in a given space, i.e. whether the garden is "place-based" or "interest-based", as suggested by Firth et al. (2011) from case-studies of two community gardens in Nottingham, England.

6.2 Place attachment

6.2.1 Description

Origins. The construct of place attachment was first proposed by geographers several decades ago (Kudryavtsev, Krasny, and Stedman 2012). Since then, research on the relationship between people and place has been substantially increasing across many social science and humanities disciplines, including architecture and environmental psychology. This body of research centers on the concept of place and on the argument that place is more than a mere background where social phenomena take place; rather it fundamentally interacts with and affects these phenomena. As Cresswell puts it: "Place is not just a thing in the world… place is also a way of seeing, knowing and understanding the world" (cited in Devine-Wright 2013, p.62).

Definition. Similarly to social capital, place attachment's definition varies across authors. One of them is: "Place attachment involves positively experienced bonds, sometimes occurring without awareness, that are developed over time from the behavioral, affective, and cognitive ties between individuals and/or groups and their socio-physical environment. These bonds provide a framework for both individual and communal aspects of identity and have both stabilizing and dynamic features" (Brown and Perkins, quoted in Mihaylov and Perkins 2014). Devine-Wright (2013) points out that place attachment can take place at various scales, that is, one may have different degrees and reasons for attachment to one's neighborhood, city, country, and the planet, and attachment strength does not necessarily decrease with increasing scale level.

Components. Though the subcomponents of the construct vary with authors, they must at least describe: the individual, the place to which she is attached, and the affective, cognitive and behavioral manifestations of her psychological bond with that place (Scannell and Gifford 2010). According to Kudryavtsev (2012), most authors use the term 'sense of place' rather than place attachment, and then divide sense of place into 'place attachment', or the strength of the attachment, and 'place meaning', or the reason for this attachment, i.e. the symbolic meaning

ascribed to the setting. Place attachment may then be further divided into place dependence (the potential of the place to satisfy an individual's needs) and place identity (the extent to which the place becomes part of the individual's identity).

6.2.2 Impact of place attachment on environmental sustainability

Pro-environmental behavior. Several authors have suggested that place attachment fosters pro-environmental behavior, as supported by results of several empirical studies performed in Norway, the United States, Canada and France (reviewed in Kudryavtsev (2012)). According to Kudryavtsev (2012), however, these studies have been performed mostly in places with abundant natural elements such as parks or in rural areas, therefore whether this relationship also exists in more urbanized or disturbed areas is unclear. Indeed, in a survey study performed by Scannell & Gifford (2010), attachment to natural place, but not civic place, predicted pro-environmental behavior, and the authors suggest that place attachment fosters pro-environmental behavior only when combined with ecological place meaning. A quantitative study in a high-natural-amenity watershed in New Hampshire, USA, supported a similar conclusion (Brehm, Eisenhauer, and Stedman 2013).

Socio-ecological memory. Another way in which place can affect environmental sustainability is by allowing the development of 'socio-ecological memory', meaning the collection of knowledge about ecosystem services that is imbedded in a wide variety of material and cognitive components that reside within a place, and is therefore a shared source of resilience. Allotment gardens in Berlin, for example, appear to be important repositories of such socio-ecological memory (Barthel, Folke, and Colding 2010).

6.2.3 Impact of place on place attachment

Compared to social capital, I could find very little research on the impact on place attachment for green space or community gardens (and none for public space), but still some research identifies this potential impact.

Green space

Arnberger and Eder (2012) found a positive correlation between community attachment and green space supply and quality from a survey of urban residents in Vienna, Austria.

Community gardens

Using a survey performed in Denver, USA, Comstock et al. (2010) found that though there was a positive relationship between neighborhood attachment and length of residency or home ownership, this relationship was no longer significant when community gardening participation was included, suggesting that place attachment can be enhanced through neighborhood activities such as gardening, even for renters.

6.3 Food knowledge and behavior

6.3.1 Description

A wide range of aspects concerning the knowledge that individuals have of food and the food system, or their behavior towards food, have been researched in the past decades, such as: 1) The impact of nutrition knowledge on diet quality. According to Spronk et al.'s review (2014), as of 2012 a weak but significant positive association had been found; 2) Why consumers choose to buy organic foods. Magnusson et al. (2003) found that personal health concerns were better predictors than environmental or animal welfare concerns in Sweden; 3) The types of considerations given to the food system and how they affect the food quality perception. Torjusen et al. (2001) found three orientations in the Southern Norway population: practical, local, and social. While social considerations were important to all, there was a divide over practical and local considerations, with those favoring local being more likely to buy organic foods.

6.3.2 Impact of food knowledge and behavior on environmental sustainability

Food knowledge is a necessary, though not sufficient, factor contributing to the change in behavior in food intake (Worsley 2002). In turn, food behavior can have important impacts on individuals' health but also, via their consumption choices, on environmental sustainability. For example, fresh foods have a lower environmental impact than processed ones (in the USA, food processing accounts for one third of the fossil fuel energy use put into producing food (Horrigan, Lawrence, and Walker 2002)), similarly to local foods (when not produced in a high-impact greenhouse) (Kulak, Graves, and Chatterton 2013), or to organic foods (Pimentel et al. 2005).

6.3.3 Impact of place on food knowledge and behavior

School gardening. Several studies have looked at the impact of school gardening programs on children's fruits and vegetable intake and found evidence of impacts on various aspects (Draper and

Freedman 2010). For example, an intervention trial study performed in Brisbane, Australia, found that the intervention led to enhanced ability to identify individual vegetables and fruits, greater attention to origins of produce, changes to perceived consumption of vegetables and fruits, and enhanced confidence in preparing fruit and vegetable snacks, but, strangely, a decreased interest in trying new fruits (Somerset and Markwell 2009). A mixed qualitative and quantitative two-year longitudinal study of the impacts of a gardening program, performed in Victoria, Australia, found significant evidence of impacts on children's willingness to try new foods, but no impact on the capacity to describe foods, and only qualitative evidence for impact on healthy eating (Gibbs et al. 2013). Increased fruit and vegetable preference and consumption were also reported in studies performed in India (Dhruba Raj 2015) and Brazil (Miguel and Ivanovic 2011). In a meta-analytical synthesis of twenty empirical studies on the topic, Langellotto and Gupta (2012) found that the most robust result was for increased vegetable consumption (though it was not clear whether it was due to increased access or to increased preference, or both), whereas the impacts of nutrition education programs were marginal or nonsignificant. Overall there is evidence that positive impacts exist, but the underlying mechanisms and influencing factors are still unclear.

Community gardens. Some studies report positive relationships between adult participation to community gardens and fruits and vegetables intake (Alaimo, Reischl, and Allen 2010; Litt et al. 2011), however evidence for a causal relationship was lacking in 2009 (McCormack et al. 2010) and I also did not find any.

6.4 Environmental knowledge and behavior

6.4.1 Impact of environmental knowledge on environmental sustainability

The field of environmental psychology has contributed a large body of research to the factors that promote pro-environmental behavior[1]. Knowledge, which has been defined as one's ability to identify a number of symbols, concepts and behavior patterns related to environmental protection, was found to be among the main contributing factors (Chawla 2009; Chawla and Derr 2012). Other main factors identified include attitude[2], motivations, perceived consumer effectiveness[3], gender, culture and available infrastructure (Vicente-Molina, Fernández-Sáinz, and Izagirre-Olaizola 2013),

[1] That is, behavior that harms the environment as little as possible or even benefits it (Steg and Vlek 2009).
[2] Perhaps related to personality - see (Nettle 2009).
[3] Perhaps similar to "sense of efficacy", as found in (Chawla 2009).

and personal history (Chawla 2009). Based on the available research, Chawla (2009) proposes a model to integrate the factors that influence environmental action: knowledge (about nature and environmental issues, and about the possible actions and skills needed) interact with sense of efficacy and motivation to influence action, in conjunction with opportunities and constraints. Motivation depends on values and attitude, expected valued outcomes, positive childhood nature experiences (which usually involve influential adults), interest and enjoyment in acting, and affordable cost. Action then leads to goals and outcomes on nature, places, other people and the self, and these outcomes in turn influence knowledge and sense of efficacy through reflection and adaptation.

6.4.2 Impact of place on environmental knowledge and behavior

Green spaces

To my knowledge no studies are currently available on the impact of urban green spaces on environmental knowledge and behavior. However, Chawla and Derr (2012) review the research concerning the development of conservation behaviors, and show that several different studies of different types (fixed-response surveys with random or representative samples, open-ended questionnaires, and long interviews) found a very important role for positive childhood experiences in "wild" nature places. Furthermore, research on environmental education programs that physically immerse students in a natural setting finds that three key ingredients are common to effective programs: 1) extended duration, 2) connection of the learning with the real world of the students' homes, communities or regions, and 3) active involvement of the students. Thus, if these ingredients are sufficient, and since they can also be present in education programs taking place in urban green spaces, then it is quite possible that urban green spaces can serve as an important tool for environmental education. It has likewise been argued that "urban green commons", by reaching out to a large public, might foster deeper learning and socio-ecological memory (Colding and Barthel 2013; Colding et al. 2013), and help to reconnect cities physically and socially to the biosphere (Andersson et al. 2014; Barthel, Folke, and Colding 2010; Tidball et al. 2010; Okvat and Zautra 2011). Interestingly though, Steg and Vlek (2009) reviewed the various factors identified by environmental psychology research as influencing environmental behavior, and did not mention previous experience with nature as one of the them - demonstrating that its importance is not widely recognized.

Community and school gardens

Arguments. Some authors argue that community or school gardens have positive impacts on environmental knowledge and behavior. Turner (2011) proposes that community gardens physically reconnect people to the food system and thereby provide a pathway towards "sustainable living practices predicated on the development of new forms of environmental or ecological citizenship" (p. 509), and that this link could be mediated by the fact that the gardens provide an "embodied" form of sustainability. Bendt, Barthel and Colding (2013), based on case-studies, suggest that public-access community gardens in Berlin offer unique opportunities for environmental learning compared to more closed forms such as allotment gardens and gated community gardens. Finally, qualitative research on school gardening programs frequently observe that the children are highly enthusiastic to participate to such programs, making it likely that these constitute rich learning experiences (Blair 2009).

Empirical evidence. Several studies have attempted to assess the impacts of school gardening programs on environmental knowledge and behavior, and some reported positive impacts (Blair 2009). However according to Blair (2009), the results are overall not conclusive, as some studies find no impact and experimental designs are not sufficiently rigorous.

7 Methods

7.1 Approach

7.1.1 Choice of qualitative research approach

A qualitative rather than quantitative approach appeared more appropriate for achieving the objectives of this research for three main reasons. First, this research is exploratory: its purpose lies more in discovering the general working of a phenomenon than in testing very specific hypotheses. Second, and because of the first reason, it seeks to understand a phenomenon in its natural setting, rather than in the predefined setting of an experiment or survey. Third, it seeks to generate a holistic view of several concepts, and the time available for this research would not allow to study all of these in a quantitative manner (Creswell 2007; Babbie and Benaquisto 2002).

7.1.2 Qualitative research strategy: case-study

Case-study. The specific qualitative research strategy chosen was the case-study. Indeed, the case-study approach is well suited to exploratory research and allows one to build a rich holistic picture of a given process or topic (Creswell 2007; Babbie and Benaquisto 2002; Yin 2009). Case-studies are also well-suited to studying processes – here, the social impacts brought about by a public urban orchard. Other studies on the social impacts of man-made spaces are usually performed using cross-sectional quantitative methods, for example by looking at the correlation between the perceived quality of public space and the sense of community in different locations (e.g. Francis et al. 2012), from which it is difficult to infer causality. Though in this work the impacts over time were not directly observed, they were observed indirectly from the stories related by the individuals, which allowed a discussion of causal relationships with somewhat greater confidence.

Single case. Though it is generally preferable to conduct several independent case-studies for a given research project in order to validate findings and identify influencing factors (Yin 2009), this was not feasible in the time and funds available for this research. Also, since the case did not, from the outset, stand out in any major way in terms of political or cultural context (Creswell 2007), I expected the findings of this case to be sufficiently representative to at least guide other similar projects in the region of Montreal or further.

Participatory. I attempted to use the participatory approach, in which community members are involved in the research with the goal of serving their needs[1], the main reason being the advocating/social change aspect of this project. To my knowledge, the participatory research approach has not previously been used in urban agriculture research. Two volunteer research partners were found: the chief gardener in charge of the project, and a member of a guerilla gardening group in Montreal. However, due to various constraints their participation was of limited extent, and their input was only obtained verbally and for the research design: I explained the research objectives and methods verbally to them, and they gave me their opinion. Both of them had a positive response. The chief gardener also provided helpful guidance concerning the procedure for the recruitment of the interviewees.

7.2 Theoretical framework

The social capital and place attachment components of the framework used for this research is adapted from Mihaylov and Perkins (2014). Perkins has researched these topics for several years (e.g. Perkins et al. 1990; Perkins, Brown, and Taylor 1996; Manzo and Perkins 2006; Long and Perkins 2007), and his interpretation of the social constructs is recognized by other researchers in the field (e.g. Zhu 2015; Scannell and Gifford 2010; Devine-Wright and Howes 2010). This framework integrates social capital and place attachment to explain how community place attachment can lead to collective action, adaptation, or acceptance, in response to environmental disruption: residents of a place assess an environmental change in function of the disruption it might cause to their personal, social and routine experiences in the place, and this assessment is influenced by their place attachment. The community response then materializes either in action, adaptation or acceptance depending on the state of social capital. Below I describe the constituents that they include in place attachment and social capital.

Place attachment. The authors distinguish between place attachment and community place attachment, i.e. place attachment at the community level. Geographically, the community in

[1] The participatory research approach was born in the 1960's in different fields of social science. It is an orientation to research that emphasizes mutual respect, co-learning, individual and community capacity building, systems change, and balancing research and action (Selener and others 1997; Minkler and Wallerstein 2008). In its most extensive application, the approach is initiated and led by community members, while the researcher serves as a facilitator for their research. However, the relative involvement of the community members and the researcher can vary (Jagosh et al. 2012).

question can be of any size (street block, neighborhood, village, city and environs, regions or country). Community place attachment differs from other forms of place attachment in four main ways: location is around one's home, there is some level of agreement among the community members, the focus of the attachment is on a whole place (neighborhood, town, etc.), and last and most importantly, community place attachment leads to complex place and social cognitions, emotions and behaviors that lead to collective, community-level actions, adaptations, or acceptance of environmental disruptions through an interpretive process at both the individual and community levels. Here I focus on community place attachment but refer to it as simply "place attachment". In the authors' framework, community place attachment includes the following four components. *Place definition* relates to the boundaries, features and attributes of the place which fit in it and make it unique in the mind of the residents. *Place bonding* relates to the individual's emotional ties to the place. *Place dependence* concerns the dependence that people have with respect to their place, that is to say how much they depend on their place to perform the activities and experiences that they desire. *Place identity* relates to how the residents define their own personal identity through their place. In this work I focused on place definition, place bonding and place dependence, and did not assess place identity due to time constraints.

Social capital. In their model the authors include the following six components in social capital. *Collective efficacy (empowerment)* is the confidence that the residents have in the efficacy of organized collective action with their neighbors. *Sense of community* refers to the feelings of membership or belongingness to a group, and the trust between neighbors. *Neighboring* relates to the help exchanged between neighbors. *Citizen participation* refers to individual and community participation in grassroots voluntary associations. *Bonding social capital* (or "place-based social interactions") refers to the emotionally-driven social interactions within the place. Finally *bridging social capital* refers to the utility-driven interactions with neighbors, local officials, and merchants. To these I also added "trust in the institutions", which is an important way in which an urban planning project can impact a community, and is included in social capital by several authors (e.g. Jones et al. 2009). In my case the "institutions" were limited to the city administration, and I therefore refer to it as "trust in the administration".

Food knowledge. In the analysis I focused on two types of food knowledge: knowledge about food itself (nutrition, varieties, recognizing plants), and knowledge about the food system (social, economic and environmental considerations).

Environmental knowledge finally was taken as knowledge about higher-level ecosystem issues that are not necessarily apparent to a single individual.

7.3 Data collection

7.3.1 Interviewing key informants

In order to collect background information on the history of the project and the city administration's motivations (section 8), key informants were sought in the following way. I first contacted by phone the city hall of Sainte-Anne-de-Bellevue (SADB), asking to speak with the people in charge of the project, and they directed me to the city's chief gardener. I then spoke with the chief gardener, and asked him who the other city administration members were who had been in charge of the project, and he directed me to a city council member. Both of them agreed on being interviewed, and semi-directed interviews were conducted with them using the same general procedure as for the users of the site (see section 7.3.3), except with different questions: they were asked to describe the history of the project and the role they have played in it, what they perceived the impacts of the orchard would be, and what their views were about the current funding of the project, its communication, and the participation of the residents in it (see section 13.1.1 for the interview guide). The socio-demographic background data of these two informants was the following:

> chief gardener: male, 54, common law, three children, interviewed on February 4 2016, in French, for 60 minutes, profession: chief gardener;
>
> city council member: male, 45, married, two children, interviewed on January 28 2016, in English, for 100 minutes, professions: cegep teacher, filmmaker, environmental activist.

7.3.2 Direct observations

I had planned to directly observe the interaction of the users of the bike path with the fruit trees in the fall. However, since only the raspberry bushes bore a substantial quantity of fruits, the observations were limited to these. The raspberry bushes formed a collection of shrubs, at about a one-meter distance from the path, near the entrance to the bike path in SADB north. The bushes bore many ripe raspberries and their bright red color was easily visible from the path (see Figure 4). I sat on a bench directly facing the shrubs on the opposite side of the bike path (I considered standing somewhere else so that I would not distract the users from looking at the bushes in front

of me, but I did not find another place to stand where my presence would not have seemed odd and would have attracted even more the attention of the users). Observations were performed on Tuesday September 22, 2015 between 1:30 and 2:30 pm and between 4:15 and 5:15 pm, with a sunny weather, 20°C and no wind, and on Saturday September 26, 2015 between 3 and 6 pm, with a sunny weather, 18 °C, and a light wind.

7.3.3 Interviewing users of the site

Ethics

The recruitment procedure and interview guides were approved by the McGill Research Ethics Board prior to performing the study, and the interviewees signed a consent form prior to starting the interview.

Recruitment

To assess the impact of the orchard on the local population, the subpopulation consisting of the users of the bike path was chosen. Indeed, they are the targeted user population of the orchard, and currently they are probably the main users of the orchard. Recruitment was done by direct recruitment on the bike path and by snowball sampling, in Fall 2015. I had also posted a recruitment ad in several places along the bike path, but no one volunteered through that means. (Input from the chief gardener was obtained for the recruitment method, and he suggested that direct recruitment would be the most efficient means.)

For the direct recruitment, I stood on the bike path in two different sections of the path (on Sainte-Marie road, and on the section going into SADB North) at various times of the day, on week and week-end days. I approached the users with the following sentence: “Hi, I am a Master’s student at McGill University and I am conducting a research study on the socio-environmental impacts of the fruit trees that have been planted along this bike path. I am looking for interviewees; would you be interested in participating?” I then handed them a business card bearing my name and the McGill University logo. Most of the users that I approached accepted to participate. I did not measure the positive response rate since I mainly approached users who were going at a leisure pace (and not cycling furiously) and who did not seem to mind being disturbed. Seven interviewees were recruited through that means.

The four remaining interviewees were obtained by snowball sampling, all of which through the interviewee Mary (pseudonym): her husband, her friend (who also used the bike path), and a

woman who had told her that she harvests blackcurrants on the orchard every year (and whose husband then also volunteered).

I stopped the recruitment at eleven interviewees when it seemed that I had reached data saturation, meaning when it seemed that no important new themes were being brought up in the last two interviews. By that stage it also seemed that I had a diversity of views on the fruit trees (not in favor, neutral, and in favor), and about an equal number of males and females. Though most participants (nine out of eleven) were between 50 and 65 years old, one was in his twenties, and one in his seventies. I also had one participant who works in SADB but does not reside there. It is possible that the recruitment method selected for those who are more interested in or their place or in sharing their views, though as the results will show such people appear to constitute a large proportion of SADB.

Interview

Process. The interviews were semi-directed, that is to say the interviewees were asked questions on which they could freely elaborate, and were recorded with their consent. The interviewees were also asked to fill out a form to collect their background information (see section 13.2 for the form). The interviews proceeded without problems, and the interviewees appeared to understand the questions well and to enjoy being interviewed.

General strategy. The questions attempted to as much as possible not directly refer to the concepts under study, and to be more concrete than abstract. For example, to see how they defined their place, the interviewees were asked what they liked and what they disliked about it. Below I describe the rationale for the specific interview themes or questions.

1) Usage and perception of the bike path: This was evaluated so as to get an idea of the interviewees' access to the trees, the bike path being the most likely reason that they would get in contact with the trees at this stage, and to see if they would spontaneously mention the orchard when talking about the bike path.

2) Usage and perception of the orchard and the project: The impacts of the orchard depend on their usage. Also, these questions might allow obtaining information on the impacts of the orchard.

3) Evaluation of the current state of the constructs: The impacts of the orchard on the constructs under study probably depend on the prior states of these constructs (Mihaylov

and Perkins (2014) argue that this is so for place attachment and social capital). Knowing the prior state is also useful when interpreting the findings. For social capital however, due to time constraints I only directly asked about community participation (but several codes relating to the other components of social capital emerged in the inductive analysis of the data), and trust in the administration could be evaluated through their views of how the orchard has been designed and maintained.

4) Evaluation of impacts: *Place attachment:* I did not attempt to directly ask whether the orchard had had an impact on the interviewees' definition of their place because it seemed that this would be difficult for the interviewees to analyze consciously. Instead I focused on place bonding by asking them whether they thought that the orchard had had an impact on their feelings towards SADB. Only the nine interviewees who were in favor of the orchard were asked this question[1]. *Social capital:* For bonding social capital, I asked the interviewees whether they have ever used the orchard in the company of other people or think that they would do so in the future. For bridging social capital, I asked the interviewees whether they have ever talked to someone they did not know on the bike path because of the orchard. If relationships develop from these encounters, they could constitute either bridging (people from different spheres of influence or with different types of knowledge) or bonding social capital (friends). I did not attempt to evaluate the impacts on sense of community or sense of efficacy, as it seemed that the project was too young for having had such an impact already. (However I discuss the potential for such impacts in the discussion.) For trust in the administration, I did not ask directly about it but several interviewees alluded to it in response to other questions.

5) Interest in participatory activities: Some studies suggest that active participation is important to the development of place attachment, social capital, and food and environmental knowledge (see section 6**Error! Reference source not found.**). However, the participation of the public in the orchard in SADB thus far has been limited to the planting days. Therefore, I sought to evaluate whether the interviewees would be interested in participating to more such activities.

[1] Though in retrospect, I should have asked the other two as well.

6) History with other food growing or harvesting activities: This was investigated to see if there was a relationship between such history and their usage or perception of the orchard or the project.

7) History with community participation.

8) Food and environmental knowledge.

Structure of the interview. For the interview to feel more natural to the interviewees, the interview guide proceeded from a higher geographical scale to a lower one with questions 1) about their place, to assess their current level of place attachment and social capital; 2) about their usage and perception of the bike path; 3) about their usage and perception of the orchard (the trees and the fruits) and of the overall project (their opinion about the actual implementation of the project by the city, their level of knowledge about the project); 4) to evaluate other impacts of the orchard on the constructs of interest; 5) about their interest in participatory activities around maintenance of the orchard and harvesting; 6) to get background information on their history with food picking or growing activities, their current level of citizen participation, and their current level of food and environmental knowledge.

Actual questions asked (presented in the same order as the results; see section 13.1.2 for the actual interview guide).

Bike path usage and perception: For what purposes do you use the bike path where we met? When do you use it, and since when? With whom do you use it? What do you like about this bike path? What would you like to see changed in this bike path?

Orchard usage and perception: What do you like about this bike path? What would you like to see changed in this bike path? Have you noticed that fruit trees have been planted along the bike path? If yes: [When did you first notice the fruit trees? Which types of fruit trees do you remember seeing?] What do you particularly like about those fruit trees? What do you particularly dislike about them? Did you sometimes pick and eat the fruits, if so in what circumstances and how frequently? What do you think is the reason that the city planted those trees? Do you think that this was a good idea? Why or why not? Do you think the city of SADB or the city of Montreal should plant fruit trees in other park areas of the city? Why, why not?

Perception of the project: What do you think is the reason that the city planted those trees? Do you think that this was a good idea? Why or why not?

Interest in participatory activities: If the city implemented programs and activities that would allow you to participate in the maintenance or harvesting of the fruit trees, would you be interested in participating? Why or why not?

Current state of constructs: *Place attachment:* 1) Place identity: What are your favorite characteristics of this place? What do you dislike? 2) Place bonding: What are your feelings toward this place? *Social capital:* What are your favorite characteristics of this place? What do you dislike? Do you engage in voluntary activities in your community, and if so, which ones? *Food knowledge:* When you buy your groceries, what factors help you chose your products? Are you at all concerned about pesticides, herbicides, or where the food comes from? *Environmental knowledge:* When you buy your groceries, what factors help you chose your products? Are you at all concerned about pesticides, herbicides, or where the food comes from? When you buy your clothes, what factors help you chose? When you buy your cleaning products, what factors help you chose?

Impacts on constructs: *Place attachment:* Did the fruit trees have some impact on your feelings towards your place? Do you think that this [the project] was a good idea? Why or why not? Do you think the city of SADB or the city of Montreal should plant fruit trees in other park areas of the city? Why, why not? *Social capital:* Did you sometimes go to the bike path specifically to pick up fruits with other people, or do you intend to do it someday? If so, with whom and when? Do you think that this [the project] was a good idea? Why or why not? Do you think the city of SADB or the city of Montreal should plant fruit trees in other park areas of the city? Why or why not? *Food and environmental knowledge:* How did you feel and what did you think then [when you picked and ate fruits from the orchard]?

Modifications. After the first five interviews were conducted, two modifications to the interview process were made. First the interview guide was slightly modified to ensure a more complete coverage of the topics that I was interested in. Thus only the last six interviewees were asked what they disliked about their place and whether they are concerned about the presence of worms in the fruits. Second, my collaborator Paula Bush inspected the interview transcripts and provided me some feedback on my prompting, to ensure that I let the interviewees speak freely and avoided

suggesting them specific answers. The length and, hopefully, the quality of the remaining six interviews were increased thanks to this.

7.4 Analysis of the interviews with the users of the site

Transcription and summaries. Interviews were transcribed verbatim and then analyzed using a mixed deductive (derived from the research questions) and inductive (derived from the data) approach, using the guidelines found in (Friese 2011; Friese 2014; Fereday and Muir-Cochrane 2006). The transcripts were first read several times and then summarized to become more familiar with the content of each interview and initiate the mental building of recurrent themes.

Coding. Then the transcripts were coded using the ATLAS.ti computer-assisted qualitative data analysis software (version 7.5.12), using deductive codes for answers to the interview questions, and inductive codes for the data-derived themes. The coding was performed in three cycles, generally following guidelines provided by Friese (2014). Codes were generated by "noticing, collecting, and thinking" about things, and grouped into categories. Each cycle ended with tightening up the code list by merging codes with few occurrences and creating or improving code categories. The code list was discussed with my supervisor at the end of the first cycle. During the second and third cycles, the code list was modified to better fit the data. There were 131 inductive codes at the end of the first cycle, 260 after the second, and 213 after the third. In the third cycle of coding, only minor refinements to the code list were found necessary, and no changes to the categories were made, therefore I felt ready to proceed to the analysis of the coded data. At that stage, there were 37 deductive codes, and the following 17 categories of inductive codes: activities, behavior, bike path, city, economy, environment, feelings, food, fruit trees, human relationships, knowledge, nature, place, qualities, social capital, time, and wellbeing. The final deductive and inductive code lists can be seen in Table 6 and Table 7 of the Appendix.

General analysis procedure. To build up the results, two main methods were used. On the one hand the list of inductive codes that intersected with a deductive code was obtained using The Code Co-occurrence Table function in ATLAS.ti. I looked at the code occurrence frequencies (provided by the software function) and the number of interviews (measured myself) in which the codes appeared, in order to get a sense of the more frequently mentioned themes and the less frequently mentioned ones. On the other hand, I built summaries of the responses for each interviewee, using guidance

from the themes emerging from the codes, and in return, the summaries helped in interpreting the code lists.

Correlations with personal history (section 9.3.2). In the interviews, I asked users about their history with wild foods and with harvesting fruits in other orchards in order to see if there was a correlation between this history and their usage and appreciation of the orchard. Doing so other information emerged concerning their experience with vegetable gardening, close experience with a farm in childhood, and experience with harvesting fruits in childhood. I therefore chose to compare the presence of these five different activities in their life history (wild foods, usage of other orchards, vegetable gardening, childhood contact with a farm, and childhood experience harvesting fruits) with the following behaviors relative to the orchard: whether they had enjoyed eating a fruit on the bike path, how open they were to eating the fruits (open if they had no fears of insects and were willing to liberally eat the fruits, no if they had some fear of insects and/or not willing to liberally eat the fruits), and whether they were in favor of the project. To do so, I built a table which contained for each interviewee a yes or no answer for the presence of each of the five activities and the three different behaviors, and then looked at whether some relationships between the presence of the activities and the behaviors were stronger than others.

Impacts. Impacts were analyzed in terms of 1) the observed impacts, meaning assessed from the actions related by the interviewees, or from what they directly said that the impacts on them were, and 2) potential impacts, suggested from a higher-level analysis of the interviews.

7.5 Ensuring transferability

Though eleven interviewees might seem like a small number to those more accustomed to quantitative studies, it is deemed sufficient for qualitative studies if a diversity of perspectives is contained, that is data saturation is reached (which was sought here as described in section 7.3.3). Indeed, transferability, or how useful the research can be to others, with qualitative studies is generated through the richness of the descriptions and analyses, rather than through a statistically significant sample size (Patton 2015). Transferability also requires that all the necessary information is included in the report. To ensure this, I followed the guidelines provided by Tong et al. (2007).

7.6 Positionality

My motivation for undertaking this research is to find ways of promoting environmental sustainability and social wellbeing, and from my experience with, and knowledge about agriculture and cities, I believe that developing urban agriculture and providing the most widespread access possible to it for urban residents could be a powerful way of working towards these goals. I am therefore probably biased towards evidence in favor of urban agriculture. Nevertheless, I also believe that the best way of serving the cause of urban agriculture is to attempt to be as rigorous as possible in its study. Thus I strove to be as objective as possible during data collection, for example by also asking the interviewees what they disliked about the orchard (though I omitted to ask those who were not in favor of the project whether the orchard had impacted their feelings for SADB, and this is a limitation) Also, during data analysis I strove to constantly challenge my perceptions and interpretations. Hopefully these strategies have contributed to reducing this bias.

It is possible that my position as a researcher encouraged the interviewees to provide answers which they thought I would receive well, though I could not find evidence for this. For example, there was a wide diversity in the responses to the questions, and the interviewees could readily provide meaningful and inter-consistent reasons for their opinions, and on the contrary I was surprised by the low level of environmental concern that the interviewees expressed given that they knew that this study was done for environmental purposes.

8 Context[1]

City. Sainte-Anne-de-Bellevue (SADB), founded in 1703, is a small suburban city of about 5000 inhabitants at the western tip of the Island of Montreal (Montréal en statistiques 2014). It is home to John Abbott College and the MacDonald Campus of McGill University, the Morgan arboretum and two nature parks (Ville de Sainte Anne de Bellevue 2013).

Initiation. In 2008-2009 the city initiated the construction of a bike path to connect its north and south neighborhoods which were previously only connected through a busy road that is dangerous for pedestrians and cyclists (see Figure 3). In 2010, the city undertook the planting of trees for landscaping the bike path and at that time the city council member (who was interviewed), who is a naturalist, avid gardener, and always looking for opportunities to plant fruit trees in his living environment to make it "as healthy and as pure and as uh, delicious as possible", brought the idea of planting mainly fruit trees. He also thought that this would further develop the current style of SADB as a special and charming place that values environmental sustainability, and perhaps even contribute to making it a leader in environmental sustainability projects, and that it would contribute to improving food security in SADB[2]. The bike path appeared as a good choice for planting fruit trees in SADB for the following reasons: 1) it is the only large public space available to the city; 2) like fruits, it is connected to the idea of "health" (active transportation); 3) in city parks, tall trees that provide shade are preferred over fruit trees, which are short; 4) the bike path might be less sensitive to the stigma associated with fallen fruits and the potential wasps and other pests they might attract. The orchard project was then developed with permaculture principles in mind and together with another city council member and a farmer from Île Perreault who has extensive experience with fruit trees and permaculture.

Implementation. The implementation was facilitated by the fact that the city received a grant from Tree Canada (a NGO working with the Toronto Dominium Friends of the Environment Foundation) in 2010, which greatly motivated the city council to accept the project. The chief gardener of SADB

[1] All non-referenced information in this section is from a personal conversation with the chief gardener of SADB in charge of the project, and semi-directed interviews with him and with the city council member who developed the project, as described in section 7.3.1.

[2] He also implemented the installation of bird houses on the bike path and these constitute for him an integral component of the orchard project.

was then called upon to implement the project. He was in favor of the idea because he thought that the fruit trees would provide beauty to humans, fruits to eat for humans and for the local fauna, and because, by providing fruits which can physically mediate the interaction between trees and people, fruit trees should facilitate the development of the relationship that humans naturally develop with trees and nature in general. He chose the species and locations for planting and managed the planting programs. These started in 2010, with two plantings per year (spring and fall), and will take place as long as the bike path is under construction (it is still being extended at the north end). The project has benefited from other TD grants, and is currently officially managed and maintained by the chief gardener, while the city council member sometimes participates in its maintenance on a voluntary basis. See Figure 4 for some pictures from the orchard.

Trees. Thus far, several hundred individual productive trees and shrubs have been planted, representing 101 different varieties of crabapples, walnuts, plum, apple, pear, Asian pear, mulberries, cherry, blackcurrant, hascap berries, blackberries, raspberries, grapes, and others. This gives SADB one of the highest levels of fruit trees diversity for a Canadian small town (Ville de Sainte Anne de Bellevue 2013). Cultivars suited to the climate are chosen, and cultivation methods are entirely organic. The species are identified with metallic labels. The trees have been productive since 2012, but production has become more significant from 2015. The trees are developing well and their principal cause of mortality is inadvertent mistreatment by the employees from the company hired by Hydro-Quebec when they perform weeding on the site. A few trees also died from the winter cold. A dozen trees have been stolen, but vandalism has not been observed.

Expected socio-environmental impacts. The city council member hopes that the project will help pollinators and that the fruit trees will bring environmental benefits as trees (such as improving air quality and reducing the heat-island effect), awaken people's appreciation of good tasting food, of the abundance of nature, and of living around fruit trees. The chief gardener hopes that the orchard will encourage local food production and consumption, and thereby reduce the environmental and health impacts of the food system (gas emissions, chemicals), as well as promote the economic development of the region. Both of them hope that the orchard will provide pleasure and happiness to the residents (through beauty, taste, comfort), that it will inspire them to become more interested in growing food themselves and in planting fruit trees in their own yards, and that they will become more knowledgeable about the Quebec fruit tree landscape (its heritage, or the breadth of the varieties that can be grown). They also both believe that these impacts will take place naturally, from the people being drawn to harvesting from the trees and noticing the benefits that it

brings, and also thanks to the volunteering activities and to word of mouth. They also think that the orchard will positively impact social cohesion in the community, as the trees will provide a topic for conversation around which people can unite (food), and in an enjoyable pastoral setting. To this the chief gardener adds that he expects positive impacts on the feeling of responsibility towards the community, and he wishes that the project focuses more on these social impacts in the future. Concerning impacts on the trust in the city administration, though the city council member sees them as limited, the chief gardener sees them as more substantial, though he believes that for these impacts to take place the residents' perception of the site should remain positive (e.g. that the site be well-maintained).

Communication. To raise awareness about the project, the city has described it in the local newspaper (Sainte-Anne Express), which is distributed to houses, and in the sustainable development plan of the city, which is freely available at public events and at the town hall. Both the chief gardener and the city council member think that sufficient communication about the project has been done, though not everyone might know about it or dare to pick the fruits: the trees are not productive enough yet for everyone to know about their existence and wanting to harvest from them. The residents will learn naturally about the project, from talking to each other and interacting with the trees, and unharvested fruits can be eaten by the local fauna.

Citizen participation. Residents have been invited to participate to the project but up to now only for the plantings, and these events were well attended. Both the city council member and the chief gardener are open to the idea of involving the participation of the residents more, but with some reservations. The city council member does not think that programs can be implemented in the coming years due to lack of funds to train the residents, and he is skeptical that the volunteers will keep up with their responsibilities in the long term in the absence of a monetary compensation. Also, their participation is not really necessary since varieties that require limited maintenance were chosen (in line with permaculture principles), and because the orchard is not commercial, such that maximum productivity is not the goal. The chief gardener does not think that citizen involvement is needed for maintenance at this time, but thinks that more participation would be worthwhile, especially for group activities involving harvesting. However, he is against the idea of involving the residents in pruning, unless they have expert knowledge, because it would cause a liability for the city in case of injury and because pruning requires expert knowledge without which the tree may be severely injured.

Figure 3. Location of the public orchard in Sainte-Anne-de-Bellevue. The red ellipse shows the area were the fruit trees have been planted, along the bike path (green line) that connects the north and south neighborhoods.

Figure 4. The orchard in the spring (top and middle) and fall (bottom) of 2015. Top: a segment along chemin Sainte-Marie, showing a cyclist and a pedestrian using the bike path (left), and blackcurrants growing (right). Middle: a more secluded section, with grapevines growing on the stone wall (left), and an area with several clustered trees (apples, Asian pears, mulberry) near the Arboretum (right). Bottom: Asian pear, apples, and raspberries on the section near Sainte-Anne-de-Bellevue north.

9 Results

9.1 Background information on interviewees

Table 1 shows the socio-demographic background information collected on the eleven interviewees. Ten are residents of Sainte-Anne-de-Bellevue (SADB), and one is a non-resident. There were about as many males as females, and English and French speakers. Most of them (9/11) are between 50 and 70 years old, but one is 22 and another 77, and all but the youngest had two or three children. Their annual household incomes ranged between 50,000$ to above 100,000$ (not shown) and they held a variety of occupations. All of them had been living (or working, in the case of the non-resident) in SADB for several years. Most of them (9/11) had grown up in Quebec, one in England, and one in Poland, and five of them had parents who had grown up elsewhere than in Quebec (Eastern Europe, Canada, Poland, USA, China). The interviews lasted on average 60 minutes, and were conducted either in English or French.

Table 1. Summary background information on the interviewees. SADB: Sainte-Anne-de-Bellevue. *: works in SADB but resides in a different municipality. #: obtained by snowball sampling via Mary. En: English, Fr: French.

Interviewee pseudonym	Age and gender	Years in SADB	Places where grew up; places where parents grew up	Occupations	Age of children	Marital status	Interview date	Interview duration (min)	Interview language
Luka	22 M	5	Island of Montreal; Eastern Europe	student	none	single	10/10/2015	38	En
Jenny	54 F	20	Montreal; Estrie	nursing teacher	16, 21	married	10/13/2015	33	En
Mary	67 F	29	Quebec city; Quebec	nurse, retired	45, 48	married to Howard	10/16/2015	59	Fr

Howard #	77 M	29	England; Ireland, Canada	chief financial officer for food industry, retired	45, 48	married to Mary	10/16/2015	39	En
Adrian	58 M	12	Poland; Poland	technician	16, 19	married	10/16/2015	37	En
Mathieu *	55 M	25	Quebec; Quebec	engineer	12, 15, 19	married	11/26/2015	65	Fr
Denise #	67 F	33	Island of Montreal; Estrie	court clerk, retired	30, 40, 44	married	11/26/2015	103	Fr
James #	54 M	8	Maine, Montreal; USA	horticulture teacher, agronomist	17, 20	married to Elisabeth	11/29/2015	53	Fr
Elisabeth #	51 F	8	Island of Montreal; Quebec	gardener, librarian	17, 20	married to James	11/29/2015	60	Fr
Jeanne	52 F	11	Quebec; Quebec	esthetician	20, 23, 24	married	12/10/2015	54	Fr
Amy	56 F	30	Montreal; China	banker	16, 22	married	12/22/2015	87	En

9.2 Bike path: usage and perception

Usage. All of the eleven users interviewed use the bike path for exercising and never for commuting. Two of them also use it for harvesting fruits during the season. They use it usually year-round and

several times a week. Seven of them use it alone, three of them sometimes with a family member, and one of them (the non-resident of SADB) always uses it together with his co-workers to take an after-lunch walk.

Appreciation. All the interviewees appreciate the bike path greatly, one interviewee even calling it "a godsend" (Mary). Indeed, the bike path allows them to exercise outside and year-round (because snowplowed) in a safe, green, rural and beautiful place that is devoid of cars. Prior to its construction they had to resort to walking or running on the streets, which was not as pleasant, "boring", and dangerous because of car traffic. Another alternative was the countryside paths, but these were not snowplowed and not practicable in the winter or when wet. Some also mentioned that they had been disappointed that the bike path had been constructed so many years after it had been promised, such as Jenny who waited for it for sixteen years, so that her kids "could not enjoy it". When asked what they would like to see changed in the bike path, several users did not have any ideas, but some mentioned that they wished that it would connect to other paths such that it could be used for longer distances, and some expressed a concern for safety (a separate lane for pedestrians, lights at night for protection). Other thoughts mentioned related to comfort and convenience (lights for being able to use the path at night, benches, more trees for more shade), and beauty (making the path curve rather than be straight).

Socializing place. It appears that for several of the interviewees the bike path is also a place where they socialize. Indeed, Luka sometimes walks there with his brothers or mother, and they enjoy talking. Mary and Denise met there, after seeing each other there several times, although they both live in SADB north and not far from each other. Mathieu uses it to take after-lunch walks with his co-worker friends, and mentioned that before the construction of the bike path such walks were less frequent or less pleasant in the winter when the countryside paths became impracticable and they had to resort to walking on the roads. James and Elisabeth get to talk to strangers who ask them questions when they are harvesting fruits. And Denise and Luka explicitly expressed that they thought that the bike path was a meeting place for the community:

> It brings people together, like I see people from like across, from the other side of the neighborhood, and they walk, walk their dogs, and we talk, and it's, it's a great place to socialize, I guess. It brings the whole neighborhood together, I guess. That's how I see it. (Luka)

> Il y a beaucoup de monde qui marche, alors quand tu les rencontres tu te salues euh. [...] C'est rare qu'on va prendre une marche pis qu'on rencontre pas personne qu'on, qu'on. [...] C'est le fun parce que tu les vois souvent, donc tu les connais un petit peu, euh, ça développe des liens entre les gens du quartier euh, sans nécessairement tous se voisiner un chez l'autre mais, tsé tu marches pis tu rencontres quelqu'un, tu parles une coupe de minutes, tu continues euh, fait que je trouve que ça euh, ça rapproche les gens en même temps. (Denise)[1]

9.3 Orchard: usage, perception, knowledge and interest in participation

9.3.1 Usage

Results from user observations

I sought to observe the behavior of the users of the bike path with the orchard by standing on the bike path in front of producing trees. I had planned to do so in early September, when most mature fruits should be available. Unfortunately, and surprisingly, although I had seen a lot of fruits growing on these trees in the spring, when I arrived on the site in September I found that close to no fruits could be found on the trees (and I later found out that two interviewees who are regular users of the orchard experience a similar disappointment every year). The only producing plants were raspberry bushes located at the north entrance of the bike path, so I focused on performing the observations with them. In a total of five hours of observation, on one week and one weekend day, 48 people passed by the bushes, either alone or in pairs. They were mostly adults cycling, jogging, walking, walking their dog, and in a few cases commuting. I only saw one instance of harvesting from the bushes: on a Saturday afternoon, two female teenagers were leisurely walking on the path, and as they reached the shrubs one of them approached them and picked and ate one raspberry, while her friend looked at her. After about one minute, they walked back towards the houses.

[1] "A lot of people walk, so when you meet you greet each other, uh. […] It's rare that we take a walk and don't meet anyone that we, that we. […] It's fun because you meet them often, so you know them a little bit, uh, it develops connections between the people in the neighborhood uh, without necessarily all going to each other's place but, you know you walk and you meet someone, you talk a few minutes, you go on, uh, so I find that uh, it also allows people to get closer."

Results from interviews

Table 2 summarizes the users' usage and perception of the orchard.

Species noticed. All the interviewees were aware that trees had been planted along the bike path. However, three of them had not noticed that these were fruit trees (Luka, Mathieu and Amy), though they had noticed one of the berry bushes (either the raspberries or the blackcurrants), but had thought that these were wild. Among the other interviewees, the number of species noticed ranged between three and seven.

Usage. All interviewees had noticed at least one of the kinds of fruits or fruit trees. Three of them had tried one fruit and six of them had harvested several fruits. Interestingly, three of them (Luka, Adrian and Jeanne) had been recruited during the observations and I had not seen them approach the shrubs at that time (and I approached them when they were returning, after they had passed in one direction already), while in the interview they said that they have eaten the raspberries several times in the past. This suggests that the results of the observations (above) are not a good indication of the proportion of users who have eaten the raspberries on occasion.

Table 2. Summary of the interviewees' usage and perception of the orchard

Interviewee	Species noticed	Fruits usage	In favor of project	Likes about orchard	Dislikes	Has had info about project	Why city planted
Luka	1	Enjoyed raspberries, hesitant to eat apples.	neutral	mediates relationship with nature	none	no	unsure, trees for environment, fruits for people?

Jenny	3	Enjoyed raspberries, not interested in crabapples and grapes because of taste, would eat other fruits.	neutral	smell nice	none	no	unsure, beauty, fauna, bees, trees not overpowering
Mary	4	Did not eat. Someone gave her one apple, she gave it to husband.	yes	beauty, fruits for people, not overpowering	none	yes	beauty, fruits for people, develop eco/rural style, trees not overpowering, unique
Howard	6	Enjoyed one apple. Would eat all fruits.	yes	beauty, not overpowering, educating children	none	yes	Encourage people to plant, community participation, develop eco place, make community more attractive, increase self-sufficiency of city
Adrian	3	Ate raspberries and apples. Would eat all fruits.	yes	no chemicals, taste	none	no	fruits for people, good for community
Mathieu	1	None. Saw raspberries and did not eat. Would be hesitant to eat apples.	no	trees for green	fruits rotting on the ground	no	unsure (against project), make residents positive towards their place

Denise	3	Tried to eat one pear, was not ripe. Interested in eating the fruits.	yes	fruits for people, beauty, smell	none (but concerned for uneaten fruits)	no	beauty, fruits for people, encourage people to plant
James	7	Ate prunes, blackcurrants, hascap berries, apples. Would eat all fruits.	yes	shields bike path from road, beauty, fruits for people	lack of maintenance	yes	beauty, implication of residents
Elisabeth	4	Ate prunes, blackcurrants. Would eat all fruits. Dislikes hascap berries.	yes	bushes as they are easier to share, fruits as gift	none	yes	develop eco style of city, the city received funds
Jeanne	5	Ate raspberries, but not cherries and grapes, does not know why.	yes	beauty, fun, unique	none	no	does not know, fauna
Amy	1	Did not eat on the orchard, fear that not edible. Ate one blackcurrant given by her neighbor.	no	beauty	attracts bees and wasps	no	unsure (against project), fruits for people, bees

9.3.2 Perception of the orchard

Favorability towards the orchard

When asked what features they appreciated or wanted to see changed in the bike path, none of the interviewees included the fruit trees in their response to what they would like to see changed, and

three of them mentioned the trees in the features that they like, and in very positive terms, for example:

> I was very conscious of the, uh putting in all the apple trees, the hazelnut trees, uh, the almond trees, uh blackberry, blackcurrants, and, uh, ss, some of the other uh, fruit trees that they put in as well as the crab-apples and, uh, uh, other native apples they put in the area. So I was very enthusiastic about that. (Howard)

However, when directly asking them whether they thought that the fruit trees were a good idea, I found three types of views: against (2/11), neutral (2/11), and in favor (7/11) (Table 2). Those two "against" (Mathieu and Amy) did not think that it was a good idea to plant fruit trees. First they do not believe that people are really going to pick the fruits:

> Ben je pense pas que les gens apprécient beaucoup, comme moi là je passe pis j'avais pas remarqué vraiment, puis, ben moi c'est plus la verdure que j'aime, l'aspect "arbres fruitiers", je trouve que c'est, c'est marginal là. (Mathieu)[1]

> Yeah. I don't know. I don't know, I didn't realize that they, they want us, do they want us to pick up, pick it up to eat?! [Laugh]. (Amy)

Second, they think the trees are going to require too much maintenance:

> Puis en fait, le risque que, le risque que je vois quand les arbres vont être matures, c'est que ça devienne un peu sale à cause de ça. (Mathieu)[2]

> But if you have bushes of raspberry, fruit trees you still have to trim it! You know, to make it. […] Eh, more money, for maintenance, no, I don't think it's a good idea. (Amy)

However, both of them were quite appreciative of "vegetation" in general:

> C'est c'est bien avoir de la, des des arbres, de la végétation, autour, mais là que ce soient des arbres fruitiers, euh. (Mathieu)[3]

---

[1] "Well I do not think that people appreciate very much, me for example I pass by and I had not really noticed, so, well me it's more the greenery that I like, the "fruit trees" aspect I find that it's, it's not very significant."
[2] "So in fact, the risk that, the risk that I see when the trees will be mature, is that it becomes a bit dirty because of that."
[3] "It's, it's nice to have, trees, vegetation, around, but then that it be fruit trees, uh."

> Over the hill, over the forty, and then I, I feel like I am at peace, 'cause I see, with the uh, les arbres, you know. I am more at peace, you know. (Amy)

For the two interviewees who were "neutral", though they were much in favor of the planting of trees, what they valued most was the trees as trees, and they were not particularly enthusiastic about their fruit producing capacity for humans, for example:

> I think they should at least do a combination of fruit and non-fruit, so that you are helping once again the bees and the other little animals that wanna eat those fruits and stuff in the winter or whatever, so I think it's nice to have a combination, yeah, yeah. (Jenny)

Finally, those "in favor" were very positive towards the fruit trees, for example:

> I think it's a wonderful idea, I think it's a, it's a, when I first heard that they are going to be putting fruit trees all along this path, I thought that was, it was a great idea. (Howard)

> Yeah yeah it was a good idea. Yeah yeah. Definitely it was good and, but it's not, not a lot of fruit trees like uh, not a lot of trees there like uh, some, I catch it like twenty, it's only twenty? Should be more or something like that. (Adrian)

Appreciated features of the orchard

When the interviewees were directly asked what they appreciated about the fruit trees, all of them appreciated at least one thing. The two most frequently mentioned features were their beauty, in particular their blooming, even for those two who were not in favor of the orchard (Amy and Mathieu):

> They're beautiful in the spring when they are all in flower, it makes a, a wonderful, uh, path to go along in the early spring, and then in the fall when all the colors of the fruits are available, [cough] excuse-me, especially the crab-apple fruits are a bright red and berries, uh, again, it is a beautiful path to walk along. (Howard)

And the fact that people can eat their fruits:

> Yeah, yeah, yeah, yeah, if you want them, if you are walking along and you know you want something to grab, they are there. (Mary).

Other mentioned features were: they are plants (likable for this alone), the trees are small and not overpowering (so that one can still feel safe and cozy on the bike path), they reinforce the health promoting aspect of the bike path, the orchard is well-maintained, the trees can contribute to helping people learn about where food comes from, the project contributes to enhancing the uniqueness of their city, and they can feed the fauna. The trees brought them pleasure in various ways: sensory (beauty, eating fruits which taste good, are fresh, have no chemicals), interaction with nature (from seeing the animals that they attract, seeing the fruits growing), and from the surprise that they brought, by being unusual in public spaces. Interestingly, features of the fruits themselves (taste, freshness, chemical-free, free) were rarely mentioned.

Disliked features of the orchard

When asked what they disliked about the fruit trees, most people responded that there was nothing (8/11). Among the three others, one person had not noticed them so I did not ask him (Mathieu), one did not like them because they attract bees and wasps and need maintenance (Amy), and one (who was otherwise very positive about the fruit trees) deplored that they sometimes lacked maintenance (James). There were nevertheless some features that most interviewees liked less about the fruit trees and that they mentioned in other places of the interviews, and these will be presented throughout sections 9.3.3 and 9.3.4.

Appreciated features of the fruits

Though I did not ask specifically about this in the interview, some interviewees provided an idea of what they thought about the fruits that they had picked on the path when I asked them what they thought or felt at that moment. Most of them mentioned freshness and ripeness. Other features which were mentioned by one or two interviewees were that the fruits were free, a "gift":

> Y a un sentiment dans la gratuité aussi, qui est, j'sais pas, on dirait que le fruit que t'es allé cueillir toi-même, qui t'a rien coûté, il est encore meilleur que celle que t'as acheté au magasin, je sais pas. » (Elisabeth)[1]

and that they do not have chemicals:

> The raspberries yeah I eat them. You know it's like uh, I like them so, because there is no chemical stuff, I hope!" (Adrian)

[1] "There is a feeling in gratuity also, which is, I don't know, it seems that the fruit that you have harvested yourself, that did not cost you anything, is even better than the one you have bought at the store, I don't know."

Interestingly, only one interviewee mentioned that they tasted better than the fruits found in the supermarket (Adrian), and a few also mentioned the fact that the presence of the trees brings a new choice to the users:

> Parce que si c'était juste un arbre qui avait pas de fruits dedans, euh, il pourrait être aussi beau mais, les gens auraient pas le choix de dire ben là ça me tente de prendre une poire, je vais n'en prendre une. (Denise)[1]

Shrubs versus trees

The inductive component of the analysis revealed that several interviewees make a distinction between fruits from shrubs and from trees. For example, Jeanne dared to pick raspberries but not the other fruits that she saw, and was unsure why:

> I[2]: Hm-hm. Et et pourquoi, les cerises vous en avez vu et vous en avez pas pris? Vous savez pourquoi ou? […] Est-ce qu'il y a quelque chose qui vous a bloqué en particulier ou, c'est juste, l'idée vous est pas venue?
>
> P: Non, l'idée m'est pas venue de, d'en d'en prendre, pas du tout, pas du tout pas du tout, c'est euh…
>
> I: Puis euh, vous avez mangé des framboises par contre [rires].
>
> P: Oui [rires]. Y étaient mûres, y étaient prêtes [rires].[3]

Mathieu, who was generally against the fruit trees, thought that shrubs were more appropriate for planting on public spaces because the fruits are less likely to cause littering:

> En fait moi si j'étais la ville j'aurais pas planté d'arbres fruitiers parce que la la, la, malheureusement, à part peut-être des des, les framboises, des trucs comme ça, les framboises peut-être, mais autrement ça a tendance à, les arbres ont tendance

[1] "Because if it were just a tree that did not bear fruits, uh, it could be pretty but, the people would not have the possibility of saying well now I feel like taking a pear, I will take one."
[2] In the quotes, "I" refers to the interviewer (the author), and "P" refers to the "participant" (the interviewee).
[3] "I: Hm-hm. And and why, the cherries you have seen them but haven't taken any? Do you know why or? […] Did something particular stop you or, it's just, the idea did not cross your mind? P: No, the idea did not cross my mind to, to take one; not at all, not at all not at all, it's uh… I: So hm, however you have eaten raspberries [laughs]. P: Yes [laughs]. They were ripe, they were ready [laughs]."

> à donner des fruits qui sont pas récoltés, les les pommes typiquement vont tomber, et puis là ça devient un peu sale, pis c'est pas vraiment agréable.[1]

Luka thought the raspberries were growing wildly and associated wild with clean and thus trusted them more than the apples:

> P: The raspberries I just, well [laughs] the raspberries are one of my favorite fruits, like I started really liking raspberries and so, like you could see a raspberry and you will, like I have a trust for raspberries, like and they are easy to pick, they are easy to pick and, apple trees for example...
>
> I: You don't like apples so much?
>
> P: No I like apples, it's just like apples directly from an apple tree like that, they have like holes sometimes, you don't know if there is a bug sitting in there, an insect…

And:

> P: I see them all like the same, like, the fruits aren't clean, I don't know, the raspberries were clean, but like I don't know about like say, apple trees or any others.
>
> I: They wouldn't be clean…
>
> P: Yeah, like yeah most of the apples aren't, it depends where you go, like I don't know.

Amy also associated shrubs with wild, however she associated this with the potential for being poisonous and thus trusted the fruits less:

> And then there is bushes there, that the guy, my neighbor was picking it up, I didn't think the city planted that, I thought they are wild! [Laugh]. That's why I don't eat anything that's wild you know!

[1] "In fact me if I were the city [administration] I would not have planted fruit trees because the the the, unfortunately, except maybe raspberries, things like that, raspberries maybe, but otherwise there is a tendency to, the trees have a tendency to give fruits which are not harvested, the the apples commonly will fall, and then it becomes a bit dirty, and it's not really pleasant."

Overall it seems that several people make an important conceptual distinction between shrubs and trees and do not perceive harvesting from them in the same way. In general, they might consider the shrubs as wild and thus proper for harvest in a space which is not a dedicated orchard, while they are more doubtful towards trees, which they assume to require chemicals and/or a lot of attendance in order to be bug-free and edible.

Factors influencing perception

Personal history. I looked at the relationship between three different features of the interaction with the orchard (having enjoyed eating fruits on the orchard; being in favor of the project; and being open to trying the fruits on the bike path - "not open" meaning either fearing worms, that the fruits are not edible, or not thinking of trying them) and the presence of different elements in their history: experience with wild foods, usage of other orchards, vegetables growing, contact with a farm as children, and extensive experience harvesting fruits as children. While the relationships between other historical factors and interaction features were not entirely consistent, a striking relationship was found between openness to the fruits and contact with a farm or extensive fruit harvesting experience as a child. Indeed, all the users who were fully open to trying the fruits on the bike path had had close contact with a farm or extensive experience harvesting fruits with their family in childhood, and they reminisced those experiences with joy: Jenny spent parts of her holidays at her grandmother's place in the Eastern townships, where she harvested fruits with her cousins; Howard grew up in the countryside and surrounded with farms and with several different kinds of fruit trees from which he ate regularly; Adrian grew up on a farm in Poland; Denise spent parts of her holidays at her aunt's farm where she harvested wild strawberries with her sisters; James and Elisabeth spent parts of their holidays going to harvest wild blueberries with their family. For the five interviewees who were not open to the fruits on the orchard (Luka, Mary, Mathieu, Jeanne and Amy), none of them had had no close contact with a farm, one had had some but limited experience harvesting fruits (Luka, a few fruits gleaned at scouting camps or while camping), and one (Mathieu) had had enjoyable experiences harvesting fruits. Indeed, Mathieu had fond memories of eating blueberries and raspberries in the wild areas surrounding his house as a child with his friends, but had little interest in eating the raspberries on the bike path. He also enjoys going to harvest apples at his brother's orchard, and used to go harvest raspberries in fields with his children. However, what he seems to appreciate in these experiences were more the activity itself and the fact that it is a social activity, than the fruits themselves, and when he uses the bike path in SADB it is not to enjoy a social activity centering on the fruits, but to have an after-

lunch walk with his co-workers, before returning to work. For example, talking about harvesting strawberries with his children, he says:

> C'était plus pour euh, c'était une activité plaisante si je peux dire là, familiale, je l'ai déjà fait y a très longtemps euh, avec des amis, pis quand les enfants étaient petits je l'ai peut-être fait quelques fois, euh, quelques fois, pis là les enfants c'est plus des ados, ça les intéresse pas vraiment, là j'ai arrêté de le faire. (Mathieu)[1]

Interestingly, the presence of these childhood experiences was not as strongly related to whether the users were in favor of the orchard, or whether they have enjoyed eating fruits on the orchard.

Interest in healthy foods. I also looked at the relationship between usage and interest in healthy foods. When asked how they chose the foods that they buy, all interviewees said that they sought to eat healthily and to eat a lot of fruits and vegetables. However, interestingly most of the interviewees who were not open to the fruits also especially emphasized their interest in eating healthy (Mary, Jeanne and Amy), showing that interest in eating healthy is not sufficient to drive openness to the fruits. Still, all of those who preferred organic foods (Adrian and Denise, and James and Elisabeth to a lesser extent) were open to the fruits.

9.3.3 Knowledge and perception of the project

Knowledge of project

Among the eight interviewees who knew that the trees planted were fruit trees, four of them had not been in contact with any information about the project, and only the remaining four knew about the origin and purpose of the project (Table 2). Two of these had gained this knowledge via the city's pamphlet distributed to every home, and two others knew about it thanks to their personal connections with the city administration.

Perception of the city's motivations

Types of reasons provided. Among all the reasons provided by the eleven interviewees (Table 2), we note that there is a diversity of responses, but these can be seen to generally fall into four kinds: the trees are for the people, for the community, for the food system, or for the environment.

[1] "It was more uh, it was a pleasant activity if I can say, familial, I have already done it a very long time ago uh, with friends, and when the kids were young I have maybe done it a few times, and now the kids are more like teenagers, they are not really interested, now I have stopped doing it."

Reasons pertaining to people were the most frequently mentioned and were: to provide them with beauty (from the colors in the trees) and a safe and comfortable environment (large trees on the bike path would be overpowering and make people feel unsafe) and to provide them with the possibility to eat the fruits.

Community reasons were relatively frequent and comprised: encouraging the participation of the residents in the community (reminiscent of social capital), making the residents like their place more (place attachment), and contributing to reinforcing the current eco/rural style of the place:

> Le petit côté écologique qu'y essaient de promouvoir dans la ville tsé, on a le marché des producteurs ici, c'est comme, y a beaucoup de gens qui ont, qui ont cette sensibilité là à Ste-Anne, à cause de la, peut-être, de la faculté d'agriculture qui attire des, cette population-là, mais, fait que c'est comme une belle continuité. Je trouve ça, c'est c'est c'est euh, ça, ça, ça commence à donner un genre à la ville pis on le continue dans c'te genre-là tsé. On se donne une couleur, on se donne un style. (Elisabeth)[1]

> […] make the uh, community attractive to the residents themselves, to say well "We are in a community that is very environmentally active, in every respect, uh, from, like you say, growing trees, and uh, uh putting in the fruit trees, and, encouraging uh small market gardens and things like that." (Howard)

Reasons pertaining to the food system were rarely mentioned, but comprised promoting self-sufficiency and encouraging people to plant fruit trees.

Reasons pertaining to the environment were relatively frequently mentioned and comprised the benefits of trees to the ecosystem, helping the bee communities, and feeding the fauna.

Uncertainty about the reasons. Interestingly, though all of them could think of at least one reason, five interviewees were quite unsure about them (they included "I don't know" in their response) (Table 2), though three of these personally had greatly enjoyed eating the raspberries on the bike path (Luka, Jenny and Jeanne; but perhaps they conceptually differentiate shrubs from trees, as

[1] "The sort of environmentally-friendly style that they try to promote in the city you know, we have the farmers market here, it's like, there are a lot of people who have, who have this interest in Ste-Anne, because of, maybe, the agricultural faculty that attracts these, this population, but, so it's like a nice continuity. I find that, it's it's it's uh, it, it, it starts giving a style to the city and we continue in this style you know: We give ourselves a color, we give ourselves a style." Interestingly, this is also the view of the city council member (see section 8).

seen in section 9.3.2). Interestingly, four of these five were those who either had a neutral or against position towards the orchard, though one was actually very much favorable to the fruit trees (Jeanne), yet she was so surprised by their presence that she could not imagine why the city had chosen to do this:

> Je sais pas. Je le sais pas. Je le sais pas pourquoi qu'y ont, qu'y ont planté ça. Honnêtement je. C'est sûr et certain que, y a, énormément d'animaux, puis euh, j'imagine que, euh, ss, c'est pour euh, pour les animaux ça peut être quelque chose de très intéressant, aussi, hm. Mais hm, je vois pas le, je vois pas le, c'est tel, c'est tellement différent, c'est quelque chose que j'ai que jamais vu fait que tsé dans le fond là c'est comme, puis euh.[1]

Even though she had already seen public fruit trees being used in Rome, and did think that the people benefit from these trees a lot:

> On était à, on était à Rome. Pis y a des citronniers, pis y a des euh, y a des petites oranges. Pis ça pousse, t'as les trottoirs, et ça pousse, et les gens vont cueillir, les gens vont vraiment cueillir. On était vraiment dans le moment où est-ce que, pis c'est assez impressionnant de voir ça, tsé je me dis euh, je me dis euh, les gens eux-autres y en profitent beaucoup.[2]

Concerns

The interviewees' perception of the city's management of the project is a topic that I had not planned to ask them about but which came up in the interviews as a seemingly important one. Two important themes were the maintenance of the orchard and the city's communication about the project.

Maintenance: Though a few interviewees said that the orchard was generally well maintained and that they appreciated the city for this, six interviewees (Jenny, Mathieu, James, Elisabeth, Jeanne and Amy) were concerned about the need for maintenance, for example:

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[1] "I don't know. Honestly I don't know why they have, they have planted that. Honestly I. For sure that, there are a lot of animals so uh, I imagine that uh, ss, it's for uh, for the fauna it can be something quite interesting, as well, hm. But hm, I don't see the, I don't see the, it's so, it's so different, it's something that I have never seen done you know actually, it's like, so uh."

[2] "We were in Rome. And there are lemon trees, and there are uh, small oranges. And it grows, you have sidewalks, and it grows, and the people go and harvest, the people really go harvest. We were really in the period when, and it's quite impressive to see that, you know I tell myself, I tell myself uh, the people them they benefit from it a lot."

> Puis euh, je comprenais pas pourquoi qu'y avaient mis ça parce que j'avais toujours l'impression que ça attirait beaucoup hm, ça attirait beaucoup de de petits rongeurs dans le fond tsé euh, parce que c'est quand même des arbres qui sont pas faciles non plus à, à, avec les bibittes pis tout ça, je pense que c'est des des arbres qui sont quand même assez fragiles. (Jeanne)[1]

Elisabeth thought that the involvement of the residents was necessary to alleviate this:

> Tsé tu peux pas juste récolter, et rien donner, faut que les gens donnent aussi pour que ça marche parce que sinon ça, à un moment donné ça va, ça va détériorer. C'est pas un, c'est pas un c'est pas un miracle si t'as des produits fr, faut faut entretenir. […] C'est normal là, on va pas payer encore, on est une petite communauté, on peut pas payer pour euh, c'est pas une ferme qu'on gère ici là, tsé. (Elisabeth)[2]

Communication: Seven of the eleven interviewees either were not sure that they were allowed to eat the fruits or that the fruits were edible, or wished that the city would add signs or other means of indicating this (and among the remaining four, three of them already knew about the project either from having heard about it or from having read about it in the city's pamphlet.) For example:

> At least have a basket, I don't know. I would find it nice if they had like a, bench or something, and like a basket where they have apples and just say oh, they could just put a small sign oh, edible apples and like, edible apples, and you just, yeah. […] they need some sort of signs saying "you could eat these apples" or something like that, like to just assure people that like, [laughs]. […] Yeah, even a small sign, that like oh, like subliminally, you would be ok you could eat these apples. (Luka)

> […] même des jeunes d'ici je suis sûre qu'il y en a qui le savent pas. Qui savent pas qu'y ont le droit. […] tsé comme on n'a pas l'habitude d'aller dans un parc pis

[1] "And uh, I did not understand why that had put that because I had always had the impression that it attracted a lot of small rodents in fact you know uh, because they are actually trees that are not easy either to to, with the insects and all that, I think that they are trees that are relatively sensitive."

[2] You know you cannot just harvest, and not give back anything, it is necessary that people also give for it to work because otherwise it, at some point it will, it will deteriorate. It is not a, it is not a miracle if you have products that are fr, one must one must do maintenance. […] It's normal, we are not going to pay more, we are a small community, we cannot pay for uh, it is not a farm that we are magaging here you know.

> de cueillir des fleurs mettons, tsé, tu prends pas les fleurs dans un jardin... Ben pourquoi là je prendrais les fruits. Oui j'ai le droit si ça fait partie de la, mais faut le savoir, puis pour le savoir il faut, il faut il faut le dire aux gens. Comme, il manque un petit bout là. Je trouve, y manque, si tu veux que ça marche, il faut que les gens puissent savoir. (Elisabeth)[1]

Four of them added that the taxes that they pay to the city should give them the right to eat the fruits or to be informed that they have this right, or that these taxes imply that the plantings should be well planned, for example:

> Pour moi c'est de l'argent du public, quand tu fais un projet public, tu dois l'annoncer au public. [...] Il faut que tu ailles jusqu'au bout dans ton projet, tsé. (Elisabeth)[2]

> Because you planted fruit trees it's nice, but, for who? Right, what's the reason. Because people don't know. People walk by along there, they are not gonna say "Ah, it's a fruit tree, let's go and grab a, a pear". [...] They, I don't know, the city would uh, ask for consult, you know consultation, ask MacDonald College, ask my husband, "What do we plant?" [laughs], Because [?] irrigation system, are you kidding, you are spending taxpayer, my taxpayer money for something that is not gonna work, you know. (Amy)

It was also mentioned that it would have been worthwhile to consult the residents about the implementation of the project:

> Euh, une chose qui serait peut-être intéressant aussi, c'est, si on demandait aux citoyens quels arbres fruitiers ils aimeraient voir plantés. Euh, bon des pommes,

[1] "Even the young here I am certain that some of them don't know. Who don't know that they have the right. […] You know we don't go to parks and harvest say the flowers, you know, you don't take flowers in a garden… So why then would I take the fruits? Yes I have the right to do it if it is part of the, but one has to know it, and to know it it is necessary to tell it to the people. Like, there is a piece missing here. I find, something is missing, if you want it to work, people must know [about it]."

[2] "For me it is money from the public, so when you do a public project, you must announce it to the public. […] You must bring your project to completion, you know."

> des poires c'est c'est bien comme choix, mais il y a peut-être autre chose qui pourrait intéresser les gens. (James)[1]

Opinion about cities planting fruit trees on other public spaces

When asked whether the city of SADB or other cities should plant fruit trees on other public spaces, only two of them were against the idea (Mathieu and Amy, who also were not in favor of the orchard in SADB), and the other were in favor. The reasons mentioned for their agreement usually intersected with the features that they appreciated about the orchard in SADB, but a few more were also mentioned: teaching people and children about how fruits are produced (Howard, Denise, and Elisabeth); teaching people that the fruits do not need to be perfect would encourage people to buy more local foods (Elisabeth); giving back something to nature since you took something away from it when you built the park for people's enjoyment (Luka); reminding people that they should respect the environment they are in (Luka – this is similar to the chief gardener's view as we have seen in section 8); providing free food (James and Jeanne); and perhaps helping those in financial difficulty (Jeanne).

9.3.4 Factors influencing usage

The inductive component of the analysis revealed that several factors currently appear to act as barriers to the usage of the fruits.

Fear of worms

I discussed the possible issue of worms in the fruits with five interviewees. Only Luka and Mathieu feared this. Interestingly, Luka was the only interviewee below 50 years old (22 years old), and Mathieu (53 years old) was one of the only two participants who were not in favor of the orchard project. The three others (Adrian, Denise and Jeanne) either did not fear them or said that they would simply cut open the fruit with a knife before eating it, as they used to do in their youth and before pesticides became more widely used. Adrian also mentioned that his children would not eat the fruits growing on the bike path nor in their own yard because of a fear of worms.

[1] "Uh, one thing that would maybe be interesting as well, it's, if we asked the citizens which fruit trees they would like to see planted. Uh, well apples and pears are a good choice, but there is maybe something that people would like."

Habit

The preference for raspberries among the interviewees was striking, except for Mathieu. Besides the reasons mentioned by Luka (taste, clean-looking, easy to pick, worm-free), it is possible that habit is a reason as well, because raspberries are a type of fruit that we are used to harvesting in public (wild) places. For example, Jeanne did not think of harvesting the cherries or the grapes even though she thought that they were beautiful, however she did not hesitate to eat the raspberries, and mentioned that habit might be part of it:

> D'ailleurs euh, quand qu'on va à l'extérieur, on a, on va souvent à un chalet, pis souvent quand qu'on marche y a des framboisiers, tsé peut-être c'est dans nos habitudes aussi. (Jeanne)[1]

Knowledge

Two types of lack of knowledge were found as barriers: 1) Knowledge about edible fruits: even though Amy has berries growing in her garden, she does not trust herself to recognize them in another place unless someone she trusts can show them to her. Likewise, Luka preferred the raspberries over the apples in part because his mother had shown him that he could eat them, but not so for the apples. 2) Knowledge about whether it is permitted to eat the fruits: This was an issue for Mary, Denise and Jeanne.

Location of the trees

Elisabeth prefers to harvest from trees that are conveniently located, in a pleasant area, and in a place that does not seem to be too public: she would never dare harvesting fruits from trees on the main street of SADB, where there are two prolific pear trees, except in the context of official activities, because she feels that the site is too "public". On the other hand, she feels that the fruits on the orchard seem wild, and thus to not belong to anyone. The behavior of the people with the trees might therefore greatly depend on the location of the trees, and the convenience and meaning ascribed to that location.

Unequal sharing?

As mentioned in section 9.3.1, when I visited the orchard in September 2015 to observe the behavior of the users of the bike path with the fruit trees I was surprised to find that almost all the

[1] "Actually uh, when we go out of the city, we have, we often go to a country house, and often when we walk there are raspberries, you know maybe it's in our habits also."

big fruits were gone, when in the spring there had been hundreds of fruits growing. Interestingly, James and Elisabeth, who frequently use the bike path in the summer to go taste and harvest fruits, also only had the opportunity to try the plums on the first year, and were never able to taste the apples or pears because they were always gone when they visited the site:

> Pas tellement, euh, j'aurais voulu mais je pense que les les pommes pis les poires sont en très grande demande, alors ça arrive très souvent que lorsqu'elles sont mûres, tout a été cueilli. Il reste presque, pas grand-chose. Ce qui est dommage, j'aimerais ça y goûter, mais en tout cas. (James)[1]

It is possible that the supply in fruits is still much lower than the demand. However, it seems likely, as James suggested, that they get harvested before they reach maturity, since a few of the interviewees had not even noticed them (Luka, Mathieu and Amy), even though they regularly used these sections of the path and the fruits are very easily seen from the path.

Personal preferences

Finally, there were other personal preferences that influenced the types of fruits that the interviewees preferred: 1) Taste: Luka ate the raspberries willingly but said that if he had seen apples he would have been less willing to eat them, in part because he particularly likes raspberries and is more suspicious of apples; Jenny did not eat the crabapples nor the grapes because she knew or feared that she would not like the taste (tart or sour); Elisabeth does not like the hascap berries that she finds sour. 2) Efficiency: Mathieu did not eat the raspberries and would have preferred apples because one can harvest a larger quantity of fruit in a shorter time. 3) Ability to share: Elisabeth prefers berry bushes over fruit trees because the fruits ripen over a longer period, so she does not need to worry about leaving enough for others.

9.3.5 Interest in participatory activities

All users except for Mathieu (the non-resident interviewee) and Amy (who is not interested in harvesting) said that they would be interested in participating in activities around the maintenance or harvesting of the fruit trees. Reasons mentioned for this interest included personal reasons (such as exercising in fresh air and in the sun, and learning something), but the most frequently

[1] "Not much, uh, I would have liked but I think that the the apples and the pears are in large demand, so it happens very often that when they are ripe, everything has been harvested. There is almost, not much remaining. Which is unfortunate, I would like to taste it, but anyway."

mentioned reasons were social, such as: 1) people knowing each other, bringing the community together:

> I guess it brings the community together, you get to know who is in Ste-Anne, and yeah. (Luka)
>
> Ben finalement euh... ça peut, ça peut être plaisant dans le sens de, de de faire des choses avec ça, justement ces fruits-là de faire la récolte euh, d'être en groupe en communauté pis travailler ensemble puis euh. Oui je pense que ça peut être ben ben agréable, oui. (Jeanne)[1]

2) Residents and the administration discussing or knowing about issues:

> Well, because I think it encourages the community uh, into facing with each other […] and I think that's important that uh, neighbors get to know neighbors and, different parts of the town get to know the other parts of the town, and also each one gets to know each other's problems and they, when coming across, which will, again, get back to the uh, the management of the city. (Howard)
>
> C'est sûr que quand tu rencontres des, des personnes que tu connais pas t'échanges euh. […] Alors des fois tu dis, tu rencontres quelqu'un, tu parles, la personne peut dire "Ah ben oui moi aussi telle chose m'est arrivée", tsé des fois d'échanger, d'échanger ça te fait voir mettons que t'es pas toute seule à vivre telle chose ou euh, in, les interrelations hein, c'est, beaucoup mieux que de rester toute seule chez vous puis euh, puis rien faire là mais, euh [rires]. (Denise)[2]

3) Helping the community, doing a good deed - if the fruits are distributed to food banks or SADB's poorer families:

[1] "Well in the end uh … it can, it can be pleasing in the sense that, to to do things like that, indeed these fruits to do the harvest uh, to be in a group, as a community, and work together and uh. Yes I think that it can be quite quite enjoyable, yes."

[2] "For sure when you meet people that you don't know, you exchange uh. […] So sometimes you say, you meet someone, you talk, the other person can say 'Ah well yes me too, that thing happened to me', you know sometimes to exchange, to exchange allows you to see for example that you are not alone to experience that thing or uh, in, the interrelationships uh, it's, a lot better than staying alone at home and uh, and do nothing but, uh [laughs]."

> Fait que si tu peux fournir une banque alimentaire en fruits pour tout un été euh, tout un automne euh, ça, au moins ça serait fait', pis ce serait pas gaspillé, c'est euh. (Denise)[1]

4) And giving back something to the community after having received fruits – Elisabeth even feels that this is necessary for her to feel comfortable harvesting the fruits:

> Tsé on peut, si on aide, on a plus, ben y a pas de culpabilité quand tu vas t'en récolter parce que tu dis "Ben moi j'ai participé à, au fait que", tsé si tu fais juste prendre le, la récolte pis tu fais jamais, tu redonnes rien, tsé c'est comme un sent, je sais pas, y a, j'aurais une certaine culpabilité, mais si je suis allée quand ils m'ont demandé pour désherber ou pour tailler, ben là euh, je me dis "Ok, j'ai le droit de les cueillir, de de, cueillir une partie, je, j'ai contribué à ce projet-là" tsé. (Elisabeth)[2]

Even Mary, who was not highly interested in harvesting the fruits for herself, appeared more interested in the participatory activities, if they could allow her to help in a concrete way:

> Yeah to, to help out, and maybe, whatever you are doing, if you could see something down the road, what you have done to help, that kind of a thing, if you could see your, you know the, what you have put into it type thing, so, yeah, I would. (Mary)

Interestingly, the interviewees never mentioned the possibility of obtaining larger amounts of fresh and good tasting fruits as a reason.

[1] "So if you can provide for a food bank the fruits for a whole summer uh, a whole summer uh, at least that would be done, and it would not be wasted, it's uh."

[2] "You know we can, if we help, we have more, well there is no guilt when you go harvest because you say 'Well me I participated to, to the fact that', you know if you just take the, the harvest and you never do, you never give back, you know it's like a fee-, I don't know, there is, I would have a certain guilt, but if I went when they have asked me to weed or to prune, well then uh, I think 'Ok, I have the right to harvest, to to, harvest a certain share, I, I have contributed to this project' you know."

9.4 Impacts of the orchard project on social capital, place attachment and food and environmental knowledge

9.4.1 Place attachment

Summaries of the responses of each interviewee to place attachment interview questions can be seen in Table 3.

Table 3. Summary of responses for place attachment interview questions.

Interviewee	Likes about place	Dislikes about place	Feelings about place	Impacts of orchard on feelings
Luka	Interesting, quiet, in touch with nature, new experience.	Not asked.	No feelings.	No. It's normal to have trees and fruit trees, especially in a rural place.
Jenny	Quiet, lots of green space, rural but close to downtown, public transit, good place for raising children.	Not asked – waited for bike path 15 years.	Practical attachment? Home, attached because of memories and nice place, will have to move when children leave, would not be sad to leave.	No. Nice to see city admin taking care of city, making it more green, but would apply to any kind of tree.
Mary	Quiet, safe, friendly neighbors.	Not asked.	No feelings. Home, but just a place, could make any place home.	No. Nice to see city admin taking care of city, making it more beautiful and

				pleasurable, but not attached to places.
Howard	Environmentally conscious community and administration, several environmental / rural services (arboretum, MacDonald college, recycling services, control of industry…), quiet, little traffic.	Not asked.	Attached. Reluctant to leave because of city admin.	Yes. Reinforces liking of city admin for being environmentally conscious.
Adrian	Quiet, good place for raising children, friendly neighbors.	Not asked.	Attached. Would be sad to leave.	Yes. He could always buy the fruits in the store, but they would not be chemical-free nor as fresh.
Mathieu	Lots of trees, his job, bike path, rural.	Nothing.	No feelings. Likes, but would be happy anywhere.	Not asked (does not think the fruit trees are a good idea).
Denise	Quiet, many young families with children, safe, isolated from shops where kids can buy candy (north), good schools, lots of	Lack of pedestrian lane on bike path, dog littering, waited for bike path.	Attached. Likes the place very much, feels lucky, would be sad to leave.	Yes. Reinforces liking of city admin because makes the city more beautiful.

	vegetation, bike path, large yard to garden, friendly neighbors.			
James	Walking distance to work and services, food market.	Highway and train noise.	Attached. Would be sad to leave.	Yes. Reinforces liking of city admin because something unique.
Elisabeth	Neighbors knowing each other, rural but close to downtown, walking distance to work and services, corner grocery store catering to needs.	Students littering, car show impairs eco style, car traffic and noise.	Attached. Home, not perfect but home.	Yes. Reminds of previous place that they liked. Particularly enjoys free food that you harvest yourself. Adds to eco style of place. Feeling of ownership for fruit trees.
Jeanne	Quiet, lots of green space and trees, isolated, amenities for outdoor activities, good place for raising children, schools, neighbors helping each other.	Lack of public transportation.	Practical attachment. Likes very much, would like to stay many more years for amenities, but not clear if feelings.	No. Maybe because the trees are not mature enough yet. Does not think she would miss it.
Amy	Unique, isolated, quiet, closed community with only single family homes, feels like community,	Industrial park, frequency of compost collection in winter, lack of public	Practical attachment? “Only place we have”, will have to move when children leave, but would	Not asked (does not think the fruit trees are a good idea).

	amenities for outdoor activities, neighbors knowing each other and being friends.	transportation.	like to keep the house for children.	

9.4.1.1 Current state

Place definition

Looking at the most frequently mentioned features that the interviewees like and dislike about SADB, we see that they generally define it as a green, rural, quiet place, good for raising children and where neighbors are friendly and helpful. They also see it as a unique, safe, clean and environmentally conscious place, providing many nature/eco-related amenities and services (compost collection, bike path, green spaces for outdoor exercise, the ecomuseum, the food markets, possibility to commute on foot). Though they appreciate its rural features, they also appear to conceive it as part of the "urban space", since they frequently either emphasized the easy access to downtown Montreal, or the lack of public transportation (a feature which you would not expect to have in a rural area in Quebec).

Place bonding

All the interviewees were very appreciative to be living (or working) in SADB for the features that it provided them. However, they did not all display the same degree of emotional attachment. Overall, I found attachment to be of three kinds: 1) those who are emotionally attached, i.e. who liked it unconditionally or would be sad or disappointed if they had to leave (Elisabeth, Howard, Adrian, Denise, James). For exemple :

> C'est chez nous quoi. Je sais pas. C'est pas parfait mais, c'est c'est c'est ce qui ressemble un peu plus à, à chez nous. (Elisabeth)[1]
>
> J'aime, j'aime beaucoup mon environnement, j'aurais de la peine de partir [rires] (Denise).[2]

[1] "It's it's our place. I don't know. It is not perfect but, it's it's it's what resembles the most to to, our place."
[2] "I like, I like a lot my environment, I would be sad to leave [laughs]."

> Yeah. Yeah. When the, yeah yeah I would be sad like uh, when we try to sell the house and then, which actually, we tried so I was not happy but... (Adrian)

2) Those who liked SADB very much but apparently more for practical than emotional reasons or did not specifically express feelings (Jenny, Jeanne, Amy):

> Oh, j'aime beaucoup! J'aime beaucoup beaucoup beaucoup, pis même, on est rendus dans une étape de notre vie où ce que les enfants sont grands, sont rendus adultes, pis y vont quitter éventuellement, puis, mes plans de retraite, je me vois très bien vivre ici encore plusieurs plusieurs années, définitivement. Parce que tout, au niveau de, de nos activités, euh, ça nous convient. (Jeanne)[1]

3) Those who appreciated the place, but would not be particularly reluctant to leave (Luka, Mary, and Mathieu):

> I wouldn't [be sad]… Well I personally I don't know, I kind of have that like somewhat like, somewhat like, [silence], hm. I personally I wouldn't miss it, it's just, it's a new experience living at SADB, it's like, a completely different area from the rest of Montreal, I find. You are really in touch with nature. (Luka)

> I: Um, and so how do you feel related to here, like, does, do you feel attached, does it mean something for you, this place where you live? P: Um, it's, uh, well… not too much, we, I don't know, we like our neighbors, but I don't think we are too, I don't, it's a place, place to, you know. (Mary)

I did not find an apparent relationship between the number of years that the interviewees have been living (or working) in SADB and the presence of feelings of attachment towards the place (for example, Adrian has been living there for twelve years, but is more attached to it than Mary who has been living there for 29 years).

Place dependence

Overall, it appeared that SADB suits the interviewees' needs for comfort and contact with nature and the city, and that this was at least partly why they appreciate it. Another reason mentioned for

[1] "Oh, I like a lot ! I like a lot a lot a lot, even then, we are at the point in our life where the children are old, they are adults, and they will leave eventually and, my retirement plans, I imagine myself very well living here still many many years, definitely. Because everything, concerning our activities, uh, it suits us."

dependence on SADB for fulfilling personal needs or desires was the need to have an environmentally conscious of city administration:

> I would be very reluctant to leave Ste-Anne's, and if I did leave Ste-Anne's it would have to be to a place very similar, very conscious of the environment and the nature around it, so it, uh, it kind of restricts many of the places you can go to, because they are not as uh, as aware of the uh, the environment. (Howard)

Overall though, there did not seem to be a very high level of place dependence among the interviewees, beyond the fact that their family currently lives there (except for Mathieu). They could have lived (or worked in the case of Mathieu) somewhere else, although it would have been sometimes less practical and possibly less enjoyable for most.

9.4.1.2 Impacts

Place definition

Elisabeth mentioned that the orchard reinforced a feature of the place that she already likes, namely its environmentally conscious style. Impact on place attachment through reinforcement of place definition is therefore possible.

Place bonding

When asked if the orchard had had an impact on their feelings for SADB, four of the interviewees answered no (Luka, Jenny, Mary and Jeanne), and five of them answered yes (Howard, Adrian, Denise, James and Elisabeth). (Interestingly, the latter are also those who feel emotionally attached to SADB.) They explicitly expressed that non-producing trees would not have had the same impact as fruit trees, for they appreciated the features specific to fruit trees such as their beauty (through the colors), nice smell, and fruits (freshness, chemical-free). Elisabeth added that the taste was also affected by the fact that the fruit was free, or a "gift":

> Fait qu'y a comme un sentiment comme ça, de quelque chose, d'un cadeau. Le fruit, il est, c'est ça, c'est un cadeau. Fait que c'est pas pareil comme euh, l'avoir acheté. Je peux pas l'expliquer mieux que ça là, c'est. (Elisabeth)[1]

[1] "So there is like that like a feeling like that, of something, of a gift. The fruit it is, that's it, it's a gift. So that it's not the same like uh, having bought it. I cannot explain it better than that, it's."

For some interviewees (Howard, Denise and James), the impact was also due to an increased appreciation of the city administration, because of its efforts to make the city more beautiful and unique (Denise and James had not previously mentioned the city administration in the features that they particularly liked about the city). A reference to the city administration was also made in the answers of four of the six who said that the orchard had not had an impact on their feelings, so overall only three interviewees of the eleven (Luka, Adrian and Elisabeth) did not refer to the city administration in their answer.

Place dependence

For two interviewees it appeared that the project made them more dependent on their place: James and Elizabeth are a couple and have the habit of going to harvest public fruits in the summer and to make jams out of them, and Elisabeth said that the project made her like SADB more because it allowed them to find again something that they had and enjoyed in their previous municipality.

9.4.1.3 Suggested mechanisms

Place definition

Reinforcing the "green" and family-oriented view of SADB. It seems likely that the orchard project will reinforce the definition that the residents have of their place as a rural, green, environmentally conscious place, good to raise children, and since this definition is an important component of their attachment to it, presumably the orchard can reinforce their attachment through this means. Indeed, from the "rural and green" point of view, an orchard should obviously fit in well with this definition. It could also reinforce the "good to raise children" view in two ways: 1) By providing a site where families can have fruit harvesting days as a family activity. Indeed, six of the eleven interviewees, including those who were against the orchard project (Howard, Mathieu, James, Elisabeth, Jeanne, Any) enjoy going to harvest fruits in orchards with their children, as a family activity:

> Ben ça, ça c'est plus à ce moment-là quand j'ai eu les enfants. À un moment donné euh, hm, on demeurait en région, fait qu'en région y avait beaucoup de vergers, et puis euh, les enfants aussitôt qu'y ont été euh, on les amenait, on partait, c'était une journée familiale. Fait qu'on partait, puis on amenait notre pique-nique, on passait là euh, la journée là-bas, pis y avait toujours euh, y avait toujours un petit

> tracteur qui tirait là euh, un petit chariot tout ça, ah oui oui [rires]. Fait que les enfants, c'était comme "la" sortie. (Jeanne)[1]

I note that for this to occur, however, the residents must start perceiving the public orchard as a place where it is fully legitimate to go and harvest fruits (more than to simply pick one or two). As seen in section 9.3.1, however, this is currently not the case. Here is Jeanne's perception, for example:

> Moi je pense que dans le fond, les gens quand qu'y vont vraiment réaliser qu'y a vraiment un fruit là, j'ai l'impression que les gens vont faire, ils vont probablement dire ils vont se prendre une poire, mais aller, récolter, j'suis pas sûre que les gens vont être à l'aise d'aller faire de la récolte, ben je pense pas. (Jeanne)[2]

Even Elisabeth, who has extensive experience with harvesting fruits in wild spaces, felt embarrassed to go and harvest large quantities of blackcurrants on the bike path at first:

> Mais la première fois j'avoue que, je me souviens de m'être sentie "Ok on a-tu fini là, on s'en va-tu" tsé. Tu veux moins n'en récolter parce que tu te sens pas sûr. (Elisabeth)[3]

2) By providing a place where parents can teach their children about fruit trees if they wish to do so, or encourage children to develop a taste for fruits, as mentioned by several interviewees (Elisabeth, Mary, Howard, Denise, Jeanne). We have seen that this has already occurred with Luka, and Jenny also thought of coming back to the orchard with her own children for that purpose.

Place bonding

Feeling of ownership. One interviewee (Elisabeth) developed feelings of ownership towards the orchard:

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[1] "So that, that it's more at the time when I got the children. At a certain point uh, hm, we lived in a rural area, so in rural areas there were a lot of orchards, and then uh, the kids as soon as they have been uh, we brought them, we left, it was a family day. So we left, and we brought our picnic, we spent there uh, the day there, and there was alwas uh, there was always a small tractor that pulled uh, a small cart all that, ah yes yes [laughs]; So that the kids, it was like 'the' outing."

[2] "Me I think that in fact, the people when they will really realize that there is really a fruit there, I have the impression that the people will say, they will probably say they will take a pear, but to go, to go harvest, I am not certain that people will be comfortable to go and harvest, well I don' think so."

[3] "But the first time I admit that, I remember having felt 'Ok, are we over now, are we going' you know. You want to take less because you don't feel certain."

> C'est comme "nos cassissiers" [rires]. J'ai jamais vu personne d'autre en cueillir fait que, euh. Mais y a, j'ai, je le sais qu'y a d'autres personnes qui en cueillent parce que des fois y en, y en manque tsé on, on y va pis on dit "Ah, y en a moins que l'autre fois", fait que. Fait que c'est c'est comme, une a, une espèce de, hm, appropriation là, je sais pas comment dire. (Elisabeth)[1]

This feeling of ownership in turn makes her feel more responsible of the orchard:

> C'est comme je dis, peut-être pour ça que mon mari disait que si oui y avait un appel à tous pour aider, on irait tout de suite, parce que on, on récol, là on récolte, fait que si y ont besoin d'aide on va y aller, c'est sûr, parce que pour nous c'est comme ben, on en profite donc faut, faut redonner.[2]

Sensorial pleasures. The interviewees frequently mentioned that they appreciated the fruit trees because of the sensorial pleasures that they provide, through beauty, taste and smell, and two of them mentioned taste as a reason that the orchard had impacted on their feelings for SADB (Adrian and Elisabeth). It therefore seems possible that the sensorial pleasures provided by the orchard could make some residents more attached to their place. Indeed, pleasure and beauty came out as the most frequent codes in the overall data (see Table 7). Strikingly though, only one of the interviewees mentioned beauty in the features that they liked about SADB (Denise), though beauty was the most frequently mentioned feature that they liked about the orchard (7/11 interviewees). Therefore, either sensorial pleasure is not that important to the interviewees when they evaluate their place, or they do not consciously think that they are important. (Though for the city council member, providing a great tasting environment is one of the primary objectives of the orchard - see section 8.)

Enhancing appreciation of an already appreciated feature of the city. The residents appreciated the bike path space very much, and appeared to consider it as a special place. If the fruit trees are also considered special, which they might be if the users get to appreciate their beauty and the taste of

[1] "It's like 'our' blackcurrants [laughs]. I have never seen anyone else harvest them so that, uh. But there is, I have, I know it that there are other people who harvest because sometimes there is, there are some missing you know we, we go and we say 'Ah there are fewer than last time', so that. So that it's it's like, a, a kind of, appropriation, I don't know how to say it."

[2] "It's like I say, maybe for that reason that my husband said that yes if there was a call for help, we would go right away, because we, we harvest, you know we harvest so that if they need help we will go, for sure, because for us it's like uh, we benefit from it so we must, must give back in return."

their fruits more, they might enhance the specialness of the bike path, and thereby the residents' appreciation for SADB.

Preserving the feeling of safety. The feeling of safety came across as generally important for the interviewees; one of the reasons they like SADB is because they feel safe in it, and similarly for the bike path. Several users mentioned that they thought that fruit trees were more appropriate for the bike path than would be regular trees, because regular trees would become big and overpowering and make one feel more isolated and less safe on the bike path. Fruit trees, on the other hand, remaining small, would not impair their feeling of being safe on the bike path. Moreover, fruit trees (and not necessarily berry bushes) also carry a connotation of inhabited place, since domesticated species are not normally found in the wild.

Receiving a gift (from living place or administration). Elisabeth mentioned that she perceived the fruits collected on the orchard as a gift, and that for this reason they tasted even better. It is not clear whether she perceives the gift as coming from her place or from the city administration, but in both cases this could positively impact her attachment to her place.

Making the place more unique. Unicity was a relatively frequently mentioned quality that the interviewees appreciated. It was used to refer to SADB, the bike path, and the orchard. The orchard, therefore, could make the residents more attached to their place by enhancing its unicity.

9.4.2 Social Capital

9.4.2.1 Current state

Bonding social capital

All the interviewees 1) live within a nuclear family, 2) mentioned that they enjoy performing some activities with some member of their family, and 3) never mentioned difficulties within these relationships. Few of them mentioned their relationships with friends, but two did so (Denise and Amy). Overall thus there appears to be a good level of bonding social capital among the interviewees, but perhaps more centered on family than friends.

Bridging social capital

Interviewees in general made little mention of relationships that relate to bridging social capital. Still, Mary mentioned that she could ask the mayor why they have planted the trees, and Denise sometimes talks with the chief gardener, who gives her advice for her garden. This suggests that

relationships between the residents and the city administration members are relatively easy to build.

Neighboring

Neighboring appeared to be high among the interviewees who are resident of SADB. Most of them (seven of ten: Luka, Mary, Adrian, Denise, Elisabeth, Jeanne and Amy) mentioned that having friendly and helpful neighbors was one of the reasons why they liked their place, and none of them mentioned something negative concerning their neighbors:

> On dit allo à tout le monde, moi je connais la moitié du monde pis lui il connait l'autre moitié fait que [rire], on a, on connait pas mal les gens, on, fait qu'on se sent dans un petit village, c'est ça que je dis quand que je dis que c'est un cristie de gros village [rire], c'est, tu te sens comme une une mentalité de village. (Elisabeth)[1]

Mary herself has frequently helped the neighbors by babysitting their children, and enjoys chatting with the elderly whom she thinks are neglected, and Jeanne was even surprised that such exchange of help could take place in (the island of) Montreal:

> […] fait que y a beaucoup d'échange qui se fait. Que j'aurais jamais pensé dans le fond qui se, qui existerait à Montréal, pis ça se fait très bien, ou des échanges de, d'outils, ou des gens qui viennent aider ou, même là on a la clôture à mettre entre les deux cèdres, ben les voisins viennent nous donner un coup de main. (Jeanne)[2]

Sense of community

Most of the interviewees who are residents of SADB (Luka, Howard, Adrian, Denise, Elisabeth, James, Jeanne and Amy) referred to SADB as a community, or more explicitly expressed that they appreciated that it felt like a community. This suggests that there is a relatively good sense of community among the interviewees. For example:

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[1] "We say hello to everyone, myself I know half of the people and he knows the other half so [laughs], we have, we know quite a few people, we, so that we feel in a little village, that's what I say when it is a freaking big village [laughs], it's, you feel like a a village mentality."

[2] "[…] So that there is a lot of exchange that takes place. That I would have never imagined in fact that would, that would exist in Montreal, and it happens very naturally, either tool exchanges, or people who come to help, or even here we have the fence that we need to put up between the two cedars, well the neighbors come to lend us a hand."

> I: Why do you think they did that [planting fruit trees], like what do you think is their reason? P: I don't know like, uh, it's something good what's for the community here and then. (Adrian)

> That's the only neighborhood that we have! Yeah. Feels like a community, yeah. (Amy)

Citizen participation

Five of the eleven interviewees (Luka, Jenny, Mathieu, James and Elizabeth) participate in voluntary activities. Among the others, three of them (Mary, Denise and Jeanne) mentioned that they would do so if they had more time. There is therefore a relatively high level of citizen participation among the interviewees.

Collective efficacy

The interviewees made little mention of their opinion concerning the efficacy of the community, other than Elisabeth who believed that the orchard could be successfully maintained with the help of the residents (and could not without it):

> Moi je pense qu'il faut, oui il va falloir que la communauté s'implique, c'est trop grand là, c'est un gros, c'est, c'est beaucoup là, parce que sinon la ville qu'est-ce qu'y vont faire eux-autres, y vont aller avec la tondeuse, y vont tondre autour des arbres pis c'est tout. (Elisabeth)

Trust in the administration

Jenny, Howard, Adrian, Denise and Jeanne trusted that the city administration has designed and maintains the site well (for example, does not apply pesticides) and even that it ensures that the fruits are worm-free, for example:

> And I am sure they don't spray them with uh… […] what is it pesticides. That I thought of too but I said no, I am sure they don't spray them so, hm. (Jenny)

> Mais y ont, à vrai dire je pense qu'ils ont dû y penser aussi là, y ont dû prendre des arbres probablement plus faciles aussi au niveau de l'entretien tout ça là. (Jeanne)[1]

The only instance of apparent lack of trust was found in Luka, who had reservations concerning the reasons of the administration for performing the project:

> We just took it for a grain of salt, to tell you the truth, like we just saw planted trees, we were like okay, like I saw it as an exchange how, you cut down trees and as a result we […] Yeah to make up for it, they decided to plant small trees next to the bike path. (Luka)

Overall it appears that there is a relatively good level of trust in the administration among the interviewees.

9.4.2.2 Impacts

Bonding social capital

Among the seven interviewees who are able to access the orchard and are interested in eating the fruits, five of them either had used or intended to use the orchard with a friend or a family member (Luka, Jenny, Denise, James and Elisabeth). For each of these, these experiences were deemed as enjoyable moments together: 1) Denise once tasted the pears with her friend with whom she regularly walks on the path, and though they did not find the pears ripe enough, they nevertheless enjoyed the experience. 2) Jenny intends to go to the orchard with her children to show them the raspberries, for a "little surprise" and to learn that food can grow in other places than a farm. 3) James and Elisabeth are both very much into gardening and enjoy harvesting fruits in the summer and making jams from them. The orchard provides them with the opportunity to perform these activities without resorting to a car, which they particularly enjoy, and they could not do this from their own trees because their yard is too small for holding fruit trees. 4) Luka is a 22 year-old male, and was shown the raspberries on the orchard by his mother. He recalled the experience with much enthusiasm, in part because he was impressed that his mother had noticed the raspberries, which he hadn't, and thereby gained "some sort of respect towards her", and he wished that they would go on walks together more often:

[1] "But they have, in fact I think that they must have thought about it, they must have chosen trees that are probably easier to maintain and all."

> Well really, like, I think it kind of strengthened it [our relationship], like, hm, I was surprised that my mom had that [vigilance?] and she was curious. I think she was more curious about what was going on in the surroundings, like she was the one that noticed the raspberries, I was just thinking about something else, and I gained I guess some sort of respect towards her, like... […] Like it was like wow, raspberries, these are good raspberries and they are here for us, and they taste good in addition to that, and we were just talking, laughing, and it was a happy moment, and in the end it was like wow, we should do this more. (Luka)

Overall, we see that even though the orchard has not been highly productive yet and though the majority of users have only eaten its fruits on a few occasions, there is already evidence that the orchard could positively impact bonding social capital within the community, by providing the basis for rich and enjoyable shared experiences between friends and family members.

This view is reinforced by the other fruit harvesting stories that several interviewees recounted. 1) Elisabeth described the experiences harvesting wild blueberries with her family as "rich family moments". 2) Jenny tells of how she harvested apples and raspberries with her cousins at her grandparents' house in the Eastern Townships as a child, and more so than the interaction with the trees and the fruits, what she enjoyed about it was the opportunity to do these things with her cousins. 3) Mathieu was against the orchard project, yet as a child harvested berries from the bushes growing around his house with his brothers and friends, and called these experiences "super cool" and "ben le fun". He also enjoys the experience of going to harvest apples at his brother's orchard every year for its social aspect, and he used to go harvest strawberries with his sons, as a pleasurable and educative family activity. 4) Amy was also against the orchard, and does not harvest the fruits and vegetables in her own garden which is tended by her husband, for she fears the mosquitoes and is "not someone to harvest". Yet, she also enjoyed going to harvest apples at the orchard owned by her brother in law on a few occasions, describing the experience as "fun", "a good outing", and "a different atmosphere". Also, as she was walking in Gaspésie with her husband and children one summer, they came across blueberries and started eating them, and she again described the experience as "fun". Overall we see from the other experiences of the interviewees with fruits harvesting that such an activity when performed with a group can provide a particularly enjoyable social experience even for those who do not personally have much interest in harvesting as such.

Bridging social capital

Most of the interviewees were not led to interact with strangers on the bike path because of the orchard. Nevertheless, this happened for three of them. 1) Mary was walking on the bike path one day, when she met a woman who was harvesting apples with her daughter in a stroller. The woman offered her an apple, commenting on how nice it was to have them. Mary did not meet this woman again afterwards. 2) James and Elisabeth are frequently asked by strangers what they are doing, when they harvest blackcurrants on the bike path, and they tell them. 3) Adrian was one day harvesting the raspberries when a woman asked him if they were edible. He told her yes, and the woman left.

Citizen participation

As seen in section 8, the orchard has already served as a means for the participation of residents in community activities, when the help of residents was called for the plantings. According to James and the chief gardener, these were well-attended, with "more volunteers than trees to plant". However, it is possible that those who participated were those who are already eager to participate in community activities, and it is unclear whether the orchard would encourage more residents to participate than any other community activities, though the high level of interest that the interviewees displayed for participatory activities (see section 9.3.5) suggests otherwise.

Trust in city administration

Five interviewees (Howard, Denise, James, Jenny and Jeanne) mentioned that they appreciated the orchard because they see it as a sign that the administration is trying to beautify the city and is taking good care of it, suggesting that it has improved their trust in the administration:

> Euh, le fait qu'un, une ville prenne euh, la peine de, de planter des choses qui sont à la, disons pour tout le monde, je pense pas que c'est toutes les villes qui feraient ça, alors euh, je trouve que c'est un plus pour la ville. (James)[1]

However, the interviews also strongly suggested that levels of maintenance and communication perceived as adequate by the residents are necessary for this trust to develop and remain. Indeed, maintenance of the orchard was mentioned by eight interviewees, and though most of them are satisfied with the current level of maintenance (except for Elisabeth and James), six of them were

[1] "Well, the fact that, a city takes uh, bothers to, to plant things that are to the, let's say for everyone, I think that it's not all cities that would do that, so uh, I think that it's a plus for the city."

concerned that maintenance will be an issue in the future (Elisabeth, Jenny, Amy, James, Jeanne, Mathieu):

> Inconvénients [soupir]... Je pense, le seul inconvénient c'est que ça demande de l'entretien, et donc c'est sûr que ça demande un, euh, ça ça demande un engagement de la part soit de la ville, soit des citoyens, à long terme, de s'assurer de pas seulement récolter les fruits mais d'entretenir les arbres et arbustes. C'est peut-être le seul inconvénient que je vois. (James)[1]

> Eh, more money, for maintenance, no, I don't think it's a good idea. (Amy)

Howard, who praised the city for the current maintenance, emphasized how important this was to him:

> I would hate to see them just plant them and let them, uh just die off and uh not be looked after. So, uh, the importance of maintaining them is very, is very very much a, a factor. There is no point in planting something and then not looking after it. (Howard)

Communication also appears as potentially important for the development of trust in the administration, as manifested by Elisabeth:

> T'as pris de l'argent des contribuables pour pour planter un arbre, donc tous les contribuables devraient être au courant, s'ils veulent être au courant, que ce projet-là existe, et y ont le droit. (Elisabeth)[2]

[1] "Inconvenients [sigh]… I think, the only inconvenient that is that it requires maintenance, and so for sure that it requires a, uh, it it requires a commitment either from the city, or from the citizens, in the long term, to ensure not only that the fruits are harvested but to maintain the trees and the shrubs. It is maybe the only inconvenient that I see."

[2] "You have take the money of the taxpayers to to plant a tree, so all the taxpayers should know, if they want tot know, that this project exists, and they have the right to."

9.4.3 Food knowledge

9.4.3.1 Current state

Table 4 provides a summary of the interviewees' responses when asked what factors they take into consideration to choose the foods that they buy.

Table 4. Summary of factors that the interviewees said they take in consideration when choosing foods they buy.

Interviewee	Factors
Luka	Must look clean and fresh. Does not look at price, except if on sale. No mention of organic.
Jenny	Price first. Quality. On sale. Health. Wishes she could buy organic but cannot afford.
Mary	Not organic. On sale. Taste. Newness. Habit. Health. Local (because our "own" and for taste).
Howard	Taste. Health. Does not trust organic. Local?
Adrian	Organic. Price.
Mathieu	Price first. Health. Variety. Does not trust organic, but trusts governmental regulatory agencies. Local not important, but wishes there was a carbon tax.
Denise	Local (for economy). Health. Organic. Fresh. Farmers' markets.
James	Price. Health. Freshness. Local (freshness, greater trust) and organic only if price difference not too high.
Elisabeth	Health. Freshness. Local (freshness, greater trust) and organic only if price difference not too high.
Jeanne	Health first. Local (for diversity and discovery, for price, for economy, greater trust). Wishes she could buy organic but cannot afford.
Amy	Freshness and price. Health. Taste. Does not trust organic. Local (greater trust).

Diversity of factors. We see that there is a great diversity of responses, though a theme common to all was health or food quality considerations, which in general meant that they sought to buy healthy ingredients such as fresh fruits and vegetables, to avoid "junk" food, eating balanced meals,

and avoiding red meat[1]. Price was a priority for some but not all. Other mentioned considerations were: freshness, organic, locally produced, and taste. Interestingly, taste was only mentioned by three, but it is possible that freshness and quality (mentioned by five) conflate with taste.

Organic foods. Concerning organic foods, there were four types of responses: 1) seeking them as much as possible (Adrian and Denise); 2) buying them only if the price difference with conventional foods is not too large (James and Elisabeth); 3) wishing to buy them but not being able to afford it (Jenny and Jeanne); 4) not trusting organic labels enough to be willing to pay the price difference (Mary, Howard, Mathieu and Amy). In all cases organic foods were discussed in terms of their impacts on personal health and not on the environment.

Local foods. Most of those (seven in eight) who discussed local foods said that they favored them. The term however was always used to mean coming from Quebec or Canada, that is, was employed more in an administrative than a geographical sense. In accordance with this, the reasons provided for this preference were not related to food transportation issues, but rather were personal or social: because of taste or freshness (Mary, James and Elisabeth); because they have a higher trust in Quebecois producers or local regulatory agencies for minimizing the chemicals applied (James, Elisabeth, Jeanne and Amy); to encourage the local economy (Denise and Jeanne); and because it is "our own" (Mary).

Environmental impacts. Mention of environmental concerns relative to the food system was only made by Mathieu, who expressed that he was strongly in favor of a carbon tax to discourage food transportation (however he was not willing to favor local foods due to environmental concerns if they are more expensive, because he did not think that his action would have a significant impact).

Overall. We see that considerations spanned both knowledge about food itself and about the food system (its socio-economic aspect). Personal (health and taste) and social (trust, encouraging the economy) considerations were mentioned, but not environmental ones, including when they favor organic or local foods. Health considerations did not suggest a very elaborate knowledge or reflection about food and nutrition or the impacts of the food system.

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[1] Though this thesis is not directly concerned with nutrition, I would like to point out that the widespread belief that red meats and saturated fats should be avoided is most probably wrong and of detrimental consequences (see for example Lawrence (2013)), yet four interviewees abode to it, and this was also the recommendation that Howard's dietician gave him. In general, their considerations about nutrition appeared rudimentary to me, in terms of types of molecules and digestion for example, though probably not less so than for the general population.

9.4.3.2 Impacts

Food knowledge. As we have seen, the orchard is still young and most interviewees have had contact with the fruits on only one or two occasions. Nevertheless, several cases of learning about fruit trees, their cultivation, and edible fruits were observed. 1) Luka, a 22-year old male, was taught by his mother to recognize the raspberries when they were walking together one day on the bike path. 2) Jenny wanted to come back with her children to show them the raspberries, for them to see that one does not need to be on a farm in order to produce food. She would be interested in participatory activities as an opportunity to learn more about gardening and fruit trees. 3) Mary, while walking on the bike path one day was shown the producing apple trees by a stranger who gave her an apple to taste. 4) Denise learned to identify the fruit trees by reading the labels that the city as put on them. 5) When they harvest, James and Elisabeth are frequently asked by passersby what is the type of fruit that they are harvesting, and this happened once to Adrian as well. 6) Amy's neighbor made her taste the blackcurrants that he had harvested on the path, a fruit she did not know. 7) Though not actual learning, there was strong potential for learning in one case: Adrian, though he grew up on a farm with a diversity of fruit trees and was very comfortable harvesting fruits on the bike path, observed a type of fruit looking like a raspberry and that he did not know[1], and for that reason did not try to eat it.

Food system knowledge. Table 5 shows the summary of the individual responses for those seven interviewees who were asked what they felt or thought when they ate fruits from the orchard. None of them mentioned thoughts about the food system at large. Evidence that the fruits on the orchard had had an impact on their food system knowledge and awareness was also not found in the other parts of the interviews.

Table 5. Summary of what the interviewees felt or thought when they harvested and ate the fruits on the bike path.

Interviewee	Feelings and thoughts upon harvesting
Luka	Good and fresh raspberries, would like to go on walks with his mother more often to harvest them, fruit trees next to a path would encourage people to appreciate nature.

[1] I believe this was *Rubus odoratus*, the purple-flowered raspberry.

Jenny	Delicious raspberries, would like to go back with container, if she does not harvest they will rot after a while, wondered if allowed to eat them but thought that the taxes she pays allowed her to, trusts that the city does not spray them.
Howard	Very pleasant feeling, feeling of continuance with nature, reminds pleasant childhood memories, natural thing to do.
Adrian	Tasted better, different taste, no chemicals.
James	Nice surprise: fruits on a public path, free food. Disappointed when they are already harvested.
Elisabeth	Embarrassed that people would think she is not allowed. Worried that she is not sharing enough. Then, feeling that the trees belong to them, and therefore that they must give back. Wishes that signs would be added on the path to explain that people are allowed.
Jeanne	They were ripe and ready. Felt good. Wondered if they are sprayed.

9.4.4 Environmental knowledge

9.4.4.1 Current state

Buying food. When they described the factors that they take into consideration to buy food, only one interviewee mentioned environmental issues: Mathieu is concerned about the carbon emissions of transportation and wishes that a carbon tax be implemented - however he is not willing to pay more for foods that have travelled less because he does not believe that the impact of his action would be significant. Though several interviewees are interested in buying organic foods, it was always for personal health reasons, and never for reasons related to larger-scale environmental impacts.

Buying clothes. The factors mentioned were less diverse than for food, and the three most important and frequently mentioned factors were price, buying local, and quality (mentioned by 10 interviewees). Other factors mentioned related to personal interests (such as convenience, comfort, fashion, health and efficiency), social concerns (such as social justice and others' wellbeing, trust, and encouraging the local economy), and one factor relating to the environment was mentioned by four interviewees: limiting consumption or increasing recycling (with second-hand clothes). Overall thus, environmental concerns were never mentioned as a priority and were never linked to a reflection about the environmental impacts of manufacturing practices or of transportation.

Manufacturing practices were in fact referred to by three interviewees, but either in terms of their impact on quality, or their social impact, and never in terms of their environmental impacts, for example:

> And I do not like slave-trade uh, goods like Bangladesh and everything else where they are paid next to nothing and treated like animals so, I just disagree with that totally, uh. (Howard)

> But uh, so, it's the quality. Yeah. I uh, I don't agree with uh, like when when I see factories burning down, and, I told Ivan, "I am not buying anything from Pakistan, they don't treat the people well!" You know? (Amy)

And when I asked Jenny whether there was an environmental concern in her preference for locally made clothes, she responded that she did not think about the environment when it came to clothes, though she probably should.

Buying cleaning products. The responses to cleaning products were more diverse than for food and clothes. The two most frequently mentioned factors were of personal order (price and health), followed by the content of harmful chemicals, convenience, habit, and quality. Interestingly, social factors were much less frequently mentioned than for food or clothes: the local factor was only mentioned by two, and one also mentioned the importance of trust. Environmental concerns were mentioned as one factor by four interviewees (Jenny, Mary, Denise, Jeanne) and for three of them (Jenny, Mary and Denise) these concerns had a substantial impact on their buying decisions concerning cleaning products, though for two of them (Mary and Jeanne) the switch to more environmentally-friendly products has not been entirely successful due to habit:

> Ça on dirait qu'on embarque dans le beat un petit peu de... Moi ma mère a toujours pris du Tide fait que moi je prends du Tide [rires]. Ça a comme toujours été ça. Honnêtement, j'chu pas Bio, pour euh, tout ce qui est produit de nettoyage, euh, malgré que j'ai déjà essayé, puis je peux pas dire que je raffole. (Jeanne)[1]

Mathieu expressed that he preferentially valued the efficiency of the product over the impacts of its contents.

[1] "Here it seems that we get a bit into the question of… Personally my mother has always used Tide so myself I use Tide [laughs]. It has always been that. Honestly I am not organic, for uh, all that is cleaning products, uh, although I have already tried, and uh I can't say that I like very much."

Overall. Though there is evidence of knowledge of environmental issues among the interviewees, based on the considerations mentioned this knowledge, or awareness of their importance, appears to be limited. The impacts of the food system, transportation, and chemicals on the environment, for example, were rarely or never discussed, and if so only in terms of their impacts on health and not of their impact on the ecosystem at large. Concerns about price, convenience, health, the wellbeing of others, and the local economy, were significantly more frequently mentioned than were environmental concerns.

9.4.4.2 Impacts

I did not observe any impacts on environmental knowledge either in the stories or the concerns that the interviewees related. However, two interviewees manifested that the orchard brought them to think about "nature":

> I guess like fruits next to a bike path would be a great encouragement for people to learn to appreciate nature I guess. (Luka)

> Well, it's just a very, pleasant feeling that you could go and just go ahead and pick an apple right off the tree and eat it, you know, it gives you a, I don't know, a, a feeling of, uh, [silence] continuance with nature I suppose. (Howard)

Furthermore, when compiling the environmental themes brought up in the context of fruit trees throughout the interviews, I found that mentions about the fauna, planting trees, bees, exchanging with nature, pollution and chemicals were made. This suggests that indeed the fruit trees do have the potential to elicit reflections about environmental issues.

10 Discussion

10.1 Summary and discussion of results

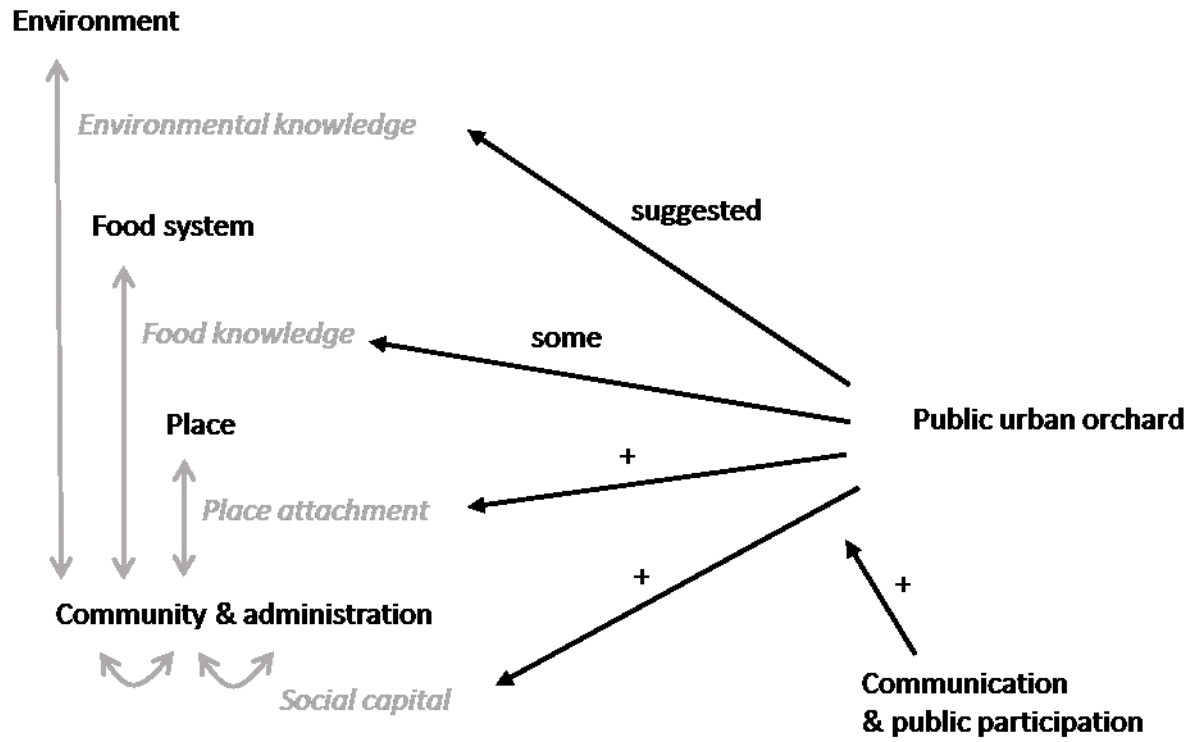

Figure 5. Summary of the findings of this research. Grey italics: the four constructs under study. The public urban orchard in Sainte-Anne-de-Bellevue was found to have no impacts on the interviewees' environmental knowledge and awareness, some positive impacts on their food knowledge, and more substantial positive impacts on their place attachment and social capital (observed or suggested, but not for bridging social capital). The results also suggest that communication and public participation could increase all these impacts, if they were added to the current project.

10.1.1 Objective and method

This research aimed at evaluating the socio-environmental impacts of a public urban orchard that has been planted along a bike path in Sainte-Anne-de-Bellevue (SADB), on the island of Montreal (Quebec, Canada). The socio-environmental constructs evaluated were: place attachment, social capital, and food and environmental knowledge. To this end observations of the users on the site were performed, and semi-directed interviews were conducted with the two members of the city administration who have developed the project and with eleven users of the bike path. The transcripts of the interviews with the users were analyzed using a mixed inductive and deductive

approach. Figure 5 schematizes the findings of this research, and these are described and discussed below.

10.1.2 Usage and perception of the orchard.

Usage is present but not extensive. All the interviewees had noticed the presence of at least one species of shrub or fruit tree on the bike path. Most of the interviewees (eight of eleven) had tried at least one fruit and two of them had had extensive harvesting experience on the orchard. Observations of the users of the site however suggested that usage of the orchard is still limited.

Reasons for favorability. Most interviewees (nine of eleven) were in favor of the project, either being very positive or not against, while two were against the idea, mainly due to maintenance concerns (rotten fruits, pruning). The appreciated features of the trees that were most frequently mentioned were their beauty and the fact that they provide fruits for the people, but also their characteristics in terms of landscaping (small and not overpowering) or their impacts on the city and the fauna. The trees provided them pleasure in various ways, such as through the visual and gustatory sensory experiences and through the experiences with "nature" that they provided. Interestingly, features about the fruits themselves (taste, freshness, chemical-free, free) were rarely mentioned. It is possible that this is due to the fact that the orchard is still young and that most of the interviewees have only eaten a few fruits. It could also indicate that these features are of lower importance to the residents. If so, this could be an impediment to the city council member's goal of encouraging the residents to reconnect with the taste of fresh fruits bred for taste and not for practical considerations, and some means of drawing the attention of the users to taste might be necessary.

Shrubs versus trees. An interesting and unexpected finding was the important distinction that several interviewees made between shrubs and bigger fruits from trees based on several different criteria, such as risk of worms, taste, ability to share, the efficiency of harvest, and seeming to be wild or not.

Childhood experiences and openness. Openness to eating the fruits on the orchard appeared to be related to extensive childhood experience with fruit trees on a farm or other places, more so than to having had previous exposure to fruit harvesting, or to the concern for healthy foods. This resonates with James' view that those among his horticulture students who have a farming background find the idea of planting fruit trees more "normal" than urban-raised ones:

> Oui, ben la plupart des étudiants, je dirais, sont très ouverts à cette idée-là. Euh, pour eux l'idée de planter un arbre c'est bien, mais de planter un arbre qui va produire quelque chose d'utile, de comestible, pour eux autres c'est... pour eux autres je dirais ça va de soi, ils ne le voient pas comme quelque chose de hors de l'ordinaire mais quelque chose de tout à fait normal. Faut dire que beaucoup des étudiants viennent de milieux agricoles, donc avoir un, un arbre fruitier sur une ferme c'est comme, c'est normal, c'est c'est pas quelque chose de surprenant. (James)[1]

This is also in line with Chawla's findings that childhood experiences are crucial to the development of adult behavior (Chawla 2009). However, it is important to remember that other factors must be at play, such as personality (see section 10.2.2).

Barriers. Several other factors were found that can influence usage and potentially act as barriers to the usage of the fruits: fear of worms (perhaps especially so for the younger generations), fear of fruits not being clean, habit, lack of knowledge (about fruit trees and about the project), the location of trees, personal preferences, and perhaps unequal sharing. Adding information boards on the site to provide information could help to address several of these barriers.

Benefits mentioned. The interviewees' perceptions of the city's reasons to undertake the project or their opinion about such projects in general suggest that they see benefits to the fruits trees in various realms: to the people themselves, to the community, to the food system, and to the environment. Benefits to the people included sensory experiences but also food security and education (teaching children and adults where food comes from, about local food, encouraging people to respect the environment). Interestingly, they usually mentioned the children's learning as mediated by their parents. This is in line with research suggesting that socializing is a critical component of learning to care for the environment (Chawla and Derr 2012). Interestingly, several interviewees were unsure about the city's reasons, though they could think of at least one, and these were in general also those who were against of neutral towards the orchard, suggesting that

[1] "Yes, well most of the students, I would say, are very open to this idea. Uh, for them the idea of planting a tree it's nice, but to plant a tree that will produce something useful, edible, for them it's, for them it's a given, they do not see it as something that is out of the ordinary but as something completely normal. It's true that many of the students come from rural backgrounds, so to have a, a fruit tree on a farm it's like, it's it's not something surprising."

providing them with more information about the orchard might make them more favorable towards it.

Concerns. Despite the overall positive perception of the fruit trees, several interviewees were concerned about their higher requirement for maintenance compared to non-producing trees (and some trusted the city administration for knowing what it is doing, while others were concerned), and several expressed the desire that the city would provide more information to the residents about the project and about their right to eat the fruits. Providing the residents with more information on the project could therefore help to alleviate both of these concerns at once, if it includes explanations on how the site will be maintained.

10.1.3 Knowledge of the project

Limited knowledge. Knowledge about the project as a city initiative was limited among the interviewees: only four of them knew about the origin and intentions of the project, three did not know whether they were allowed to eat the fruits or not, and three had not noticed the big fruit trees, but only the bushes, and thought that these were wild. Among those who knew about the project, two had obtained this information through their personal contacts with the city administration, and two through the city's pamphlet issued to the residents. This strongly suggests that most residents do not read the city pamphlet, and therefore that most of them do not know about the origins and intentions of the project. Interestingly, those who were in favor of the project were more certain about the city's motivations to undertake the project, suggesting that providing more information could increase the favorability in the population. Lending further support to this idea, seven interviewees wished that signs would be added to inform people that they have the right to eat the fruits. Four of them furthermore mentioned that since the project was financed through the taxes paid by the residents, they should know about it.

Possible negative consequences. Other results from this study suggest that this deficiency in the population's knowledge about the project could impede the impacts of the orchard in the following four ways: 1) It might reduce sharing. Indeed, it is possible that some residents are not aware of the need to share, and do not leave enough fruits for others (section 9.3.4). 2) It might reduce usage, when users do not know whether the fruits are edible or whether they are allowed to eat them. 3) It is likely to prevent positive impacts on trust in the administration, first because the residents do not know that the administration is responsible for the project, second because it will not address the concern about maintenance within the population, and third because of a missed opportunity to

allow the residents to learn about the valuable aspects of the design (such as its foundation on permaculture principles). It might even impair trust in the administration for those who think that it is the administration's duty to inform the residents, or those who are not aware that the permaculture principles imply a minimal maintenance requirement, such as less pruning (Holzer and Whitefield 2011). 4) It also prevents impacts on food knowledge, since teaching the residents about the design of the project would also introduce them to food growing considerations.

Another reason for communication. Overall therefore, despite the views of the developers of the project (section 8) it seems that though the current level of communication about the project is not problematic, increasing it would probably increase the proportion of the residents who use the fruits and the impact on trust in the administration. This thus constitutes a second reason that increasing communication about the project would be beneficial, besides addressing the residents' concerns (see above). Interestingly, the developers also think that information about the orchard will spread naturally, through residents talking to each other. However, there is evidence that this might not necessarily be the case: Elisabeth, though she wishes that the city would inform the residents about the project more, herself does not wish to promote it too much, out of fear of losing her crop. She said:

> […] mais c'est sûr que c'est pas, euh, [rire] on n'en fait pas nécessairement la promotion parce qu'il y en a trois, fait que on dit, on le dit pas à trop de monde, mais c'est sûr si les gens nous en parlent on va leur dire, si ils nous pognent après les cueillir on on va leur dire qu'est-ce qu'on fait. (Elisabeth)[1]

The information communicated could include the project design, information about the species (such as its origins, uses of the fruits, etc.), as well as information on the food system and the environment. Various means could be employed for this: explanatory board distributed throughout the orchard, organizing guided tasting visits, or using the city's website.

10.1.4 Participatory activities

High interest. Because such activities are developed in other cities, and because various research suggests that active participation is important to providing the socio-environmental impacts of

[1] "[…] but for sure it's not, uh [laughs] we don't necessarily promote them because there are three of them, so that we say, we don't say it to too many people, but it's true that if people ask us we well tell them, if they catch us harvesting we we tell them what we are doing."

community gardens (see section 6), I asked the interviewees whether they would be interested in participating in group activities for the maintenance or harvesting of the trees. Nine of the eleven interviewees said that they would be highly interested (and they were also those nine who were also in favor of the project). This seemed surprising since most of the interviewees generally preferred to use the bike path alone to exercise and relax, and that some of these were not highly interested in eating the fruits on the bike path.

For interaction and reciprocity. Interestingly, the reasons the interviewees gave for this interest were usually of a social nature, such as giving back to the community and meeting people, and much less of a personal order, such as learning about the fruits or obtaining larger amounts of fruits. It thus appears that the participants on the whole are very interested in interacting with or contributing to their community. (That their motivation for participating would be in great part social and related to their community is also suggested by the fact that the only non-resident interviewee (Mathieu), was one of the two who had no interest in the participatory activities, even though he does enjoy harvesting fruits with his family and friends, and even though he enjoys volunteering.) This desire for interaction and reciprocity was further displayed by one interviewee who said that she did not feel comfortable harvesting the fruits without the opportunity to give back something to the community (such as help). It is possible that this desire indicates the already high level of sense of community in SADB, and it would be interesting to see if the result would be similar in cities or neighborhoods with a lower sense of community. In any case, in SADB itself it appears that developing such participatory programs has a substantial potential to enhance the impacts of the orchard on social capital and place attachment by providing opportunities for interactions that would not exist otherwise.

Other research. This finding is reminiscent of some other research. For example, social interactions may be among the most important motivations for residents to participate in community gardens (Guitart, Pickering, and Byrne 2012), and a case-study performed in Denver, Colorado found that social interactions were one of the main health promoting factors, together with the aesthetic appeal of the neighborhood, and perceived collective efficacy (Litt et al. 2015).

Impacts. Public participation could contribute to enhancing the impacts on the constructs under study, as we will see throughout the three sections below. It could furthermore positively impact on 1) wellbeing and quality of life within the community, as activities that actively engage us have the most impact on our happiness (Haidt 2006). In turn, quality of life can impact sustainability (see section 10.2.1); 2) the cost of maintenance for the city, and the long term survival and success of the

project. Indeed, if one day the city council member and / or the chief gardener could no longer care for the project, or if the future administrations have less interest in the fruit trees, active engagement within the population could ensure the survival of the project. Indeed Baycan-Levent & Nijkamp (2009) compared the relative success of the green space planning and management policies across 23 European cities, and identified citizen participation as one of four factors that predicted success. 3) Furthermore, participatory management schemes have been proposed by several authors has having positive impacts on environmental sustainability through various means: better correspondence to democratic ideals, empowerment of marginalized groups (Stringer et al. 2006), social learning (Colding and Barthel 2013; Colding et al. 2013; Bendt, Barthel, and Colding 2013; Folke et al. 2011), increased mixed-usage of the site (Mehta 2009), and enhanced equality of access to the site (Wolch, Byrne, and Newell 2014; Hodgkin 2011).

Practical considerations. Though the city council member thought that participation of the residents would be nice, given his past experience he was skeptical that it would work if not complemented with a form of remuneration. It might be useful to compare his experience to the literature to see if some approaches are more likely to be successful than others. Furthermore, the actual activities that such programs would include would have to be thought of in conjunction with the chief gardener and perhaps his crew members. Indeed, according to the chief gardener, pruning of the trees is a task that requires expertise and should not be performed without solid knowledge (see section 8). Maintenance of the site could however also involve other maintenance tasks, such as watering, installing protections on the trees, or management of the surrounding vegetation. Weeding itself could be quite useful, since several trees have been killed by the crew hired by the city or Hydro-Quebec to weed the site, and this has been an important problem (see section 8). Other tasks could involve site design, such as developing and adding information boards, or boards on which residents could report their harvest to facilitate sharing, or community tasks, such as surveying the residents to know the kinds of fruits that interest them most (which would also be an interesting way of informing them about the project).

10.1.5 Impacts on place attachment

Place definition. Evidence was found that the orchard could positively impact place attachment by reinforcing the place definition of SADB as an environmentally-conscious place. The data further suggested several mechanisms through which the orchard could impact place definition, such as by reinforcing their “rural, green, and good to raise children” place definition.

Place bonding. Substantial evidence for positive impacts on place bonding was found, perhaps especially for those who already feel attached to SADB. This was mediated either by the personal features that the trees provided (fruits, beauty), but interestingly for a few interviewees their reason was in reference to the city administration, namely because they saw the orchard as a sign that the city administration had at heart to make the place more beautiful and more pleasurable to them. Even those who said that the orchard had no impacts on their feeling for SADB interpreted the orchard in terms of what it implied regarding the city administration, and overall only three of the eleven interviewees did not discuss the administration in their response. The data further suggested several mechanisms through which the orchard could impact place bonding: by developing feelings of ownership, providing sensorial pleasures, enhancing appreciation of an already highly appreciated feature of the city (bike path), preserving the feeling of safety that they appreciate in their living place, providing the feeling of receiving a gift, and making the place more unique[1]. Finally, research suggests that doing a favor to someone makes us like this person more (Jecker 1969); participation of the residents to the maintenance of the orchard could possibly similarly increase the orchard's impact on their attachment to their place.

Place dependence. Finally, though evidence of impacts on place dependence was not seen for most interviewees, it appeared to have impacts for two of them who enjoy minimizing their usage of the car, and for whom harvesting fruits is an important family activity - suggesting that such impacts are possible.

Place attachment connected to social capital. Overall, the data suggest that the orchard does positively impact place attachment on about half of the interviewees who were in favor of the project (five out of nine), and that this impact could take place through the personal benefits that it brought them or through enhancing their appreciation of the city administration. Interestingly, their responses were very different from when I asked them whether other cities should also plant fruit trees, in which case they usually mentioned the impacts on learning about food instead. It seems unlikely that the interview questionnaire led them to think about the city administration. Indeed, the city administration had not yet been discussed prior to this (see interview guide in the Appendix). Another potential cause is the fact that, though the interview guide phrased the question as "Did the fruit trees have some impact on your feelings towards your place?", during the

[1] Interestingly, this advantage of being unique would be lost if such public urban orchards were implemented in several other municipalities. But presumably in that case the other potential mechanisms could still take place.

interviews I replaced “your place” by “Sainte-Anne” because it felt clearer. However, I do not see why they would have systematically associated “Sainte-Anne” with the city administration and not the physical place, since they used “Sainte-Anne” at other points of the interviews obviously to refer to the physical place, e.g. “’cause we live on the island of Montreal, and then, in that area of Sainte-Anne’s north, […] we actually […] have what we call ‘taxi collectif’” (Jenny). In line with the framework developed by Mihaylov and Perkins (2014), these results show that there is a complex interplay between place attachment and social capital.

10.1.6 Impacts on social capital

Bonding social capital. Though the orchard has not been highly productive yet, and usage among the interviewees has been minimal (for most, limited to only tasting a few fruits), several instances were found of events caused by the orchard that are likely to improve the relationships of the interviewees with their family members or friends by providing the basis for a particularly enjoyable moment together. It was also found that fruit harvesting activities in other places are highly enjoyed as social and family activities by most interviewees, including those two who were against the orchard project. Thus substantial evidence was found for the potential of the orchard to positively impact on bonding social capital in the community.

Bridging social capital. Some evidence for potential impacts on bridging social capital was found, as the orchard had on a few occasions caused strangers to interact on the site. However, under the current circumstances it would be difficult for these interactions to lead to repeated interactions which are necessary for the building of relationships (Paranagamage et al. 2010). For this reason, I suggest that participatory activities around the fruit trees that would allow for repeated interactions between the same people could potentially substantially increase the impacts of the orchard on bridging social capital.

Sense of community. I did not attempt to evaluate the observed impacts on sense of community. However, as seen in section 9.3.5, most interviewees explained their interest in participatory activities through community reasons (interacting with the community, helping it, or bringing it together), strongly suggesting that the orchard has the potential of enhancing their sense of community, especially if participatory activities are added. The data suggest two other means through which these impacts on sense of community could take place: 1) Providing a means of actively sharing communal resources, for example if some features were implemented for enhancing sharing (such as signs advising to think of the other residents, or a tallies for people to

report their harvest), which could perhaps also help to alleviate the apparent current unfair sharing that is taking place. 2) Making their community feel more unique, similarly to what we have seen above in place attachment. 3) Contributing to making the bike path into a Third Place (Oldenburg 1991), namely a place that allows and fosters informal and repeated interactions between individuals in a community, and thereby contributing to building their sense of community. Indeed, it appeared that the bike path was also a socializing place for several interviewees (see section 9.2), something which I had not expected. First, the results showed that the fruit trees have provided the basis for engaging conversation on a few occasions. Second, one interviewee emphasized the opportunity that the bike path provided her to repeatedly meet the same people in an informal context, free of further obligations, and to develop relationships thereby:

> […] ça développe des liens entre les gens du quartier euh, sans nécessairement tous se voisiner un chez l'autre mais, tsé tu marches pis tu rencontres quelqu'un, tu parles une coupe de minutes, tu continues euh, fait que je trouve que ça euh, ça rapproche les gens en même temps. (Denise)[1]

She added that the presence of a topic of conversation, such as one of the walkers walking his dog, encouraged these exchanges – the fruit trees may also provide such a topic, as believed by the chief gardener (section 8). Finally, when people are harvesting, they are still, which is more conducive to the development of a conversation than when they are moving.

Citizen participation. Since the orchard has already served for citizen participation (through the calls for volunteers for the planting days, and which were well attended), there is evidence that it could potentially contribute to develop citizen participation further if more participatory activities around the orchard were implemented. The data is insufficient to tell whether it would actually do so, but it does suggest it, since the interviewees were highly interested in such activities, even those who otherwise never participated in voluntary activities earlier nor expressed a wish to do so. It is furthermore possible that a greater part of the population would be more interested in such participatory activities than in other types of activities, since fruit trees can attract people of various ages and abilities, and are connected to social issues that are more likely to touch several people. In line with this was Howard's view:

[1] "[…] it develops connections between people in the neighborhood uh, without necessarily visiting each others at our homes but, you know you walk and you meet someone, you talk a few minutes, you continue uh, so that I find that uh, it brings people closer at the same time."

> Like the older people tend to go for bingo, or bowling, the younger people go for salsa dancing, and Zumba, and etcetera, uh this is this is more for everybody to participate, or everybody can get use of, and if they were to crop these, they just, not even vegetables, but the fruit, then, um, they could even give it to the poorer families, and there is a lot of poorer families in Ste-Anne's, so they could give that fruit to the poor families in Ste-Anne's that may be uh, nutritionally deprived of certain vitamins, so, I think that way it would be beneficial too. (Howard)

Collective efficacy. I did not attempt to evaluate the impacts on collective efficacy. However, similarly to sense of community, it appears possible that collective efficacy could be enhanced through the participatory activities, through an experiential demonstration that the community is able to act collectively and thereby promoting the collective sense of efficacy. Enhancement of sense of efficacy could then enhance actual efficacy, since the sense of efficacy is an important factor predicting personal action at the individual level (Chawla and Derr 2012), and it seems likely that the same is true at the community level.

Trust in the administration. As seen above, several interviewees said that the orchard has positively impacted their appreciation of the administration, suggesting that it also positively impacted their trust in the administration. However, substantial evidence was also found that maintenance of, and communication about, the orchard that are perceived as adequate by the residents was necessary for this impact to take place.

Overall, the results showed that impacts on social capital at the level of the community are likely for bonding social capital and trust in the administration, though the latter is sensitive to communication about the project and maintenance of the site that are perceived as adequate by the residents. The data also suggest that impacts are possible for bridging social capital, sense of community, citizen participation, sense of community, and collective efficacy, and that are likely to be substantially enhanced through participatory activities.

10.1.7 Impacts on food knowledge

Food. Several instances of impacts on food knowledge were observed. It is also notable that six interviewees (Mary, Howard, James, Elisabeth, and Jeanne) thought that the fruit trees on the orchard could provide a means for people, in particular children, to learn about fruit trees and about where food comes from, or to develop an appreciation for fruits (Howard and Denise).

Food system. However, no evidence was found for impacts on food system knowledge or awareness. It is possible that this lack of impact is due to the limitations of the research design, or to the fact that the orchard is still young and thus has had no such an impact yet. However, it seems likely that for the orchard to entice on its own to reflect and learn about the food system on the part of the residents, the notion of the food system would have to be present in their minds already. Yet, it appeared that the interviewees had limited notions of the food system, and these revolved around economic considerations and very little to none around social (such as health and equity) and environmental ones. Thus for impacts on food system knowledge, the orchard would probably once again benefit from being supplemented with information on this topic. It is also possible that increasing the awareness of food system issues among the users of the orchard would enhance their appreciation of the local, fresh, and organic features of the fruits, and thereby further enhance the impacts of the orchard on the other constructs. Learning is also more likely to take place if participatory activities are implemented, as found by (Bendt, Barthel, and Colding 2013) in their case-study of public-access community gardens in Berlin.

Behavior. Though I did not attempt to research the impacts on behavior, the data also allow speculating on these. Indeed, though their childhood experiences appeared to be tightly related to the interviewees' openness to the fruits (section 9.3.2), I did not see such a relationship with their adult behavior in terms of gardening: the only two interviewees who tended a garden as adults were not those who had had a close experience with a farm as children, and among those who did not tend a garden, several had grown up with a garden tended by the parents. This could be interpreted as reflecting the importance of constraints in determining behavior (Chawla 2009), since presumably tending a garden involves more obligations than does tasting fruits growing in a public space. Thus, for the orchard to significantly impact people's behavior when it requires choosing courses of action that are energetically or financially more expensive, the introduction of additional motivating factors (beyond the orchard) would be necessary. Such additional motivation however might still be partly provided by the orchard, since it could also encourage a shift in the cultural norms, or contribute to enhancing the appreciation for taste, and thereby promote a preference to more sustainably and more locally grown foods.

The importance of adult mentors. Interestingly, several interviewees mentioned that the trees would be useful for children to learn about where food comes from, and several of these specified that this could take place via parents showing their children. This resonates with Chawla's findings (2009), that childhood experiences with influential adult mentors are among the inspiring factors that

adults with active pro-environmental behaviors most frequently provide. Pertinent to public orchards planted in parks, the other mainly mentioned motivation is to have had positive experiences of play and recreation in nature. This suggests that public urban orchards in which adults and children can freely interact and play are potentially very useful tools for educating children about food and the environment, and thereby to encourage them as adult to favor pro-environmental behaviors. It would be interesting to perform longitudinal studies on this topic in the future.

10.1.8 Impacts on environmental knowledge

Unlikely. Clear evidence of impacts on environmental knowledge was not found, although talking about the fruit trees did generate some thoughts about the ecosystem among the interviewees. It is also interesting to note that three interviewees thought that the fruit trees could influence people's feelings, thoughts or behavior, by enticing them to think more about nature or to plant fruit trees (Luka, Howard and Denise). Still, based on the results obtained it appears unlikely that the orchard would encourage the users to reflect much about large-scale environmental issues, if the orchard is not complemented with more information, because, similarly to food system knowledge, a preliminary notion of the environmental system is probably needed. The orchard however might make the users more receptive to such information (especially if the information is grounded in their real-life experiences).

Behavior. Impacts on environmental behavior are likely to take place if participatory activities are implemented, as found by Andersson et al. (2014) through their 15 years of research on green infrastructures in Stockolm, Sweden.

Impacts are likely to be indirect. The idea that closer contact with the sources of our food, such as fruit trees, would make people more sensitive to food and environmental issues, is seductive (at least to me), but when one thinks about it, history of the western world is proof that the connection does not necessarily take place[1]. The importance of a connection with our food sources for improving how our society deals with environmental issues might exist but through more indirect means, such as by providing a basic knowledge about food growing - or what has been called "socio-

[1] I must often remind myself of my uncle who grew up on a farm when chemical fertilizers and pesticides were not common, and yet as an apple producer became a fervent adept of pesticides, because this is what his training had taught him to do and also, I suppose, because this was his cultural norm.

ecological memory" (Barthel et al. 2010) - so that this knowledge is available if and when people develop the desire to come back to more sustainable modes of production. Another possibility, as mentioned above, is through promoting a shift in the cultural norms.

10.1.9 Social versus environmental concerns

More frequent. The factors that the interviewees said they took into consideration to choose the products they buy exhibited an interesting trend: after price, the interviewees mentioned socio-economic considerations much more frequently than environmental ones, which were only rarely mentioned: they preferred local foods because of their impacts on the economy and not to reduce carbon emissions; they often mentioned strongly avoiding to buy clothes from industries that do not respect human wellbeing, but only one of them (Denise) mentioned industries that do not respect the environment; and they sought to avoid harmful chemicals in cleaning products, but usually for their health and that of their family and never for environmental reasons – only one interviewee (Denise) said that she tried to avoid "sending too much in the environment". This finding is reminiscent of what others found in the context of community gardens (Guitart, Pickering, and Byrne 2012), organic foods consumption (Magnusson et al. 2003), and food quality perception (Torjusen et al. 2001).

Explained by biology? Since environmental issues are also, ultimately, social issues, it seems to me that this bias towards social considerations is either a matter of knowledge or of relative importance. In terms of knowledge, the interviewees could be more knowledgeable of socio-economic issues than of environmental ones, or more knowledgeable of the link between economy and human wellbeing than of the link between environment and human wellbeing. But it could also be that human wellbeing is simply more important to them than is "environmental well-being". The data is insufficient to sort out the different possibilities, and furthermore the two possibilities might not be independent, as it could be that knowledge and importance reinforce each other. However I would argue that a higher relative importance is a more likely cause (and also a cause of higher knowledge of social issues). Indeed, first it seems understandable that people give more importance to people than to the planet at large. Empathy, after all, is mediated by mirror neurons (Ramachandran 2011), so it is probably more difficult to have feelings for entities that are more different from ourselves. Second, it seems natural that shorter, less complex links between action and impacts on people would be easier to conceptualize and thus would be given higher priority (Whiteside 2006). And social relationships are extremely important to us, as they are better predictors of well-being and lifespan than physical health or financial success (Haidt 2006).

The importance of trust. Within these social considerations, trust appeared as a quite important one to the interviewees. It concerned their relationships with other individuals as well as with more abstract social entities such that the city administration, farmers, stores, governmental agencies, goods producers, or even with non-human things such as goods (cleaning products and fruits). It was a particularly important factor involved in their consumption choices, perhaps especially for food. For example, Luka did not trust apples on the orchard, but trusted that his mother could recognize edible fruits; Mary, Howard, Mathieu and Amy did not trust organic certifications and did not buy organic foods for that reason, while Adrian did not trust non-organic farmers; Mathieu, Amy, Howard, and Jeanne trusted the Canadian governmental agencies to ensure that chemicals are not overused by food producers, more so than agencies from foreign countries; Denise, James and Elisabeth trusted Quebecois food producers to not overuse chemicals; Jeanne trusted local clothes makers to make better quality products. These findings agree with the social capital literature arguing that trust is an important constituent of the social fabric (section 6.1), as well as with research showing the importance of trust in regulating behavior (Dunning, Fetchenhauer, and Schlösser 2012), and with the works of E.O. Wilson and Haidt (Haidt 2006) who suggest that social constructs such as religion facilitate exchange and trade through regulating behavior, and thereby enhancing trust – and the greater trust observed here for geographically or administratively closer entities is explained in their framework by the importance of group selection (Haidt 2006). It is important to point out that, given that the notions and the agents that individuals trust do not necessarily provide the most beneficial information or products, this reliance on trust could be problematic, as was found in some research on social capital (section 6.1).

Impact on promoting sustainability. If social considerations are indeed of central importance to people, more so than environmental, and perhaps even more so than economic ones, then this would imply that it would be beneficial, when trying to promote environmental sustainability, to put greater emphasis on social considerations, and to more clearly and visually explain the links between environment, socio-economy, and human well-being. It also suggests that asking people to pose pro-environmental acts that might deteriorate the strength of their social integration is unlikely to be effective.[1] It also highlights the importance of ensuring that the influence of trust is positive rather than negative (though, finding how this can be done probably requires a great deal

[1] I was not able to find literature comparing social versus environmental concerns to evaluate the validity of this idea.

more research). It is noteworthy that these considerations were not mentioned in one recent review article in environmental psychology (Steg and Vlek 2009).

Impact of personality. Environmental psychology has found that prosocial individuals are more likely to be pro-environmental, and that some personality traits such as greater locus of control are important factors influencing behavior (Steg and Vlek 2009), but what about individuals who are less pro-environmental? What do they care about, and what are their personality traits? Indeed, some personalities might tend to care more about health and the environment than others, who care more about social relationships (and thus socio-economy), so that trying to make the latter change their behavior using the same considerations that motivate the first are doomed to fail. Differences in personality traits were shown to be important predictors of political allegiance (Haidt 2013); it thus seems reasonable that they would be important predictors of environmental concern and behavior as well. I suggest that more research should be done on this topic. This could also perhaps help people on the different sides of the spectrum to better understand, communicate, and work with each other to resolve the different issues. As one of the interviewees put it:

> C'est euh, c'est ça que je trouve dommage d'une manière, parce que, il y a certaines choses qui se font pour l'environnement que c'est fantastique, c'est extraordinaire, pis il y a d'autres choses c'est la pire affaire que tu peux pas faire. […] Si à un moment donné ça pouvait tout' se mettre ensemble ça pis dire 'ben là on'... Parce qu'éventuellement il va falloir qu'ils changent […]. (Denise)[1]

10.1.10 Other practical considerations

We have seen above that various factors might influence the socio-environmental impacts of public urban orchards planted by city administrations, such as the maintenance level of the site, the communication about the project, and the participation of citizens in the project. Here I would like to discuss two other factors of practical interest: what is planted and where it is planted.

[1] "It's uh, that's what I find unfortunate in a way, because, there are certain things that happen for the environment that they are fantastic, it's wonderful, and others that are the worse things that you could do. […] If at some point they could all get together and say 'well now we'… Because eventually they will have to change."

What to plant? It was surprising for me to find that the interviewees were on the whole very open to eating raspberries, and often apparently less interested in other types of fruits. It is possible that berries are in general more appreciated than bigger fruits are, though I was not able to find literature to confirm this[1]. In any case, would this pattern indeed be representative of the general population, it would perhaps be preferable to mainly plant berries such as raspberries in areas where people have less interest in fruits or more fear of publicly growing foods. Furthermore shrubs have other advantages: they ripen over a longer period (as mentioned by one interviewee), and are in general hardier and easier to prune than fruit trees such that they probably lend themselves more easily to maintenance programs involving the citizens. Varieties without thorns can be chosen. To address the concern for the uncontrolled spread of the plant, confined areas such as those enclosed in pavement might be preferred. However, it might be more important than for fruit trees to label the shrub such that people do not fear eating the fruits, since they are more easily mistaken for wild and thus potentially toxic. It would also have to be considered that fruits grown from bushes are more likely to be contaminated by pollution (see section 5.1). In this respect mulberry trees could also be considered, for they are trees (and beautiful) yet produce berries, so they could be planted where rotten fruit is a concern (with the caveat, though, that people are probably not as accustomed to these fruits), and also still produce well in less sunny areas[2]. Nut producing trees might also be a good option where rotten fruits are a concern. Several different kinds can be grown in Quebec, such as hazelnuts, walnuts, pine nuts, hickory nuts and chestnuts (see e.g. Arbre À Noix 2016)

Where to plant? Cities are reluctant to plant fruit trees in developed urban spaces such as sidewalks or parks because they are concerned with rotten fruits (and this is one reason that the developers of the project in SADB chose the bike path to plant fruit trees). This research provides evidence that planting along bike paths is a worthwhile avenue to consider: these sites have a high attendance, and are perhaps less sensitive to maintenance issues than are urban parks. Nevertheless, I believe that the idea of planting fruit trees in more developed urban spaces should not be discarded. Indeed, this is the best way to maximize access to the trees. For example, it would provide access for people who are by personality interested in discovering fruit trees and food production, but

[1] But I have often observed that when young children are given a platter of fruits, they tend to eat the berries first - and one adult observing the behavior one day told me that "children know what is good".
[2] Told me the chief gardener and the city council member.

who would not have the opportunity to do so otherwise[1]. However, this would have to be done carefully in order to ensure that the people are willing to harvest the fruits. Indeed, the present study found that the fact that the tree does not seem as "clean" or as public is a deterrent for some to harvest. Ensuring that the trees are harvested is important to maximize their positive impacts but also to minimize their negative impacts, as on people whose trust in the administration would be impaired by the sight of rotten fruits.

10.2 Why urban agriculture?

As we have seen above, the results of this work suggest that public urban orchards can have positive impacts on the four constructs under study, especially if complemented with means of increasing participation and information. Here I would like to discuss some other potential impacts of public urban orchards (and more generally of urban agriculture projects which involve the residents) which were suggested by the inductive component of this research.

10.2.1 Improving quality of life

Impact on quality of life? A few summers ago I visited Veliko Tornovo, a medieval Bulgarian town perched on a hill and overlooking green valleys. At the hostel where I stayed, I met a German man who worked as an environmental policy analyst for the German government, and we went to visit the town together. That evening, as we were getting lost in the meander of tiny and tortuous cobble-paved streets of a quiet residential area, we suddenly came across a large old plum tree growing seemingly unattended on the side of the street, and gorged with ripe fruits. We tasted them; they were absolutely delicious. So we stopped and ate plums for a while, in a silence only marked by exclamations, and sharing our discoveries of particularly flavorful patches. Eventually we finally stopped eating and resumed our walk. After a minute or two, my friend suddenly said to me, as if he had just made an important discovery, "Juliette, *this* is quality of life!" I was a bit surprised by his words since we had not discussed quality of life earlier, but because I felt that I knew what he meant I simply smiled and did not ask him to elaborate. Today, I wish I had.

Suggested by findings. The results of this research indeed suggest that public urban fruit trees have the potential of increasing quality of life, at least by providing pleasurable sight and gustatory

[1] I recently met two people who became great classical music fans though nobody they knew had introduced them to that type of music – they simply discovered it on the radio.

experiences. For example, the beauty provided by the trees was particularly appreciated by the interviewees (section 9.3.2). Also, all of them, even those who said that they were not interested in harvesting the fruits on the bike path, talked about some other experience harvesting fruits in the wild or in orchards as particularly fun and enjoyable.

Other arguments. Geography and environment (climate, environmental and urban conditions) were shown to be are important factors in predicting wellbeing, more so than was recognized until now (Brereton, Clinch, and Ferreira 2008), and studies have suggested that green spaces (Tzoulas et al. 2007) and gardening (Genter et al. 2015) can be sources of pleasure. It can also be suggested that urban agriculture can impact on quality of life by providing meaningful sensory-motor experiences for the urban residents of developed countries, and thereby reduce the "individual rift" with nature caused by urbanization and commodification of food production, as suggested by McClintock (2010). Indeed, for the increasingly larger proportion of the population who works in offices, commutes in a motor vehicle, and rests in front of the television, everyday life is increasingly devoid of physical experiences involving creating something concrete and useful to more immediate needs, involving other senses than sight and hearing, and interaction with non-human beings and non-human-made things[1]. (The main such experiences that are still available are provided by owning pets or raising children. Even farmers now experience their "natural" surroundings in the removed safety of their tractors.) Since we are not brains in vat, it seems likely that this lack has an impact on our wellbeing. One study suggests that this may be so, concerning sensory modalities (Schifferstein and Desmet 2007)[2].

Quality of life and sustainability. Quality of life may also impact environmental sustainability. First, researchers increasingly recognize that policy approaches to sustainability would greatly benefit from also including wellbeing in their variables to maximize: sustainability and wellbeing being interdependent, one must take both in consideration if one wants to maximize any of them in the long term (Verhofstadt et al. 2016; Kjell 2011; Helliwell and Barrington-Leigh 2010). Sustainability frameworks taking into account the impact of the living environment on quality of life have been recently proposed (Cloutier and Pfeiffer 2015; Moser 2009).

[1] While on the other hand internet has increased access to factual information, and airplanes have increased access to the whole world, and we praise them for this.
[2] Sen argued that the role of economic development is to help people have lives that they have reasons to value (Sen 2000). He did not discuss, however, what such lives are - and maybe we need to reflect upon this more.

Second, it is possible that quality of life could also impact sustainability through mindfulness. Indeed, there is evidence that mindfulness promotes subjective well-being, which in turns is associated with pro-environmental behavior (Ericson, Kjønstad, and Barstad 2014). In addition, mindfulness might be a complementary approach to the precautionary principle. Indeed, an important issue linked to sustainability is how to deal with risks brought about by technological innovations, given that scientific knowledge is never complete, and the precautionary principle has been suggested as a means of dealing with this (e.g. Whiteside 2006; Ravetz 2004). It might be that placing greater emphasis on the quality of life provided by the living environment, by increasing awareness of the sensory experiences linked to the environment, could constitute an additional means[1]. If we were more sensitive to the noise and the smells generated by cars, industries, and chemicals of all sorts, would we accept them as easily? For sure, not everything that is dangerous for us or the environment is noisy, smells or looks bad - but many things are. And sensorial tastes are not entirely subjective, as they are based on some fundamental neurological properties of the brain (Ramachandran 2011). I therefore wonder if finding ways of encouraging people to be more attentive to the sensory aspects of their surroundings (and not only of the content of their plate or of the latest movie) could not help to counterbalance the potential hazards of technology. I was not able to find research looking at the influence of the living environment on mindfulness (though interestingly, a google search suggests that "mindfulness based interior design" is a flourishing industry), and it would be an interesting line of research to initiate if it does not already exist.

10.2.2 Reducing urban sprawl

Desire for a quiet and green living place. I was struck by the uniformity of the responses of the interviewees when asked what they liked about SADB: quiet, green, rural. (I believe that with "quiet" the interviewees in large part meant "little car traffic". Indeed, most interviewees mentioned car traffic, and always in negative terms.) Some also added the fact that it is close enough to downtown Montreal to be able to enjoy the city. For example:

> It's very quiet, and lots of green space, but you are still on the island of Montreal, so you get the best of both worlds, you kind like, have a home in the city, but you are in the country, so I like that. (Jenny)

[1] I assume that quality of life is something that is provided for free by our living environment, that is to say, should not have to be bought.

Connected to urban sprawl? This led me to wonder if this desire for a living environment that is quiet and green (and perhaps even rural-looking) is not one of the forces promoting urban sprawl. Indeed, a recent study conducted in Liverpool, England, concluded that policy efforts appeared to have reached the limits of their capacity to reduce sprawl, since a certain proportion of the population simply desires to live in suburbia (Couch and Karecha 2006). This thought was also reinforced by two personal anecdotes. The first is the fact that the street where I live in Montreal is very near downtown and yet is lined with many old trees and feels very "green", and on several occasions I heard people who visited me, and who lived in a "rural" suburban area, say that if they had to live in the city then they would be willing to live on such a street. The second is the reasons that led my parents to choose to live in a monotonous suburb. I can think of two, besides the "green and quiet" aspects, and the affordable housing price: the possibility of having a green space in which to garden, sit, relax and socialize, and an access to a workshop - and perhaps they would have accepted to live in an urban apartment if they could still have enjoyed these activities there. If my parents were representative of a good proportion of the people who chose to live in the suburbs, then this would mean that making cities greener, quieter, food producing and more conducive to performing creative manual activities could be a means of reducing the tendency towards urban sprawl (together with making housing more affordable).

For certain personality types? It could be that this need for rural and green spaces and manual activities is especially high in people of a certain type of personality. The observations of one of my interviewees concerning the personalities of his two sons are in line with this thought:

> C'est intéressant la psychologie des gens. Y en a un, c'est comme lui, y en a c'est comme la nature c'est ben important pis l'autre c'est plus euh, c'est pas important, ben, non, c'est plus le sport, ouin c'est ça les deux, y en a un y est plus euh, plus euh, aller dans la nature, bricoler, bricoler des... pis l'autre c'est plus euh, là y est à, y en a un qui est adulte maintenant, euh, pis c'est lui qui est allé planter des arbres, l'autre y est plus euh, euh sport donc euh, lui euh, ce qui l'intéresse c'est plus les sports euh, plus urbain, la mode, il s'habille bien, il fait du sport, euh tsé, c'est plus urbain, psychologie plus urbaine, l'autre c'est psychologie plus de la campagne, d'une certaine façon euh, dans le sens qu'y a, y

> aurait aimé ça être à la campagne, et faire des choses euh, puis évidemment il est encore un peu de ce sens-là tsé, là. (Mathieu)[1]

Lending further support to this idea, differences in the geographical distribution of personality types were shown to exist between the different American states, and selective migration was suggested as one of the causes (Rentfrow 2014). Thus it is possible that cities as currently designed do not suit the preferences of some personality types, such as more introverted ones who feel more comfortable in more quiet and green environments (Nettle 2009)[2], and therefore that the urban environment negatively selects for them. If so, this phenomenon could be a cause of urban sprawl, but also of a loss of diversity and thus development of social capital (Paranagamage et al. 2010) and creativity (Jacobs 1969) within the urban environment. In that case, greater access to urban agriculture (with reduction of car traffic) might be one way of ensuring that all personality types can find their niche in the urban milieu.

10.2.3 Should cities plant fruit trees? Evaluating priorities

It might be surprising that providing such apparently innocuous and quite possibly beneficial pleasure to its residents would be something that cities would be hesitant to do. The reason provided is maintenance. But why not worry about the maintenance cost of the roads? Presumably, because cars are associated with mobility, which is highly valued, and because they feed the current economy. Thus, for the value of public fruit trees to be reassessed, we probably also need to reassess our priorities as a society, for example the relative priorities given to efficiency and sensorial pleasure, or how we want to acquire sensorial pleasures, or our relationship to the economic system. To this, one may add that the nuisances brought by fruit trees can be significantly reduced with appropriate organization and planning (whereas the hassles brought by cars are extremely difficult to reduce, even with new technology).

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[1] "It's interesting the psychology of the people. One of them, it's like him, one of them it's like nature is quite important and the other it's more uh, it's not important, well, no, it's more sport, yeah that's right the two, there is one who is more uh, more uh, going into nature, crafting, crafting some… and the other it's more uh, now he is, one is an adult now, uh, and it's the one who has gone planting trees, the other one is more uh, uh sport so uh, him uh, what he is interested in it's more the sports uh, more urban, fashion, he dresses well, he does sports, uh you know, it's more urban, more urban mentality, the other it's more the countryside mentality, in a way uh, in the way that, he would have enjoyed living in the countryside, and do things uh, and of course he is still a bit that way you know."

[2] Note that consistent differences in personality traits, such as sociability, akin to the introversion/extraversion in humans, are also observed in non-human animals such as fish (Rentfrow 2014).

10.3 Limitations and transferability

Omission. During the design of the interview questionnaire I omitted to include the question of whether the orchard had had any impacts on their feelings for SADB for the interviewees who were against the project, and I realized this only while analyzing the interviews. This is a drawback in that this question might have allowed obtaining valuable information concerning the potential negative impacts of public urban orchards. Still, despite this omission, insights into this were obtained with the other data. These insights might have been more complete without this omission, but there is no reason to believe that misleading conclusions arose from it.

Negative results. Limited impacts were observed for food and environmental knowledge, and this could be due to the limitations in scope (assessment method, limited timeframe) of the research. It is possible that more substantial impacts would be observed through more extensive research designs. At the very least, this negative result suggests that impacts on these constructs are unlikely to be observed at this scale (time, method) of inquiry.

Positive results. Various unknowns make it difficult to say with certainty that the positive impacts observed will also be observed in other contexts.

1) Skewed age distribution of the interviewees: though one of the interviewees was 22 years old, all the others were above fifty. Since we do not know whether younger generations have the same attitude towards fruit trees, it is not clear that the same impacts would be observed on the younger generations. For example, Luka's behavior and the comments made by Adrian about his own children suggest that fear of worms in the fruits may be higher among younger people. If that is so, their appreciation of the trees would be reduced, and thus the impacts of the orchard as well. It is possible that this could be compensated by their parents showing them how to deal with this, or perhaps by a greater interest in organic foods, but this is unclear and the impacts on younger generations must be further researched.

2) Sample representativity: the interviewees were recruited among the users of the bike path. Whether the proportion of users in the population is sufficiently large, or whether these users are sufficiently representative of the population of SADB, for the orchard to have an impact on the community at large is not known. Also, the fact that while recruiting I only approached users of the bike path who appeared open to this could have introduced a bias towards more sociable people,

and therefore perhaps a bias towards greater social capital impacts. However, the fact that the interviewees described their community as a very sociable one makes this unlikely.

3) Site representativity: The place (bike path) where the fruit trees are located is highly appreciated. It is possible that the residents are more receptive to the trees for this reason.

4) City representativity: This analysis suggested that SADB might be a particular urban context in a few respects, making it unclear to which extent the results obtained in SADB are generalizable to other cities. First, it is unusually green and involves farming activities. This could cause the residents to be more open to eating the fruits than they would be in more urban environments. This could also increase the appreciation of the orchard in part because the orchard reinforces its definition as green and rural (see section 9.4.1). In an environment where the fruit trees clash with the residents' definition of their place, they might react with indifference or even negatively. In that case, it is possible that making use of public consultation or participation could improve the reception of the public to the project, as well as focusing on types of trees that are less problematic in terms of littering or maintenance, such as fruit bushes. Second, as the results have shown SADB also seems to be endowed with particularly high levels of social capital and place attachment which might not necessarily be found in other areas on the island of Montreal, or in other cities. since the impacts of a project will depend on the starting conditions of these constructs (Mihaylov and Perkins 2014), different impact might take place in these cases.

4) Small city size: SADB is relatively small, with only 5000 inhabitants, and social relationships in small cities might undergo different dynamics than in larger ones. For example, the small size could make the residents feel "closer" to their city administration such that their trust in the administration is more easily affected by an urban planning project (the residents have probably generally already met the mayor, and it is probably easier to develop trust in a specific person than in an abstract entity). If so, in larger cities one could find means of ensuring that there is a clear entity that can be associated with the project – for example, an administration in charge of a neighborhood rather than of a large city.

5) Newness of the fruit trees. Finally, what would the impact of a new orchard be in a place where fruit trees on public spaces already exist, as is the case in Rome or Sevilla, or in the developing world, where contact to food growing is not as remote as it is in the developed countries? It appears difficult to predict. Acceptability might be high, but the impacts might be low, for the new trees might not be particularly noticed. It seems that specific studies are required to sort this out.

Overall: Though the results cannot be straightforwardly transferred to other contexts, on the other hand it was perhaps fortunate that SADB was chosen for this study, since that perhaps made it easier to observe positive impacts, and therefore to be able to see that these impacts are possible - though modifications to the orchard project design might be needed for these impacts to also be generated in other contexts. In addition, in accordance with the nature of qualitative research this analysis allowed to reveal pathways and relationships between the constructs and to reveal the importance of various factors. The latter could guide the implementation of such projects in other contexts, and the further development of a framework linking urban planning projects and socio-environmental sustainability. Indeed, the framework proposed here (Figure 1), integrating relationships between people and their environment at several and relatively comprehensive scales, could serve as a starting point towards a more holistic view of the human-environment problem.

10.4 Future directions

The framework proposed here could be further developed and refined, for example by adding the emotional bonds to food and environment (emotional bonds being already included in social capital and place attachment). One could also look into ways of integrating it with the framework proposed by Chang (2013), in which social capital and sustainability are conceptualized as a bidirectional link between social capital and natural capital. This framework might be generally useful to integrate socio-environmental sustainability objectives into urban planning.

It would also be interesting in the future to perform similar studies with other public urban orchards to research in greater detail the impacts on the four constructs of interest, as well as to test the ideas proposed in this work concerning public participation and communication. One could also compare the impacts observed in the different places so as to look into the influence of history, culture and geography, or compare the impacts at the individual scale to look into the influence of personal history and personality. Such studies could serve not only to better understand how public urban orchards in particular and urban planning projects in general can impact socio-environmental sustainability, but also more generally to contribute significantly to our understanding of the relationship between humans and their environment.

11 Conclusion

This research is concerned with the impacts of the design of the urban environment on the way its residents interact with each other, their administration, and the local and general environment, in the context of environmental sustainability. The underlying hypothesis is that some designs could provide worthwhile benefits, and here this hypothesis was tested for one design in particular, namely public urban orchards. Indeed, though cities and the food system currently face great environmental challenges, cities might also be the best places where to invent new ways of living and organizing society and the food system: according to Jane Jacobs, thanks to its intermingling of people(s) and trades, cities have always been where innovations took place, including the invention of agriculture (Jacobs 1969). Moreover, since they are not directly dependent on providing ecosystem services within their boundaries, they provide a relatively safe space to explore new management strategies and governance structures for ecosystem stewardship (Andersson et al. 2014). I hope that this work will serve as an encouragement to think and experiment with urban design strategies which provide cost-effective means of increasing the wellbeing of humans and the planet[1]. However, much more work is needed to better understand the links and their complexities underlying this potential, so as to better take advantage of them.

[1] Indeed, it was recently found that urban planning professionals in Finland still doubt the potential of urban planning to impact on environmental sustainability, even from the biophysical point of view (Säynäjoki, Heinonen, and Junnila 2014).

12 Dissemination

In preparation are: a manuscript for submission to a peer-reviewed journal, an executive summary for city administrations, and a newspaper article to present the findings to the general population and the residents of Sainte-Anne-de-Bellevue.

13 Appendix

13.1 Interview guides

13.1.1 For city administration members

Introduction

The purpose of this interview is to gain a better understanding of the socio-environmental impacts of public urban orchards. You have been selected to this interview because as a city administration member of the city of SADB, your views and experiences will help us to improve this understanding.

Your participation in this research is subject to a process and understanding of informed consent, and your participation is voluntary. With your permission, audio of this interview will be recorded. All files, recordings, transcripts, and identifiable data will be kept confidential. This interview is expected to last about 45 minutes.

Questions / Points to cover

Background info

-Can you tell me the history of the project, and the role you have played in it?

-What is your current role/responsibility in the orchard?

Impacts

-What were your reasons for wanting this orchard planted?

-What do you hope the impacts of this project to be in the short term and the long term?

[*If not covered:*]

-Do you think that the orchard could have an impact on environmental sustainability, if so how?

-Do you think that the orchard could have an impact on the interactions between the people in the community? If so, how?

-Do you think that the orchard could have an impact on the interactions between the residents and the city administration?

-Are you happy with the way it's going so far?

-What would make you consider the project a success?

-Which indicators would you use to evaluate this success?

Funding

-How does the city currently fund this project? *[Make sure to separate various budget allocations (trees, grass, benches, picnic tables etc.)]*

-Do you think that the city could and should make changes to the way the project is funded?

Participation

-Currently, who participates in the decision making and management of the fruit trees?

-Currently, who participates in the planting and maintenance of the fruit trees?

-The chief gardener told me that he lacked human resources for the maintenance of the trees. How do you think that the city should overcome this?

[If not covered:]

-In some cities, programs have been implemented in which residents are trained to maintain public trees or public fruit trees, such as in New York, Vancouver, or Seattle. Do you think that the city administration of SADB should develop similar programs, or encourage their development by other entities?

-What about programs for the harvest of the fruits?

Communication

-What has the city done to raise awareness of the fruit trees among the residents?

-In your opinion, to what extent are residents aware of the presence of the fruit trees?

-Are you happy with this level of knowledge?

-What do you think is the level of knowledge among the residents concerning the origin and purpose of the project?

-Are you happy with this level of knowledge?

[If not covered:]

-Do you think that the residents know that they are allowed to eat the fruits?

Conclusion

-Are there any other thoughts or aspects that you wish to talk about?

13.1.2 For users of the bike path

<u>Introduction</u>

The purpose of this interview is to gain a better understanding of the socio-environmental impacts of public urban orchards. You have been selected to this interview because as a resident of the island of Montreal your views and experiences will help us to improve this understanding.

Your participation in this research is subject to a process and understanding of informed consent, and your participation is voluntary. With your permission, audio of this interview will be recorded. All files, recordings, transcripts, and identifiable data will be kept confidential. This interview is expected to last between 30 and 45 minutes.

Questions / Points to cover

Geographical definition of their place

-Where do you live?

-Since when do you live there?

Place definition and bonding

-What are your favorite characteristics of this place?

-What do you dislike? (Only asked for Interviews 6 to 11)

-What are your feelings toward this place?

Bike path usage and perception

-For what purposes do you use the bike path where we met?

-When do you use it, and since when?

-With whom do you use it?

-What do you like about this bike path?

-What would you like to see changed in this bike path?

Fruit trees usage and perception

-Have you noticed that fruit trees have been planted along the bike path?

If yes:

-When did you first notice the fruit trees?

-Which types of fruit trees do you remember seeing?

-What do you particularly like about those fruit trees?

-What do you particularly dislike about them?

-Did you sometimes pick and eat the fruits, if so in what circumstances and how frequently?

If yes:

Fruit trees impacts

-How did you feel and what did you think then?

-Where you concerned about the possibility of the presence of worms in the fruits? (only asked for Interviews 6 to 11).

-Did you sometimes go to the bike path specifically to pick up fruits with other people, or do you intend to do it someday? If so, with whom and when?

-Did you ever talk and become acquainted with other people because of the fruit trees?

If no:

-Why not?

-Did the fruit trees have some impact on your feelings towards your place?

-What do you think is the reason that the city planted those trees?

-Do you think that this was a good idea? Why or why not?

If no:

-Well, fruit trees have been planted by the city along this bike path. What do you think is the reason that the city did this?

-Do you think that this was a good idea? Why or why not?

-Now that you know about those trees, how likely is it that you will pick and eat their fruits in the future?

If likely:

-Would you ever consider going to pick the fruits with other people, if so with whom and when?

-Do you think the city of SADB or the city of Montreal should plant fruit trees in other park areas of the city? Why, why not?

-If the city implemented programs and activities that would allow you to participate in the maintenance or harvesting of the fruit trees, would you be interested in participating? Why or why not?

Background information on food picking/growing activities

-Do you ever pick fruits elsewhere?

-Did you have any experiences with fruit trees as a child? If yes, which?

-Do you harvest wild foods (mushrooms, hunting, fishing…)? Which, where and how?

Background information on current citizen participation

-Do you engage in voluntary activities in your community, and if so, which ones?

Background information on food and environmental knowledge

Now I will ask you three last questions about your consumer preferences.

-When you buy your groceries, what factors help you chose your products?

-Are you at all concerned about pesticides, herbicides, or where the food comes from?

-When you buy your clothes, what factors help you chose?

-When you buy your cleaning products, what factors help you chose?

13.2 Background information questionnaire for the interviewees

You may skip any of the questions that you do not wish to answer.

1. Year of birth:
2. Approximate yearly household income (select one):

   □ 0 to 20,000 $
   □ 20 to 40,000 $
   □ 40 to 60,000 $
   □ 60 to 80,000 $
   □ 80 to 100,000 $
   □ Above 100,000 $

3. Where were you born?
4. Where did you grow up? (List all places where you lived at least one year.)
5. Where did your parents grow up? (List all places where they lived at least one year.)
6. What is your current occupation?
7. List your past occupations, if any.
8. What is your marital status (select one):

- □ married
- □ common law
- □ widowed
- □ single

9. List the ages of your children, if you have any.

10. Do your children live with you?

13.3 Codebook

Table 6. Codes for the deductive component of the analysis and number of occurrences. PA: place attachment, SC: social capital, FT: fruit trees, EK: environmental knowledge, FK: food knowledge. The left-hand side of the code name stands for the code category, while the right-hand side stands for the code itself. FT: fruit trees; SC: social capital.

Code	Occurrences
#background_Age	11
#background_Cultural background	14
#background_Gender	11
#background_Have children	10
#background_history with farming	9
#background_history with fruit trees_adult~	19
#background_history with fruit trees_childhood	13
#background_history with gardening_adult	7
#background_history with gardening_childhood	9
#background_history with wild foods~	14
#background_income	7
#background_Occupations	16
#background_Years spent in living place	11
#bike path_liked	27
#bike path_usage	22
#bike path_what would like changed	16
#buying_cleaning products	13
#buying_clothes	13
#buying_food	14
#buying_food_organic	3
#fruits_worm in the fruit	7
#FT_orchard_asking residents opinion	2
#FT_orchard_disliked	26
#FT_orchard_feelings when harvesting	7

#FT_orchard_knowledge of project	18
#FT_orchard_liked	37
#FT_orchard_Perception of the project~	34
#FT_orchard_reason city planted	15
#FT_orchard_species noticed~	19
#FT_orchard_usage	33
#FT_public_opinion cities planting	13
#interest in participating~	15
#place_disliked~	11
#place_feelings~	20
#place_liked~	23
#place_liked_lachine	1
#SC_voluntary activities	11

Table 7. Codes for the inductive component of the analysis and number of occurrences.

Category	Codes	Occurrences
activities	activities_alone	7
	activities_discover / adventure~	8
	activities_exercise	48
	activities_family activity	16
	activities_learn	3
	activities_maintenance	8
	activities_manual labor	6
	activities_nature_camping	4
	activities_nature_gardening~	5
	activities_observe / notice	5
	activities_outside / fresh air	10
	activities_play	6
	activities_success	1
behavior	behavior_change	6
	behavior_choice	3
	behavior_convenience	22
	behavior_efficiency	6
	behavior_habit	23

	behavior_independence	7
	behavior_personality~	2
	behavior_trying~	3
bike path	bike path_benches	8
	bike path_connecting the city	4
	bike path_connecting to other paths	7
	bike path_drivers usage	2
	bike path_lights	2
	bike path_path for pedestrians	3
	bike path_snow plowed in winter	5
city	city_admin is taking care of	13
	city_communication between admin and residents	11
	city_public transportation	8
economy	economy_against big corporations	2
	economy_buying local	25
	economy_buying local_encourage local economy	3
	economy_buying local_not important	1
	economy_gift / free	5
	economy_money_assets	3
	economy_money_price~	48
	economy_money_price not important	1
	economy_money_receive~	3
	economy_money_taxes	8
environment	environment_animals / fauna~	4
	environment_bees~	3
	environment_chemicals~	11
	environment_composting	3
	environment_consumption / recycling~	5
	environment_EKA	17
	environment_EKA_impacts	1

	environment_exchange with~	7
	environment_GHG / global warming~	2
	environment_planting trees	5
	environment_pollution~	3
	environment_water	2
feelings	feelings_negative_anger~	3
	feelings_negative_bored	3
	feelings_negative_disappointed	6
	feelings_negative_dislike	2
	feelings_negative_embarassed~	8
	feelings_negative_fear	14
	feelings_negative_immoral~	2
	feelings_negative_not interested	4
	feelings_negative_sad~	7
	feelings_negative_trust_no	2
	feelings_other_ownership	3
	feelings_other_uncertain	9
	feelings_pleasure~	82
	feelings_positive_freedom	3
	feelings_positive_good memories~	13
	feelings_positive_happy~	11
	feelings_positive_impressed	5
	feelings_positive_interested~	42
	feelings_positive_lively / rich	2
	feelings_positive_love~	9
	feelings_positive_lucky	8
	feelings_positive_surprise	9
	feelings_positive_trust~	2
food	food_cooking	6
	food_eating	6
	food_FKA_impacts	12
	food_knowledge~	6

	food_markets	4
	food_organic	8
	food_planting edible plants	2
	food_wasting	8
fruit trees	FT_berries	3
	FT_drivers usage	28
	FT_eating because someone showed	3
	FT_fruit not perfect	3
	FT_fruits attracting insects/pests	4
	FT_knowledge about fruits	6
	FT_learning / teaching about fruit trees~	3
	FT_orchard	1
	FT_orchard_add signs/objects	4
	FT_orchard_allowed to eat fruits	8
	FT_orchard_blooming	10
	FT_orchard_bringing fruits back home	11
	FT_orchard_convenience	5
	FT_orchard_eating fruits_animals	9
	FT_orchard_eating fruits_people~	6
	FT_orchard_everyone can use~	7
	FT_orchard_fruits all taken / no fruits	5
	FT_orchard_fruits for people~	28
	FT_orchard_fruits ripeness	8
	FT_orchard_growth~	9
	FT_orchard_labels on trees	2
	FT_orchard_maintenance	17
	FT_orchard_more trees	3
	FT_orchard_not overpowering	5
	FT_orchard_picked: no	7
	FT_orchard_picked: yes	6
	FT_orchard_raspberry	21
	FT_orchard_rotten fruits	7

	FT_orchard_seem wild	4
	FT_public_encourage people to plant	2
	FT_public_learning about_all	9
	FT_public_learning about_children	7
	FT_public_location of trees~	7
	FT_public_make children like fruits	3
	FT_public_people eating	4
	FT_public_perception~	6
human relationships	hr_being allowed~	3
	hr_closer	3
	hr_community~	8
	hr_concern for others' wellbeing	6
	hr_disagree	2
	hr_exchange~	4
	hr_food for people in need	5
	hr_friendliness	7
	hr_help / contribute~	10
	hr_knowing people	3
	hr_meeting people~	13
	hr_non organized interaction	2
	hr_respect	4
	hr_sharing	6
	hr_social justice	2
	hr_someone else does it	3
	hr_talking	12
	hr_trust	20
	hr_working together for a goal	4
knowledge	knowledge_experience	5
nature	nature_animals~	12
	nature_connection with~	6
	nature_green space~	20

	nature_learning about	3
	nature_pets	8
	nature_plants~	29
place	place_arboretum/ecomuseum	10
	place_attached_no	4
	place_attached_yes	8
	place_cars / traffic	24
	place_commuting_active~	10
	place_commuting_car	4
	place_country but close enough to downtown~	6
	place_countryside / rural	16
	place_family place~	7
	place_farm / farming	15
	place_highway / road	6
	place_home~	4
	place_house~	4
	place_industry	4
	place_nature/eco place~	7
	place_PA_impacts~	16
	place_pop density~	7
	place_privacy	3
	place_property~	2
	place_reference point	2
	place_school / university	9
	place_socializing place	2
	place_spatious / open	5
	place_water body	8
qualities	qualities_beauty~	66
	qualities_bucolic	3
	qualities_cleanliness	12
	qualities_congruency~	6

	qualities_fashion	4
	qualities_freshness	18
	qualities_natural	10
	qualities_normal	3
	qualities_perfection	3
	qualities_quality~	14
	qualities_quantity	4
	qualities_quiet / calm~	20
	qualities_self-sufficiency	2
	qualities_size	5
	qualities_smell	8
	qualities_sound_noise	6
	qualities_taste	30
	qualities_taste_not considered	2
	qualities_unicity	14
	qualities_uniformity	1
	qualities_variety~	4
social capital	SC_bonding_children / babies	28
	SC_bonding_family	6
	SC_bonding_friends	6
	SC_bonding_neighbors~	19
	SC_bridging	2
	SC_Citizen participation~	13
	SC_Collective efficacy	2
	SC_impacts	32
	SC_Trust in administration	15
time	time_day / evening	4
	time_long time	11
	time_more often~	3
	time_not enough time	6
wellbeing	wellbeing_coziness / comfort	11
	wellbeing_health	33

	wellbeing_health_chemicals_cleaning	8
	wellbeing_health_chemicals_food~	35
	wellbeing_mind	3
	wellbeing_quality of life	4
	wellbeing_safety	25
	wellbeing_shade	5

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