Rethinking urban redevelopments

A circular urbanism strategy for the Faubourgs redevelopment in Montreal, Canada

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STUDENT REPORT

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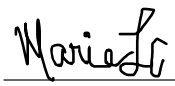

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By rethinking urban redevelopment, circular urbanism is presented as a strategy that municipalities can design to maximize their temporal, material and spatial resources, while fulfilling neighborhood community needs. The circular urbanism concept suggests closing the loops of time, material and space for redevelopment projects. The authors propose to consolidate the concept by combining three existing planning practices: multifunctionality, adaptive reuse and urban regeneration. A roadmap is designed to facilitate municipalities' implementation of circular urbanism in redevelopment projects. The case of the Faubourgs redevelopment in Montreal, is proposed by the C40 in the frame of their competition 'Students Reinventing Cities' and is used as case to iteratively develop and improve the roadmap.

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By signing this document, each member of the group confirms participation on equal terms in the process of writing the project. Thus, each member of the group is responsible for the all contents in the project.

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| Summary |

The social and environmental unsustainability of redevelopment projects is an important issue in the planning field, as new buildings are constantly being constructed, raw materials are increasingly extracted despite their finite amount, and natural land is being urbanized, while alternative processes for redevelopment could maximize the use of already built buildings, already extracted materials and already urbanized land. Urban redevelopment projects are done linearly as the mechanisms, roles, and expertise are already in place for linearity. The process of reusing existing temporal, material, and spatial resources is much more complex. Hence, natural resources are under pressure as the linear redevelopment of cities does not account for possible fulfillment of existing community needs and the reduction of Co_2 emission that could result from an alternative process.

This thesis aims to propose a roadmap assisting the transition to a circular process for urban redevelopment projects. The goal is to propose a design process that could help municipalities identify the three types of resources on their territory, understand the needs of their communities related to these resources and create synergies between needs and resources identified. The maximization of the use of all resources, otherwise considered as waste, in redevelopment projects contributes to greater social, cultural, environmental, and economic sustainability. Hence, the project aims to examine and answer how the design of circular urbanism by Montreal Municipality can be a strategic driver for sustainability in the case of Faubourgs neighborhood redevelopment. The motivation behind choosing the specific case study is the international competition organized by C40, namely 'Students Reinventing Cities'. The goal of participating in such a competition is the opportunity to share research findings on a global scale, making this thesis, not just an academic paper, but help foster a discussion about the potential and importance of circular urbanism in the planning field.

Through the theoretical framework, circular urbanism is defined by the transposition of the principles of the circular economy to the process of making the city. By adopting this approach, the city can permanently rebuild itself. Interviews with academic experts and a literature review allowed for the framing of the thesis. From this chapter derives the analytical framework, the circular urbanism roadmap develops from the theories where each step is presented. Interviews with academic experts, literature review, municipal strategies analysis guided the elaboration of the roadmap. The analysis conducted is the implementation of the circular urbanism roadmap to the specific case of the Faubourgs' redevelopment in Montreal. Literature review, academic and local expert interviews, policy review, and municipal plans were used as methods. Different possible synergies are proposed towards the end of the analysis, but their appropriateness would only be possible to access given a real-life application of the roadmap. The analysis highlights the different elements that would be relevant for the Montreal Municipality to use in the event of the application of the roadmap for the redevelopment of the Faubourgs, but most importantly demonstrate the feasibility and validity of the roadmap, as it was iteratively improved by its application to the case study. The thesis concludes with a discussion about key aspects such as the potential for municipalities to use strategic planning towards circularity, the importance of the context in the development of such as strategy, and the role of planners in the development of the necessary synergies. The conclusion of the thesis answers the research question about how the design of circular urbanism by Montreal Municipality can be a strategic driver for sustainability in the case of the Faubourgs neighborhood redevelopment, by reviewing the complementarity of the main elements from the different sections of the thesis.

| Abstract |

This thesis examines the potential that circular urbanism holds as a sustainability strategy for urban redevelopment projects. Current redevelopments done in a linear process fail to maximize temporal, material, and spatial resources, while at the same time is unsuccessful to address important community needs in redeveloped areas. Alternatively, circular urbanism can be considered as an adaptation of circular economy to the urban redevelopment process, combining urban regeneration, adaptive reuse, and multifunctionality practices to optimize the use of existing temporal, material, and spatial resources in the fulfillment of neighborhood community needs. The Montreal Faubourgs redevelopment is proposed by C40, a network of cities committed to addressing climate change, in the frame of the competition 'Students Reinventing Cities'. The Faubourgs redevelopment is used as a case study to demonstrate the feasibility and validity of a proposed circular urbanism roadmap. The review of literature, municipal documents, and policies, mainly the Specific Urban Plan produced through extensive public consultations for the redevelopment of the area, as well as semi-structured interviews with academic and local experts was conducted. The aim is to develop, through a design thinking process, a circular urbanism strategy that is iteratively created with a concrete case study, to contribute to greater sustainability in urban redevelopment projects. This thesis intends to answer the following research question: How can the design of circular urbanism by Montreal Municipality be a strategic driver for sustainability in the case of the Faubourgs neighborhood redevelopment? Lessons that municipalities can learn from the application of the circular urbanism roadmap to the redevelopment of the Faubourgs neighborhood are discussed such as the potential for municipalities to use strategic planning towards circularity, the importance of the context in the development of circular urbanism strategy, and the role of planners in the development of the necessary synergies.

Keywords: circular urbanism, strategic planning, urban redevelopment projects, design thinking, multifunctionality, adaptive reuse, multifunctionality

| Participation in C40 Students Reinventing Cities Competition |

C40's mission

C40 is an international network of 97 megacities aiming to tackle the ongoing climate crisis (C40, 2020). Their main focus is the effective collaboration of different cities around the world to share knowledge concerning climate action leading the way towards a healthier and more sustainable urban future. C40 believes that cities are the main site for transformation when it comes to deal with the climate emergency (C40, 2020). C40 network, created and led by cities, is providing proven models that other cities and national governments can adopt, and is uniting the world's leading mayors around climate action. C40 member cities earn their membership through action and the creation of performance-based requirements is ensuring a way of monitoring the work of member cities towards sustainability, resilience, and equity (C40, 2020).

Students Reinventing Cities

Students Reinventing Cities is an international competition for students and academics. 18 cities around the world have identified small neighborhoods, blocks, or main streets and are open to collaboration (C40, 2021). Sustainable and inclusive solutions of these urban areas are expected, improving the quality of life of the local community, and rethinking how neighborhoods are planned and designed in a way that reduces emissions, promotes resilience, and delivers a high quality of life (C40, 2021). Students Reinventing Cities competition, to help guide students in developing meaningful and deliverable solutions, developed 10 design principles for a green and thriving neighborhood. These principles are: (1) close to home, (2) People-centered mobility & thriving streets, (3) Connected place, (4) A place for everyone, (5) Clean construction, (6) Green energy and buildings, (7) Circular resources, (8) Green spaces, climate-resilient and nature-based solutions, (9) Sustainable lifestyles and (10) Green economy (C40, 2021).

Motivation

This thesis attempts to address issues related to the south sector of the Faubourgs neighborhood in Montreal, Canada. One of the reasons for choosing to participate in the competition and choosing specifically this site is that one of the group members is originally from Montreal. The native knowledge of the language and the understanding of the local context made possible the realization of many of the interviews in French as well as the use and facilitation of the existing network of possible partners. Another reason is the opportunity provided by C40 to allow an open collaboration between students and city governments for tackling the addressed problems in the specific sites. Furthermore, through the network of C40, the suggested ideas can be spread out on a global scale, making this thesis, not just an academic paper, but an idea that can be rolled out and heard in other municipalities around the world, accelerating their climate agenda.

For the purpose of reducing lengthy phases, the authors refer to 'the redevelopment of the South section of the Faubourgs neighborhood' as 'the Faubourgs redevelopment' throughout this thesis.

| Glossary |

Abbreviation	Term
CE	Circular Economy
CU	Circular Urbanism
C40	C40 Cities Climate Leadership Group
EMAF	Ellen MacArthur Foundation
PPU	Plan Particulier d'Urbanisme des Faubourgs [Faubourg's Special Urban Planning Program
SD	Sustainable Development

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| 1 | INTRODUCTION

This chapter introduces the specific problems addressed by this thesis, as well as the case study area investigated. As this thesis is conducted in parallel to the participation in the C40 competition 'Students Reinventing Cities', the relevance of this approach is described in 1.2. Finally, the structure of the thesis is presented highlighting the main research questions and the associated sub-research questions, each of which is answered in a specific chapter of the thesis.

1.1 Problem formulation

Cities are constantly evolving, and neighborhoods are being redeveloped when previous functions are no longer needed or desired. Cities have been built around industries during the industrial period, but those industrial functions are being relocated to the periphery of cities, leaving prime locations close to city centers to be redeveloped. Some spaces in cities have the potential to fulfill neighborhood community needs much greater than their previous function did, and this thesis aims to facilitate this transition.

Urban redevelopment projects are generally done linearly, as the process of reusing the existing is much more complex than building anew is immediately considered when there is a need, as the mechanisms, roles, and expertise are already in place for the linear process to take place (Grisot, 2019). This linear process of building and redeveloping cities greatly puts pressure on natural resource extractions and does not account for possible reduced emission of Co2 that could result from an alternative process. Between 60 and 80% of the material, consumption can be attributed to cities, consuming up to 80% of the global material and energy supply and producing 75% of global carbon emissions (Camaren & Swilling, 2012). Additionally, 60% of a building's emissions are attributable to its construction phase, with the materials used for the structure accounting for as much as 40% (UN Environment Programme, 2020). Therefore, there is an urgent need to transform the ways of producing and redeveloping urban areas to stay within planetary boundaries.

The unsustainability of redevelopment projects, in social and environmental term especially, is a recurrent issue in the planning field, as new buildings are constantly being constructed, raw materials are increasingly extracted despite the finite amount, and natural land is being urbanized, while alternative processes for redevelopment could maximize the use of already built buildings, already extracted material and already urbanized land (Grisot, 2019). In linear redevelopment projects, three identified resources; temporal, material, and spatial, could be optimized through the application of circular urbanism (CU) approach. The goal of this thesis is therefore to propose a CU process for redevelopment projects, which includes the three loops of circular economy (CE) adapted to urban planning and focuses on intensifying, transforming, and recycling the existing. The researchers of this thesis argue that three resources in redevelopment projects would greatly benefit the neighborhood community if they were maximized and are presented in the following paragraph.

Figure 1: Temporal resource, own illustration

First, buildings are often singled function, meaning that they are not thought about in terms of temporality. Temporal resources are available while buildings are vacant meaning there is time in space, which could be useful, if properly synergized, to fulfill community needs for space. Instead of building a new structure to accommodate the community's needs, functions can be combined in the same space, for different times in a day. Additionally, the transitional time between old functions and new functions has the potential to be repurposed for other community needs. To illustrate, buildings are not generally used all day long during the week, and on the weekends, as well as during all seasons. Office spaces are used only during daylight, while community group meetings take place only in the evening, sometimes in specific buildings for that purpose (Grisot, 2019).

Figure 2: Material resource, own illustration

In linear redevelopment, material, buildings, and elements are often automatically demolished or thrown away instead of reused or repurposed because it's simpler and the mechanisms and legislation in place are made for use of new material and elements. There is limited expertise for an alternative process. Nonetheless, many elements and building materials could be reused or repurposed which would save embodied energy, free space in landfills, and reduce co2 emission. Maintaining heritage buildings also strengthens the community's historical attachment to the place while maintaining and occupying older buildings can also be more financially viable than building a new building (Gražulevičiūtė, 2006). This thesis grasps the opportunity to question the necessity of building from new and instead, to rethink the urban fabric in terms of the potential held by existing buildings, coupled with the potential to impact carbon emission and the uses of raw material (Grisot, 2020).

Figure 83: Spatial resource, own illustration

The third resource to scrutinize in linear redevelopment projects is land or spatial resources. Many spaces on-site that have been decaying, or of which functions have gradually been relocated, are vacant or underutilized. In the meantime, needs from some of the local community could be fulfilled on vacant but already urbanized land. Urban sprawl is a problem that afflicts most cities, as land on the outskirts of cities is easily accessible, creating environmental and social degradation (Grisot, 2020). Maximizing the spatial resource could be the opposite of sprawl, reusing this already urbanized land in the city, sparing nature from being urbanized.

The goal of the researchers behind this thesis is to create a design process that could help municipalities identify the three types of resources relative to CU on their territory, understand the needs of their communities related to these resources and create synergies between those needs and resources. Such applied circularity reduces the three types of possible 'waste', by maximizing their uses and therefore contributing to greater sustainability, for all pillars (social, cultural, environmental, and economic) in redevelopment projects.

This thesis takes place in the frame of the C40 competition 'Students Reinventing Cities', to be able to share the outcome of the research to a real-life situation, in the hope to contribute to the field, by

providing insight on a possible alternative way for the planning process of urban redevelopment projects. The framework provided by C40 fosters an opportunity for the team to present the findings of this thesis, and if the proposal gains sufficient attention by C40, the process proposed by the roadmap towards circularity in urban planning could be replicated and scaled to redevelopment projects in other cities that are part of the C40 network. Different municipalities part of the C40 network have identified areas for which they ask student groups to propose design ideas, and the Montreal case of the redevelopment of the Faubourgs is used as the case study for this thesis.

Montreal, Canada is quickly developing and has a current political climate that is favorable to circularity initiatives. Montreal is divided into different boroughs, but communities identify themselves as part of smaller neighborhood levels, which is the scale at which community needs have the greatest potential to be fulfilled. Neighborhoods are pivots in driving global sustainability (Boyle, Michell, & Viruly, 2018). The Faubourgs area is used as a case study to attempt to implement an alternative process to a redeveloping process, which would intensify, transform, and recycle as many available resources as possible. Montreal Municipality has recently undertaken a long and thorough planning exercise in the Faubourgs sector, getting input from more than 1000 people, to develop a community vision and plan for the future of the area (Urban Planning Department of the Ville-Marie Borough, 2020). This planning exercise capitalizes on the two main complexes of the area being relocated, both the industrial complex of the Molson Brewery and the institutional complex of the Radio-Canada national radio station. Montreal Municipality has embraced the opportunity to make sure that the redevelopment of this area is in line with the municipal intentions, and with the neighborhood community needs. The industrial history from the 19th century, combined with the sector rupture due to major urban renewal and highway construction operations between 1950 and 1980, highlights many wounds to heal while this change in functions is the opportunity to considerably improve the neighborhood (C40, 2021).

This thesis aims to answer the following research question: How can the design of circular urbanism by Montreal Municipality be a strategic driver for sustainability in the case of the Faubourgs neighborhood redevelopment? (RQ), which is explained in the conclusion of the thesis.

The theoretical framework aims at presenting how circular urbanism can be framed in a neighborhood redevelopment (sq1). This is conducted by a literature review and academic expert interviews.

The analytical framework aims at elucidating how municipalities can facilitate the design process of circular urbanism (sq2), where the roadmap is presented, emerging from the theoretical foundations of the previous chapter and adaptable to different contexts.
The analysis is then conducted to apply the analytical framework to the case of the Faubourgs neighborhood redevelopment. It is based on local expert interviews as well as plans and policy reviews, notably the *Plan Particulier d'Urbanisme* [Specific Urban Plan], which was created after an extensive public consultation process for the Faubourgs redevelopment.

The discussion following the application of the roadmap to the Faubourgs redevelopment is be concluded by the answer to What can municipalities learn from the application of the circular urbanism roadmap to the redevelopment of the Faubourgs neighborhood? (sq3).

And finally, in the conclusion, the main question is answered, about the strategic potential of the CU concept.

Some working definitions that will be used throughout the paper are relevant to highlight here. First, this project follows the American Planning Association definition of redevelopment, being: "redevelopment generally involves the development or improvement of an area that was developed at some time in the past but presently suffers from real or perceived physical deficiencies such as blight or environmental contamination or is developed for uses that have become obsolete or inappropriate as a result of changing social or market conditions" (American Planning Association, n.d.).

Then, as neighborhood communities have different needs that are not met (temporal, material, and spatial), while in parallel, much 'waste' is being produced, that could be considered as resources and used to meet those needs. For this thesis, the working definition for the neighborhood is "a geographically delineated sub-area of a city, where residents interact, share services and facilities and are connected to a broader system of neighborhoods under the umbrella of a city" (Zheng et al. in Boyle et al., 2018, p.2).

Circularity emerges as a legitimate concept to work towards urban sustainability (4.1.1), which is established in section 4.3, as closing the circuits of different urban resources are explained, economically through CE (4.2), scientifically through urban metabolism (4.2.1), socially through circular city theory (4.2.2). For a circular agenda to be implemented, cities have to adopt strategies orienting actions towards it, namely through strategic planning (4.1), often by detailing their sustainability plan for more precision about circularity. CU (4.3), despite not being consolidated in the academic sphere, combines three urban planning practices of multifunctionality (4.3.1), adaptive reuse (4.3.2), and urban regeneration (4.3.3), arguing that by intensifying uses, transforming the existing and recycling spaces, urban fabrication can greatly improve the sustainability of redevelopment projects.

1.2 Relevance of participating in C40 case competition for Montreal

Circularity at the urban scale in Canada is much less developed than in Europe (F. Scherrer, personal communication, April 30th, 2021). In part, because there is no significant private actor that pushes the research and development of the concept, but also as the public sector has started using the CE concept very late compared to their European counterparts. Currently, in Montreal, circularity is discussed almost exclusively at the service of economic development, and it is not applied by the local urban planners (F. Scherrer, personal communication, April 30th, 2021).

The team considered the competition as an opportunity to push the circularity agenda into an urban planning direction and create a discussion arena for politicians, planners, and C40 members. The thesis aims to help Montreal Municipality link CE and urban planning as is a new official priority for Montreal Municipality to incorporate and facilitate circular practices. The use of this case study aims at making the municipality aware that this circular approach to redevelopments can fit with the municipality's plans.

According to Scherrer (2021), there is a problem of maturity of the CE concept in Quebec but there is a potential for the scene to change very quickly, as in Quebec, compared to France for example, the society that can change very fast. Once there is an agreement towards a certain transformation, the process can be implemented rapidly, but it takes time to accept and understand the need to transform. Scherrer argues that the players are very conservative, but there are a lot of key elements already in place that can be mobilized (F. Scherrer, personal communication, April 30th, 2021), which provides a ground for the choice of this case study.

| 2 | RESEARCH DESIGN

In this chapter, the way this research has been designed is presented, guided by the main research question and the three supportive sub-questions, providing an overview of the focus of this thesis. The research design diagram is introduced making evident the connection of the thesis with design thinking and the iterative approach used. Lastly, a reflection on the theories of sciences which affect the way this thesis is conducted is presented.

According to the above-formulated problems, the main research question was developed, accompanied by three supporting sub-research questions. There are three explanatory questions (main RQ, SQ1, and SQ2) which "seek explanations or understandings of a situation, event, behavior, practice or policy or they seek predictions, assessments of the consequences of situations, events, behaviors, practices or policies" (Farthing, 2016a, p. 6) and one descriptive question (SQ3) which "seek for answers that describe a situation, event, pattern of behavior, or set of practices" (Farthing, 2016a, p. 6). The main research question is intentionally answered at the end of the thesis maintaining the interest of the reader and summing up the questions previously dealt with. Such practice can provide an overall summary and a complete picture of the research topic.

Throughout the thesis, design thinking was applied through an iterative procedure (see figure 4 Research design). The round shape of the research design translates that each chapter is iteratively informing the other offering a flexible and adaptable way of resolving generated issues through the improvement and consideration of different perspectives and resources.

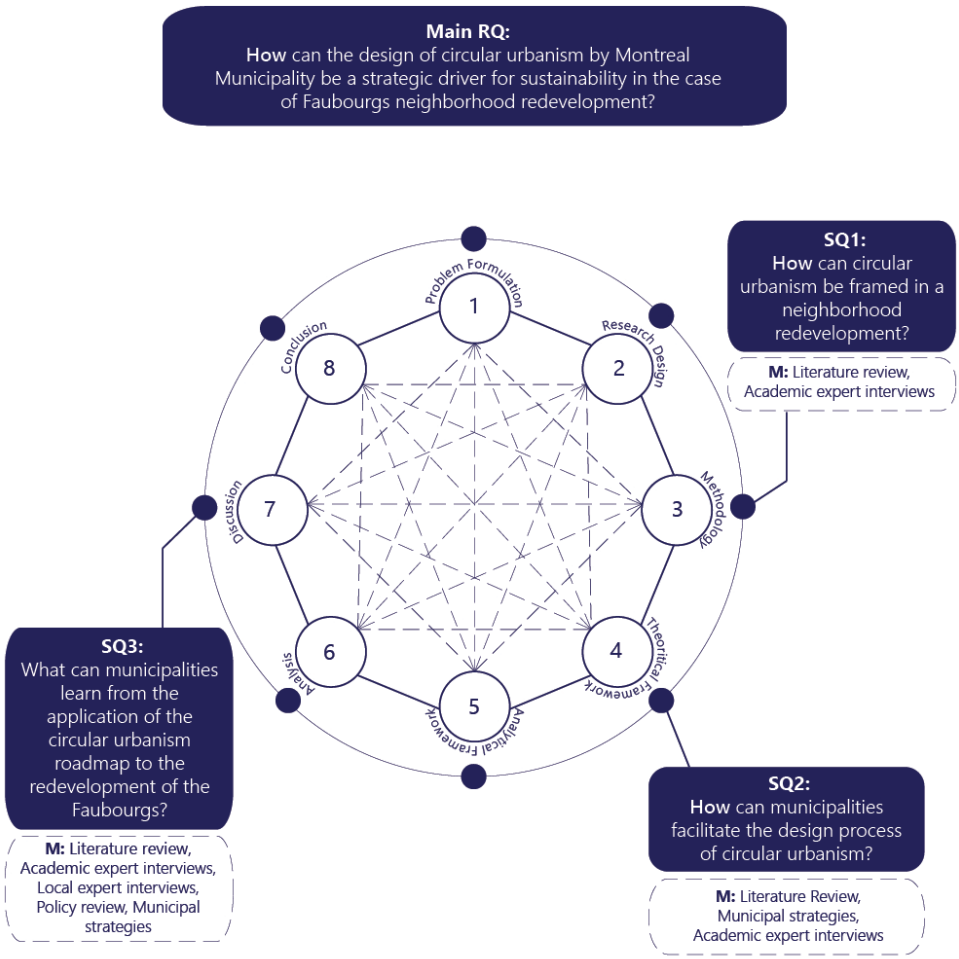


Figure 164: Research design, own illustration

The thesis is thereby carried out through the following main research question:

How can the design of circular urbanism by Montreal Municipality be a strategic driver for sustainability in the case of the Faubourgs neighborhood redevelopment?

As highlighted in problem formulation, communities at the neighborhood level have a number of needs that are not met, while in parallel, 'waste' generated in the urban context, in terms of time in space, material, and land, can be considered as a resource, and used circularly to meet these needs. To answer this question, a close investigation of the Faubourgs case study is necessary to understand the complexity of the area and the contextual dependent elements. Such investigation is supported by interviews of local experts as well as by literature and review of policy and municipal strategies.

The first sub-research question aims at building a common vocabulary and provides an understanding of the theories used throughout the thesis:

How can circular urbanism be framed in a neighborhood redevelopment process?

The complex and interrelated theories of CE, urban metabolism, and circular cities help the elaboration of the concept of CU, as it is not consolidated in academia, while the concept is being consolidated by the translation of the three loops in terms of multifunctionality, adaptive, reuse and urban regeneration. The theories shape an academic background and identify the existing gaps in the literature. Hence, the need for the creation of strategic planning for municipalities to facilitate CU in urban redevelopment projects is highlighted by the bridging of the different elements presented as important in the different described theories. To answer the first sub-question in the theoretical framework chapter, an extensive literature review is conducted in combination with interviews with academic experts.

After the comprehension and assimilation of the various theories with the creation of the theoretical framework, the second sub-research question aims to answer:

How can municipalities facilitate the design process of circular urbanism?

The identification of key concepts highlighted in the previous sub-research question help to ensure that the central issues and the key aspects referred to on the theoretical framework are addressed in the design process of the CU roadmap. In the analytical framework, an eight steps roadmap is developed to facilitate the understanding and application of CU for redevelopment projects. Each step is elaborated thanks to inputs from interviews from local and academic experts, and points highlighted in the literature. Furthermore, municipal strategies from other cities also influenced certain steps of the roadmap.

In the subsequent chapter, the CU roadmap, presented and extensively described in the analytical framework, is applied to the case of the Faubourgs neighborhood redevelopment in Montreal. The analysis arises from the combination of the information collected from interviews with local experts paired with the analysis of municipal plans, namely the *Plan Particulier d'Urbanisme (PPU) [Specific Urban Plan]* that influenced the outcome of this chapter leading to the third sub-research question:

What can municipalities learn from the application of the circular urbanism roadmap to the redevelopment of the Faubourgs neighborhood?

The implementation of the CU roadmap to a specific context aims at iteratively improving the steps to advance the possible comprehension of the CU process. A reflection is then presented to highlight various barriers and limitations for the application of the roadmap, and reflections related to transferability, generalization, context-dependency, feasibility, and practicability of the process.

2.1 Theories of Science

The way this research was shaped, the intention of the researchers, the way data were used, and how it was accounted for by the two researchers greatly impacted the research, as explained in this chapter.

First, the researchers had a discussion, very early in the semester, about the interest in finding a way to make the most of this research project, the interest being that the topic had to be something relevant to the pragmatic planning world, producing a piece of research that had the potential or the opportunity to contribute to something outside of academia. The opportunity that the C40 competition brought was fulfilling exactly that purpose, was enabling the possibility to share the knowledge gained through this semester-long research, sharing the concept of CU to a wide network of municipalities and planning actors. This early desire and realization fit in the pragmatic paradigm. The researchers have, therefore, in parallel to this thesis, presented the result of the analysis and proposed a very context-dependent solution for Montreal Municipality, that results from the application of the CU roadmap to the case study, again confirming the pragmatic research approach.

This project, therefore, follows Flyvbjerg's instructions for critical planning research that matters as it suggests three important components; that researchers should approach 'real-world problems, meaning 'problems that matter to groups in the local, national, and global communities in which we live should be addressed' (Flyvbjerg, 2006, p. 284), that "researchers should engage with values" (Flyvbjerg, 2006, p. 284) and that research should participate in policy debates so that 'the results of research should be communicated effectively and dialogically to fellow citizens and their feedback should be carefully listened to" (Flyvbjerg, 2006, p. 284).

It is important to highlight that our case study makes the research very context-dependent, as well as the questions that arose during the various stages of this research that guided our research. Therefore, the philosophy of pragmatism that emphasizes the fact that research should be guided by the research questions, is being used. Feilzer (2010) argues that pragmatism as a research paradigm supports that a continuous cycle of abductive reasoning is primarily guided by the researcher's desire to produce socially useful knowledge. In abduction, researchers ''move back and forth between induction and deduction—first converting observations into theories and then assessing those theories through action'' (Morgan, 2007, p. 71). Saunders et al. (2009) argue that a mix of philosophical positions and methods can be used as long as they conjunctively support the answering of the research questions.

Deductive reasoning is the most common view of the nature of the relationship between theory and social research according to Bryman (2012). The description of the deductive approach explains well the process of the researchers for this thesis as "researchers draw on what is known about a particular domain and on relevant theoretical ideas to deduce a hypothesis that must then be subjected to empirical scrutiny" (Bryman, 2012, p. 23). In this thesis, theoretical research led to the elaboration of the CU roadmap, which was then scrutinized through the application of the roadmap of the Faubourgs redevelopment in Montreal. Then Bryman adds "embedded within the hypothesis will be the concepts that will need to be translated into researchable entities", which in this context are the different steps of the roadmap, also being the analytical framework (Bryman, 2012, p. 23).

Nonetheless, the focus of the thesis relies heavily on the actor's perceptions, but the belief is that the team's interpretation of CU processes can be improved by the support of our understanding through the chosen theoretical perspectives. The nature of our project is exploratory, as CU is a recent and not-so-known adaptation of CE in urban process research and practice. The research approach is based on abductive reasoning, where an understanding of a phenomenon is supported by being reflected in relevant theory and supports the teams understanding of the involved actors' perceptions and the processes in general (Saunders et al., 2009).

This project is following a design-thinking process, and "design thinking relies on abductive reasoning as an effective way to alternate intuitive and deliberate actions, [it] is a form of logical inference which starts by observing, followed by searching for the simplest and most likely explanation, refining it until the solution is considered sound" (Diderich, 2019, p. 15). The researchers started with an "incomplete set of observations and seek[ed] the simplest and most likely solution" (Diderich, 2019, p. 15). The first draft of the solution, in the case of this thesis, the CU roadmap, was then improved upon through inference until the researchers were satisfied that it could be considered a strong solution. To the contrary of deductive reasoning, this process of abductive reasoning implies that the researchers did not assume that "the solution is contained in the premises of the problem" (Diderich, 2019, p. 15). The researchers for this thesis have followed an iterative process, meaning they have adapted each step of their process from the results given in the following step, and the solution, the development of the roadmap, as well as the result of the analysis, were not contained in the premise of the problem but were rather discovered because of the analysis steps.

Recently, design thinking has become a mainstream wicked problem-solving approach. Based on abductive reasoning, a formal logic of inference starts with observing and identifying the nature of the desired value to achieve and seeks simple and most likely explanations (Dorst, 2015 in Diderich, 2019). Through the followed iterative process of designing and validating at different stages of the analysis, and of the elaboration of the roadmap, the research team combined exploratory and confirmatory phases in an iterative way (Diderich, 2019).

Additionally, the researchers develop a potential process derived from the key points of the theoretical framework, that can also be considered as a hypothesis, which was then tested on a single case study, to then try to infer from that application on a single context the generalizable elements, while at the same time highlighting the context-dependent elements, it supports the deductive part of the abductive reasoning.

The research was designed in a way that different interviews build on top of each other's inputs and added different insights, knowledge, and theories that influence the course of the research. For example, the interview with Mammone highlighted some planning tools to secure partnerships, which we then asked Sigouin to confirm or infirm, where she explained that this tool was not known from the

Montreal politicians or planning department, but instead a different tool (PPCMOI) had similar outcomes. This process also comes to complement the iterative, therefore abductive reasoning of the thesis.

As this project develops a strategy for CU in the form of a roadmap, derived from theories in combination with value-driven data from interview partners, as well as our knowledge, the project inscribes itself in a post-positivism. Our project follows a post-positivistic approach as the main features are the fact that values help shape the process of research, that the ways we chose to frame and conceptualize our project was chosen and driven by values and political context, that the knowledge used and produced is socially constructed and that we are quite a skeptic about the certainties of our research findings (Farthing, 2016c). The researchers agree that observations and data analyzed are theory-laden and that researchers are inherently biased by their cultural experiences, world views, and values. The researchers access what is the truth and only will retain and analyze the information that they believe resonates with their comprehension of the truth, of the reality.

| 3 | METHODOLOGY

The methods used for data collection are presented and explained in this chapter. Methodological approaches such as literature review, case study, document analysis, academic, and local experts' interviews as well as collaborative analysis of qualitative data are presented in the chronological order used during the research project. The different methods adopted gathered the necessary data to answer the research questions.

3.1 Literature Review

A literature review is conducted to gain a better understanding and a new perspective of the topic under investigation, enhance and set a common vocabulary of the subject, and help to delimit the research problem (Randolph, 2009).

First, the interest in researching CU arose from the researcher reading of the book *Manifeste pour un urbanisme circulaire: Pour des alternatives concrètes à l'étalement de la ville'* [Manifesto for a circular urbanism: For concrete alternatives to the sprawl of the city] written by Grisot in 2020. It is important to mention much information about CU used in this thesis was taken from the book, as CU is not a concept consolidated in academia. The validity and reliability of this source, as not peer-reviewed to the same extent as academic papers, were accessed based on the author's expertise and role as a planning professor and researcher at the University of Nantes in France.

An overall assessment of the published articles mentioning 'circular urbanism' was made, leading to the researchers' realization that the concept was not yet academically consolidated, as no mention of the term 'circular' and 'urbanism' jointly were providing results. Other similar combinations of words or concepts that had similar definitions were discussed in papers, but no mention of 'circular urbanism' as a whole appeared on scholarly research platforms. To overcome the obvious novelty of the concept in academia, the thesis is supported by a traditional review of publications related to various theoretical concepts such as sustainability, CE, urban metabolism, circular cities, multifunctionality, adaptive reuse, and urban regeneration. The sources were carefully assessed, contributing to the creation of an overview of the concepts within the published literature on adjacent concepts. Other documents used and critically analyzed for the elaboration of the theoretical framework are scientific peer-reviewed articles and official reports.

Through the careful review of the literature, a basis of the state of the research was developed, identifying the gap in the literature, and establishing the need for further research concerning the urgent need for the development of strategic planning to facilitate CU for municipalities. Furthermore, the literature review helped the group with creating the research questions and setting the delimitations of the thesis, as well as supported the elaboration of a majority of the steps of the roadmap.

3.2 Case Study

As mentioned in 2.1 (theories of science), a case study is used to deductively test the hypothesis, here the roadmap proposal, which is then subjected to empirical scrutiny. Montreal's Faubourgs redevelopment case study is in this context the empirical frame to help scrutinize the proposed roadmap, to test, and improve the different steps, in an iterative way. The case study research conducted for this research project aimed at analyzing the potential for CU, the theory proposed. The use of a case study method is to test the developed process proactively and pragmatically for applying circularity in the redevelopment process.

According to Yin (1984)," a case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not evident" (Yin, 1984, p. 23). This definition resonates with this thesis as the researchers investigate the potential of CU as a strategic intervention for urban redevelopment projects, in the specific case of the Faubourgs redevelopment project in Montreal. By the analysis of the Faubourgs context, the researchers aim at gaining context-dependent knowledge to iteratively modify the roadmap. As researchers, we are careful about summarizing with only one case study (Flyvbjerg, 2006) and put forth that different regulatory and cultural contexts could bring very different outcomes.

The unsustainability of redevelopment projects, in social and environmental term especially, is a general issue in the planning field, as new buildings are constantly being constructed, raw materials are increasingly extracted despite the finite amount, and natural land is being urbanized, while alternative processes for redevelopment could maximize the use of already built buildings, already extracted material and already urbanized land.

Therefore, the choice of redevelopment case to examine could have been random, as most redevelopment examples could have been useful to test the roadmap and would have provided a strong basis for drawing conclusions, highlighting generalizable elements as well as context-dependent ones. As explained in the problem formulation (section 1.1), the case choice was based on the C40 competition 'Students Reinventing Cities', where 18 cities have proposed a case study. This thesis focuses on the case study of the South section of the Faubourgs neighborhood in Montreal, in the province of Quebec, Canada. By choosing a case from the provided sites of the competition, the researchers capitalized on the potential of being able to share and influence real-life urban planning. An example is the knowledge sharing taking place during interviews with local experts, as the researchers contributed to the spread of the concept of CU, and to the potential of it being increasingly considered as a possible process for redevelopment projects. This was made possible as the interviews with local experts started as discussions about CU as an innovative process and the possibility to apply CU theory for the redevelopment project of the Faubourgs to set the scene for the following discussion.

The specific choice of the Montreal case emerged as one of the researchers is originally from that city, facilitating a better understanding of the planning and cultural context, as well as practically providing facilitated contacts with existing networks of possible interview partners. To sum this up, the choice of case is pragmatic, capitalizing on one of the researcher's backgrounds and social capital to strengthen the possibilities of a useful piece of research. It can be said that the case was selected based on convenience. The choice of Montreal between other cities provided by the competition was also based on the preliminary knowledge of the researcher from Montreal, that the political and cultural context there is currently favorable to sustainability, and to some extent to circularity, but that any help to

facilitate the circularity process would be well received by the municipality, which also was the receptor of the competition submissions.

The current COVID-19 pandemic did not allow the researchers to visit the case study site, partly hindering the abilities of the researcher to get a sense of the situation nor allowed the researchers to get a first-hand experience nor to meet with the local population for local workshops. This case study research was conducted from a distance, but methods to alleviate the described shortcoming were adopted. Greater proximity with the site might have allowed a more specific analysis of the case, but given the time limit, the analysis was conducted only to a certain depth and a municipality that wishes to apply more concretely the roadmap will, of course, have a better grasp of the context. Therefore, the fact that the researchers were not on the site did not, in the opinion of the researchers, alter the iterative process of designing the roadmap, nor the application to the case study to iteratively improve the roadmap.

Three of the five misconceptions highlighted by Flyberg (Flyvbjerg, 2006) are particularly relevant to challenge in the case of this research project. For the second misconception, the researchers of this thesis believe that there are some possibilities to generalize some elements based on this single case, which contributes to the scientific development of CU theory. Additionally, the researchers of this thesis believe that the case study is suitable for hypothesis testing and theory building, as Flyberg's 'misunderstanding 3' contradicts the misconception that "case studies are most useful for generating hypotheses" (Flyvbjerg, 2006). In this thesis, the case study is used to test the feasibility, relevance, completeness, and usefulness of the proposed roadmap. About the fifth misconception highlighted by Flyberg (2006), the researchers argue that the specific case study of the application of CU to the Faubourgs redevelopment provides ground for the extraction of general propositions.

It is also important to highlight that the use of the case study in this thesis helped the researchers refine and improve the roadmap iteratively. The steps of the roadmap were thought about with the help of figuring out how could that be done on our case study. The researchers attempted to achieve all steps, to the best of their abilities and accounting for the fact that the researchers are not the implementation planners for the specific case, but rather testers, to improve the roadmap to make it the most effective, clear, and useful for a real-life implementation by context-specific actors. When an obstacle arose in the analysis of the case study, or when a step initially thought about did not make sense, was not clear, or required division to better be able to apply the step, then the researchers would edit the roadmap to make it researchable. This explains the very iterative role that the case study played in the elaboration and improvement of the roadmap.

3.3 Document Analysis

In qualitative research, a wide spectrum of documentation can be analyzed. Records of particular significance in planning research are containing both written and visual elements like photographs, maps, plans, diagrams, and official statistics (Farthing, 2016b). Diversity of document types can assist since "the researcher uncovers meaning, develop understanding, and discover insights relevant to the research problem" (Merriam, 1988 in Bowen, 2009, p. 29). They can be perceived as the 'physical traces' of social life and practices since they are "socially defined, produced and consumed" (Coffey,

2013, p. 5), providing a deeper understanding of the social, institutional and organizational setting (Coffey, 2013). According to Bowen (2009), documents provide diversity and mixture of purposes in research, highlighting the significance of five specific functions following as: "documents provide background and context, additional questions to be asked, supplementary data, a means of tracking change and development, and verification of findings from other data sources"(Bowen, 2009, p. 30). He further stated the effectiveness of data gathering through documents when observations are no longer available or specific details have been forgotten (Bowen, 2009).

The benefit of rich local understanding can be combined with the specific function of documentary material, providing data on a specific context helping the researcher acquiring a deeper knowledge of the place's history and local elements (Bowen, 2009). Moreover, the generation and reading of documents is rarely an isolated and stand-alone procedure since they are generally created, developed, and used in a close relationship and combination with other documents (Coffey, 2013). Hence, the collection and analysis of diverse types and forms of documents throughout the thesis were a critical, comparative, and combinatorial process helping the group obtaining deeper knowledge, recognition, and assimilation of the investigated topics. Taking into consideration the thesis's needs and the subjects under examination extensive research, understanding, and analysis of relevant literature was fundamental for the improvement and synopsis of theory and know-how, the group's habituation with the ongoing developments, the identification of new research areas, the evaluation of the application of the research questions and the establishment and description of compatible methodologies (Dakduk & González, 2018).

In this thesis, public records such as organizational and municipal documents were read, to form an understanding, and to be critically analyzed. The majority of the documents were found online mainly on the municipality's webpage and the data room created and shared by C40. The careful analysis of documents focusing on what they represent and for what they are used to achieve helped the group in "[…] paying attention to the knowledge that documents 'contain' about a setting, but also examining their role and place in settings, the cultural values attached to them, their distinctive types and forms" (Coffey, 2013, p. 5).

Furthermore, the main document analyzed was the *Plan Particulier d'Urbanisme des Faubourgs* (PPU) [Faubourg's Special Urban Planning Program]. A PPU is an official document and a planning component defining an overall vision for certain areas and specifying the planning intentions and development interventions. The PPU includes a summary of the characterization of the territory, an analysis of the main issues, and a more detailed analysis of sections of the territory including a historical description, a state of the current situation, and an analysis of the specific issues of these sectors (Urban Planning Department of the Ville-Marie Borough, 2020). The careful analysis of this document helped the group to get an overall understanding of the current situation, the surrounding context, and the deficiencies in the Faubourgs area.

Additionally, various types of maps were studied and analyzed. Google Map was of great importance in the thesis since the group could visually visit the site and search, understand, highlight and identify the area and its context, as the Covid-19 pandemic and the global travel restrictions did not allow the researchers to go on site.

A close investigation of background papers such as population data, housing, immigration rate, tables, graphs, statistics, demographics, etc. was fundamental for the understanding of the local context contributing to their adequate involvement and consideration in redevelopment projects.

Secondary data and documents are complementary and especially with the use of interviews, a better and deeper understanding is established concerning the aim of the thesis (Farthing, 2016).

Lastly, an analysis of the background paper referred to the 2001 and 2016 Census of Population in the Faubourgs neighborhood was realized (Montreal Municipality, 2018), acquiring a wide knowledge of the local community values and the local cultural context (Vanclay, 2003). Hansen & Johnstone (2019) argues that "[…] to understand a present situation and predict scenarios for the future you cannot find the answers by looking at the past, but rather need to make a point of departure in the current state of a community" (Hansen & Johnstone, 2019, p. 486). Hence, a careful selection and a summary of baseline data and community issues and attitudes were made, related to the context and the scope of the thesis, leading to the development of a community profile and assisting the group with the identification of demographic, economic, housing, etc. characteristics.

3.4 Academic and Local Experts' Interviews

Five semi-structured interviews were conducted to gather qualitative data for both the understanding of CU theory, but also to build a contextual understanding of the case study, in which the roadmap is implemented, to iteratively improve it.

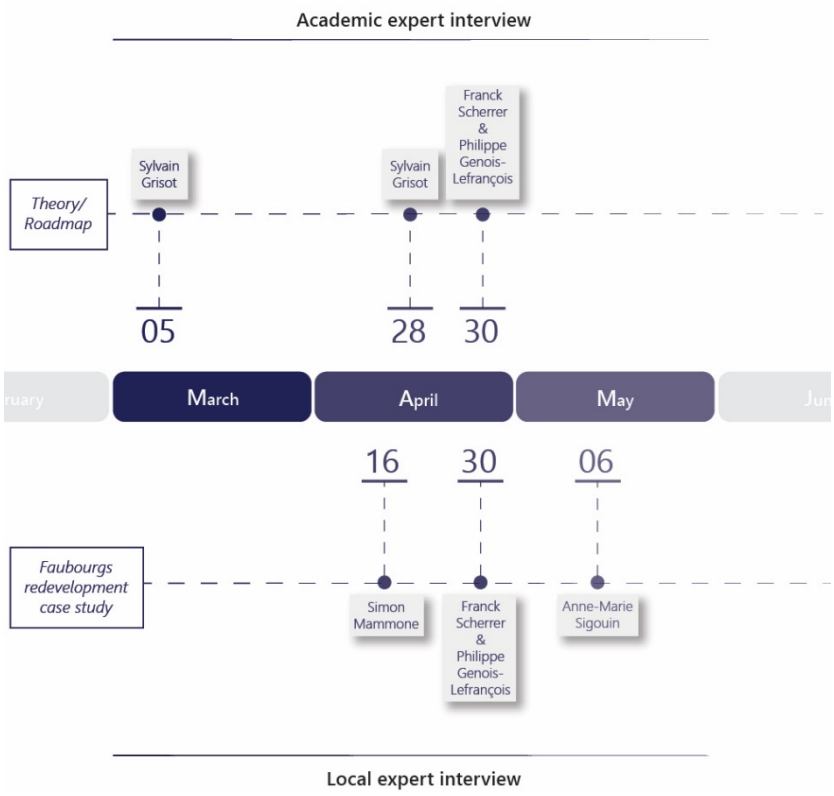


Figure 5: Interview timeline, own illustration

Farthing (2016) highlights the different types of interviews given their variation in the degree of structure, which "relates to the degree to which the interviewer has control over the topic and the specific questions asked in the interview" (Farthing, 2016, p. 5). As the researchers' aim is not to have the entire control over the interview, but rather to guide the discussion towards topics of particular interest, a semi-structured interview guide was used in each conversation, providing the interviewer with freedom and flexibility to elaborate on past experiences and knowledge of the specific context.

As visually represented in figure 5, the procedure of organizing and conducting the interviews started in March and lasted until May. The interviews can be divided into two categories, the first one being interviews that helped the theoretical foundation of the thesis, and the elaboration of the roadmap with the main elements of those theories, and the second category is the interviews with interviewees that had knowledge about the Faubourgs redevelopment or the Montreal context of

circularity. Academic experts from the field of CE, CU, and urban planning, academia was contacted and interviewed helping to shape the roadmap and the theoretical understanding of the concepts and their applications. Local experts were contacted to help develop the researcher's application of the roadmap to the context-specific case of the Faubourgs redevelopment.

The order in which interviews were conducted is estimated to have had an impact on the research. When one information was gathered through an interview, then in the following interview, it was possible to ask for precision and approval or disapproval from another actor with perhaps the same, or a divergent point of view, which provided a source to validify the interview data. Many points that are presented in the analysis have been verified by another interviewee. The fact the last interview conducted was with an elected official, working on the Faubourgs area, and very knowledgeable of circularity provided strong validation to the data as her expertise and knowledge can be considered of strong validity, allowing to conclude the data collection with high validity, encapsulating a lot of points raised by previous interviewers.

In all interviews' possible partners, planners, municipal elected official, and planning academics were reached by e-mail with a short-written description of the overall scope and goal of the thesis, and a clear request on what the researchers considered their input could be, and how it would be useful to the thesis and the competition (see Appendix 1). Out of the 10 persons or groups contacted, 5 experts offered to participate in the interview (see Appendix 2), through a digital platform, ensuring the consent of the interviewee to be recorded to facilitate future transcription. Two of the people contacted referred the researchers to another person considered to be able to answer better the researchers' questions. The two contacts made by this snow-ball technique enabled two of the 5 interviews, therefore were very productive. A majority (3 out of 5) of the interviews were conducted in French, as each interviewee was offered to speak in their language of choice, between French and English. The result of the interview is expected to have been more fluid and conducive in their mother tongue language. The team then transcribed the interview and translated it, to the best of their abilities, some nuance can have been erased through the translation, but the transcription text was reviewed to make sure the quality of the qualitative data was maintained (see Appendix 3). In the following days after the transcription, they were thoroughly analyzed and organized by themes, for each step of the roadmap. When an interesting point would come up, that proved to be relevant, but that was not yet included in the roadmap so far, a new step was drafted, which again reinforces the iterative design of the research.

The interviews were held following a general structure and guidelines. According to Kaiser (2014), a guideline is assisting the data collection but also is creating thorough interview questions capable of highlighting and translating the particular research problem and theoretical assumptions. The guidelines were somehow different for the two groups of interviewees, as theoretical and practical interests required different themes to be raised (see Appendix 4). All interviewees were asked their professional roles, but then the theoretical interviewee questions differed from the local interview which was then asked about the context of the Faubourgs, the current state of circularity in Montreal, and the application and feasibility of the CU roadmap, several sub-questions were developed and adapted according to the individuals interviewed.

The interview partner chosen is considered as experts, for each of their roles in either the theoretical development of the concept, such as Grisot, the development of circularity in Montreal, such as Scheer and Genois-Lefrançois, or their active and important role in the Faubourgs area, such as Mammone and Sigouin. As Farthing highlights, "interviewees are key players, who, because of their

position, and their participation in the rather complex processes, are assumed to be authoritative sources" (Farthing, 2016, p.163).

The interview partners are here introduced with a description of their role and their contribution to the elaboration of this thesis is presented.

Sylvain Grisot – Author of *Manifeste pour un urbanisme circulaire : Pour des alternatives concrètes à l'étalement de la ville* [Manifesto for a circular urbanism: For concrete alternatives to the sprawl of the city]

Sylvain Grisot is an urban planner from France, associate researcher at the University of Nantes as well as running the consultancy and innovation agency Dixit, for the transformation of the city, focusing on CU. He regularly works in the "Sustainable City Design Lab" of the Nantes-Atlantique School of Design. He often engages in construction projects at the city level, supporting the transition of the urban fabric through CU. His book 'Manifesto for circular urbanism: For concrete alternatives to the sprawl of the city was the group's first inspiration for this thesis, adapting the concept of CU to this specific case study and developing a roadmap to facilitate CU's use in planning.

Two interviews were conducted with Grisot, one more theoretical, and the later one to discuss and confirm or infirm the research so far achieved, and have a discussion about the roadmap, potentially to add or modify steps, as the researchers had a much greater comprehension of CU and had drafted the first version of the roadmap by the time of the second interview. The first interview was conducted through Zoom on March 5th, 2021 and lasted 55 minutes. The main aim of this first interview was to further our comprehension of the concept of CU and discuss avenues of methodologies. The second interview was conducted through Zoom on April 28th, 2021, it lasted 1h15 and aimed at discussing our theoretical framework and the first step of our roadmap.

Simon Mammone – Development Manager at Groupe CDH

Simon Mammone is a planner and urban designer who graduated from McGill University in Montreal, Canada. He has experience in spatial planning, urban design, and public engagement in Canada and abroad. His field of knowledge expands from real estate development to affordable housing policy, including matters of equity, heritage, and SD. Currently, he is a Development Manager in social housing cooperation involved in the redevelopment of the Radio-Canada site, in the Faubourgs neighborhood. His input permitted the researchers to acquire knowledge about the context, the local needs, and local insights from the planning sector in the area.

The interview was conducted through Zoom on April 16th, 2021, and lasted 52min. This interview aimed at gaining a better understanding of the different actors on the redevelopment project, as well as to define the needs of the community.

Franck Scherrer – Urban planning professor and researcher, Philippe Genois-Lefrançois – PhD student

Franck Scherrer is a planning professor in the School of Urban Planning and Landscape Architecture at the University of Montreal and the director of the summer school: "City, territory, circular economy". He works in the laboratory called *Le Lab Prospective* [The Perspective Lab], mainly on transitional urbanism and how to anticipate better the possible futures of societies in the face of transition as well

as the territorial deployment of CE. As a planning professor and circular researcher in Montreal, his deep understanding of the planning context and his knowledge of the current state of CE in Montreal is the most precise, which is a great asset for this research.

Philippe Genois-Lefrançois is currently a Ph.D. student in the Faculty of Planning at the University of Montreal, researching the relationship between the urban environment and the territorial deployment of circular strategies. He is working with Franck Scherrer on projects related to the topic of interest which is the reason why Scherrer invited him to join the discussion. Since 2017, he is a research assistant at the Institute for the Environment, Sustainable Development, and the Circular Economy. His doctorate focuses on the intersection between urban metabolism and the socio-technical transition of urban planning.

The interview was conducted through Zoom on April 30th, 2021, it lasted 1h35 and aimed at better understand the state of CE in Montreal, the principles of CU, the roadmap, and Montreal urban planning context (actors, dynamics, tools).

Anne-Marie Sigouin → Montreal Municipality Councilor

Anne-Marie Sigouin is a politician in Montreal, serving as a Municipality councilor in the district of Saint-Paul–Émard–Saint-Henri-Ouest in Montreal. She was first elected in the 2013 municipal elections, as a member of the Project Montreal Political party, and then re-elected for a second time in the 2017 elections. She is also a designated councilor on the Ville-Marie borough council, the borough where the case study is located. She additionally chairs the urban planning advisory committee of her borough since 2013, making her very knowledgeable about planning questions in Montreal. She participated in several meetings about the redevelopment of the Faubourgs area, participated in the analysis, comments, and opinions presented during the elaboration of the PPU des Faubourgs. Additionally, as the head of the Commission of Culture, Heritage, and Sports, she works on the enhancement of buildings and heritage sites, in their rehabilitation when they have been vacant for a long time, or when they are put to new uses, which are all linked to CU.

The interview was conducted through Facebook Messenger on May 6th, 2021, it lasted 45m and aimed at understanding the political and local context of the borough of Ville-Marie, the municipal actors involved in the redevelopment project in Faubourgs, and the overall process. As a politician, her knowledge of the local context of Ville Marie and particularly of the Faubourgs neighborhood and her input on the municipal processes was very valuable for the group and also infirmed or validated some data collected in previous interviews.

3.5 Collaborative Analysis of Qualitative Data

Taking into consideration and recognizing the complex issues the thesis is carrying out, collaborative analysis of qualitative data is adopted as a method with various benefits. According to Cornish et al., (2016), knowledge can be gained by the integration of various perspectives provided by multiple researchers enhancing, in that way, trustworthiness and limiting individual biases. Hence, collaborative data analysis can be described as a method in which more than one researcher is engaged in a multidisciplinary research project offering the opportunity of formulating and establishing new ideas

through different viewpoints on the same issues (Cornish et al., 2016). The authors further claim five methodological benefits linked to this method (inter-coder reliability; incorporating rich local understandings; perspective-transcending knowledge; reflexivity; useful knowledge) suitable for gaining multi-perspective knowledge about the research's topics (Cornish et al., 2016).

After the careful examination of all five benefits, the benefit of incorporating rich local understanding was valuable, providing easier access and analysis of official documentation. In this case, since many documents, articles, and official plans are published in Canada, having a French-speaking group member was to a high degree helpful and time-saving.

Another benefit closely related to the specific context was the perspective-transcending knowledge which is evident due to the mutual effort and partnership of particular and distinct trained researchers. Hence, "perspective-transcending knowledge is an understanding of the situation that goes beyond the limited individual perspectives to the 'emergence' of a higher-level, more synthetic knowledge" (Cornish et al., 2016, p. 6). Accordingly, the combination of diverse viewpoints and perceptions through different group members is argued to provide an enhanced and more comprehensive understanding of the stated problems (Cornish et al., 2016). The interview transcriptions were, for example, analyzed by both researchers to make sure all relevant data, linked to the analysis of each step of the roadmap had been extracted from the transcription. The different backgrounds knowledge of the two researchers, superposed by this combined analysis of the transcription ensured that the relevant information was used in the analysis.

Furthermore, the benefit of reflexivity throughout the research process was identified through the implementation of intensive brainstorming sessions and peer-review of text. Particular perspectives are produced as a consequence of individual interpretations thus, "reflexivity about [the] ideological, theoretical and methodological predispositions is advocated as a step towards transparency" (Cornish et al., 2016, p. 7). Therefore, analyzing and reflecting upon an alternative perspective, questioning, and discussing the existing interpretation and presumption of reality was a great help for conducting this master thesis.

Additionally, the last benefit of a collaborative analysis of qualitative data is the creation of useful knowledge which is one of the group's biggest ambitions. The group members collectively attempted throughout the report to avoid "own peculiar languages, infused with assumptions, and embedded in historical traditions" (Cornish et al., 2016, p. 7) and focused on the creation of systematic knowledge, useful outside the limits of academia such as other practitioners, students, researchers, municipalities or even the general public.

| 4 | THEORETICAL FRAMEWORK

As the research topic is quite recent and complex, the theoretical chapter is helping to limit the scope of the analysis and the conclusion which can be derived from it. Therefore, the chapter focuses on a few concepts that are key for the understanding of the topic. The aim of the theoretical chapter is also to develop a vocabulary that is consistently used throughout the thesis.

First, strategic planning (section 4.1) is elaborated to explain how the overarching goal of planning for sustainability can be achieved (section 4.1.1). Then, the CE is described (section 4.2), with its different development of the concepts by different sectors of activity, namely urban metabolism for the technical aspects of flux (section 3.2.1), and circular cities for the more social aspect (section 4.2.2). CU is then explained as a recent theory, not yet consolidated in academia (section 4.3), that combined three concepts, all linked to the loops of CE adapted to CU, namely multifunctionality (section 4.3.1), adaptive reuse (section 4.3.2), and urban regeneration (section 4.3.3). Each theory highlights key elements that are carried out for the elaboration of the CU roadmap (section 5.2). The chapter is concluded by a synthesis of the different themes through answering the first sub-research question: How can circular urbanism be framed in a neighborhood redevelopment process?

4.1 Strategic Planning

Strategic planning can be defined as a series of "disciplined efforts to produce fundamental decisions and actions that shape and guide what an entity is, what it does, and why it does it" (Bryson, 1988 in Olesen, 2017). Albrechts (2017) argues that strategic urban planning has the potential to be transformative, contrary to conventional planning that maintains the existing social order (in Bolger & Doyon, 2019). Future actions can be planned through strategies and can balance multiple objectives and multidimensional processes (Hall & Tewdwr-Jones, 2011 in Bolger & Doyon, 2019). Strategic planning consists of orienting governance practices to developing an action framework for urban redevelopment in a certain direction (Bolger & Doyon, 2019). Local governments in context-dependent planning systems produce strategic planning documents and can inform researchers about the values and attitudes of the planning profession (Farthing, 2016d). Municipal strategic plans are often considered the primary documents describing a municipality's commitments and their path to reach the said commitments (Bolger & Doyon, 2019). Strategic plans can take many forms, but all aim to improve coordination and overcome isolated development. Governments can develop roadmaps and action plans, creating a communal vision with quantitative targets, associated with a "monitoring process to assess progress and impact of actions" (Zwiers, Jaeger-Erben, & Hofmann, 2020, p. 123).

Fisher & Forester (1993) have argued that a broader movement within policy analysis and planning theory has reconceptualized strategic spatial planning (in Olesen, 2017). Indeed, storytelling and strong storylines are integral parts of spatial strategies, as to be effective, strategies need to be persuasive. To mobilize the attention of actors around the core ideas that specific strategies are working towards, they have the transformative power to shape key actors' opinions, decisions, and action processes (Healey, 2009 in Olesen, 2017). The more recent theorizations about strategic spatial

planning emphasizes that spatial planning "is not just about the articulation of strategic ideas, but about persuading and inspiring many different actors, in different positions" (Healey, 2007 in Olesen, 2017, p. 980).

The timing for introducing a new strategy is important and "has as to be right to be worth the effort'" (Healey, 2009 in Olesen, 2017, p. 980). The success of a spatial vision in mobilizing support and slowly becoming embedded in the governance infrastructure of an urban area is often credited to a particular moment of opportunity in time and space. For an idea to be considered politically viable, sometimes a long process of attempts and incremental steps is needed. A strategic planning project can require a long process before it has the potential to gain sufficient political attention (Olesen, 2017). A monitoring phase should be put in place to track the state of advancement and potential critical issues that may arise during the implementation of the strategy plan (Longato, Lucertini, Fontana, & Musco, 2019), see roadmap step 8.

Bolger and Doyon (2019) have researched the role of strategic planning in facilitating CE in the urban setting to understand how local governments are promoting CE initiatives through strategic planning, the constraints, and opportunities to apply CE principles through local strategic planning. The authors argue that there is insufficient research on the role of strategic planning to transition towards circularity in the urban context and highlight the relevance to investigate strategic planning potential concerning the transition towards circularity (Bolger & Doyon, 2019).

Nonetheless, it is argued by Næss (2001) that CE can be useful for a municipality as a strategic driver to reach sustainability as long as strategic urban planning towards sustainability is goal-oriented, see roadmap step 1. Additionally, Högstörm et al. (2018) add that sustainability, being a multi-level challenge, requires current planning practices to be more collaborative (in Bolger & Doyon, 2019). Bolger and Doyon (2019) also highlight the link between studying the strategic planning potential to enable circularity by highlighting that the United Nations Planning Sustainable Cities report in 2009, recommended that urban local authorities should "implement a comprehensive set of policies and strategies that bridge natural and human systems in urban areas" (United Nations Human Settlements Programme, 2009 in Bolger & Doyon, 2019).

4.1.1 Sustainability

As it is common knowledge now, urbanization has exponentially grown in recent years, as humanity reached a milestone in 2008 when the urban population surpassed the rural one for the first time in global history (UNFPA, 2007). Due to this urbanization trend, the evolution of cities is linked to various negative impacts such as increased demand for energy and water resources, land use, transportation, and industrial and residential infrastructure (Allam, Dhunny, Siew, & Jones, 2018; Nevens, Frantzeskaki, Gorissen, & Loorbach, 2012). Hence, cities can be described as the places where the majority of unsustainable practices occur (Nevens et al., 2012) since they are accountable for almost 75% of the international resource consumption (Madlener and Sunak 2011 in Nevens et al., 2012). On the other hand, cities are the foundation for the creation and application of policies and decision-making on the daily basis (Nevens et al., 2012). Therefore, "[…] cities can even be considered as potential 'motors' for sustainable development (SD) or 'hubs' for extreme innovation" (Nevens et al., 2012, p. 112). Working towards sustainable practices requires the cooperation of numerous actors, with a similar agenda and cannot be accomplished in a silo, see roadmap step 7.

The concept of SD has various definitions as it is associated with different meanings and interpretations (Mensah, 2019). In this thesis, the Brundtland's Commission (1987) definition of SD is adopted reading as "[…] development that meets the needs of current generation without compromising the ability of future generation to meets their own needs" (WCED 1987 in Mensah, 2019, p. 7), see roadmap step 3. Taking into consideration the above-mentioned definition of SD, sustainability is discussed and distinguished by different themes or dimensions known as pillars (Alexandrescu et al., 2018). The 'three-pillar model' including economic prosperity, environmental conservation, and social equality, and justice is the most used, widely recognized, and common conceptualization of SD (Alexandrescu et al., 2018; Mensah, 2019). In this thesis, a fourth dimension -culture- is integrated into the concept of SD (see figure 6), as it is explained in section 4.3.3 adaptive reuse. To assess the impact of sustainability practices on the different pillars, evaluation of certain goals can be predicted to coordinate the agenda of different actors, see roadmap step 8.

Figure 6: Four pillars of sustainability, own illustration, source: Antonia Gravagnuolo et al., 2017; Guzmán & Roders, 2014; Loach et al., 2017

To research sustainability, a relatively recent concept that aims at maximizing the uses of existing resources to avoid extracting raw material is the development of CE theory. Circularity is archived by creating synergies between sectors, see roadmap step 5, allowing the output of one entity, to be the input of another, therefore increasing sustainability.

4.2 Circular Economy

To improve sustainability in different sectors, the recent rise of the concept of CE has the goal to work towards the reduction of the use of raw material in different sectors of society, a framework for closing loops of different processes. CE is, as defined by the Ellen McArthur Foundation (EMAF), the leading actor in the definition and development of CE, "an economy that provides multiple value-creation mechanisms which are decoupled from the consumption of finite resources" (Ellen MacArthur Foundation and McKinsey, 2015, p. 23). Based on key literature review, Geissdoerfer et al., (2017) define the CE as "a regenerative system in which resource input and waste, emission, and energy leakage are minimized by slowing, closing, and narrowing material and energy loops. This can be achieved through long-lasting design, maintenance, repair, reuse, remanufacturing, refurbishing, and recycling" (Geissdoerfer et al., 2017, p. 766). The slowing, closing, and narrowing loops are accomplished through synergies between different entities. The assessment of potential synergies at a

systemic level among actors or activities at a district and city scale is key in achieving CE (Nohra & Barber, 2019) see roadmap steps 5 and 7. To respond to the quest to achieve sustainability, some authors recognize that the interpretive flexibility of the sustainability paradigm can be used as a strength, allowing its adaptation to different contexts but others critique the blurriness that it greatly hampers operationalization. The concept of CE, on the other hand, as argued by Kennery et al. (2007) is often seen as more narrowly framed providing clearer directions for its implementation.

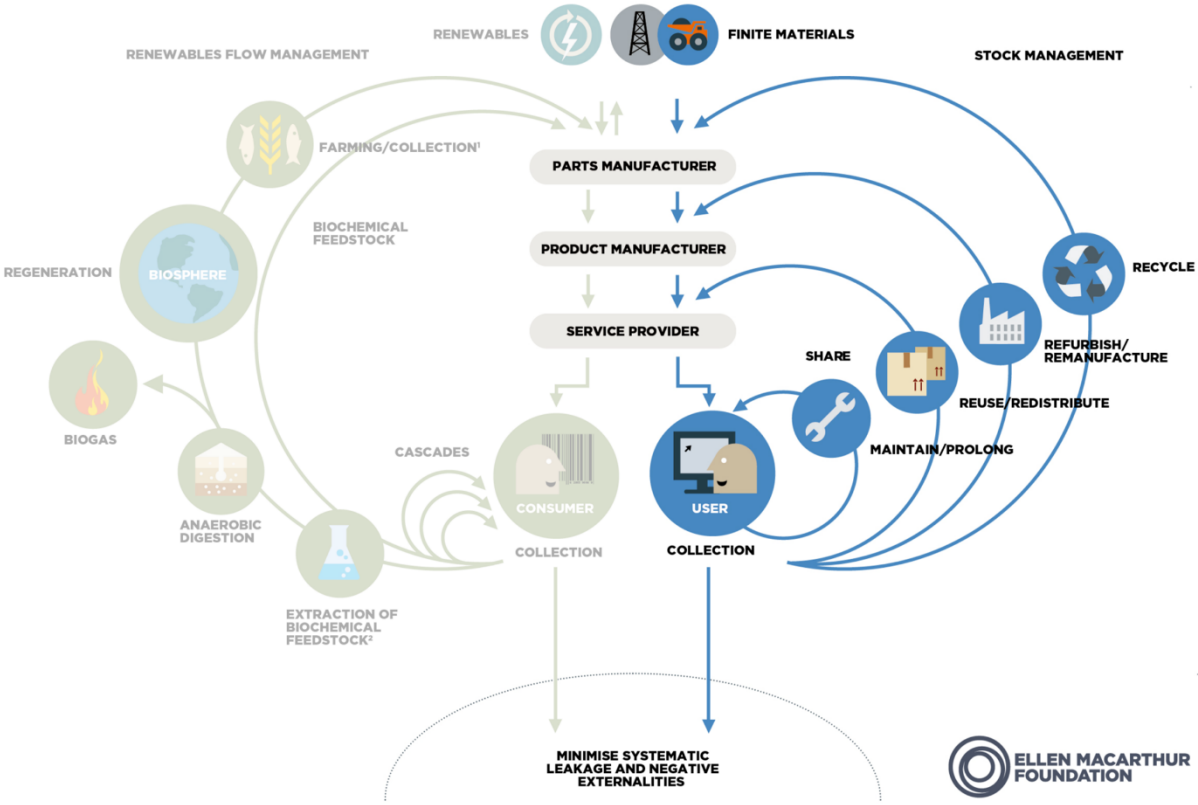


Figure 7: RESOLVE Framework for a circular economy, source: EMAF, 2015 in Williams, 2019

Already in 1966, the close-loop economical concept emerged from Boulding's work (Williams, 2019b). The EMAF developed a conceptual framework, namely 'RESOLVE' that specifies six actions that should be used to transition towards a CE (see figure 7). These steps are framed by Williams (2019) as such: (1) Regenerate: transfer to renewable energy and materials; regenerate ecosystems and return recovered biological resources to the biosphere, (2) Share: keep product loop speed low and maximize utilization of products, by sharing them among different users; (3) Optimize: increase performance/efficiency of a product; remove waste in production and supply chain; leverage big data; (4) Loop: keep components and materials in closed loops (re-use, recycle, recover, remanufacture) and prioritize inner loops; (5) Virtualize: dematerialize resource use by delivering utility virtually and (6) Exchange: replace products/services for lower resource-consuming options" (Williams, 2019, p. 2749).

CE is a model for production and consumption, which heavily emphasizes the production side, with the ultimate goal "to achieve the decoupling of economic growth from natural resource depletion and environmental degradation" (Geissdoerfer et al., 2017, p. 757). CE is gaining traction as a concrete tool to achieve sustainability in cities, but the similarities and differences between the terms of CE and sustainability remain ambiguous (Geissdoerfer et al., 2017). Academics, industries, and policymakers

are increasingly interested in the concept of circularity, and all of its realizations. The blur around their conceptual contour of both CE and sustainability (4.1.1) was studied by Geissdoerfer et al. (2017) to strengthen the uses' efficacy of using the approaches in research and practice and to contribute to conceptual clarity. Nonetheless, the relationship between the two terms is recognized as having positive repercussions since it maintains diversity while clarifying the full range of complementary approaches (Geissdoerfer et al., 2017). CE arose as an attempt to breach the widening gap between economic growth and environment preservation (Kennedy et al., 2007).

CE is not yet well adapted to urban context as it is "a framework for an economic system rather than an urban ecosystem" (Williams, 2019b, p. 2750). Obersteg et al. (2019, p. 20) support the same argument by emphasizing the non-spatial characteristics of CE being mostly oriented towards the "reorganization of enterprises, sectors and the economy". Girardet (2014) argues for a regenerative city concept which attempts to connect the concept of CE and urban development approaches. The inclusion of a social aspect to the implementation of CE in cities is highlighted by Williams (2019). Both authors argue for the need for effective governance to the success of replicating the CE process and consideration to cities (Obersteg et al., 2019).

CE, as described here, lacks in different aspects, which have been developed in recent here into the academic literature. Urban metabolism research has added to CE the scientific elements, while the circular cities agenda aims at adding the social elements to the understanding. These concepts cumulate to the development of an umbrella concept, the one of CU which tackles the proactive process to reach circular and sustainable cities.

4.2.1 Urban Metabolism

To complement the CE concept, urban metabolism translates it in terms of inputs and outputs of flux - water, energy, and waste. Urban metabolism is used as a metaphor for the resource consumption of cities, as it requires the input of energy and materials to exist and grow just like a living organism, and produces waste (Wolman, 1965). Urban metabolism research includes systematic studies of the inputs, outputs, and storage of energy, water, nutrients, materials and wastes for an urban region" (Kalmykova & Rosado, 2015). Over the last decade, going beyond merely pushing a circular agenda in the creation of new business models and economies within the urban context, various concepts have been advanced concerning resource consumption and flows of materials, see roadmap step 4. It is in 1965 that the term was first delineated by Wolman who first developed the approach as a comprehensive one. The author aimed at understanding the flows into and out of cities and has since been adapted with the addition of social and economic aspects in the more recent development of the concept (Wolman, 1965). Recent authors have also added to the concept by proposing concrete guidelines to build and redevelop cities more circularly (Kennedy et al. 2011 in Obersteg et al., 2019).

The urban metabolism approach, despite being quite comprehensive and still evolving to encapsulate increasing partnerships to refine its holistically, provides quantitative data to reduce the environmental impacts of cities. As urban metabolism is the scientific translation of economic-oriented CE, it remains faulty to provide guidelines for the process that could help policymakers and practitioners to transition towards a more circular process in city-making. A circular approach to the way of managing consumed and produced resources in the urban setting, such as materials, energy, water, and land has

the potential to substantially decrease the consumption of finite resources globally. It is also alleviating resource security urban problems, "waste disposal, greenhouse gas emissions, pollution, heating, drought, and flooding" (Williams, 2019b, p. 2746).

Urban metabolism research can support the design of CE in cities as it considers resource consumption and environmental pressure of urban areas in a systemic way (Kalmykova & Rosado, 2015). The health of cities depends on spatial relationships with surrounding hinterlands and global resources. Increasing metabolism implies greater loss of farmland, forests, and species diversity, which is also associated with increasing traffic and therefore of pollution (Kalmykova & Rosado, 2015).

The methods used in urban metabolism research and analysis are very useful to grasp a concrete understanding of the functioning of the cities. The use of such a methodological approach to the understanding of cities, by the identification of metabolic processes can help identify threats to the sustainability of cities, and therefore facilitates the elaboration of solutions (Kalmykova & Rosado, 2015). A method widely used for urban metabolism research is material flow analysis. It is "a systematic assessment of materials, and their stocks and flows, over time and space, within a defined system" (Kalmykova & Rosado, 2015, p. 3). To reduce the ever-increasing resource flows to cities and their corresponding environmental impacts, complex management of the urban metabolism is required (Ghafouri & Weber, 2020), including solutions engaging many different actors, see roadmap step 7. A CE, which would reduce the need for materials from the hinterland, is one of the most promising approaches to urban metabolism management (Ghafouri & Weber, 2020). A circular urban metabolism aims to create local cycles of material and energy to decrease the environmental burden of existing urban areas (Williams, 2019a), see roadmap step 5.

Despite being very complex and considering a myriad of elements about circularity in cities, a social account seems to be missing from the urban metabolism theory. This the ground on which the concept of circular cities emerged, as described in the following section.

4.2.2 Circular Cities

A circular city builds on the previously mentioned concepts while going beyond the creation of a CE and circular business models and beyond the input/output analysis within the urban context to suggest "regeneration and renewal of complex urban ecosystems" (Williams, 2019b, p. 2759). The concept of circular cities encompasses principles of CE across all its functions, to formulate an "urban system that is regenerative and restorative by design and it aims to generate prosperity and economic resilience for itself and its citizens" (Ellen MacArthur Foundation, 2017, p. 7), while decoupling value creation and economic growth from the consumption of resources. According to Williams (2019), until present times, industrial ecologists and economists have greatly influenced the direction of the discussion about CE in cities, concentrating on closed-loop industrial systems, while the author argues that this simplification is highly incomplete when applied to a city-scale (Williams, 2019). For the development of a truly circular society, "consumption patterns produced by lifestyles, social practices, and systems of provision will need to be tackled" (Williams, 2019b, p. 2752).

To the concept of circular cities, is added from the previous conceptualization, the consideration that urban infrastructures are 'resource mines' (Williams, 2019b). Realizing that the construction phase and the maintenance of infrastructure account for more than 50% of the total global

raw resources consumed yearly, and for more than 33% of the total global energy use and associated emissions (Purnell, 2013), provides insight into how a circular process could alleviate this overuse of raw material. Cities accumulate resources that could use for other purposes, the "continuous need for materials and energy services has resulted in substantial accumulations of natural resources in buildings, infrastructure, products, and waste deposits, see roadmap step 4. Williams adds that "at a time when resources are becoming increasingly scarce, these technospheric resource reservoirs might offer an opportunity for more sustainable development, or at least provide an alternative to virgin production and recycling of annual waste flows" (Williams, 2019, p. 2747).

Therefore, the re-use, and when not possible the recycling of infrastructure must be prioritized in a circular city (Lacovidou and Purnell, 2016 in Williams, 2019b). An additional added focus on the circular cities concept is to localize production and consumption. It encourages pro-environmental behavior and local symbiotic capital sharing resources. The focus of the circular cities concept is on lifestyles and social practices as the main added contribution to the field (Williams, 2019b). Building vacancies additionally result in the underutilization of infrastructure in cities, such as water, sewage, transport, education, health systems, all of which are an important waste of resources (Rink et al., 2012 in Williams, 2019b). However, vacant land can provide opportunities for temporary uses and urban transformation (Nemeth and Langhorst, 2014 in Williams, 2019), see roadmap step 5.

Cities are indeed crucial actors for the proponents of the CE: "As major engines for economic growth, cities can drive the circular economy agenda forward to unlock economic, environmental, and social benefits" (EMAF, 2020 in Bassens, Kębłowski, & Lambert, 2020, p. 893). However, the roots of CE lie in the debates on industrial ecology, environmental economics, and sustainability (Boulding, 1966; Stahel & Reday-Mulvey, 1981). Conceived in the early 1990s (Pearce & R. K. Turner, 1990), the notion of the CE was discussed primarily among engineers, natural scientists, and economists. It is only in the last decade that the debate has shifted from industrial implementation to more conceptual reflections and matters of territorial governance, see roadmap step 7. That explains the need for increased research on how to apply CE to the city's functioning and, as is the case in this project, for an alternative process of redevelopments.

As covered in this section, the social conditions are necessary to genuinely transition towards more circular cities and sustainable lifestyles. The necessary holism to achieve such circularity in cities is still undeveloped in the literature, but the proposition made by the CU concept, as described in the following section, comes to complement that gap.

The three previously explained theories, namely CE, urban metabolism, and circular cities, all aim to break the paradigm of economic growth by closing cycle loops. CE has shifted the way sustainability is being conceptualized and creates the basis for many subsequent ramifications of the concept. Understanding the evolution of CE and its adaptation to urban studies creates ground for CU theory to emerge.

4.3 Circular Urbanism

To reach more circular cities, a circular process of urban planning to facilitate circularity for urban redevelopment projects arises as a very recent concept. Indeed, CU is defined by Grisot (2020) as "the transposition of the principles of the circular economy to the process of making the city. It proposes

concrete alternatives to urban sprawl by concentrating and organizing the city so that it is permanently rebuilt on itself" (Grisot, 2020, p.80). Grisot argues that CU produces a flexible city, capable of adapting continuously to changing needs, see roadmap step 3, to optimize the use of land that has already been developed, thus avoiding the consumption of new agricultural or natural land.

The focus of CU, as defined by Grisot (2020), is on rethinking the existing city, to avoid spreading city functions outside of the already artificialized land. CU has not yet taken shape in terms of scientific concepts and is therefore not sufficiently stabilized (S. Grisot, personal communication, March 5th, 2021). The process of CU is to reverse the business-as-usual redevelopment process when first, municipalities and developers think about a design project with a concrete solution, and later think about where to get all the resources to build it. CU suggests to rather first analyze what the city and the close surrounding have to offer and has as 'waste', see roadmap step 4, and then think about the best way to do a design proposal, see roadmap step 5. So-called 'waste' can be in the form of material, as CE usually refers to, but CU brings the priority to 'wasted' time in spaces, spaces that are being used only at certain specific times, and whole buildings elements, such as windows and sinks for example (Grisot, 2020).

New models and processes must be established to integrate the logic of the CE and in particular the principles of scalability and reversibility, at each stage in the fabrication of the urban fabric. The urban planning process thus transforms from linear to circular, initiating cycles of intensifying uses, transforming the existing and recycling spaces to avoid any new consumption of land or the multiplicity of abandoned land. Three loops allow the city to transform itself rather than to expand as illustrated in figure 8.

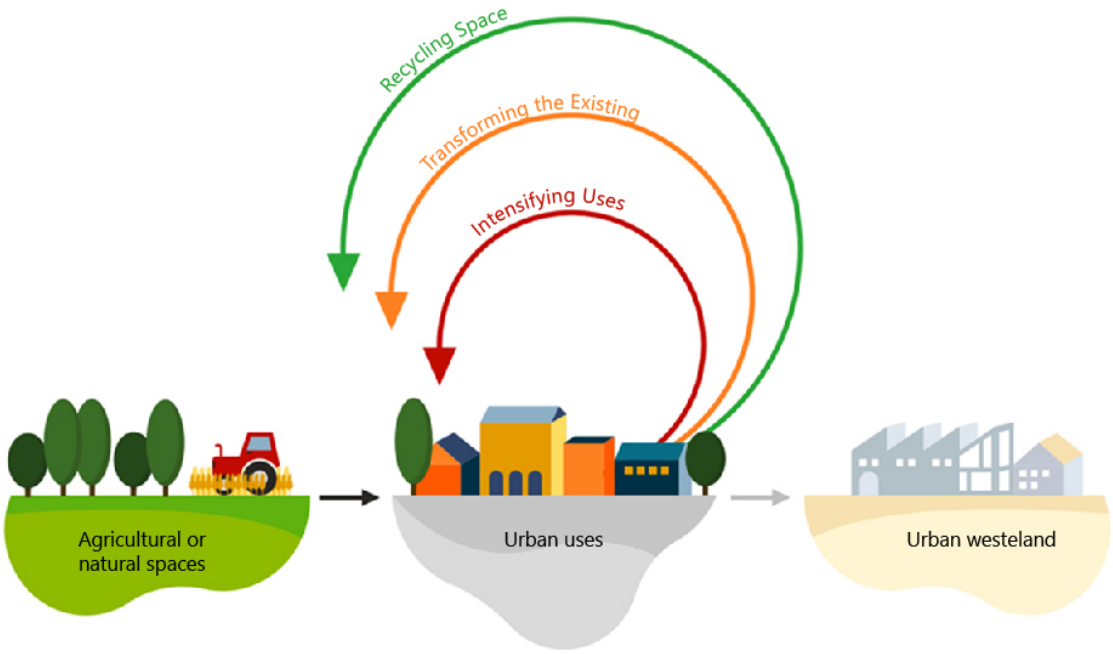


Figure 8: Circular Urbanism Loops, own adaptation, source: Grisot, 2020

As developed by Grisot (2020), the first loop aims at intensifying uses. It suggests making better use of the existing city to avoid building, by maneuvering its time and organization. Cities are full of vacant and under-used spaces and buildings. These spaces are often ignored or do not have a central part in the discussion about urban planning. Rather than building anew, CU proposes to capitalize on

the potential of the existing city. Necessarily, building anew is sometimes necessary to fulfill the required functions and needs of the neighborhood, but CU emphasized the urgency to build only multifunctional new buildings.

The second loop proposed by CU is to transform the existing by densifying the urban fabric and transforming its buildings to respond to new needs by reworking the existing (Grisot, 2020), see roadmap step 3. The assumption is that existing buildings should be transformed rather than deconstructed, new buildings can be created with future evolution in mind. For an older neighborhood that is changing drastically, “the need to bring new uses to the neighborhood is essential" (Grisot, 2020, p. 137).

The last loop of CU again, as developed by Grisot (2020) is the recycling of spaces. The current linear urban development process of the city generates waste, namely urban wastelands. The third loop rather suggests recycling these spaces to give them new uses (Grisot, 2020). Each of these loops allows the flexible city to permanently rebuild itself, saving soil, energy, and materials. The shorter the loop, in the same manner as the CE cycles, translates in “the simpler the operation, the fewer resources mobilized and the most limited environmental impact” (Grisot, 2020, p.82).

Grisot argues (2020) that CE is increasingly seen as synonymous with waste recycling, which is not enough, and the concept has much more potential than this reduction of it. The author argues that there is an urgent need to integrate circularity in public policies, with issues of consumption reduction, eco-design, and better synergies between territories in particular (Grisot, 2020), see roadmap step 1. According to Grisot (2020), only a few cities or territories have effective strategic documents on the scale of real urban dynamics. The author argues for the need for a strategic framework on the scale of the territories experienced by residents. Prescriptive strategic documents allowing citizens to engage in dialogues, to establish a clear principle of stopping the artificialization of land to protect agricultural land threatened by development, particularly on the outskirts of cities, and to impose on local authorities a systematic evaluation of the built-up and land deposits on their territory and to define the methods for compensating consumption of land (Grisot, 2020).

A circular approach favors processes in loops, as short as possible, to save as much as possible of the resources mobilized. CU proposes cohabitation of uses, a complex endeavor, but confronting the complexity can enable the enhancement of many existing urban resources by intensifying their use: “These resources must be identified to make the best use of them, even if it means inventing new modes of governance and organization” (Grisot, 2020, p. 86), see roadmap step 4.

The transition to CU requires coordination and, while being a single model, the approach takes very different forms in different territories, and different projects, where everyone must play their part (Grisot, 2020), see roadmap step 2. Mobilizing all the links in the chain; developers, landlords, promoters, demolishers, recyclers, is one of the great necessities and challenges of CU, create a discussion among all actors to create synergies between them, see roadmap step 5. Grisot argues that to achieve the implementation of CU more efficiently, new professions have to be invented and new tools have to be forged. As working on the existing city is technically complex, due to “land fragmentation, restrictive land parcels, sensitive neighborhoods, soil pollution, buildings to be deconstructed, etc., new skills will need to be developed. But above all, it is a difficult game of actors, requiring real political support over time, often long, technical skills that are sometimes scarce, and operators capable of moving forward under uncertainty” (Grisot, 2020, p.70).

CU calls for a transition from a linear and fragmented process where each actor intervenes one after the other in a formalized, to an iterative process in which the end of the chain feeds the upstream

stages with its feedback (Grisot, 2020). This is a task that requires collective work, to find a solution to an identified need or problem with a stakeholder, to cross different points of view, and to look for solutions collectively. CU strongly mobilizes the whole chain of local actors, voluntarily engaged in the approach (Grisot, 2020), see roadmap step 6. Grisot (2020) argues that "traditionally, building the city involves highly formalized project processes, where the stages follow one another in a sequential and watertight manner, with a clear role for everyone" (p.163). CU breaks with these well-established practices and requires a high level of coordination of very different actors. CU projects are often ever-changing and require constant adaptation (Grisot, 2020).

Grisot (2020) highlights the necessity of a high level of coordination from very different actors (Grisot, 2020) for implementing CU, such a new process for urban regeneration breaks well-established practices. Stakeholders in the urban sphere have their specific knowledge and expertise which makes agreements and collaboration very complex to develop, and ample communication between stakeholders is necessary to reach the implementation of circular projects (Grisot, 2020). Different actors must align their actions and encourage different partnerships for the engagement of private actors through public contracts, land transfers, and financing. In CU like in CE, collaboration with competitors can be required as the concept of closing cycles consists of exchanging materials. Grisot (2020) adds that fostering cooperative behaviors is possible with the help of contractual, legal, and insurance terms. New partnerships are necessary and feasible, even if they require work, see roadmap step 7.

The progress of the transition needs to be evaluated regularly and publicly, to adjust what needs to be adjusted, to improve the process, and facilitate the solutions, see roadmap step 8. Grisot (2020) argues that there needs to be "the establishment of a follow-up process, on the ground, to ensure that the measures are properly implemented" (p.155). Grisot (2020) argues that CU requires the acceptance of dealing with many unknowns. Uncertainty is the opposite of the linear process that allows creating something new: a succession of stages inscribed in a controlled process and in which efforts are oriented towards the reduction of uncertainties.

The three loops discussed here are directly linked to three concepts present in urban planning research. First, the shortest loop 'recycling spaces' is be consolidated with multifunctionality theory (see section 4.3.1)., then the second loop, 'transforming the existing' is better explained with adaptative reuse theory (see section 4.3.2) and finally, urban regeneration complements to the CU concept by validating the longest loop suggested, about recycling spaces (see section 4.3.3).

4.3.1 Multifunctionality

A concept that has been advocated as one solution towards more sustainable cities has to do with land use. Indeed, to avoid urban sprawl, the combination of multiple urban functions on the same land use unit is described as a highly effective solution. Temporal resources can be optimized when applying multifunctionality through the different phases of a redevelopment project, see roadmap step 4. Priemus et al. (2004) defines multifunctional land use (MLU) as "the implementation of more functions in a determined place in a determined period of time" (Priemus et al., 2005 in Van Broekhoven & Vernay, 2018, p. 5). The comprehensive definition of multifunctional land use can bring new perspectives in planning, which involves improving the functional performance of existing urban spaces

and therefore diminishing the need to build new facilities while still maintaining the quality of life in dense cities (Batty, Besussi, Maat, & Harts, 2004).

Priemus et al. (2004) argue that multifunctional land use could "produce advantages of synergy and contribute to both the economic vitality and the environmental quality of modern cities" (Priemus et al., 2004, p. 270). Important factors to this subject are the analysis of the contributors and those who benefit from such synergy, see roadmap step 5. Results are not certain or predictable, therefore the authors argue that a multifactor analysis is needed. Additional research on the field is called for by Priemus et al. (2004) as the added value is unclear in multifunctional land use implementation (Priemus et al., 2004, p. 270). Dieleman and Wegener add to multifunctional land use research the links with compact cities, urban sprawl, and smart growth. The authors argue that a lack of strong planning intervention at the regional and local levels leads to inevitable urban sprawl, which can be reduced with a multifunctional land use approach.

Batty et al.'s work on the other hand focuses on how to represent multifunctionality and answer the question 'How can we represent density and diversity in space and time?' (Batty et al., 2004) and present different ways to use tools such as GIS to account for verticality and 24h city. Spatial land use includes various seasonal and even annual cycles, but the most significant variation is the 24-hour day cycle, the movement of uses from work to leisure and personal life. Entertainment functions are mostly in use in the evenings and weekends while offices are mainly used during the daytime. The night-time cycle attracts people who might never use these areas for any other function. Multifunctionality is a theme that runs through many substantive discussions of the contemporary urban scene (Batty et al., 2004).

Functions can be added to an existing building, during different phases of a building life, from its existing use, during the transitional phase between two purposes, as well as can be planned for the new functions given to a new building. Many opportunities arise from thinking about multifunctionality during the vacancy phase. Transitional occupancy holds many opportunities that should not be overlooked, according to Baillargeon and Diaz (2020). Temporary occupancy initiatives on vacant sites have for a long time been associated with activism and transgression but are now being used by municipalities in their redevelopment strategy as well as envisioned as a vehicle for the creative economy and as a driver of innovation (Colomb, 2012). Many authors believe they will become common practice and will integrate traditional planning (Baillargeon and Diaz, 2020). In this context, transitional urbanism grows in interest as a practice that is allowed, that should be planned for, and that can be a prefiguration stage for perennial redevelopment projects (Baillargeon and Diaz, 2020). The projects implementing transitional occupancy have proven effective to create rapidly an unprecedented economic and cultural ecosystem, to gain city-wide outreach of the building and the neighborhood, to occupy rapidly and flexible leasing arrangements, to reduce vandalism and fire hazards, to reduce the degradation of the built environment and to quickly detect breakage, leaks, and infiltrations (Baillargeon and Diaz, 2020). Other opportunities for transitional occupancy include the possibility of a quick and flexible upgrade at a low cost, the possibility of reimbursement of the fixed charges for the owner allowing to justify the minimal maintenance of the building and thus to avoid the degradation of the heritage and to provide an opportunity to identify a sustainable use for the building (Baillargeon and Diaz, 2020).

The most highlighted issue related to transitional occupancy has been that land use planning in some contexts is not receptive to this kind of alternative uses (Baillargeon and Diaz, 2020), see roadmap step

2. For example, zoning in North America has proven to tools in place such as 'conditional use', but that the organizational culture is not enough open, and that the professionals are also generally not so open (Baillargeon and Diaz, 2020). As zoning and the potential to modifying zoning regulation is very political and greatly changes between boroughs, mixed-use can be difficult to develop (Baillargeon and Diaz, 2020). The most important element and barrier to implementing transitional use is the negotiation with the owners of the property or the project (Baillargeon and Diaz, 2020), see roadmap step 7. Once a strong agreement is consolidated with the owner, the possibility of making projects allows unlocking the other stages of the development of a project (Baillargeon and Diaz, 2020). Other than that, in different instances, the bad conditions of buildings can also be an important barrier, as well as the potential financial profitability that can be greatly reduced if a building requires important investment before being able to host transitional uses (Baillargeon and Diaz, 2020).

4.3.2 Adaptive Reuse

The 20th century and the development of modern industrial societies, focusing on consumption and growth, established the idea that the reuse of already existing materials was "a sign of poverty, marginality, and backwardness of its users" (Brilliant & Kinney, 2011 in Huuhka & Vestergaard, 2019). As already referred to in section 1.1, even though the construction sector is accountable for 60% of a building's carbon emission and characterized as the biggest waste generator (UN Environment Programme, 2020), the modernist perception of all things new is yet highly influencing the industry (Huuhka & Vestergaard, 2019). Building construction and materials are carrying a big amount of energy and are emitting CO2. This energy is referred to as embodied energy and is defined as "the energy required to construct a building, including the extraction of raw materials, manufacture of building products and construction of the building" (Sabnis, Mysore, & Anant, 2015, p. 3). Hence, an urgent need for the reduction of embodied energy is evident in the concept of reusing, repurposing or, extending the use of building materials. By following these concepts, there is great potential on reducing these embodied impacts, since the reuse and repurpose of materials and building elements can often have smaller environmental footprints than the extraction of resources and creation of primary materials (Nußholz, Rasmussen, Whalen, & Plepys, 2020), see roadmap step 4.

Despite the gains of economic globalization, cultural globalization can contribute to the creation of diverse threats and consequences in the social, political, economic, and cultural environment (Gražulevičiūtė, 2006). For that reason, the conservation of the cultural and historic urban environment (The Getty Conservation Institute, 2009) and the identification of individual and particular characteristics indicating the distinct identity of a place, is fundamental (Gražulevičiūtė, 2006). In 2013, following the confirmation of numerous studies, UNESCO (2013) highlighted the importance of culture and culture diversity and stated that it "should be considered to be a fundamental enabler and potential driver for sustainable development" (UNESCO, 2013, p. 5). In UN's New Urban Agenda (2016), culture is considered as an influential component for SD the crucial role of cultural heritage in the urban context. Hence, it is evident that there is a growing realization concerning the equivalent importance of culture with the three pillars of sustainability: society, economy, and environment (Antonia Gravagnuolo, Girard, Ost, & Saleh, 2017; Loach, Rowley, & Griffiths, 2017). The multidimensional and complex interconnection of the sustainable elements is indicating culture as the fourth pillar of SD highlighting the importance of cultural heritage preservation for the promotion and widespread

acceptance of cultural sustainability (Antonia Gravagnuolo et al., 2017; Guzmán & Roders, 2014; Loach et al., 2017).

According to UNESCO (1972), cultural heritage is defined as "a monument, group of buildings or site of historical, aesthetic, archaeological, scientific, ethnological or anthropological value" (UNESCO, 1972, p. 2). Cultural heritage is accountable for various tangible and intangible benefits to the social and urban environment (Chohan & Ki, 2005), concerning the creation of sustainable communities, generation of economic development, and improvement in resource productivity (Gražulevičiūtė, 2006). Cultural heritage preservation is strengthening the community's development by sustaining "structures upon which whole societies and lifestyles have been built" (Guzmán & Roders, 2014, p. 3) and identifying own characteristic features and promoting its economic ability to compete in the global market (Foster, 2020; Gražulevičiūtė, 2006; Guzmán & Roders, 2014). Hence, according to Gražulevičiūtė (2006), five different factors introduced as 'Five Senses of Quality Communities' can influence the financial competitiveness and prosperity of a community. These five factors are the sense of place, identity, evolution, ownership, and community (Gražulevičiūtė, 2006), which can be enhanced through the collaboration between actors cooperating, see roadmap step 7. These five senses are embodied by the essential feature of cultural heritage since social attachment and the feeling of belonging, ownership, and responsibility is created (Chohan & Ki, 2005; Gražulevičiūtė, 2006). Furthermore, memory and identity are shaping the city's character, unique elements, social traditions, and cultural identity (Guzmán & Roders, 2014).

The preservation of cultural heritage and historic buildings establishes economic development as various positive benefits are reached, such as the creation of job opportunities and generation of local household income (Gražulevičiūtė, 2006). Additionally, contrary to previous understanding, the maintenance and occupancy of older buildings can be more financially vital than of a modern building (Gražulevičiūtė, 2006).

Taking into consideration the numerous benefits that cultural heritage is providing to the social and urban environment, the avoidance of underutilization and abandonment of heritage buildings is particularly important for local communities (Foster, 2020), see roadmap step 5. Besides, actions and CE principles implemented in contemporary structures such as dismantling and reusing of materials, are barely appropriate and relevant in historic urban areas due to particular and uncommon typical features and national and international attempts "[…] oriented to its preservation, conservation and transmission to future generations" (A Gravagnuolo, De Angelis, & Iodice, 2019). Hence, for the operation and utilization of CU in the historic built environment, adaptive reuse of cultural heritage is appearing as the most viable and suitable solution (A Gravagnuolo et al., 2019). According to Foster (2020), "an adaptive reuse of a cultural heritage project is the retrofit, rehabilitation, and redevelopment of one or more buildings that reflects the changing needs of communities" (Foster, 2020, p. 1). On the other hand, although adaptive reuse is mostly used and known for the environmental benefits such as the ability to prolong a building's life, prevent the generation of demolition waste, repurpose the embodied energy and reduce the energy consumption, the promotion and improvement of social, cultural and economic advances are crucial to the society and the SD of urban areas (Yung, Chan, & Xu, 2014). Thus, adaptive reuse can be viewed as a component of a sustainable urban regeneration approach and as an essential element for the achievement of SD and the promotion and improvement of the four different dimensions of sustainability (Yung & Chan, 2012).

However, diverse geographical settings have different characteristics since all buildings and the way that can be adaptively reused is particular and uncommon, context-related, and community-based

(Foster, 2020). Hence, adaptive reuse should be investigated in-depth in terms of economic growth, environmental protection, approximate and relevant context, social network and inclusiveness, design principles, policies and strategies supporting, generating, and enriching CU for the development and promotion of SD (Yung et al., 2014), see roadmap step 2. To conclude, material resources can be optimized when applying adaptive reuse through the different phases of a redevelopment project.

4.3.3 Urban Regeneration

As already referred to, cities and their citizens hold a central role in reaching global sustainability since the interplay between the urban environment and human activity is situated in a central position for SD (Boyle et al., 2018). The most potent and practical tool for resolving a broad range of urban issues, recognizing social, economic, physical, and environmental concerns and finding long-term solutions regarding contemporary cities, is urban regeneration (Boyle et al., 2018). Hence, urban regeneration can be characterized as a complex approach accountable for redesigning, redeveloping, and revitalizing existing urban areas and enhancing the life quality of a specific community (Allam et al., 2018). Further, this complexity can be evident, since various types of urban redevelopments, such as brownfield, greenfield, institutional or industrial redevelopment require different types of analysis and overall management (De Sousa, 2000), see roadmap step 2. The acknowledgment of the physical form of the immediate surroundings of a site and the history that has shaped it reinforces the local character and distinctiveness of urban regeneration projects (Allam et al., 2018).

Extensive land use and sprawl in the urban periphery are caused by the continuously rising demand for land although the existence of underused land plots in many city centers (Amirtahmasebi, Orloff, Wahba, & Altman, 2016). The intensification of existing urban areas through the approach of urban regeneration can be the future response to the extensive demand for land since higher density is closely linked to economic prosperity and social involvement (Amirtahmasebi et al., 2016), see roadmap step 2.

The regeneration of underused urban land can strengthen the SD of various cities considering that making denser cities can eliminate a large amount of CO2 emissions (Amirtahmasebi et al., 2016). Furthermore, plans, policies, and programs for the promotion of sustainable cities involve the re-use of neglected land and abandoned structures, minimizing the interest for new developments in peri-urban areas, and multiplying the interest of urban centers (La Rosa, Privitera, Barbarossa, & La Greca, 2017). The effective regeneration of under-used urban areas is contributing to the establishment of sustainable local communities and promotion of inclusiveness since the transformation and creation of new public and open spaces are stimulating social involvement and cohesion, community engagement, local economic growth and diversity, and general advancement of the citizens' life quality (Amirtahmasebi et al., 2016; Boyle et al., 2018), see roadmap step 4. On the other hand, underused urban areas can be considered as an ecosystem recognizing and acknowledging all living organisms, humans, and non-humans (Tarsitano et al., 2020). Such recognition can lead to the enhancement of biodiversity and restoration of ecosystems in former urbanized areas, attributing to various benefits such as improvement of the quality of life, reconnection with the natural environment, and promotion of sustainability (E. Tarsitano, A. Rosa et al., 2020).

Inventions are incorporated, creating the need for the adaptation of a program suitable for a specific geographical context (La Rosa et al., 2017). This is necessary since different countries face different urban problems influenced by particular socio-economic, institutional, political, environmental, and cultural frameworks (Couch, Sykes, & Börstinghaus, 2011). Hence, a contextualized type of actions is needed to promote and support urban regeneration projects highlighting "[…] that 'context matters and different conditions and settings contribute to different planning cultures, urban problems, and policy approaches" (Couch et al., 2011, p. 6), see roadmap step 2.

Urban regeneration is characterized as a productive approach for accomplishing sustainability (Allam et al., 2018), but at the same time as a complex and multidisciplinary process and field of research (Boyle et al., 2018; La Rosa et al., 2017). Such complexity is creating an increased need for the establishment of different partnerships among the public and the private sectors, for the promotion of an effective and viable development (Allam et al., 2018; Amirtahmasebi et al., 2016), see roadmap step 7. The different interlinkages among various elements of the urban fabric, concerning the effective regeneration of the land, are generating possible synergies between various interested groups and different types of actors (Amirtahmasebi et al., 2016), see roadmap step 5.

The ultimate goal of urban regeneration is the rehabilitation of value from degenerated urban areas and social and economic structures (Nowakowska & Grodzicka-Kowalczyk, 2019). Commonalities between CE and urban regeneration are evident since both processes pinpoint the importance of the circulation of goods in urban structures and the restoration "[…] of value and the reuse of resources that have been potentially "used up" in development processes" (Nowakowska & Grodzicka-Kowalczyk, 2019). Hence, urban regeneration can be characterized as a suitable platform for the application and development of CE ideas into the urban setting as circularity provides various favorable circumstances for accomplishing sustainable and efficient urban regeneration processes (Nowakowska & Grodzicka-Kowalczyk, 2019).

The three practices explained above, namely multifunctionality (section 4.3.1), adaptive reuse (section 4.3.2.), and urban regeneration (section 4.3.3), relative to the different loops of circularity, complement the CU theory. These three methods highlight that some mechanisms to maximize the temporal, material and spatial resources are already existing in urban planning and are effective in fulfilling community needs. The application of a combination of the three practices in redevelopment projects paves the way for CU to be adopted by planning entities.

4.4 How can circular urbanism be framed in a neighborhood redevelopment process?

To answer the first sub-research question, namely 'how can circular urbanism be framed in a neighborhood redevelopment process?', a summary of the previous section is necessary. As cities rapidly develop and redevelop on themselves, an adaptation of the, to some extent, incomplete and inadequate, CE concept becomes necessary to transition towards a more sustainable urban future. With a growing agenda to move towards sustainability and to remain within planetary boundaries, the evolution progression and adaptation of CE to redevelopment projects is key and is being used as a concrete alternative to the current linear processes.

Many concepts have evolved around the adaptation of CE theory and practices to cities. First, urban metabolism (section 4.2.1) translates the concept of CE in cities in scientific terms of input and outputs of elements, waste of material, and energy. Additionally, this declination of the initial concept of CE is very useful and pragmatic, but somehow lacks social components accounting for necessary changes in lifestyle and social practices, leading to circular behaviors among the population, which is discussed by the elaboration of the concept of circular cities (section 4.2.2).

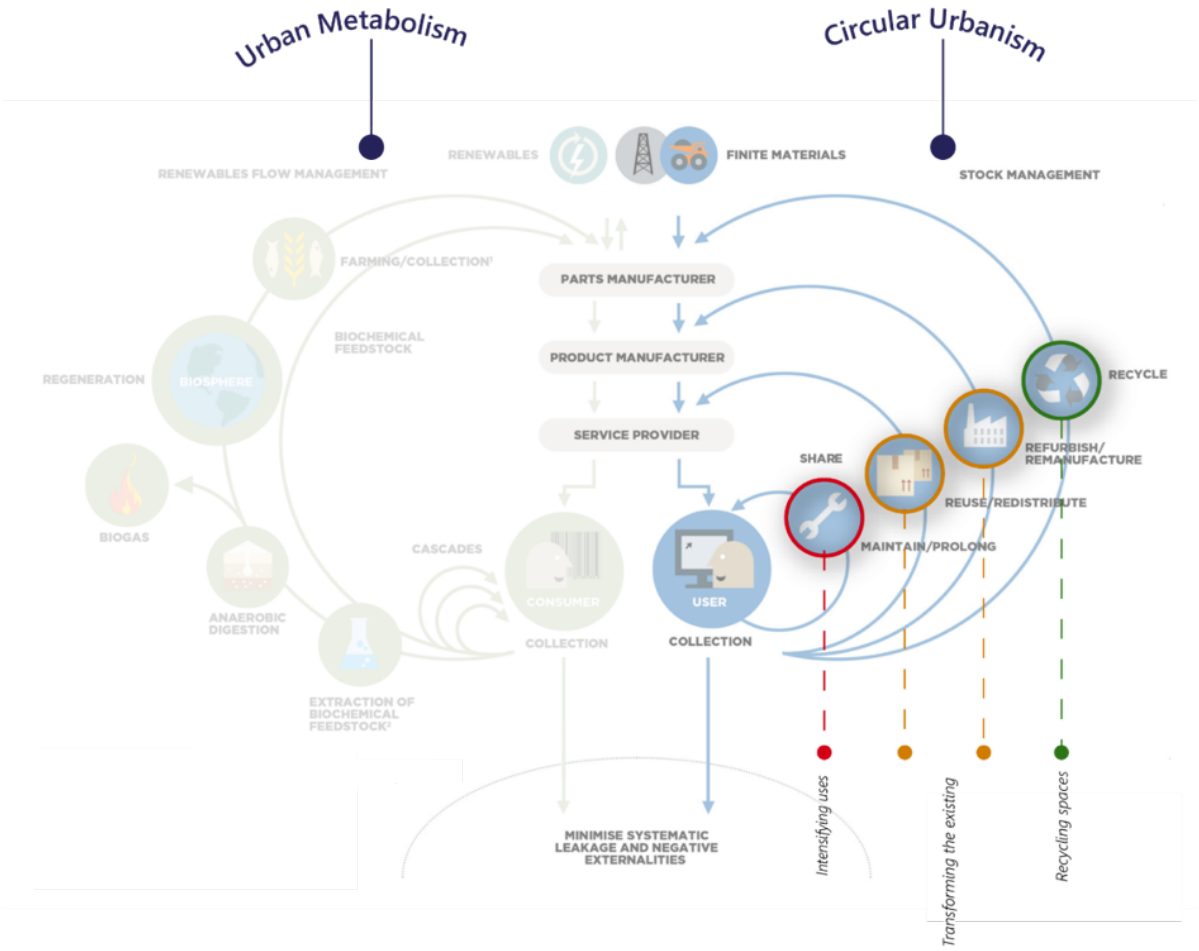


Figure 9: Theoretical framework adapted to EMAF diagram, own adaptation, source: EMAF, 2015

The initial graphic provided by the EMAF has been used by a majority of researchers to illustrate the concept of CE and has been widely used in practice and academia. This diagram was adapted to the CU concept by Grisot (2020) and the link between the three loops of CU are very clear with the different loops of CE (see figure 9). The shortest loop of CU suggests 'intensifying uses', which directly relates to planning for multifunctional uses, it being represented by the 'share' loop in the initial diagram. Then the second loop of CU 'transforming the existing' encompasses 'maintaining and prolonging', 'reuse and redistribute' as well as 'refurbish and remanufacture' and relates to adaptive reuse of buildings. Finally, the last loop of CU 'recycling spaces' is directly linked to the 'recycle' in the EMAF diagram, being a direct link to urban regeneration projects, as they are, by definition, recycling spaces in cities, as they do not require further urbanization of agricultural or natural land. All in all, CU proposes the three loops, which have direct relations to scientifically developed concepts, therefore consolidating the concept of CU.

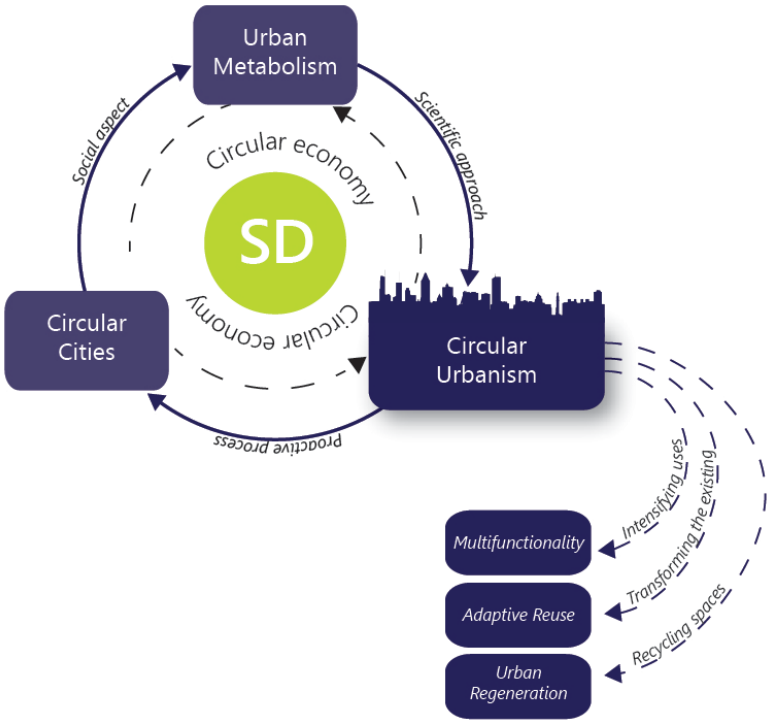


Figure 10: Theoretical framework, own illustration

Following these different added ramifications to the initial concept of CE understood and developed by various fields, a new concept that emerged recently and has not yet been consolidated in the academic field is the proposed CU concept, which includes strategies to reach circularity in the development and redevelopment of cities (see figure 10).

The main goal of CU, as suggested by Grisot (2020), is to alleviate the pressure that urbanization poses on natural land at the limits of cities. Taking a somehow different focus, this thesis addresses merely the two first loops of CU, namely the shortest one – intensifying uses, and the second one – transforming the existing. Nonetheless, the aim of sparing natural land from being urbanized is a very important goal and necessitates further research. For CU to be actively used in city planning, a methodology on how to apply the concept requires to be further developed, with keys for methodological steps that have been identified throughout the chapter. Municipalities and professionals in the redevelopment sphere would benefit from getting to know such a framework, to be able to apply it, which would also allow the evaluation of such method to improve it iteratively, to ultimately reach genuine circularity in the planning field.

4.5 Emerging Need to Develop a Strategic Plan for Circular Urbanism

Figure 11: Circular urbanism roadmap link to theory, own illustration

Strategic planning (section 4.1) has been established as a useful way to lead towards sustainability (section 4.1.1). To be proven effective, strategic planning should be goal-oriented but has nonetheless the potential to be transformative. Then, circularity is established as a legitimate goal to thrive towards (section 4.2, section 4,2,1 and section 4.2.2), as it is increasingly on the research agenda, and takes different avenues, the scientific and social one in addition to originally arising from the economic sphere. Circularity is proven key in addressing many problems, but the complexity of its implementation is also central as it requires multiple stakeholders and unusual partnerships. Circularity is therefore approved by the scientific community as an effective goal that holds the potential to be very instrumental in the transition towards more sustainability, despite suffering

the barriers to its implementation. CU (4.3) is then added to the discussion, without being completely stabilized in academia until now, but takes inspiration from CE, urban metabolism, and circular cities, elucidating that circularity should also account for spatial elements and that a circular approach to the fabrication and redevelopment of the city could have a positive impact on the problem of sprawl and the use of natural land outside of cities, that could otherwise be spared from being urbanized. Three practices are then added, each of which is relative to the different loops of circularity, coming to complement the CU theory. Multifunctionality (4.3.1) translates the 'intensifying uses' loop of CU, adaptive reuse (4.3.2) enters to support the 'transforming the existing' loop while urban regeneration (4.3.3) comes to complement the 'recycling space' loop. These three practices highlight that some mechanisms to maximize the resources are already existing in urban planning, that are effective in fulfilling community needs.

The necessity to develop a strategic plan to facilitate CU for municipalities then becomes clear for the thesis researchers, leading to the elaboration of a roadmap that bridges elements highlighted as crucial in the different theories discussed in this chapter. A roadmap can be characterized as "[…] an extended look at the future of a chosen field of inquiry […]" broadly applied to encourage innovation, strategic planning, and policy development (Phaal, Farrukh, & Probert, 2009). The goal of this strategic plan is therefore to facilitate the implementation of those three practices (multifunctionality, adaptive reuse, and urban regeneration) jointly, in a systematic way for redevelopment processes. Key concepts from each theory from chapter 4 have informed and shaped the elaboration of the following roadmap (chapter 5), that would ensure that the implementation of CU is addressing the main issues and key aspects highlighted in the theories on which CU is based and on the practices that it requires.

| 5 | ANALYTICAL FRAMEWORK

The theories discussed in the previous chapter have shaped the understanding of the CU concept, its possible applications, and the key elements to its implementation. In this chapter, design thinking, the way in which the roadmap was created, is be explained, followed by the answer to the second sub-research question, namely 'how can municipalities facilitate the design process of circular urbanism?'. The CU roadmap is then presented, with a diagram highlighting the theories from the previous chapter that have shaped each step, then explained with a short analysis of the reasoning that supports and justifies every step.

5.1 Design Thinking Process

Design thinking can be characterized as a solution-centered methodology (Raynor, Doyon, & Beer, 2017) focusing on various problems and communicating them through a visual language (Diderich, 2019). The combination of logical thinking and creativity is offering a flexible and adaptable way of resolving generated issues (Diderich, 2019). Design thinking holds several key features valuable and adaptable to many disciplines (Riverdale & IDEO, 2011). Such features are the human-centered character - focusing on people's needs and ambitions -, the iterative nature of the method – improving, considering, and using resources and information- and the collaborative aspect – offering a variety of different perspectives and open communication (Diderich, 2019).

In urban planning, design thinking focuses mainly on the urban setting and the included elements rather than the tangible goods (Mensonen & Af Hällström, 2020). Due to the engagement of citizens in the process, a feeling of ownership is created (Mensonen & Af Hällström, 2020), assisting policymakers to design systems that advance the public value and correspond to citizen needs (Raynor et al., 2017). The cross-disciplinary nature of design thinking "[…] encourages citizens, end-users, policymakers, agencies, and governmental departments to work in a collaborative and iterative manner" (Raynor et al., 2017, p. 218), assisting the overall planning process.

The design process of the roadmap is supported by the five-stage design thinking model suggested by the Hasso-Plattner Institute of Design at Stanford (see figure 12). The proposed five stages are: empathize, define, ideate, prototype, and test (D. School, 2010).

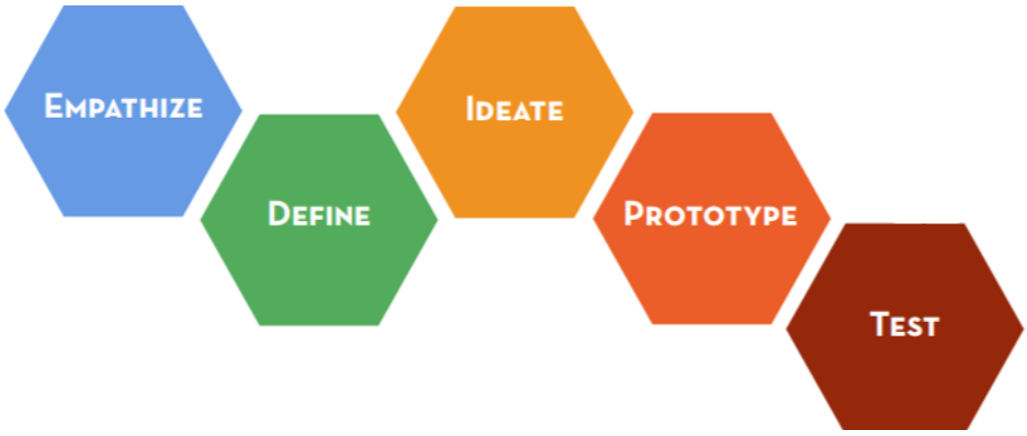


Figure 12: Design thinking model, source: Hasso-Plattner Institute of Design at Stanford (2010)

Empathy can be described as the main element of a human-centered design process; hence a deeper understanding of the problem and the concerned actors is important through their observation and further engagement in the process. The second stage is focused on the analysis and synthesis of the previous findings, identifying the people's needs and insights, and aiming for the identification of a specific and purposeful challenge. After the analysis and synthesis of the observations and the definition of a clear problem statement, the generation of various creative design ideas takes place. The aim of the fourth stage of the model is concentrated on the representation and experimentation of feasible and potential solutions for the variety of problems already identified in the previous steps (roadmap step 6). The last stage is providing an iterative ground for feedback, optimization, and evaluation of the suggested solution and refinement of the identified problems (D. School, 2010).

The integration of this model of design thinking in the process of developing the roadmap provided an opportunity to examine diverse problems from different perspectives and gain authentic and illuminating insights. Furthermore, the use of a method already tested in different concepts and contexts is adding value and enhancing the credibility of the process, supporting and justifying the creation and application of the CU roadmap.

5.2 Circular Urbanism Roadmap

Derived from the different theories presented in chapter 4, an eight steps roadmap has been conceptualized to facilitate the understanding and implementation of CU for redevelopment projects. Each step arises from points highlighted in the literature, combined with inputs from academic interviewees. Some municipal strategies and roadmaps have also inspired the elaboration of certain steps of this roadmap, such as the Amsterdam Circular Monitor (Gemeente Amsterdam, 2020) and the Paris Circular Economy Roadmap (Paris City Council, 2017).

The roadmap is directed to the entity that would have the competencies to apply it for a redevelopment project. It is most likely the urban planning department of the municipality that would have this mandate. Each step has to be done iteratively, meaning that the result of one step is influencing the outcome of the others, and a constant revaluation of the results of each step is increasing the appropriateness and effectiveness of the results. Some leading questions aim to guide the application of each step. Then the aim of the step is described, making the roadmap easily understandable and applicable. The steps are the product of this research, but the context in which each planning entity is applying the roadmap is greatly influencing the process and the outcome. The necessity and importance of each step have been highlighted from the literature presented in chapter 4, as represented visually in figure 14-21.

The roadmap cannot be realized by only one actor. The quadruple helix model of innovation needs to be applied. The helix works jointly to stimulate innovation in governance and the cooperation between the universities, the private sector, and the local governments, and the civil society through public participation in terms of urban planning. All the interactions create new dynamics, innovation, and collaboration. (P. Genois-Lefrançois, personal communication, April 30th, 2021). According to Grisot, one of the biggest problems of the century is the disability of different stakeholders to share and collaborate. As sharing is a complex procedure, requiring organizational efforts, legal and human resources, specialized know-how, relevant skills need to be developed (S. Grisot, personal communication, March 5th, 2021). All the actors needed to implement circularity are present on the

territory, but there is the need to “create a governance to bring these actors together” (F. Scherrer, personal communication, April 30th, 2021).

Figure 13: Circular urbanism roadmap, own illustration

As referred to in section 5.1, design thinking was integrated into the process of developing the CU roadmap. The roadmap was created and divided according to the five stages model proposed by the Hasso-Plattner Institute of Design at Stanford. The proposed five stages are linked with the seven out of eight steps of the roadmap providing a better understanding, explanation, and justification of the application and scope of each step (see figure 13). The iterative nature of design thinking was

emphasized since step 8, monitoring and evaluating, was applied systematically in the completion of the 'understand', 'explore' and 'materialize' sections of the roadmap.

STEP 1. *Developing circularity goals*

To what extent does the city wish to achieve circularity in its redevelopment projects?
How much time/material/space does the city wish to avoid wasting?

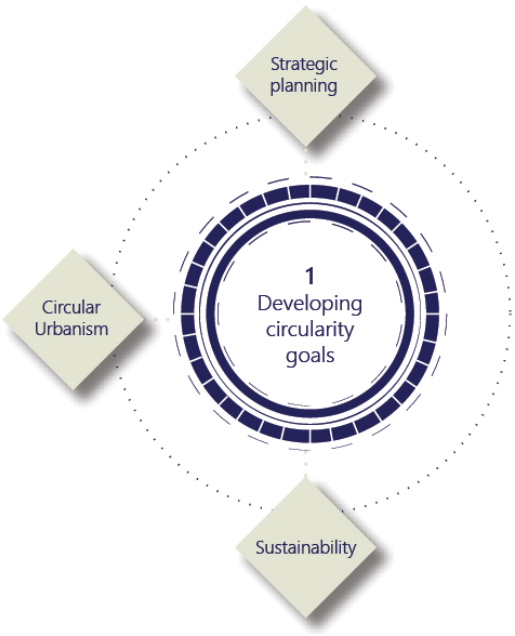


Figure 14: Step 1, own illustration

Aim: This initial step is for the municipality to set clear, achievable, and measurable circularity goals for redevelopment projects. The proposition and identification of indicators and targets about circularity goals, in terms of time, material, and land use, is a valuable tool for guiding the planning vision of the project (P. Genois-Lefrançois, personal communication, April 30th, 2021). This step should emerge from the environmental ambition of each municipality and is guiding the following steps. The iterative monitoring throughout the process is ensuring that the goals are being incrementally approached. Goals have to be identified for each of the three resources (temporal, material, and spatial) and aim at building the strategic vision in terms of circularity (see section 4.1 strategic planning). In many cases, this is building on the Climate Plan or sustainability strategy already published by many municipalities (see section 4.1.1 sustainability). Here are some examples of circularity goals that could be proposed for this step:

<u>To make the most of available land:</u>

- In a redevelopment project of Xm2, X% of the area should be regenerated in green areas and X% in public spaces
- X number of wastelands should be allocated to a circular activity (circular business or activity that makes the most of a type of waste)

<u>To make the most of available material/heritage elements:</u>

- X% of the deconstructed materials must be reused in the redevelopment of the neighborhood

The C40 Clean Construction declaration suggests 50% on those two indicators

- By 2030, X% reduction in raw materials consumption
- Embodied emissions should be reduced by at least x% for all new buildings and major retrofits by 2030; reducing embodied emissions by at least x% of all infrastructure projects by 2030

To make the most of available time in certain spaces

- Add functions in x% of 'wasted' time during the vacancy phase and the new use

A. UNDERSTAND

Empathize: Conduct research to develop an understanding of your users

STEP 2. *Understanding the context*

In which context this redevelopment takes place (former use, identity of the neighborhood, political situation)?
To what extent is circularity already integrated into the municipality's strategies and actions?

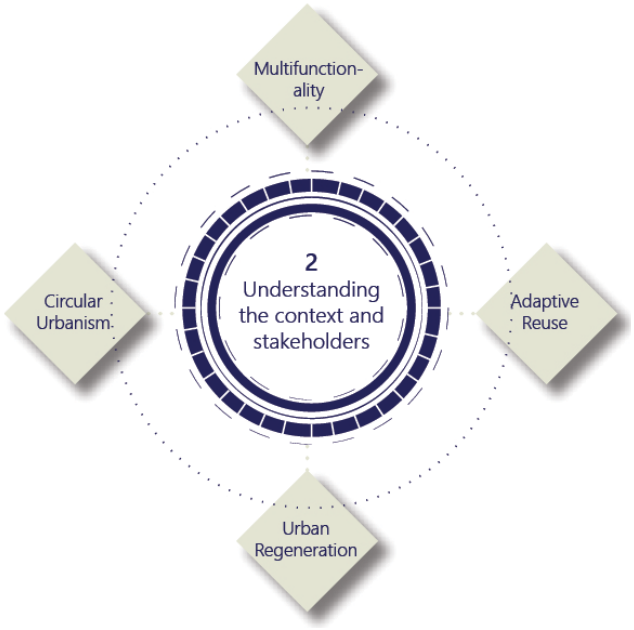


Figure 15: Step 2, own illustration

Aim: This step is essential and is determining considerably the appropriateness of the synergies possible for the specific redevelopment. The understanding of the context by the municipality is key in drawing an overall picture of the area, of the project, and the community surrounding it (see section 4.3.1 multifunctionality). It helps to understand the physical form of the immediate surroundings of a site and the history that has shaped it and helps create redevelopment that reinforces local character and distinctiveness (see section 4.3.2 adaptive reuse and 4.3.3 urban regeneration). Strategic analysis is setting the scene with the addition of site analysis to highlight the specificities of the site.

Identifying the stakeholders

Who has a say or interest in the area?

Aim: Understanding the different stakeholders is key to help the municipality facilitate the synergies identified in the following steps. Each actor has an important role to play in the implementation of CU. Through understanding the context, the stakeholders are inevitably identified. Depending on the stakeholders, planning and urban problems can be tackled through different synergies.

Define: combine all your research and observe where your users' problems exist

STEP 3. *Identifying the community needs for time, material, and land*

Aim: It is important to understand what the different groups of the community need and want to better be able to find the best circular solutions and find compromises and agreements. The analysis of the needs should be divided according to the three categories of resources: temporal, material, and spatial. Fulfilling community needs with available resources work towards achieving social sustainability (see 4.1.1 sustainability). Developers can have strong power in redevelopment projects and local community gains can be difficult to be ensured by the municipality (A-M. Sigouin, personal communication, May 6th, 2021). Planners need to work towards enabling the fulfillment of those needs (S. Mammone, personal communication, April 16th, 2021).

Figure 16: Step 3, own illustration

STEP 4. *Identifying temporal, material, and spatial resources*

What resources are available during the different phases of the redevelopment project??

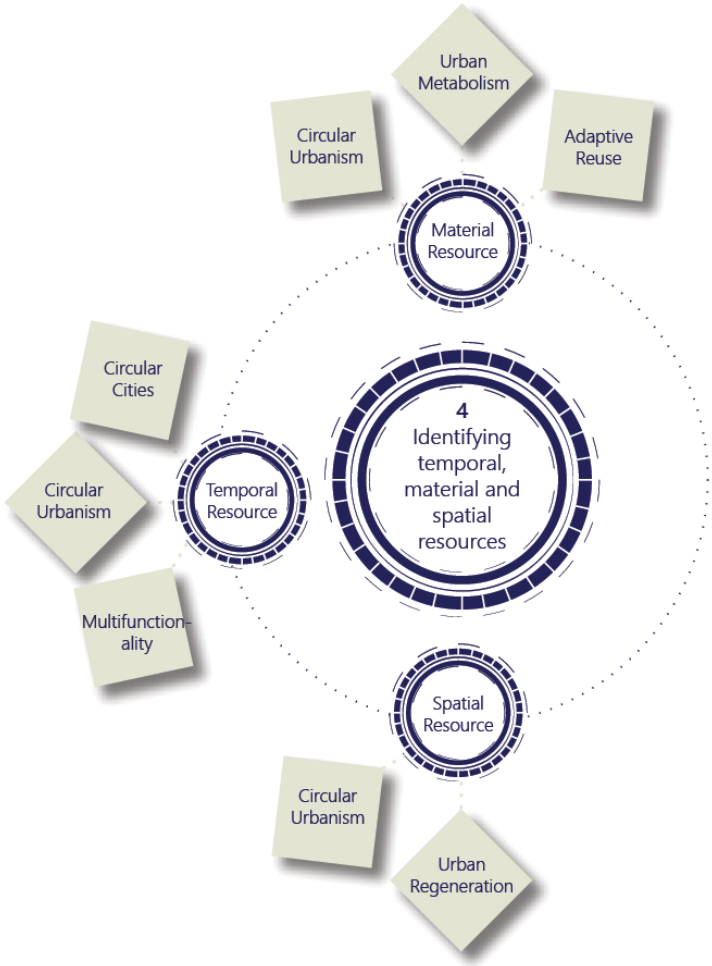


Figure 17: Step 4: own illustration

Aim: This step is the main addition that CU brings to linear redevelopment projects. It helps to identify the different resources that each stage brings. This also aims at making actors aware of the different valuable resources that could become waste in linear redevelopment projects. Temporal resources can be used as a way to promote social cohesion (see 4.2.2 circular cities). Material resources can optimize the existing flows without requiring the use of new primary materials (see 4.2.1 urban metabolism). Spatial resources can be used to fulfilled community needs

There are three main stages of a redevelopment project which all bring different resource elements.

1. Vacancy – when the building is vacant and awaiting to be demolished or repurposed.
2. Demolition – when building elements can be saved before their construction, renovation, or demolition.
3. New use – when a new building is built, and new functions are taking place.

Resource analysis

For stages 2-3-4 mentioned above, resource analysis should be conducted to identify the availability of different elements:

a. Available time in certain spaces is characterized as a temporal resource (see 4.3.1 multifunctionality).

b. Available material and elements are characterized as a material resource (see 4.3.2 adaptive reuse).
c. Land availability is characterized as a spatial resource (see 4.3.3 urban regeneration).

B. EXPLORE

Ideate: Generate a range of creative ideas

STEP 5. *Conceptualizing synergies*

How to combine needs and available resources?

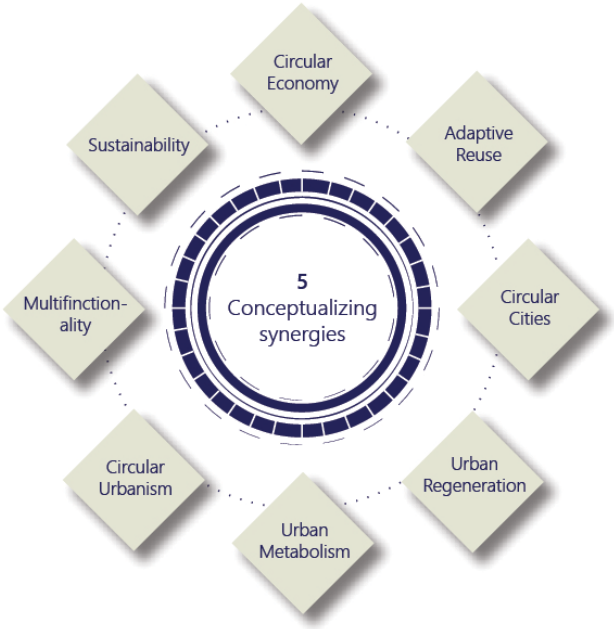


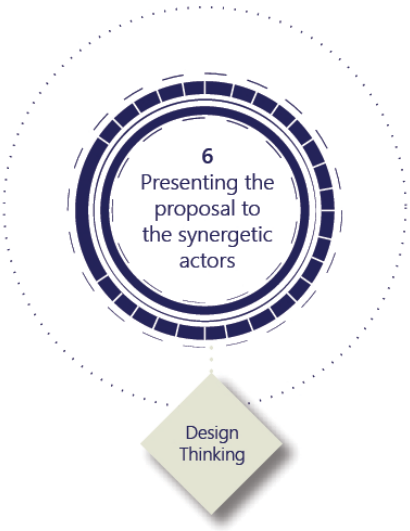
Figure 18: Step 5, own illustration

Aim: After understanding the needs of the different stakeholders in step 3, and having identified the different available resources in step 4, the step of finding the best combination of their complementarity is possible. This step allows to finally propose a possible scheme with repurposing land, reusing material, and adding functions in available time in spaces, throughout the different stages of the redevelopment. The goal of circularity being to close the loops of different elements (see 4.2 circular economy and 4.2.1 urban metabolism) the synergies identified in this step become a vector to fulfill the needs of the community (see 4.2.2 circular cities).

Prototype: Build real tactile representation for a range of our ideas

STEP 6. *Presenting the proposal to the synergetic stakeholders*

What do the potential partners think of the proposed solutions?
What elements can be improved to develop the final proposal?



Aim: This step aims at presenting several ideas to the synergetic actors, addressing the identified needs, and fulfilling the identified available resources. The character of this step is experimental, testing the feasibility and practicability of the
potential solutions, to iteratively improve them with the different inputs (see 5.1 design thinking).

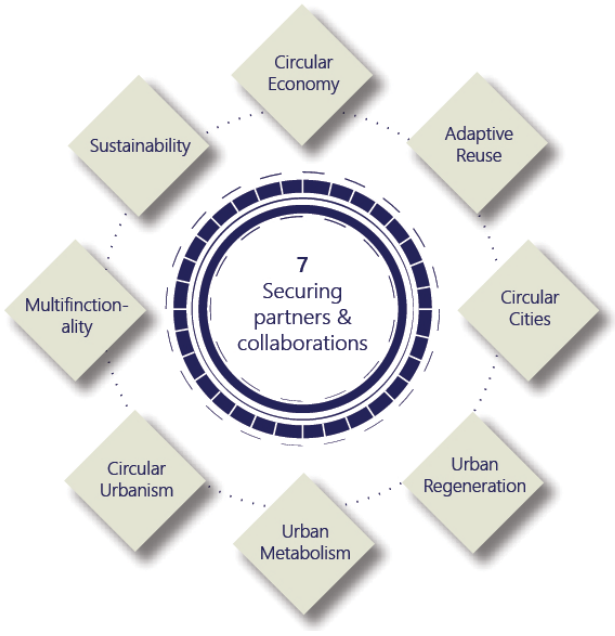
Figure 19: Step 6, own illustration

C. MATERIALIZE

Test: Return to your user for feedback

STEP 7. *Securing partners & collaborations*

Who can facilitate synergies and how can they be implemented and secured?

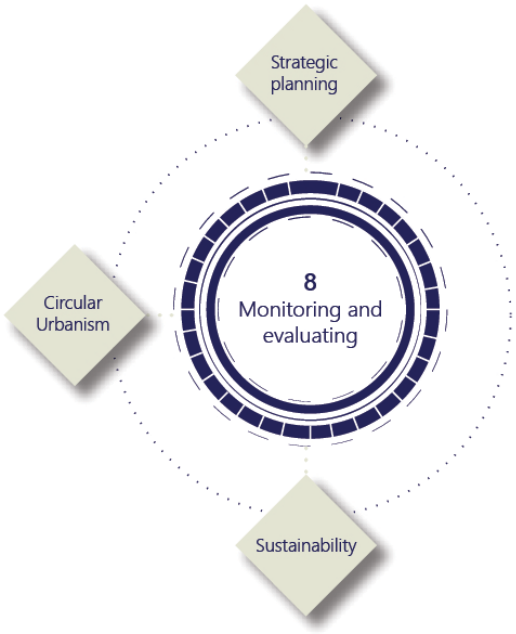


Aim: Securing partners that are willing to implement the proposed synergies identified in step 5 requires the solidification of collaborations and agreements. This step aims at finding which agreements are in place in the context to facilitate the incorporation of community needs in the redevelopment projects through the municipality's planning tools (A-M. Sigouin, personal communication, May 6th, 2021 and S. Mammone, personal communication, April 16th, 2021). As different stakeholders have specific knowledge, access to different technologies, and expertise, the step of finding how to synergize all those elements is a very complex one and requires multiple collaboration and communication between the various stakeholders involved.

Figure 20: Step 7, own illustration

STEP 8. *Monitoring and evaluating*

To what extent did the project achieve the strategic goals of circularity?
What lessons learned from this project help the municipality improve the process for future redevelopment projects?



Aim: This step aims at creating a feedback mechanism for regular revision and potential modification of the project process towards the accomplishment of the goals and of the improvement of the application of the roadmap (see 4.1 strategic planning). The monitoring aims at evaluating if the circularity goals were achieved. The procedural practicality should be proven and improved upon, to ensure that the roadmap can be used more efficiently for other redevelopment projects, inspire others and accelerate the transition towards more circular practices (see 4.1.1 sustainability). The evaluation aims at improving the roadmap through feedback from different stakeholders and experts, to adapt the roadmap to the local context given the complexity of a specific project.

Figure 21: Step 8, own illustration

5.3 How can municipalities facilitate the design process of circular urbanism?

The answer to this question is the roadmap presented above. The researchers elaborated this strategic plan, the roadmap as a way to facilitate the municipalities' transition towards a circular process for urban redevelopment projects. Following these 8 steps aims to help municipalities implement CU, by identifying the three types of resources on their territory, namely temporal, material, and spatial resources, understanding the needs of their communities related to these resources, and identifying synergies between the identified needs and resources.

The roadmap elaborated in the frame of this thesis should be seen as a strategic plan to guide municipalities, providing the essence of a flexible roadmap, but it is the responsibility of the municipality, or the entity in charge of a redevelopment project, to adapt it to the local context. Steps are then modified, added, removed to fit better the context and to most appropriately and efficiently bring more circularity in redevelopment projects. The way each step is approached can depend on each municipality. To facilitate the design process of their context-dependent roadmap, municipalities have to include many different voices in the discussion, to have a completer and more appropriate process.

This step-by-step roadmap is guiding municipalities to implement CU in redevelopment projects, but municipalities should adopt the roadmap to their local processes and local knowledge, this guide is merely to start the discussion and to lead the way towards a wider comprehension and easier implementation of CU. For example, contexts have different conditions, such as the state of the buildings, which has a great impact on the possibility of adding a transitional use. Maximizing the three different resources could be prioritized differently from one context to another, which would still facilitate the transition to more circularity in the planning field.

A crucial element as well, to facilitate the design of CU is the importance of the last step of the roadmap, the monitoring and evaluating of the circularity goals as well as the roadmap in itself, to ensure that each project realized with the roadmap in a municipality provides lessons to improve the roadmap to improve the following projects.

In the following chapter, the roadmap, steps 1-8 are applied to the case study of the redevelopment of the south sector of the Faubourgs in Montreal, Canada. This process is iteratively realized with the elaboration of the roadmap itself, following the design thinking process (see section 5.1).

| 6 | ANALYSIS

The analysis conducted in the frame of this thesis is the application of the CU roadmap, as presented in the analytical framework of chapter 5, to the case study of the Faubourgs redevelopment in Montreal. As explained in chapter 3 (Methodology), an in-depth municipal document analysis paired with the input of valuable interviewees has provided the researchers with key information enabling them to follow this roadmap and to come with concrete propositions that would lead to the application of CU for the redevelopment. That said, none of the steps are completely implemented, in the way that the limited knowledge of the context and of the process of redevelopment in Montreal, coupled with the limited time to conduct this analysis and the remote location of the researchers from the site makes this analysis somehow superficial. Municipalities that are interested in CU as a way to redevelop certain areas, in collaboration with developers that are interested in the approach, would come to much more concrete and realistic outputs, given more resources and knowledge. The analysis presented here merely aimed at iteratively adapting the steps of the roadmap by testing the feasibility of the analysis on this specific case. The second aim links directly to the competition to which the researchers are participating, as the proposal presented to the municipality required practical inputs linked to the redevelopment.

The entity that would apply the roadmap for the Faubourgs redevelopment in Montreal, would be, according to Sigouin, the urban planning department of the Montreal Municipality, and the Ville-Marie borough, as well as to the *Bureau de la transition écologique et de la résilience* [Office of Ecological Transition and resilience]. Those three entities would be the most relevant to do feasibility studies to access the possibility of deploying a circular approach for that specific development, with relations to the regulations and the conditions that are set by the municipality for each redevelopment project (A-M. Sigouin, personal communication, May 6th, 2021).

6.1 Developing circularity goals

To what extent does the city wish to achieve circularity in its redevelopment projects?
How much time/material/space does the city want to avoid wasting?

The step of goal setting aims at identifying clear circularity goals for the redevelopment. This step would have to be realized by the municipality, as the circularity goal for each element needs to be a concerted decision between regulatory and political entities while being realistic in terms of implementation. In Montreal, the circular goals would be in line with the Climate Plan 2020-2030, which already sets the trajectory that the municipality is following concerning sustainability and climate change. The mayor has announced the municipality's commitment to decrease the greenhouse gas emissions of the city by at least 55 percent below 1990 levels by 2030 (Montreal Municipality, 2020). The Climate Plan is reflecting the population, as citizens have been strongly consulted to write this plan. Montrealers are considered as important to set the trajectory for sustainability and having the

opportunity to voice their opinions and concerns on environmental issues that shape the municipality's fight against climate change and to facilitate the municipality's ecological transition (Montreal Municipality, 2020).

There are 31 mentions of the term 'circular' in the Climate Plan 2020-2030 (Montreal Municipality, 2020), therefore showing that there are already discussions and will to change towards more circularity in different sphere of urban planning, the setting of circular goal allows to define those goals in city development and redevelopment.

Different goals have to be identified for each of the three types of resources, land, material, and time to ensure that redevelopment projects are utilizing the three resources that have the potential to greatly meet community needs. Some suggestions for Montreal Municipality have been inspired by some of the interviews conducted with academic and local experts, the others have been inspired by Amsterdam's circularity plan and Paris Circular Economy Roadmap, two cities that Montreal Municipality looks up to.

First, to make the most of available time in certain spaces, the municipality could require developers to add functions in x% of available time during the vacancy phase and new use.

Then, to make the most of available material and heritage elements, the municipality could require X% of the deconstructed materials must be reused in the redevelopment of the neighborhood. The Paris Circular Roadmap (2017) requires 70% of reuse while the Dutch, through their Circular Dutch economy by 2050 strategy suggest 50%. Montreal can also aim for a reduction in raw materials consumption by 2050, to fit with the GHG reduction target emitted by Plante. There could also be an aim of reducing embodied emissions by at least x% for all new buildings and major retrofits by 2030 and reducing embodied emissions by at least x% of all infrastructure projects by 2030.

Finally, to make the most of available land, Montreal Municipality could require that in the redevelopment project of Xm^2, X% of the area should be regenerated in green areas and X% in public spaces or that X number of wastelands should be allocated to a circular activity (circular business or activity that makes the most of a type of waste).

6.2 Understanding the context and identifying the stakeholders

In which context does this redevelopment take place (former use, identity of the neighborhood, political situation)?
To what extent is circularity already integrated into the municipality's strategies and actions?

The contextual analysis presented in this section is a summary of the context of the project for the purpose of the thesis. We would like to highlight that we are realistic and aware that the scope of the contextual analysis is much more superficial than if a municipality was to do this analysis, as a step in the implementation of CU to redevelopments in their municipality. Many elements were possibly not grasped and the municipality itself knows much better the context that we can in the timeframe of this thesis. Montreal Municipality has produced the PPU and is much more aware of the historical, cultural, and political elements. Nonetheless, we argue this step is crucial as it determines the following steps since the context is dictating what is possible to do in a different context. The analysis is being separated into two main levels, the strategic level, aiming to understand the bigger context in which the redevelopment takes place, and then the site analysis, to understand more the micro-level elements that have a direct impact on the redevelopment. In the strategic analysis, the following are examined; the geographical context, the political context, the planning procedures, the state of Montreal with CE, and finally the state of CU elements in Montreal. The site-level analysis presents the community profile, the redevelopment planning process for Faubourgs specifically, the specifics about the two main entities (A. Radio-Canada complex and B. Molson complex). This step concludes with the identifications of the stakeholders for the redevelopment.

6.2.1 Strategic analysis

Geographical context

Montreal Municipality is situated in Canada, in the province of Quebec (see figure 22). The redevelopment of the Faubourgs is located in the Ville-Marie borough, a borough that is an important unit in Montreal, both politically and culturally. The Faubourgs area is located east of Montreal city center, close to the central business district and bordering the river, and close to the Jacques Cartier bridge linking the island to the south shore.

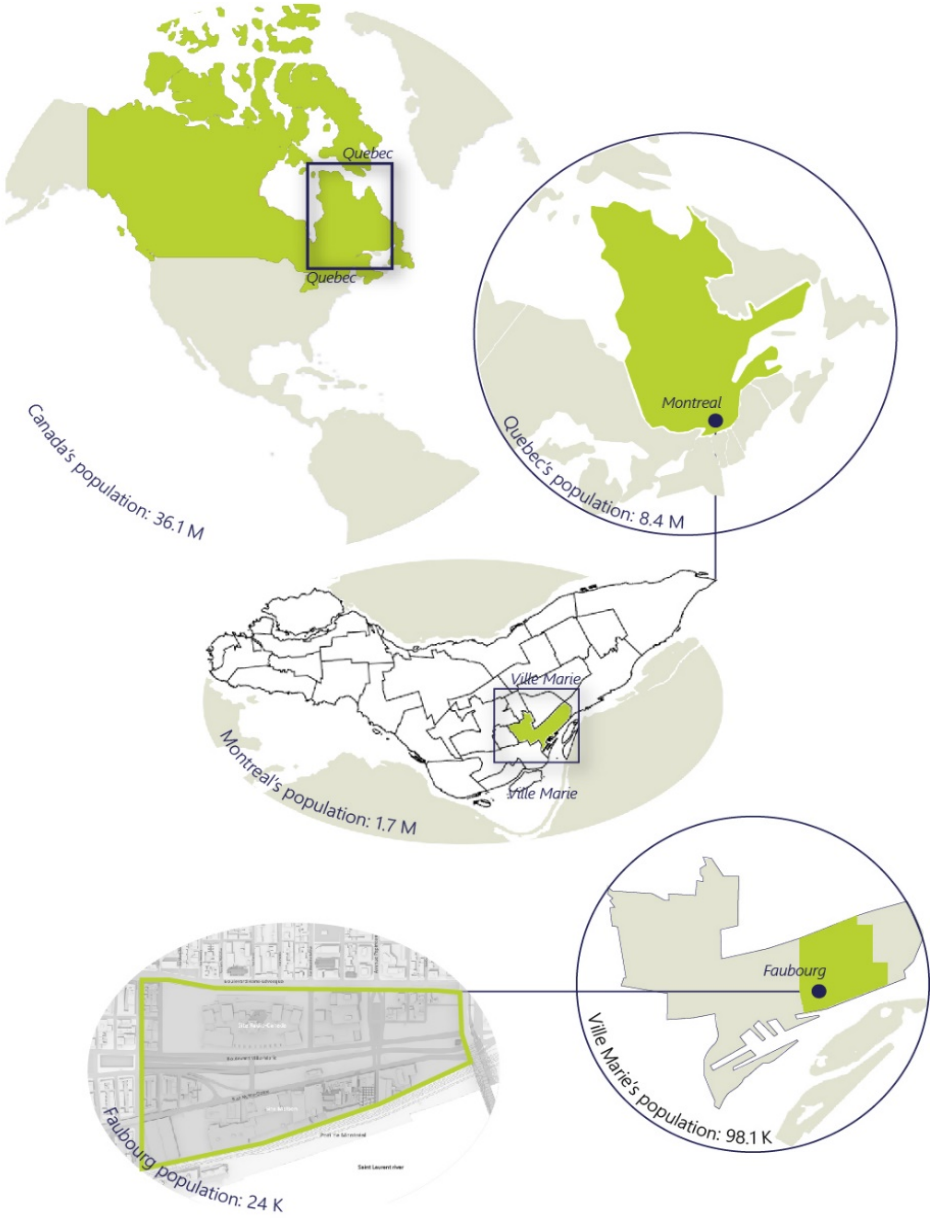


Figure 22: Geographical context of the Faubourgs, own illustration, source: Urban Planning Department of the Ville-Marie Borough, 2020 and Google Maps

Political Analysis

The Montreal administration, led by Valérie Plante from the party *Projet Montréal* (Montreal Project) was elected for the mandate from November 2017 to 2021 and committed in September 2019 to reduce the city's greenhouse gas emissions by 55% from the 1990 level by 2030. According to the Youth Council, Montreal has important political and economic levers to ensure its transition as it has jurisdiction over land-use planning and housing. As an administration, the Municipality has started to integrate circular principles into its practices and policies, but the Youth Council argues that could certainly do more and do better (Conseil Jeunesse de Montréal, 2020).

In December 2020, the administration also launched the 2020-2030 Climate Plan, which provides 46 measures to achieve its objectives in terms of reduction in GHG emissions. This plan is

based on five major themes around mobility, buildings, the exemplary of the City, governance, and mobilization (Montreal Municipality, 2020).

The Conseil Jeunesse de Montreal (CJM) [Montreal Municipality Youth Council] has also published in 2019 a report called *Synthèse de l'avis sur l'économie circulaire à Montréal: une transition vers un futur durable* [Summary of the opinion on the circular economy in Montreal: a transition to a sustainable future] (Montréal Youth Council, 2019). The fact that the youth council, a "consultative body created in 2003 to advise the mayoress and the executive committee on the concerns of young people" worked on drawing the lines of state of CE in Montreal, and to suggest guidelines for the implementation of circular practices demonstrates the interest that young people have in CE and their desire to accelerate the transition towards circular practices (Montreal Youth City Council, 2019).

Planning procedures

Planning in Canada/Quebec

In Canada, land-use planning is governed by provincial legislation, but the municipal councils are the ones adopting land use plans and enacting zoning by-laws that regulate land use planning and development within their jurisdiction. At the provincial level, it is the Quebec Ministry of Municipal Affairs and Housing that takes care of planning matters. As of now, the main planning law in Quebec dates back to 1979, the *Loi sur l'aménagement et l'urbanisme (LAU)* [Land Use Planning and Development Act], and hasn't drastically been changed since but will be renewed in 2022, after a year of drafting. The change in the National Strategy could lead to the imposition of guidelines to ensure that, in residential development projects, spaces for schools, shops, and local services are planned upstream (Gouvernement du Québec, 2021).

Planning in Montreal

In Montreal, each borough has a borough chapter in the Plan d'Urbanisme [Planning Act] where the administration of each borough can decide to modify existing regulations, by proposing modifications or amendments to meet certain objectives set up by the individual borough (A-M. Sigouin, personal communication, May 6th, 2021).

One tool that the municipality has is the *Droit de Préemption* [Right of Premption], which the municipality can use to ensure that the community needs are represented in big redevelopment projects. Once a promoter or developer acquires a site, the municipality has a right of review, meaning it opens a negotiation process for various elements that have been identified as important by the citizens of the sector. This tool is used to negotiate with the developer concerning certain gains, such as the presence and location of social housing, green areas, and possible accessibility to the river (A-M. Sigouin, personal communication, May 6th, 2021).

Another tool that is regularly used in Montreal and that is included in the provincial Urban Planning Law (Loi sur l'Urbanisme LAU) (A-M. Sigouin, personal communication, May 6th, 2021) is the Projet Particulier de Construction, de Modification ou d'Occupation d'un Immeuble (PPCMOI) [Particular Construction Project, with Modification or Occupation of a Building]. It is a tool used when a project is submitted to the borough and deviates from the local urban planning by-laws but that does not deviate from the Planning Act. This tool allows the municipality to reach gains so that the project is as contributary as possible to the site and the community. The types of gains are similar to the gains

from the Right of Preemption, such as more greening, more non-constructed spaces, protection of heritage elements, protection of views river (A-M. Sigouin, personal communication, May 6th, 2021).

Additionally, another tool linked to CU is the Metropolitan Land Use and Development Plan (PMAD) was passed in 2002 and made it possible to determine urbanization perimeters and enabled the slowing down of the encroachment on agricultural land in the territory of the Metropolitan Community of Montreal. The goal of this plan is to offer a concerted vision to create attractive and dynamic living environments, developed according to the principles of SD. The municipalities of Greater Montreal have the mission to integrate the objectives of the Plan into their local planning tools. The PMAD was adopted following a broad public consultation by the 82 municipalities of the Montreal Metropolitan Community. The consultation process is now used as an example for an outstanding example of what is possible when municipalities, civil society, and citizens work together towards the same goal (Communauté métropolitaine de Montréal, n.d.).

A law that is linked to the possible implementation of CU in Montreal is *Métropole Mixte* [Mixed Metropolis]. It is a new law adopted in 2021 and being in effect since April 2021, that regulates development, and aims at improving the supply of social, affordable, and family housing. It demands private developers to allocate a portion of their development to social, affordable, and family residential units. The law requires that anyone who is developing a residential project with an area greater than 450 m2 (equivalent to approximately five dwellings) must sign an agreement with the municipality to contribute to its supply of social, affordable, and family housing. This also applied to projects including new buildings, an expansion, or conversion. The agreement can take different forms, such as “transferring land or a building in exchange for a financial contribution, building homes that meet certain criteria or else a financial contribution” (Montreal Municipality, 2021). This law also entails that the municipality has a veto over the plans of a private developer, where redevelopment plans can only be accepted and implemented by the private sector, if the municipality has made sure the new regulation is applied and that the location of those social, affordable and family residential units are appropriate, limiting the possibility of the developer to cluster them in a corner of the development (S. Mammone, personal communication, April 16th, 2021).

The planning tool that is relevant the most in the context of a redevelopment in Montreal is the Plan Particulier d’Urbanisme (PPU) [Special Urban Planning Program]. It is the primary document used in the analysis of the Faubourgs area for the contextual analysis as well as to understand the stakeholders and their needs. To understand the significance and relevance of this document, an explanation of this planning tool’s elaboration is necessary.

A Plan Particulier d’Urbanisme (PPU) [Special Urban Planning Program] is a comprehensive plan produced when an area is facing or planning to face significant change. The PPU sets goals (physical, social, environmental, and economic) for the future and proposes actions to achieve them, including new planning regulations, improved public facilities, programs, and policies. The municipality’s planners are responsible for writing the PPU, in some instances, with other professionals’ help. Expected residents, long-time residents, real estate developers, large institutions, community organizations, urban planners, retailers, and elected officials are consulted throughout the drafting of the plan to allow a contribution of a plurality of views. The process of a PPU can be briefly explained as followed. The municipality first identifies areas that are expected to face major changes, and where detailed planning is needed to ensure that everyone benefits. A PPU can be initiated by elected officials or citizens. Then, a neighborhood profile is elaborated with studies to help identify the needs of the

neighborhood and the elements that could be included in the PPU. Then, the PPU identifies goals for the future of an area and the planning regulations, public facilities, programs, and policies to achieve them, while further studies can be conducted to avoid potential adverse effects. The municipality asks residents and anyone else who feels concerned to come and express their ideas, thoughts, and needs. There can take the form of public hearings, working groups, workshops, surveys, and interviews. The public consultation entity in Montreal is the *Office de consultation Publique de Montréal* (OCPM) [Montreal Public Consultation Office]. It is independent, meaning members are neither elected officials nor municipal employees but they are entrusted by the Montreal Municipality council or executive committee to acts as a neutral third party between the public, the developers, and the Municipality. Finally, the Municipality Council and the Executive Committee vote either to adopt the PPU as is or to incorporate the changes proposed as a result of the public consultation. The Montreal Master Plan is then amended to incorporate the PPU, and the borough's planning by-laws are amended to incorporate the PPU (Office de Consultation Publique de Montréal, 2011).

Montreal and the Circular Economy

The Montreal Municipality has several political and economic levers enabling it to implement circularity strategies and models. “Based on the powers devolved to it, the Montreal Municipality can act on at least four fronts in the CE, through regulations, procurement, the budget and taxation and finally as an example through its practices as an administration” (CJM, 2019). Montreal is leading the path in North America, compared to other cities, but greatly lags compared to European cities. Indeed, Montreal is still at the beginning of its transition process (CJM, 2019; F. Scherrer, personal communication, April 30th, 2021).

CE is increasingly integrated into the vision of development for the municipality. Many strategic papers published by the municipality are talking about CE and suggest actions to fasten the transition. First, already in 2016, one of the priorities of the 2016-2020 Sustainable Montreal Plan, the plan that came just before the Climate Plan 2020-2030, was to “make the transition to a green, circular and responsible economy”. As Scherrer argues, CE in Montreal is very oriented towards economic development and is still very marginal (F. Scherrer, personal communication, April 30th, 2021). Then, the 2018-2022 Accelerate Montreal Economic Development Strategy sets the objective to develop key geographic sectors with a focus on SD while promoting the CE (CJM, 2019). Additionally, the action plan for the economic development of the *Bâtir Montréal [*Building Montreal*]*, resulting from the strategy discussed previously, suggests to “establish partnerships to actively support the circular economy” and to increase “the number of partnerships in the circular economy » (Ville de Montréal, 2018). Finally, in 2020, Montreal has committed to becoming a zero-waste territory by 2030.

In 2017, within the framework of the Sustainable Montreal Plan 2016-2020, the EDDEC Institute and the Lab Ville Prospective, headed by Scherrer at the time, and researched by Genois-Lefrançois published a report called *Cartographie des acteurs et initiatives en économie circulaire sur le territoire de l'agglomération de Montréal* (Mapping of actors and initiatives in the circular economy on the territory of the agglomeration of Montreal). The report listed a total of 274 initiatives linked to CE in Montreal. Among them, 41.2% are the work of social economy enterprises, non-profit organizations, and cooperatives, 35.4% are carried out by companies, industries, and businesses while 19.7% are done by municipal entities. The remaining 15% are made up of citizen, collective and institutional initiatives (Scherrer, Abrassart, Crahes, & Cyr, 2017, p. 13).

Despite the number and diversity of CE initiatives in the municipality, obstacles have been highlighted that slow down the implementation process. The main restraints to CE initiatives were raised and corroborated by different stakeholders involved in the field of economic development or the CE in Montreal between June and September 2019. The first obstacle mentioned is the complexity of the political system of Montreal, made up of an agglomeration, a central city, 14 peripherical cities, and 19 boroughs. As the "borough constitutes a local political level which can be a vector of transition to ensure the implementation of circularity strategies, their number tends to complicate the standardization of practices on the territory, even to promote work in isolation of the arrondissements and administrative units" (CJM, 2019). This entails that boroughs, can work in silos and different level of governance makes it harder to synergize.

Montreal is relatively at the beginning of its process of transition towards circular practices, and the goal remains mainly economic. Additionally, the municipality still "does not have a well-defined and integrated vision, nor a circular economy plan or roadmap" (CJM, 2019). Although several documents refer to the CE, it is difficult to determine a common thread, the objectives often remain vague, and no indicators have been developed to monitor the initiatives and progress (see section 4.1 strategic planning). According to many stakeholders interviewed to produce the Youth Council report, working in isolation remains a reality despite the numerous efforts are currently being made to coordinate the various departments and the various boroughs (CJM, 2019).

Another obstacle highlighted by the *Conseil Jeunesse de Montréal* [Montreal Municipality Youth Council] (2019) concerns the rigidity of the regulatory and legislative frameworks to which the actors of economic development, both at the municipality and from the private sector, were subject. This framework regulates internal operating rules, as well as external ones, as they are imposed by higher levels of government, for instance, the Quebec government. "Although responding to legitimate principles of transparency, effectiveness, and efficiency, the rules concerning the award of contracts, including the rule of the lowest bidder as well as the contractual context, were mentioned as obstacles to innovation" (CJM, 2019). Likewise, zoning regulations can hamper economic transition when certain activities or businesses are not permitted or are restricted in certain areas. Finally, the networking of people and materials was mentioned by the actors interviewed by the CJM as one of the difficulties encountered to implement circularity strategies and models. Logistically, entrepreneurs and citizens alike want to part or acquire materials or objects, but as there is no organization of flows and deposits of available material, despite the desire to do so, it remains impossible (CJM, 2019).

The CJM concludes its report with a call "for the Montreal Municipality to take a much more assertive leadership and, like other cities in the world, to establish an ambitious CE plan that allows it is up to all the vital forces to coordinate their actions" (CJM, 2019).

As of March 2021, the Montreal Municipality has announced an investment of $ 1,275,000 to accelerate the development of the CE in its territory (Montreal Municipality, 2021). This is part of the economic recovery plan *Une impulsion pour Montréal: Agir Maintenant* [An impetus for Montreal: Act Now], as a hope for a more sustainable recovery from the COVID-19 pandemic, which put great pressure on cities and businesses. Such an important amount is a first among Canadian cities. Their goal with this fund is to "develop a circular economy roadmap from 2021 to accelerate the transition from a linear model towards a more circular model" (Montreal Municipality, 2021).

The economic recovery plan also highlights the collaboration between the municipality and the *Synergie Montréal [Montreal Synergy]* initiative of PME MTL Est-de-l'Île, to offer support to the companies by supporting businesses having a circular process in the development of CE projects and business models. The Municipality's contribution aims to combine support and financing, to favors an

effective process to support businesses in their transition (Montreal Municipality, 2021). The mayor announced that "Our recovery must be green, inclusive and local and the Montreal Municipality intends to be a leader. We will mobilize and channel the efforts and contributions of the economic ecosystem to ensure a recovery that leaves no one behind. This partnership makes it possible to pool the efforts of the Municipality and the support organizations of the businesses it supports. This support must continue to facilitate the economic transition for the benefit of the ecological transition" (Montreal Municipality 2021).

The Municipality is strengthening its financial support for *Synergie Montréal*, a company acting as a platform for businesses "to offer them the opportunity to implement various CE strategies to promote their resilience, stimulate the local economy and develop the potential for innovation for eco-responsible business solutions" (Ville de Montréal, 2020). The objective of this investment is to increase circularity as it is seen to "be a major contribution to the achievement of the Montreal Municipality's objectives in terms of reducing greenhouse gas emissions and reducing residual materials, in accordance with its Climate Plan and its 2020-2030 strategic vision" (Montreal Municipality, 2021).

There is also, on the provincial level, the platform *Québec Circulaire* [Circular Quebec] that aims at "bringing together the variety of initiatives, tools, and expertise currently dispersed towards accelerating the transition towards a CE through the convergence of actors, projects, and tools (Québec Circulaire, n.d.). Other businesses and organizations have the mandate to facilitate the CE in Montreal, such as Lande and Entremise. "Lande facilitates citizen reappropriation of vacant land in Montreal. We draw attention to the underutilized potential of these spaces by valuing them and activating them in a transitory way" (Lande, n.d.) while Entremise "designs, implements and operates transitional occupancy projects alongside public actors, owners, and communities to allow entrepreneurs, traders, creators, citizens or community organizations to revive vacant or underused buildings by creating inclusive living environments" (Entremise, n.d.).

Culture of circular urbanism in Montreal

To conduct a contextually appropriate circular process for a redevelopment, it is important to research the context in which the proposed actions are taking place. The different cultural history and dynamics of individual cities greatly affect how easily the proposed synergies are implemented and the degree to which circularity can be reached.

In the case of Montreal, this step allows showing that a circular approach to urban redevelopment can be somehow easily integrated, as there is a culture of temporality and similar initiatives already present on the territory. Large companies in Montreal are gaining interest in the CE model but it is still a very bottom-up movement in Montreal, where it is mostly social economy small organizations, startups, community groups that are acting on circularity terms. Bottom-up initiatives are better mobilized than top-down ones in Montreal. Additionally, there are not many actors who claim to be working on circular urban fabrication (P. Genois-Lefrançois, personal communication, April 30th, 2021). It is only recently that the transition towards circularity has become an official priority of the Montreal Municipality, for example, it takes a central in its economic development plan (F. Scherrer, personal communication, April 30th, 2021).

Combining uses (temporal resources)

Finally in terms of time in space, of combining uses, Montreal is not very advanced compared to European cities on that front but still has some very successful examples (F. Scherrer, personal communication, April 30th, 2021; S. Grisot, personal communication, March 5th, 2021). For example, there are multifunctional buildings such as Santropol (see figure 23), that combines a productive vegetable rooftop garden, kitchens to prepare meals to deliver to community members in needs, and some community rooms to rent, and also different rental places for groups that need space, such as a company growing mushrooms, a bicycle repair workshop, etc. Apart from sparse initiatives like this, "there is a lack of experience. It is discussed, but there is no irrepressible movement around the idea" (P. Genois-Lefrançois, personal communication, April 30th, 2021).

Figure 23: Santropol building, source: https://santropolroulant.org/en/2017/08/an-elevator-to-the-rooftop-garden/

There are also companies like Entremise (see figure 24) in Montreal that "designs, implements and operates transitional occupancy projects alongside public actors, owners, and communities to allow entrepreneurs, traders, creators, citizens or community organizations to revive vacant or underused buildings by creating inclusive living environments" (Entremise, n.d.). Entremise also highlights that in 9 plans and strategies, the Montreal Municipality mentions the tool or lever of a transitional use, whether it is a use or occupation for the development of the Municipality (Entremise, n.d.).

Figure 24: Young project - Transitional laboratory, source: https://entremise.ca/nos-realisations/projet-young-2

Transitional uses are another tool that Montreal Municipality is developing and experimenting with over the years. Transitional projects are perceived by the municipality in a very positive and favorable way. Nonetheless, the reoccupation of a vacant building sometimes is requiring big investments, according to the state of disrepair of the building. It can be characterized as a complex process including various constraints. For the last 2-3 years, there have been some pilot projects, but Sigouin argues that it can just be done in cases where the building is occupied almost immediately,

without having to invest a large amount of money. As soon as a building of heritage interest is vacant, there is often interest in doing such a project but there are a lot of restraints to the implementation to those enterprises. In many cases, just to make it occupiable, sometimes it takes really big investments. The feasibility of transitional projects depends on how old the building is and how well it has been maintained. (A-M. Sigouin, personal communication, May 6th, 2021)

Underused material (material resources)

Figure 25: Champlain Bridge, source: https://financialpost.com/news/economy/delays-in-approving-new-champlain-bridge-cost-taxpayers-500-million-auditor-general-finds

In terms of unused material, some initiatives are being rolled out about reusing construction material, but it is still not a practice that has been absorbed by mainstream building thinking. A project currently happening, but that is considered by Scherrer as having lost his potential, is the Material Reuse Competition from the deconstruction of the original Champlain Bridge (see figure 25) which allows groups to submit projects on how they could reuse some components of the former bridge. But projects like this remain marginal, and as Scherrer argues, the stage of reuse of material and elements is very immature in Montreal and the lack of circuits makes the transition very difficult (F. Scherrer, personal communication, April 30th, 2021).

On the territory of the PPU, the municipality has chosen objectives concerning the rehabilitation of a Municipality building that's been abandoned for almost 40 years, the Old Craig Pumping Station (see figure 26), and that is in an advanced state of disrepair. There is a group of citizens, along with the heritage community, involved in the project and desire to rehabilitate and enhance this building. The building is in such a bad state, that Sigouin argues that the conclusion the municipality will probably come to is that we cannot keep it as it is, but everything will be dismantled, each stone and each structural element, to integrate these materials in an eventual reconstruction- rehabilitation, probably reintegrated in a new contemporary form to the building (A-M. Sigouin, personal communication, May 6th, 2021). In parallel, a building that has been built the same year with the

Figure 26: Craig Pumping Station abandoned for 40 years, source: https://memento.heritagemontreal.org/en/site/craig-pumping-station/

Figure 27: Riverside Pumping Station used by Montreal Blacksmith organization for 20 years, source:https://imtl.org/montreal/building/Station_de_pompage_Riverside.php

same purpose, but that has not been occupied since the closure of the pumping station, 40 years ago, is in a much greater condition, because of the care and maintenance provided by the users (see figure 27). The old pumping station Riverside has been occupied for 20 years by the *Forges de Montréal* [Montreal Blacksmith], an organization that has a mission to preserve, spread, and transmit blacksmithing and blade smithing-related knowledge (Les Forges de Montréal, n.d.). The Montreal Forges occupied the old Riverside station, and ensured, by their occupation, and the care they brought to the building, that today it is still in good condition. This parallel demonstrates how occupancy of the buildings helps the preservation and sustenance of the buildings (A-M. Sigouin, personal communication, May 6th, 2021).

Underutilized land (spatial resources)

Figure 28: Aire Commune, source: https://cultmtl.com/2021/05/aire-commune-to-return-at-a-new-location-with-live-music-montreal-summer-lachine-

In terms of the use of underutilized land, Montreal has developed very popular initiatives in the past 2-3 years (A-M. Sigouin, personal communication, May 6th, 2021). Many vacant lots are transformed during the summer with temporary urbanism, such as Aire Commune (see figure 28), in the Mile-End and Village au Pied-du-Courant (see figure 29), in the Hochelaga neighborhood. These temporary infrastructures hold concerts, yoga classes, markets, activities for all, and are free of access and very used by Montrealers. Montreal has a strong relation with temporary urbanism, as temporary projects are springing in many neighborhoods, all through different seasons. They are used as a tool, often supported by the Municipality, to create livable and accessible places to enjoy the outdoors playfully and attractively. Additionally, urban agriculture also holds a strong place in many Montrealers' hearts, and many initiatives use urban agriculture as a way to provide accessible and local food to the community, but also as a social tool for cohesion and greenery. Many back streets are converted in *Ruelles Vertes* [Green

Figure 29: Village au Pied-du-Courant, source: http://www.releveenurbanisme.ca/2015/04/04/village-au-pied-du-courant-a-montreal/

Alleys], where the back street is converted from a shared street to a pedestrian alley with vegetation and managed by the neighborhood residents themselves. There are also companies like Lande that "facilitates citizen reappropriation of vacant land in Montreal. We draw attention to the underutilized potential of these spaces by valuing them and activating them in a transitory way" (Lande, n.d.).

These examples, for the three types of resources to maximize, demonstrate that the state of circularity in Montreal is at a turning point, where some initiatives are already engaged in circular processes, which provides fertile ground for the municipality to ensure that circular processes are applied systematically.

6.2.2 Site analysis of South sector of the Faubourgs

To begin understanding the specific case area, an overall picture is necessary. The area holds important historical and heritage value dating back to the city's industrialization times during the second half of the 19th century (Urban Planning Department of the Ville-Marie Borough, 2020). The site, part of the Faubourgs area, is composed of two vast single-purpose sites, both iconic for Montrealers and tourists, whose occupants have announced their departure and, hence, settled the site for a complete repurpose. Such departure is setting the ground for a radical transformation, forming the largest area undergoing redevelopment in the borough. The site has the particularity of having major infrastructure surrounded from the north by the Ville-Marie highway, from the east by Jacques-Cartier Bridge, and from the south by the train tracks and St. Lawrence River covering a total of approximately 20 hectares (Urban Planning Department of the Ville-Marie Borough, 2020). The first big entity included in the site is the Radio-Canada tower (7 ha), the public national broadcasting company, whose functions have been relocated to the east of the area in a new complex, said to be better adapted to new digital technologies building. The second major component of the area is the Molson-Coors Brewery (12 ha), an important landmark that by the end of the year will be relocated to Longueuil, a municipality across Montreal, on the south shore of the St. Lawrence River (Urban Planning Department of the Ville-Marie Borough, 2020).

Figure 30: Visualization of the two main sites, source: C40, 2021

Community profile

As already referred to in chapter 3.3 (document analysis), the creation of a community profile helped the group to identify and acknowledge specific particularities of the local community and the context in Faubourgs. The 2001 and 2016 Census of Population in Faubourgs area, created by the national statistical office of Canada was studied, analyzed, and used for the development of the specific community profile illustrated in figure 31 (Statistics Canada, 2016).

Other than that, in the 'Centre-Sud', the bigger borough in which Faubourgs is located, Mammone emphasized the fact that people living there are active in their community. [...] They talk to each other and there is actual networking and helping each other (S. Mammone, personal communication, April 16th, 2021). Another insider's perspective on the area, which is also highlighted by Mammone and demonstrates the importance of analyzing the context of redevelopment is illustrated by the consequence of dynamics in the evolving neighborhood. In the case of the Faubourgs redevelopment, there is the 'Campement Notre-Dame' that is a "direct consequence of that neighborhood gentrifying and people losing their jobs" (S. Mammone, personal communication, April 16th, 2021). The camp was right outside of the area identified by the PPU on Notre Dame and "was clearly a consequence of what was happening in that neighborhood" (S. Mammone, personal communication, April 16th, 2021). All in all, it shows that there are injustices at the community level in the Faubourgs area and that major changes such as the redevelopment of these two complexes need to account for the diverse population in the neighborhood.

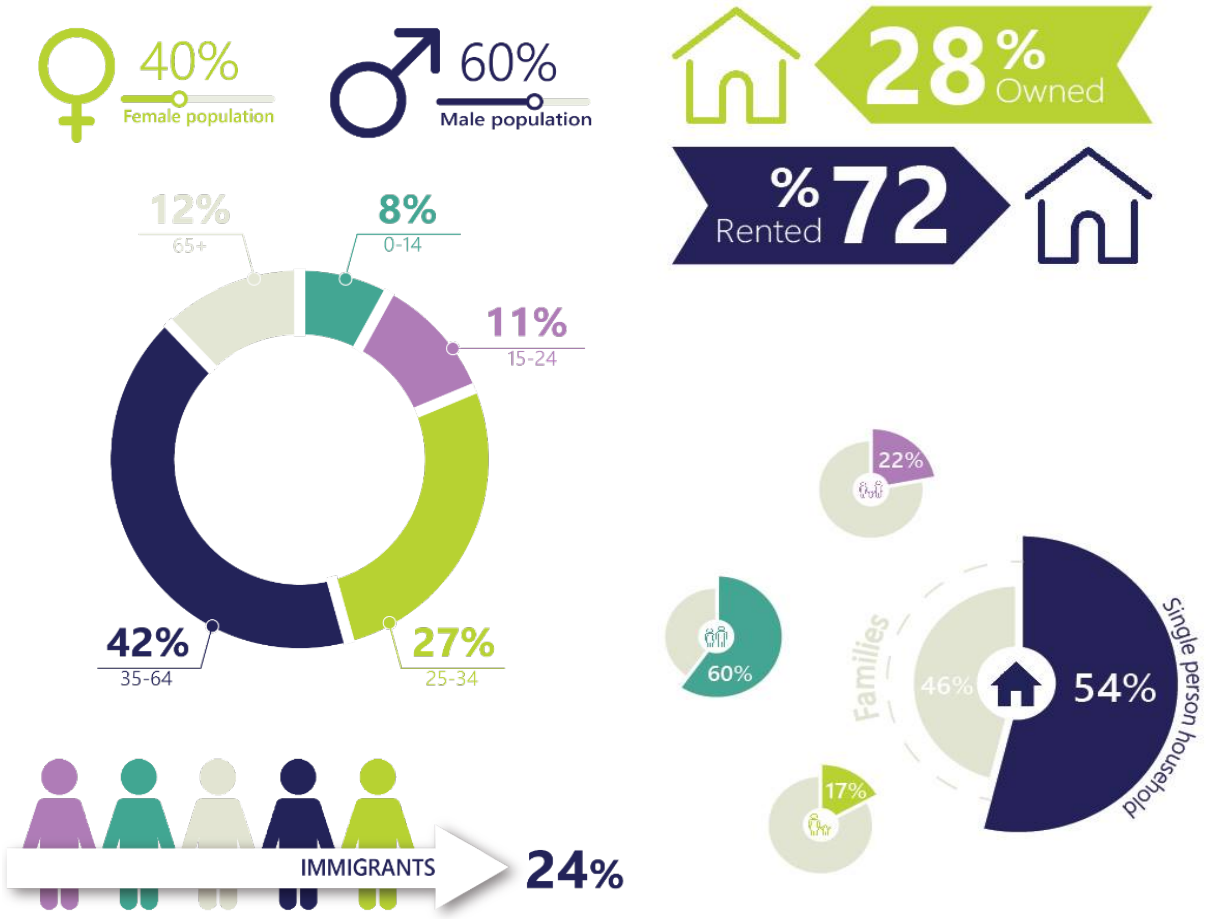


Figure 31: Community profile, own illustration, source: Urban Planning Department of the Ville-Marie Borough, 2020

The redevelopment planning process in Faubourgs

Sigouin elucidated the planning process that took place for the Faubourgs redevelopment. First, consultations have taken place upstream of the elaboration of the PPU by Ville-Marie's urban planning department, in collaboration with the central planning department in the city center. These consultations took into consideration the population's needs, ideas, concerns, and thoughts. Afterward, a draft of the PPU was made and submitted to the *Office de Consultation Publique de Montreal* [Montreal Public Consultation Office]. The 3 commissioners included in this project, held a public hearing and received 83 different proposals from the community and different stakeholders in the neighborhood. Then, the commissioners made recommendations to the Municipality's administration. The administration (Ville-Marie borough- civil servants, elected officials, and urban planning professionals) was obliged to respond to these by incorporating the various inputs so the initial project is then modified with the inputs from the public consultation. The 83 memoirs submitted to the *Office de consultation Publique de Montréal [*Montreal Public Consultation Office]. were then grouped into categories of interventions (transportation, public spaces, urban form, etc.). The urban planning professionals at the municipality, with the elected officials, then worked together to formulate answers to these recommendations, combining expert knowledge about regulations and planning guidelines, with the needs of the population and therefore are the judge of what requests are highlighted, and to what extent each proposition account for in the final document. The final project is still to be voted at the Municipality Council and will return to the borough's level for its implementation (A-M. Sigouin, personal communication, May 6th, 2021).

Sigouin has also affirmed that the municipality has used its Right of Preemption in the redevelopment project to gain some community benefits for the redevelopment (A-M. Sigouin, personal communication, May 6th, 2021), see Planning Procedure section 6.2.1.

Specific site analysis

The following information has been gathered for the two main entities to allow for understanding the area, the stakeholders, main development aspects, etc. The two main sites are in very different planning and redevelopment phases and different analyses and solutions are required. The aim is to understand better the context to later seek for resource potential mostly in terms of time in space for the old radio Canada site as the redevelopment project is already in advances planning stages by a developer, and perhaps more in terms of buildings structures for the Molson-Brewery site as the redevelopment has not been fully planned yet.

A. Old Site Radio Canada

History

In 1951 Radio Canada's main production center was established. A year later, the arrival of television and the need for space for program production, created a dispersion on Radio-Canada's workforce occupying by the end of 1956 more than twenty buildings across Montreal (Urban Planning Department of the Ville-Marie Borough, 2020). In 1963, the federal government, the Montreal Municipality, and the Canadian Broadcasting Corporation (CBC) formalized the choice of a new site for the public broadcasting company. The current site of Radio Canada was chosen (Urban Planning Department of the Ville-Marie Borough, 2020). This urban renewal operation involved the demolition of a central part of the former Quebec City suburb, one of Montreal's first urbanization sites, an almost three-hundred-year-old neighborhood with its schools, churches, commercial facilities, and more than 600 housing units (Urban Planning Department of the Ville-Marie Borough, 2020).

Figure 32: December 1963 - former blocks shape and layout of the streets visible, source: Urban Planning Department of the Ville-Marie Borough, 2020

Current situation

In 2015, the Government of Canada decided to transfer the activities of the Canadian Broadcasting Corporation to a new complex, better adapted to new digital technologies (Urban Planning Department of the Ville-Marie Borough, 2020).

Figure 33: Current situation of Radio Canada, source: Chartier, 2021

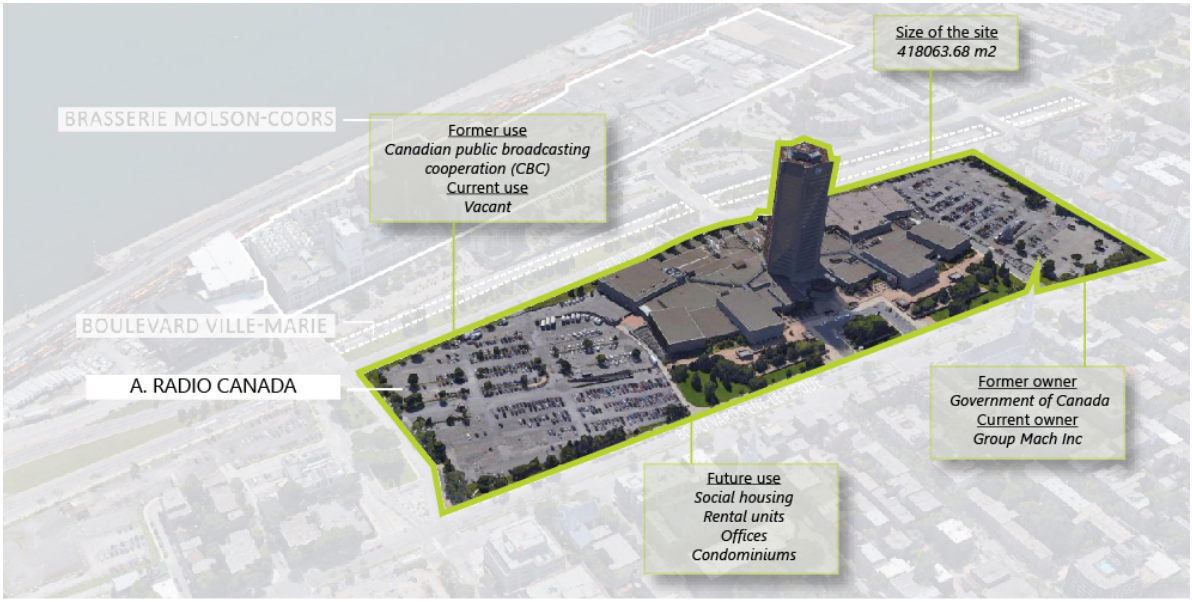


Figure 34: Details of the Radio-Canada site redevelopment, own adaptation, source: Urban Planning Department of the Ville-Marie Borough, 2020 & https://www.c40reinventingcities.org/en/students/sites-in-competition/faubourgs-area-south-of-sector-1476.html

B. Site Molson Brewery

History

In 1782, John Molson immigrated from England to Montreal, opening a brewery at the eastern end of the city suburb (Urban Planning Department of the Ville-Marie Borough, 2020). During the first half of the 19th century, numerous expansions and modifications took place on the brewery's property, while new buildings were built by the Molson family on the rest of their land (Urban Planning Department of the Ville-Marie Borough, 2020). In the early 1980s, the brewery expanded further and by 1990 acquired the form that the brewery has now (Urban Planning Department of the Ville-Marie Borough, 2020). Due to all these various acquisitions throughout the years, numerous street sections had to be closed changing the morphology of the site as shown in figures 35 and 36 (Urban Planning Department of the Ville-Marie Borough, 2020). Lastly, Molson brewery, which became Molson-Coors after a merge with U.S.-based Coors in 2005, announced in November 2017 that it would be moving to the Longueuil Municipality by 2021, putting the property for sale (Urban Planning Department of the Ville-Marie Borough, 2020).

Figure 35: Molson Brewery in 1926, source: Urban Planning Department of the Ville-Marie Borough, 2020

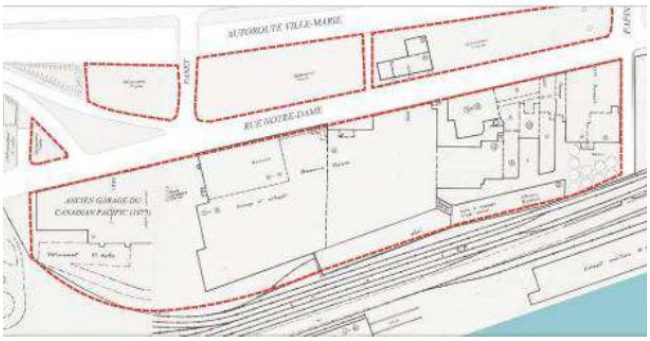


Figure 36: Molson Brewery in 1982, source: Urban Planning Department of the Ville-Marie Borough, 2020

Current situation

Figure 37: Current situation of Molson Brewery, source: Chartier, 2021

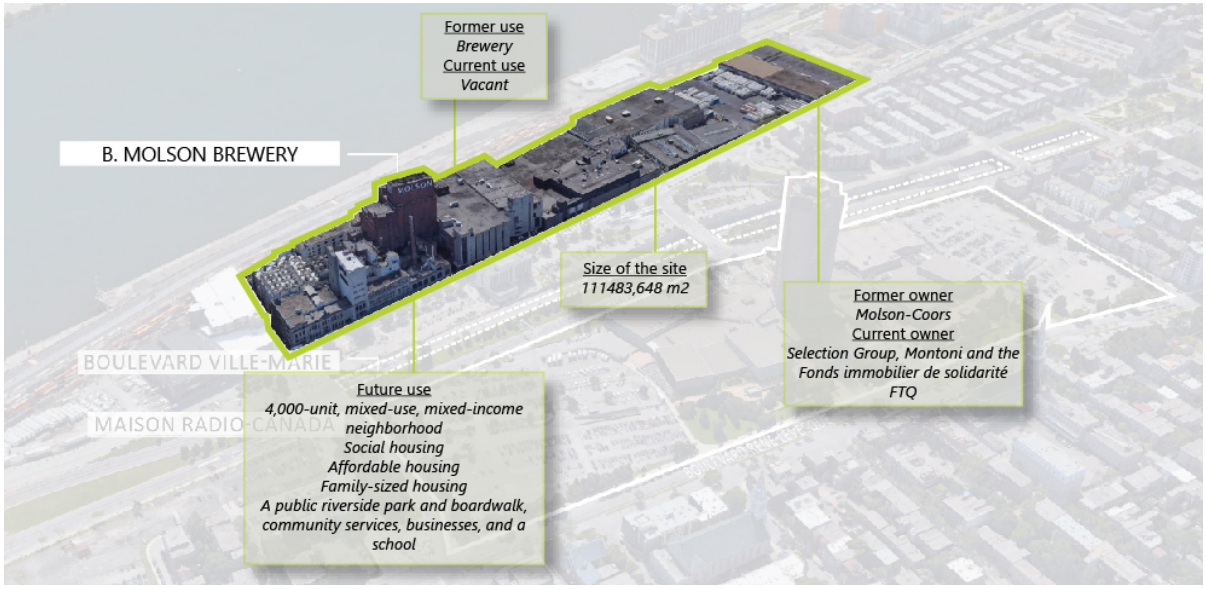


Figure 38: Details of the Molson Brewery site redevelopment, own adaptation, source: Urban Planning Department of the Ville-Marie Borough, 2020 & https://www.c40reinventingcities.org/en/students/sites-in-competition/faubourgs-area-south-of-sector-1476.html

6.2.3 Stakeholders identification

Who has a say or interest in the area?

From the previous analysis presented, where the redevelopment is put into context, many stakeholders have been identified with the help of the local experts through interviews and the analysis of the PPU. To facilitate the synergies required for the following steps, the stakeholders are being considered to know how they can participate in the fulfill temporal, material and spatial resources, to grasp a more complete picture of the needs of the population for the area. The researchers acknowledge the limited depth of the analysis in this step because of time and resources limit, but a municipality implementing ment of the community needs in relation to the opportunities provided by the resources identified.

According to 'Quebec Circulaire', "the transition to a circular economy requires the involvement and collaboration of all societal stakeholders, […] as well as local, provincial and federal governments that implement related programs and legislations. […] The circular economy can constitute a powerful lever for change" (Quebec Circulaire, n.d.).

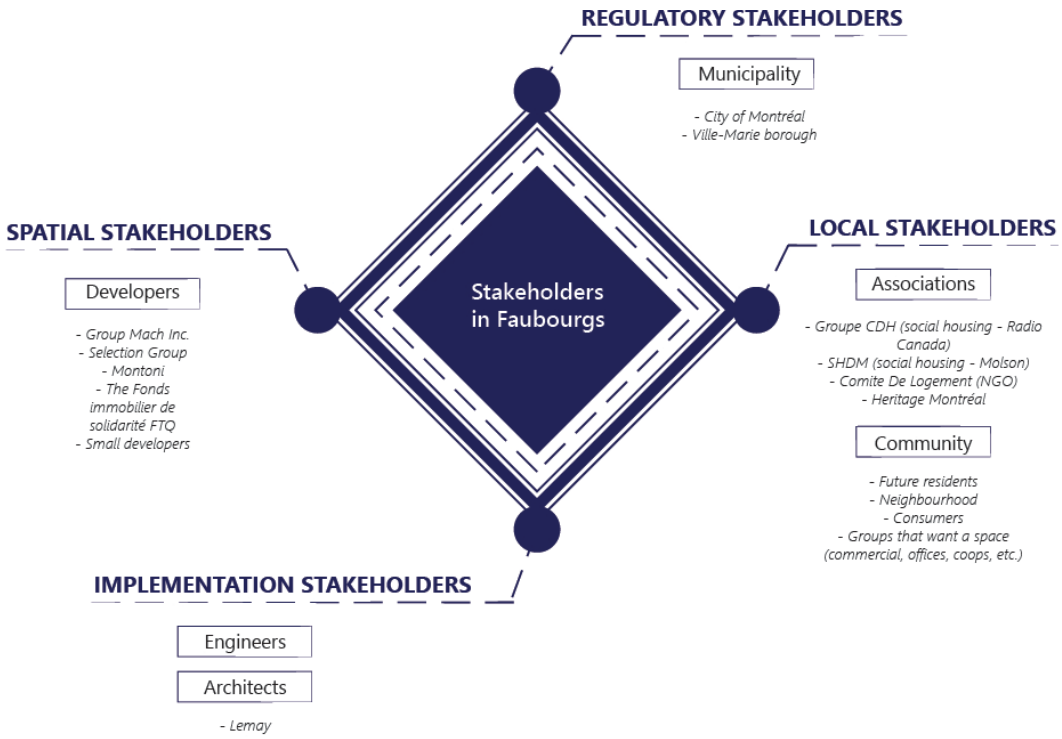


Figure 39: Stakeholders, own illustration, source: Urban Planning Department of the Ville-Marie Borough, 2020 & interviews with local experts

6.3 Identifying the community needs for time, material, and land

What are the community needs?

Further than insights provided by local stakeholder interviews to identify precise community needs, the PPU was analyzed to bring out the needs that were linked with the three CU loops, linked to temporal, material, and spatial resources, to grasp a more complete picture of the needs of the population for the area. The researchers acknowledge the limited depth of the analysis in this step because of time and resources limit, but a municipality implementing the roadmap would have much greater resources and knowledge to draw a more accurate portrait of all the needs of the community. The PPU of the Faubourgs highlights different orientations grouping the needs expressed by the various stakeholders consulted throughout the process. The 14 orientations are further separated in different strategic interventions suggested to improve the broader categories of the orientation. Each orientation has between one and four proposed interventions, with details about each of them. Here, the orientations and the strategic interventions have been extracted from the complete list to account only for the ones linked to one of the resource streams; temporal, material, and spatial. In Table 1 Community needs associated with the three resources, the strategic orientations have been categorized in the 'resource' column where the needs are situated.

	TEMPORAL NEEDS	MATERIAL NEEDS	SPATIAL NEEDS
Living environment			
Orientation 2: Consolidate the community life of the neighbourhood	2.1: Support the community vocation 2.4: Ensure the link between new developments and existing neighbourhoods	2.2: Consolidate the neighbourhood and community equipment network 2.4: Ensure the link between new developments and existing neighbourhoods	2.1: Support the community vocation 2.4: Ensure the link between new developments and existing neighbourhoods
Orientation 4: Enrich the network of green spaces and places of identity		4.2: Enhance the history of the neighbourhood through public spaces	4.2: Enhance the history of the neighbourhood through public spaces 4.3: Preserve green spaces at the block level
Orientation 5: Reinforce the presence and diversity of activities	5.1: Perpetuate or accompany the development of new diversified activity poles		5.1: Perpetuate or accompany the development of new diversified activity poles
Built environment and urban form			
Orientation 9: Preserve and enhance the built heritage		9.2: Encourage the preservation and appreciation of industrial heritage	9.2: Encourage the preservation and appreciation of industrial heritage
Orientation 10: Ensure a balanced densification in the sector to be redeveloped	10.1: Encourage a medium-intensity densification in the sector to be redeveloped		
Orientation 14: Reduce energy consumption throughout the area	14.1: Promote efficient building construction	14.1: Promote efficient building construction	

Table 1: Community needs associated with the three resources

Need of time

Time is a valuable resource, and community groups could make the most out of several available times, all through the redevelopment phases, but also in the available moments when the building's new uses are implemented. There is a striking need for community vocation, meaning that actions should be taken to facilitate community activities and meeting places. This can happen both during the vacancy phase as well as once the new use is implemented and there are available moments in buildings. This orientation also focuses on making sure the new development comes to complement the old neighborhood smoothly. The need to diversify activities, including maintaining cultural ones is highlighted. The Faubourgs have been identified in 2009 as a cultural district by the Montreal Municipality and characterized by a concentration of jobs in cultural and creative circles. One of the objectives to preserve the artistic ecosystem is to ensure the presence of places of creation and production, also as they have almost disappeared from the rest of the borough (Urban Planning Department of the Ville-Marie Borough, 2020). Of particular relevance is the need to densify the sector. Finally, the need for new construction to fulfill community needs, such as meeting places for community members can be fulfilled simply by optimizing the uses of the existing buildings by combining uses, therefore reducing new constructions.

Need of material

Many community groups would benefit from the reuse of material building elements, or the desire to preserve the heritage of the area. Material and heritage elements can be hard to link to specific direct community needs unless the population could participate in workshops or creative processes to highlight how they could use those material and building elements better than being discarded. The community needs public equipment, such as urban furniture in parks and streets. There is also the need to feel like the new development is part of a whole with the rest of the existing neighborhood. As

highlighted by Sigouin, the citizen's attachment to the various architectural landmarks or heritage interest in the landscape of their neighborhood is often brought up in the participation process and is an element generally underestimated by politicians. (A-M. Sigouin, personal communication, May 6th, 2021). Additionally, according to Mammone, there is something of historical value to be celebrated, a 'living heritage' (S. Mammone, personal communication, April 16th, 2021).

Need of land

Land can be used for many uses, and unused or vacant land has the potential to be transformed for much greater community purposes. To reinforce the importance of strategies 4.3 and 2.2, Mammone argues the community needs for schools, public parks, equity of the space communities, and social spaces as very pressing needs (S. Mammone, personal communication, April 16th, 2021). Linked to strategies 2.1 and 5.1, Mammone argues that the population needs commercial offers that fit their income. This includes a range of different supermarkets, not only the high-end ones where working-class people are not able to afford. There is currently no way to regulate diversity in retail which makes the actors concerned about what will the offer be (S. Mammone, personal communication, April 16th, 2021)

6.4 Identifying resources

What resources are available during the different phases of the redevelopment project?

Temporal resources

In a specific building, available time can be identified throughout moments of the day; on a 24h analysis, and throughout different phases of redevelopment; vacancy, demolition, and the new use. In the vacancy phase, the whole building is available (depending on many other factors such as the safety of the structure of course). Then, during the demolition phase, time would not be used as it can be dangerous for people to be around. Finally, when a new function is put in a new building, time can also be available as there are moments during which the function implemented by the developer can be complemented by other functions.

The analysis of the temporal resources in the vacancy phase of the redevelopment should be done in greater detail by the owners of the buildings, in cooperation with the municipality for an expert analysis of the state of the buildings and make feasibility study about each building. This step is of course not possible in the context of this thesis, but an explanation of the potential that holds the use of the vacant time for fulfilling community needs is important.

The temporal resource analysis (see figure 40) for the possible new uses of buildings is not specific to the Faubourgs redevelopment and can be used in another context, but of course, a deeper analysis of the unused time for each building would be more useful for the municipality to find the real 'time-waste' in each context. Nonetheless, this illustration represents that different building functions offer different times when the building could be available. The uses of an office building also differ from weekdays to weekends, when for the latter, much of the time during the weekend can be seen as a resource to fulfill other community functions. For example, as shown in figure 40, office spaces are usually occupied between 9h to 17h, and have no activity between 17h to 22h and again from 6h-9h. For retail places, on the other hand, the buildings have activities from 10h to 18h, therefore could be available for other uses from 6h-10h and from 18h to 24h.

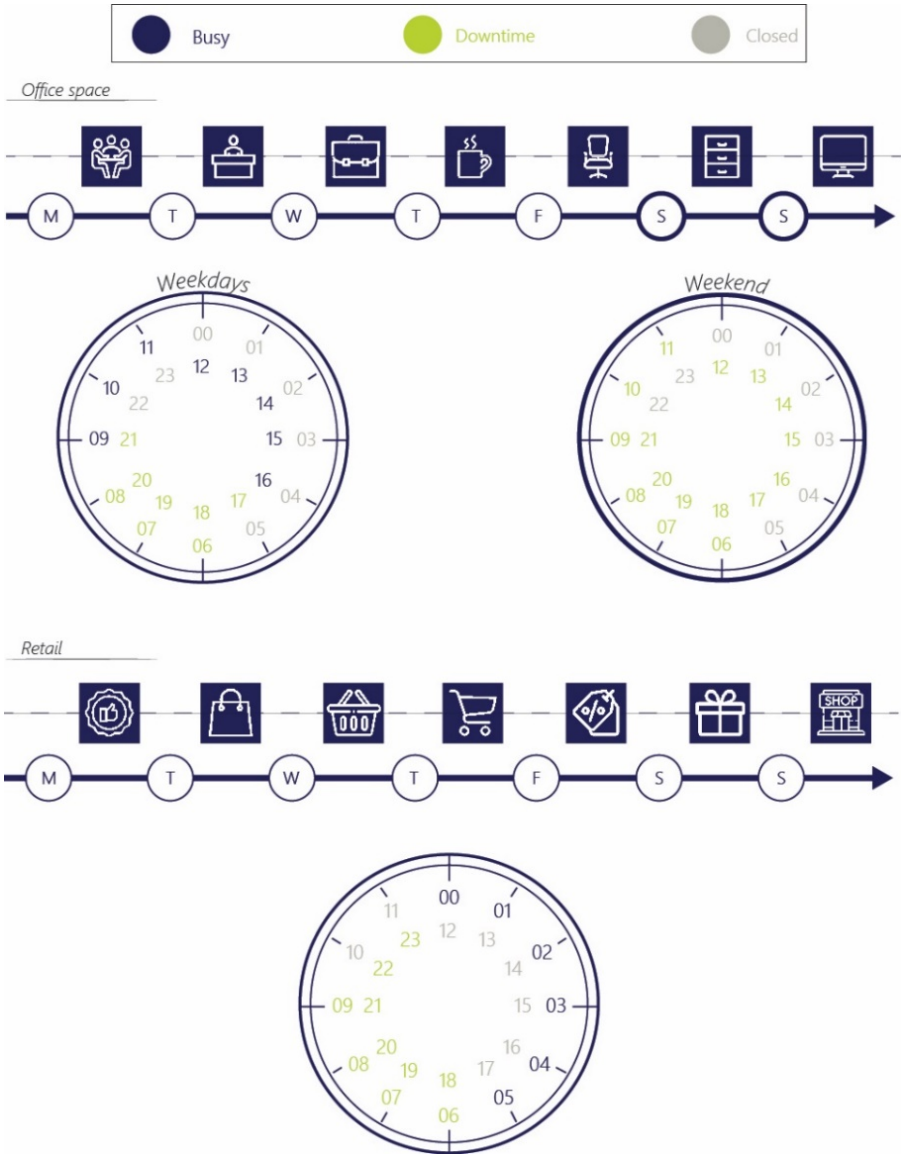


Figure 40: Temporal resource analysis on 24h, own illustration

Material resources

In linear redevelopment projects, many material resources are being wasted as buildings are being torn down for new buildings to take place. As mentioned in section 4.3.2 (adaptive reuse), the current process of redevelopment accounts generally not so much for the potential of reusing material elements as expertise and logistics are not well developed. In terms of identifying the structural elements or building elements such as windows, doors, or other materials that can be reused, the scope of this thesis did not allow for an exhaustive process to identify elements that would be wasted throughout the redevelopment. The goal here is to highlight that many elements of the existing buildings should be considered as a resource and not as a waste, that could be used for other purposes. The buildings that will be demolished have windows that can be reused or repurposed, brick walls can also be cut and reused for other buildings. Despite the clear obstacles to implement a careful evaluation and identification and the logistics of storing the saved elements, the knowledge is existing and could save a considerable number of resources. This also allows for heritage elements to be reused and to be preserved on site, sometimes with new purposes. Sigouin mentions that the Montreal Municipality is lacking the means of controlling or monitoring the process of reusing materials on the site or a specific project. Hence, it is under the developer's ease to decide if and how the reused or recycled materials can be stored and used on site. The Municipality is not involved in the process (A-M. Sigouin, personal communication, May 6th, 2021).

In Montreal, each borough determines its bylaws governing demolitions. Hence, in Ville-Marie, when demolition is authorized, the proceeding is allowing a deconstruction rather than a demolition submitting a plan for the reuse of the materials (A-M. Sigouin, personal communication, May 6th, 2021). This agreement has also to be accompanied by a plan for the reuse of materials that the developer has to submit before deconstruction work starts. Recently, the Ville-Marie borough has added that the plan has to be consistent with the goals of the *Plan Local de Développement Durable* [Local Sustainability Plan] (A-M. Sigouin, personal communication, May 6th, 2021).

Spatial resources

In the case of the Faubourgs redevelopment, it is not evident or so useful to identify spatial resources or land that is unused or underused as all the land as the whole 200000 m2 has been bought and will be redeveloped. This spatial resource identification can be more useful in the application of CU on neighborhood areas that are not completely being redeveloped. The idea here is to highlight that underused land, or vacant spaces in the city can be used for more useful purposes, may them be proposing a temporary use for some community group, or giving back to nature. Not much here can be discussed as there is very limited usefulness to conduct this analysis as the developer most likely has plans for all the land but is useful to think about the possibility to use some parts of the land to reintroduce green natural areas to the redevelopment.

6.5 Conceptualizing synergies

How to combine needs and available resources?

This step aims at finding solutions, that would combine the needs of the population identified in section 6.3, with the resources identified in section 6.4. As this analysis is somehow superficial, as this roadmap should be carried by local municipalities and developers, the synergies presented here are only some of the very numerous possibilities that would arise from a concrete implementation of the roadmap.

One idea proposed with a lot of interest by both Scherrer and Genois-Lefrançois is to put an urban agriculture facility on the redevelopment proposal. Scherer argues for the validity of these ideas as it incorporates a whole organic loop, with the possibility of creating a local loop for organic material into compost, of food production for the neighborhood. Creating multifunctional space around the food loop was, according to Scherrer a very powerful idea for the redevelopment (F. Scherrer, personal communication, April 30th, 2021). Genois-Lefrançois adds that it could also fulfill a function of the community's need for green and public spaces. It can be combined with the concept of the nourishing forest (P. Genois-Lefrançois, personal communication, April 30th, 2021).

Table 2 Possible Synergies is adapted from table 1 from needs identification and illustrates the synergies possible between needs (section 6.3) and resources (section 6.4). The column on the left identifies the orientations and strategic interventions highlighted representing the needs of the population that are linked to temporal, material, and spatial resources coupled and the availability of the three resources in the different phases of redevelopment. The elements in the table represent how can the needs and the resources be better combined.

		Temporal Resource			Material Resource			Spatial Resource		
	Resources identified in analysis	**Vacancy**	**Demolition**	**New use**	**Vacancy**	**Demolition**	**New use**	**Vacancy**	**Demolition**	**New use**
	Needs (from orientations/strategies		Only if safe						Only if safe	
Living Environment	**Orientation 2: Consolidate the community life of the neighborhood**									
	2.1 Support the community vocation	Community/artist space						Greenhouse for community building		
	2.2 Consolidate the neighborhood and community equipment network						Chairs made of doors from old buildings for urban furniture in public spaces			
	2.4 Ensure the link between new developments and existing neighborhoods	Addition of functions for the residents of the Faubourgs in the development (ex: greenhouses/farmer market, artist and community meeting space)						Putting functions for the residents of the Faubourgs in the development (ex: greenhouses/farmer market, artist and community meeting space)		
	Orientation 4: Enrich the network of green spaces and places of identity									
	4.2 Enhance the history of the neighborhood through public spaces					Save and store material and elements	Old doors and windows from the site leave their trace in the new development through the creation of chairs and greenhouses			Public spaces around the Molson buildings
	4.3 Preserve green spaces at the block level									Restoration of natural green areas from urbanized land
	Orientation 5: Reinforce the presence and diversity of activities									
	5.1 Perpetuate or accompany the development of new diversified activity poles	Multifunctionality in buildings						Mix uses in the park (farmers market + food production + leisure)		
Built Environment	**Orientation 9: Preserve and enhance the built heritage**									
	9.2 Encourage the preservation and appreciation of industrial heritage						Adaptive reuse of certain heritage elements or elements that perpetuate the identity of the site			
	Orientation 10: Ensure a balanced densification in the sector to be redeveloped									
	10.1 Encourage a medium-intensity densification in the sector to be redeveloped	Multifunctionality in buildings								
	Orientation 14: Reduce energy consumption throughout the area									
	14.1 Promote efficient building construction	Avoidance of building by increasing multifunctionality in existing buildings					Preservation of as much as possible existing building stock (saving embodied energy)			

Table 2: Possible synergies

Here are some of the synergies that could be implemented for each of the resources to maximize:

Temporal resources

In any building, the temporal resources identified by a 24-hour analysis, and through each phase of redevelopment: vacancy, demolition, and new use, could be optimized into a time resource. During the vacancy phase, a warehouse or storage building on the Molson site can be repurposed to create a mixed-use space, where different artists can exhibit their work or have their studios, enhancing and promoting community engagement and participation in cultural activities. After the new site is built, the offices can be designed and used in a multi-functional manner. Adaptable and flexible floor plans with movable furniture and foldable partitions are proposed to meet the space needs of community groups as identified by the need's analysis. Time available at certain times of the day or during a weekend can be used by community groups such as the Montreal LGBTQ+ community.

Material resources

During the demolition phase of the site, many materials and elements need to be saved from demolition to repurpose them for other uses. Windows from buildings slated for demolition can be considered as a resource and then stored and reused to create a greenhouse for community agricultural activities. The same procedure can be followed for the removal and reuse of doors from buildings slated for demolition. The old doors leave their mark in time by being used as chairs in the public spaces of the site, this urban furniture is designed simply without support tools. Warehouses and storage areas can be transformed into community workshops, encouraging people to participate in the process of creating and experimenting with the reuse of materials and innovative techniques.

Spatial resources

To capitalize on the spatial resources identified on the redevelopment perimeter, and to best serve the needs of the community, the most interesting synergy is the transformation of the parking lot east of the CBC. This is an opportunity to convert the parking lot into a public park with a variety of activities, using tactical urban design facilities. This solution would also increase biodiversity by adding natural spaces to the highly urbanized site. Here, chairs made from old doors and greenhouses created from windows of nearby buildings otherwise slated for demolition recall the history of the neighborhood. The greenhouses can be places of community agricultural production, promoting urban agriculture, and local community engagement.

6.6 Presenting the proposal to the synergetic stakeholders

What do the potential partners think of the proposed solutions?
What elements can be improved to develop the final proposal?

This step of the roadmap would have to be done by the planners in charge of implanting the roadmap in the specific context. It is also useful for this step to have certain best practices examples to demonstrate that some of the solutions proposed in the specific context have been implemented in a similar situation, which often motivates stakeholders as they see that is it feasible as others have done it. The feedback from the different stakeholders also can act as a way to improve the process and as well as the outcome.

6.7 Securing partners & collaborations

Who can facilitate synergies and how can they be implemented and secured?

The identified synergies to combine community needs with associated resources is only one step in implementing CU in the redevelopment (see section 6.5). Once the synergies have been presented to the synergetic actors (see section 6.6), certain tools and regulations can help to secure the partners and facilitate collaborations. Securing the partners that would enable those collaborations is a quite complex step given the sometimes unusual arrangements that CU proposes, where actors are not necessarily aware, or think about the risks and don't see enough benefits for them to comply with this CU process. The synergies identified in the previous step have to be facilitated and organized by the cooperation of different stakeholders, and this through different arrangements that can be secured by regulatory tools. Many tools are available for municipalities and community groups to demand community benefits in redevelopment and can vary considerably from one redevelopment to another, even within a single city, because, as in the case of Montreal, each borough decides on its possible agreements with developers. The following tools could be used by Montreal Municipality.

This step of the roadmap, in the frame of this thesis, is only the preliminary research steps to highlight the different tools that can be used to ensure collaboration between different stakeholders, but the actual securing of those collaborations can only be done by the municipality that applies the roadmap for a concrete project on the ground. This step is very complex, but thankfully, in Montreal, there is already a mechanism in place to facilitate and secure the identified synergies. It is the case of *Synergie Montréal* [Montreal Synergy] initiative, as mentioned in section 6.2.1 that supports companies having a circular process in the development of CE projects and business models, already working with the municipality and that has been granted an important municipal budget to facilitate synergies at the municipality level to recover from the COVID-19 crisis transition (Montreal Municipality, 2021).

Sigouin adds that the Ville-Marie borough is also using the tool called Projet Particulier de Construction, de Modification ou d'Occupation d'un Immeuble (PPCMOI) [Particular Construction Project, with Modification or Occupation of a Building]. It is a tool used when a project is submitted to the borough and deviates from the local urban planning by-laws but that does not deviate from the Planning Act. This tool allows the municipality to reach gains so that the project is as contributive as possible to the site and the community. The types of gains are similar to the gains from the Right of Preemption, such as more greening, more non-constructed spaces, protection of heritage elements, protection of views. This tool is regularly used in Montreal and is included in the Urban Planning Law (A-M. Sigouin, personal communication, May 6th, 2021). The municipality could through the use of PPCMOI, set objectives concerning waste management, water management, building with recycled materials, or achieving a certain level of energy performance in redevelopment projects. Such objectives are different among boroughs in Montreal, and according to Sigouin, Ville-Marie has quite high requests on that font, making sure that developments are fulfilling the right needs for the community and the neighborhood. The fact that the neighborhood can request different things from developers depending on where the redevelopment takes place in Montreal, creates an environment of unpredictability that is not appreciated by developers (A-M. Sigouin, personal communication, May 6th, 2021). The borough of Rosemont has modified its regulations on the PPCMOI in January 2019 to ensure that when there is a request to change the zoning from industrial to residential, developers are required to provide a minimum of 5% of the square footage of the development in artist's or artisan's studio. According to Sigouin, this initiative paves the way to more community demands in

redevelopment projects and could be potentially used for this redevelopment project (A-M. Sigouin, personal communication, May 6th, 2021).

With concrete planning tools such as PPCMOI, the theories proposed could be linked with practice, and the idea of CU could be practically implemented. As argued by Mammone, an important levier that community groups have to convince developers to add an amenity for the community in their new development is that support from the community is a great asset for the developer. There can be an important exchange from the community to the developer in this context. The community cannot provide financial means but can give support, which is crucial to the developers (S. Mammone, personal communication, April 16th, 2021). If this planning tool is being used, then citizens could act as consultants. Once the renders from the developers are being presented, then the community can have a say on where each element should be placed. With the historical knowledge of the place that residents have, they could help shape a new development that makes more sense and is more contextually appropriate (S. Mammone, personal communication, April 16th, 2021).

Cities are very limited in their financial means, which makes the project of preservation of buildings of heritage interest particularly hard as the financial resources and expertise of people involved do not necessarily meet the desire of preservation. In the case of Molson brewery, the allowance of greater heights in certain places on the site was proposed as a way to palliate the financial needs, to generate interesting revenues for the developers. These revenues can be inserted into the restoration and maintenance of the heritage buildings (A-M. Sigouin, personal communication, May 6th, 2021).

These are the regulatory and planning tools that have been highlighted by the local stakeholder interviewee that could be instrumental in the implementation of synergies in the redevelopment projects in question. Other tools could also be relevant, and once more, would be easily identified by the planning department of the borough working on implementing CU in the redevelopment in question. The main obstacles to the securing of these partnerships are further elaborated in the discussion chapter (see chapter 7).

6.8 Monitoring and evaluating

To what extent did the project achieve the strategic goals of circularity?
What lessons learned from this project help the municipality improve the process for future redevelopment projects?

This step is also not conducted in the scope of this thesis but the reflection to understand how the solution presented can potentially help reach the goals identified in the first step of the roadmap is important.

This step aims to hold accountable CU as a goal to thrive towards. It also aims at making sure that the synergies recommended through the analysis and then implemented truly improve sustainability, these can be monitored with the evaluation of the different goals that have been set in the very first step of the roadmap. As this roadmap takes an iterative process, each project or redevelopment using CU as a strategy is bringing valuable lessons that can be instrumental in improving the roadmap, the concept of the process in general. Lessons are learned from partnerships, synergies that work or need more efforts to be possible in the specific context.

It is also important to make sure that there is a succession, a governance for the circularity of the project. If all the steps of the roadmap are being accomplished, the end is a project, but no concrete implementation has been done, but the important factor is that everybody who is implicated in the project knows what they could do and what they have to do. So, the end of the roadmap steps is not the end of the story. Someone also has to be identified through the steps, to have the responsibility to "keep the keys" (S. Grisot, personal communication, April 28th, 2021). Grisot argues that it can be an actor that is involved in the project, and has legitimacy for many other actors, to determine a project manager for the circularity project is crucial to make sure to "turn the loops" (S. Grisot, personal communication, April 28th, 2021). In a normal process, it is easy to know who is the one in charge of each step, may them be architects or the engineer for example. But in such alternative processes, it is not so clear. (S. Grisot, personal communication, April 28th, 2021)

6.9 Lessons from the analysis

As mentioned in the introduction of this chapter, the implementation of the full roadmap would surely have yielded different details and relevance, if it was conducted by planners in charge of the specific redevelopment, in close contact with the community, and with the different stakeholders, and with more contextual knowledge. It is important to recognize that this analysis is conducted with a humble perspective that the very entity that would be given the task to apply this roadmap in a real-life situation would be in a better situation to pursue a conclusive analysis, which would lead to the best possible synergies proposed.

To conclude this analysis, a short recapitulation of the outcomes of the eight steps is described. First, the goals elaborated proposed in the first step set the bar from the strategic direction of the use of CU. Then the understanding of the context of the stakeholders was fundamental to set the scene and situate the researchers in the context of the case study, from a strategic macro perspective to the micro, site level. The different contextual analysis such as the political situation or the circularity culture informs about the existing conditions to apply the proposed change in practices, by the implementation of CU. Then the identification of the community needs gave a purpose to the process, given all the information gathered until that point. Then, the identification of the resources brought light to the resources possible to use in the neighborhood to fulfill the above-mentioned needs. Thereafter, the possible synergies were conceptualized. The following steps were only conducted to some extent, as presenting the proposal to the stakeholders was not conducted, nor the step about securing the partners and collaborations, as the scope of this project limited the relevance and possibility of this step. Local regulatory tools and ways Montreal Municipality can secure the fulfillment of community needs in redevelopment are analyzed, to give an idea about the possible mechanisms in the specific case. Finally, the last step in the case of this analysis was intrinsic to the process, where each step of the roadmap was constantly adapted, while the level to which the goals of circularity were reached was beyond the scope of the project, as it required more quantitative methods of assessment.

That said, this operationalization of the roadmap in the context of the Faubourgs redevelopment was conducted to test and improve the roadmap itself and come with synergetic solutions. These were developed to the best of the researchers' knowledge to fulfill the identified needs of the population in the Faubourgs neighborhood, with the identified temporal, material, and spatial resources that had the potential to be saved from becoming waste. The process of design thinking used to develop this roadmap, to test it in a case study, and to iteratively improve it, comes to complement

the relevance of using this process towards the ambition of being able to share the knowledge about CU and to demonstrate to municipalities that this roadmap can concretely help them find circularity solutions for their redevelopment projects. As this roadmap was crafted with the purpose to be shared with different municipalities' administration, through the competition from C40 "Students Reinventing Cities", a discussion about the potential of generalization of this case study, and the generalizable elements of CU, and the ones specifically context-dependent is elaborated in the reflection of the following chapter.

| 7 | DISCUSSION

What can municipalities learn from the application of the circular urbanism roadmap to the redevelopment of the Faubourgs neighborhood?

The application of the roadmap in the redevelopment of the Faubourgs demonstrates that municipalities can benefit from using such a strategy, to achieve their sustainability ambitions, as the application of the roadmap developed in the frame of this thesis is instrumental towards the sustainability of redevelopment projects. As explained above, community needs from the neighborhood that is being redeveloped can be fulfilled by the maximization of the use of the three resources part of the CU loops. Indeed, the researchers argue that by intensifying uses, transforming the existing, and recycling spaces, redevelopments can integrate themselves into the existing fabric by fulfilling the needs of former residents of the area and not only the needs of the new residents, additionally providing greater sustainability. As demonstrated through the analysis of chapter 6, the application of CU, translated by a systematic analysis of the three resource streams and the subsequent development of appropriate solutions for the maximization of each resource, has the potential to greatly fulfill community needs.

The researchers highlight their desire for humbleness, meaning that this thesis participated in a very incremental way to the consolidation of the CU concept. It contributes to its elaboration as it expanded its recognition in Montreal planning circle, as the proposal will be presented to several stakeholders involved in the redevelopment projects in Montreal. The process started from empathy towards the community, as design thinking proposes, and the researcher supports the necessity for planners to start from an empathic place towards the population they are planning for. The ambition was to demonstrate the initial steps to take towards CU for redevelopment projects and to create an arena for discussing further elaboration of the roadmap, of the process of CU in planning.

Strategic planning for circular urbanism

The elaboration of this roadmap for its application on the redevelopment of Montreal is in line with the municipality's strategic vision and intention to develop a roadmap to fasten the development of circularity on its territory. Nonetheless, different strategies can be elaborated and implemented by different municipalities, towards the application of CU, to improve sustainability, the roadmap presented here is a single proposition to achieve similar results proposed by the researchers. 'Circular' is a 'flag' term, as argued by Grisot (2020), and the concept of circularity is an attractive term that converges interests and its proactive stance to reach sustainability greatly has traction in the real world. For example, the book that has spurred the interest for this thesis is titled 'Manifesto for a circular urbanism'. As rightfully highlighted by Grisot, without this title, chances are that the researchers would have not encountered the book, therefore would not have worked on this particular topic. Grisot argues the benefits of having slogans and of communicating under those flagships affect reality (S. Grisot, personal communication, March 5th, 2021). Bolger and Doyon have nonetheless raised concerns about the limited capacity of local governments to implement strategic priorities (Bolger and Doyon, 2019). The different contexts in which CU is used as a strategic driver towards sustainability will greatly impact the capacity of the municipality to efficiently apply the roadmap. In the case of the

Faubourgs redevelopment, as Montreal Municipality recently stated its intention towards developing circularity, the strategy has a great potential to be implemented. The concern raised is being addressed with the elaboration of the first step of the roadmap that highlights the importance of setting goals as a strategic driver to reach sustainability. Different municipalities will set goals that are fitting with their context and the state of circularity in which they are.

Contextually responsive roadmap application

The strategy proposed in the frame of this thesis, namely the roadmap elaborated in chapter 5, aims at facilitating the transition towards more circular redevelopment but remains adaptable to different contexts. As argued by Boyle et al. (2018), "urban redevelopment strategies need to be derived from the urban realities of a particular place or context" (p.1). Therefore, as argued in 5.3, the roadmap proposed is a skeleton, that has been iteratively modeled to fit different contexts, and does not predict a solution, but rather proposes steps that would lead to the identification and realization that many community needs can be fulfilled through the implementation of CU. Of course, the openness and interest of developers would have an impact on the synergies possible, but the step of 'identifying possible synergies' could be done by planners or the entity in charge of applying the roadmap, no matter the context.

The necessity or appropriateness of some of the loops proposed in the roadmap will also vary depending on the context, wherein some situation, maximizing the spatial resource, the land, might not be at all a possibility if it is very densely built, whereas in some redevelopment the priority could be on maximizing this resource. The needs and context of the site on which the roadmap is applied will determine its orientation, which remains in the frame of a circularity strategy, no matter the weight given to synergetic solutions created for each of the three resource streams.

Relevance of a roadmap for circular urbanism deployment

Working on the existing urban fabric is technically complex, as it requires processes of land splitting, restrictive plots can take part in sensitive neighborhoods or areas where the soil is polluted and needs to be decontaminated. It is above all a complex game of stakeholders, which requires political support over long periods. There is also a need for technical skills that can be rare, as well as operators that are capable of moving forward in uncertainty. In a linear redevelopment, the stages of the redevelopment are linked in a sequential manner, where each actor plays a role that is clear and well-defined. In CU redevelopment on the other hand, as the process is not yet mainstream, each project requires new schemes of actors and new steps or almost trial and error. A redevelopment following a CU approach breaks the well-established practices and requires a high level of coordination from very different actors (Grisot, 2020), as explained in CU section 4.3. Transdisciplinary thinking is needed to apply the mechanism of CU. For example, the implementation of adaptive reuse of buildings in urban redevelopments necessitates collaboration between different disciplines and skills, as it is the work of to only name a few, artists, conservationists, engineers, architects, etc. to ensure the feasibility and implementation of the transition of the buildings (Foster, 2020). This is also where the role of planners takes place, where their skills are necessary as project managers to understand everybody and facilitate the translation between sectors, to translate the issues and the language of one to another. Planners, with their holistic comprehension of the urban context, can help synergize the set of actors necessary to the CU implementation, with their specific knowledge, technologies, and expertise.

Generalization potential and replicability

From the very beginning of the process of this thesis, the researchers were aware of the limitation of generalization of such process, as planning has evolved from positivism that was giving strict solutions to problems, to post-positivism that aims at providing keys to address wicked problems. The worry for this project was the impostor syndrome that wanted to avoid generalizing as if the knowledge of the researchers, after only one-semester research would be greater than municipal entities that know the context in much greater depth.

As the CU concept is not consolidated in academia, nor yet really used in practice, coupled with the fact that the researchers did not interview partners of different contexts than Montreal and France, the researchers cannot assume that the roadmap is applicable everywhere. Interviews with a wider range of partners, playing different roles in the urban projects, as well as from different contexts, would have strengthened the validity of the roadmap, as well as the validity of the results of the analysis of the case study. Further testing of the roadmap, through different case studies of different redevelopments, would also strengthen its validity.

Given the completely different cultural and regulatory context provided by different redevelopments, setting an example is of what is possible to achieve if the roadmap is being applied is a strategic tactic in the process of sharing the CU knowledge, as accomplished with the participation of the researchers to the C40 competition. From an academic point of view, the transferability of the roadmap cannot be scientifically asserted. Rather, the idea was to start from a concrete case to identify elements of methods, and of projects on which the identification of specific generalizable elements is possible, for other contexts that have similar conditions (S. Grisot, personal communication, March 5th, 2021).

An important aspect to highlight on the other hand, with the application of this roadmap to the Faubourgs redevelopment context, is that, even if the redevelopment is singular and any generalization should be done very carefully, the type of redevelopment is not singular. Many major redevelopment projects have very similar conditions, as they are taking place in working-class neighborhoods going through major infrastructure redevelopment. The redevelopment made by developers can, and often are, not catering to the existing working-class residents. The profit necessary for such an important redevelopment to be financially viable for the developers requires the construction of higher-end residential units, which also brings a commercial offer to cater to the needs of the people able to afford those units. Therefore, it is interesting to highlight that the application of the CU roadmap in a context that is similar to the one of the Faubourgs is likely to have similar results in terms of being able to fulfill community needs and archive the possible mix between residents of the rest of the neighborhood and the residents that would move in the new development.

Importance of synergies and the role of the planner

Even though policymakers are interested in strategies that would contribute to greater circularity in cities, the implementation of those strategies faces limits. As argued by Obersteg, (2019) “policymakers often rely on important economic stakeholders to execute circularity in cities, while the development and implementation of these strategies lack an involvement of a broader stakeholder setting” (Obersteg et al., 2019).

The essence of circularity is partnership relations as the synergies required to the application of the concept is the use of one actor’s output as the input for another actor. On the other hand, one of the main barriers to implement circularity in planning is the need for concertation of several

occupants for the same site (Entremise, n.d.), which is linked the step 7 of the roadmap and highlights the potential role of a deliberative and communicative planner, to facilitate that concertation. A planner has this complex role of facilitating the processes, the dialogue, co-decision, and knowledge sharing in addition to the establishment of agreements. It seems to be a consensus that the main challenge to the implementation of CU is the relationship between stakeholders. There is a need to improve legal and human resources to accompany the arrangements needed to implement CU. Grisot argues that "it is the problems of the century" (S. Grisot, personal communication, March 5th, 2021). The implementation of multifunctionality, for example, requires different functions to share the same space, at different times, which can require adaptation and compromises. Learning to share requires organizational efforts, know-how, translators and many associated skills are to be developed (S. Grisot, personal communication, March 5th, 2021).

Relevance of this approach for Montreal

The idea of elaborating a roadmap for Montreal was consolidated from, as mentioned in the strategic analysis (section 6.2.1), the announcement that Montreal Municipality made in March 2021 that an important investment was being made for the acceleration of the CE in the Municipality, which also emerged from the economic recovery plan of the post-Covid-19 era. The goal stated with this announcement of the fund is to "develop a circular economy roadmap from 2021 to accelerate the transition from a linear model towards a more circular model" (Montreal Municipality, 2021). The development of the roadmap presented in this thesis, therefore, aims at contributing to the achievement of the Montreal Municipality's strategic plan to reduce greenhouse gas emissions and residual materials, in accordance with its Climate Plan and its 2020-2030 strategic vision. The researchers, therefore, were satisfied to support this mission, as some members of the Montreal Municipality apparatus, would be made aware of the roadmap conceptualized for this thesis, as it is presented for the C40 competition.

The dominant angle taken by Montreal actors about circularity is the local economic development one, Scherrer argued that one of the main focus of importance in the application of any circular proposition in Montreal should be to create employment through circularity, putting more emphasis on opportunities created through this approach (F. Scherrer, personal communication, April 30th, 2021).

Additionally, one reason explaining the limited CU projects in Montreal, according to Scherrer, is that there is less need for space in Montreal than in Europe, where the concept originated from, as Montreal built density is much smaller than some cities of the same size in France. The problem highlighted by Scherrer is the aging of the infrastructure. The solution of maximizing infrastructures is not necessarily the most relevant in the Montreal context, again argued by Scherrer. There is a serious infrastructure aging problem, as a lot of the infrastructure is suddenly aging as they have been built around the same years with the same materials. Often, projects that would fulfill CU principles require serious investment in the infrastructure to implement multifunctionality in time and mutualization from the planning stage of the project. But the idea of mutualization poses problems of safety and of standards of use, etc. (F. Scherrer, personal communication, April 30th, 2021).

Another point highlighted in the interviews about the relevance of proposing a CU roadmap for Montreal redevelopments is the question of the necessity of another strategy by the municipality. Indeed, Mammone argues that the roadmap could be used as guidelines from the municipality, but not as a strict regulation. He adds that there are already a lot of regulations on private developers and too

many guidelines add bureaucracy and considerably slow down projects (S. Mammone, personal communication, April 16th, 2021). His point of view coming from the social housing sector is understandable as the needs of housing for a more vulnerable part of the population should be minimally impacted by unnecessary bureaucracy. This is a limitation to strategic planning that necessitates being further reflected upon when applying a strategy, as suggested in this thesis.

Feasibility & Practicability

The question of the feasibility of the application of the three loops proposed by Grisot also arises, as well as about the practicability of the roadmap for municipalities. As supported by Genois-Lefrançois, the loops are not a completely new process, they are already existing urban planning principles that are revisited, where one aims to limit urban sprawl by reusing space with applying the recycling, reduce, reuse, recycle (P. Genois-Lefrançois, personal communication, April 30th, 2021). Therefore, the application of CU is feasible and possible. Given also Montreal Municipality recent ambition to be more circular, it is possible to believe that CU will be increasingly used in practice, given that Montreal already has a strong culture of urban circularity, even without naming it as such (see section 6.2.1 Strategic Analysis - Culture of circular urbanism).

An element to consider concerning urban planning and circularity is the lack of space for circularity. To be able to maximize the material resources on-site, logistic areas for the storage of materials need to be considered and planned for. Developers want to use the land for activities of higher economical value, so profit, such as residential real estate for example. There is a need for space logistics, warehouses of construction materials, there is the need to reinstate the spaces required by the circular city, so it remains attractive and avoids this refractory impact. (P. Genois-Lefrançois, personal communication, April 30th, 2021)

The steps proposed in the frame of this thesis are only the fruit of the development of the thesis that took place during one semester, but municipalities who decide to implement the roadmap should modify the steps to their processes to make them more practical for them, therefore increasing practicability.

Reflection of the limitations of the thesis

A redevelopment process is a complex multilayered process, which the researchers somehow simplified for the purpose of the thesis. Therefore, the researchers acknowledge this simplification and add that having considered more the developers' side of the process could have led to different results and other steps of a redevelopment delivery process might have been included. Interviewing a developer of important projects, ideally Groupe Mach or Groupe Sélection, the owners of the two parts of the Faubourgs redevelopment would have provided a much more diverse range of qualitative data, but as the focus was on proving that there is an opportunity for the municipality to fulfill community needs with this CU, the researchers decided that the scope of this project was excluding developers from the interview methodology.

The researchers highlight that more time would have allowed a wider diversity of input for the elaboration of the roadmap. Inputs from different interviews, coming from various contexts would have greatly strengthened the validity of the roadmap and proven its relevance as a somehow generalizable strategy. Discussion with practitioners of other global north countries, as well as practitioners of global south countries could have added depth to the discussion. As argued by Farthing (2016), "[…] framing is a necessarily a selective process. A researcher cannot study every aspect of a

problem, [therefore], there has to be some selection of those aspects to focus on" (p.18). The limited timeframe and the distance between the researchers and the case study area limited to some extend the analysis possible. The framing of the research also limited the different topics that would have been equally interesting to tackle. The researchers also framed the project in a way that the power relations and governance were not examined, which the researchers support is key in solving wicked problems, therefore further research on this topic would be necessary to propose appropriate governance reflection results. Academic interviewees also highlighted that framing the project with change management and action-network lens (as suggested by Grisot) or transition theory (as proposed by Genois-Lefrançois) would also have been particularly relevant to the development of CU as a planning theory.

The researchers also highlight the desire to make the research matter, which was done through the participation in parallel to the C40 Students Reinventing Cities competition. The wish was originally also to take an action-research direction for the project. There was unfortunately not enough time, nor the possibility to travel to the case study given the COVID-19 pandemic to engaging with the Faubourgs community, which could be a very relevant next step, not only to better grasp their needs but also to create this feedback mechanism suggested in step 6 of the roadmap, that would, through living-labs for example, foster a feedback loop to improve the appropriateness of the synergies and solutions resulting from the roadmap application.

| 8 | CONCLUSION

How can the design of circular urbanism by Montreal Municipality be a strategic driver for sustainability in the case of the Faubourgs neighborhood redevelopment?

Redevelopment projects are, in the most instances, accomplished through a linear process, with the necessary mechanisms, roles, and expertise already proven effective and efficient. As urbanization increases, the linear building sector puts natural resources under pressure, highlighting the urgent need to shift the course of action to stay within planetary boundaries. Hence, the transition needed to achieve the projected trajectory requires urban redevelopment projects to be realized with the implementation of CU through applying the three loops: maximizing the potential of temporal, material, and spatial resources. A redevelopment process that would intensify uses, transform the existing and recycle spaces would translate pragmatically the concept of CU.

Cities around the world can be drivers of SD as they strengthen their climate agenda to achieve sustainability. Lately, CE arose as a key strategy to improve sustainability and is used as a concrete alternative to shifting away from the current linear processes of decoupling growth from raw materials. On the other hand, CE is relatively a new concept not yet well adapted to the urban planning context. The development of urban metabolism adds to the CE concept the scientific methods of input and output of fluxes while circular cities complement by adding the social pillar of CE accounting for fundamental changes in lifestyle and social arrangement. Hence, CU is introduced, inspired by CE, urban metabolism, and circular cities to incorporate circularity in the urban planning context to minimize urban sprawl by avoiding the use of natural land outside the urban fabric. Three more practices are then introduced, linked to the different loops of CE, participating in the consolidation of CU theory. These three loops allow the city to transform itself rather than expand. The first loop translating as ‘intensifying uses’ is linked to multifunctionality as a way to combine multiple uses and advance the functional performance in an existing space, maximizing its temporal resources. The second loop namely ‘transforming the existing’ is linked to adaptive reuse as it is closely associated with the reuse and repurpose of building materials, structural elements, and the reutilization of existing heritage buildings promoting environmental, social, economic, and cultural sustainability. The last loop ‘recycling spaces’ bridges the concept of urban regeneration to revitalize underused urban land to strengthen the quality of life of the community. These three practices pinpoint some already existing mechanisms in urban planning, which, if applied systematically through the implementation of CU, could maximize the available resources and contribute to the fulfillment of community needs.

Hence, a collective and organized strategic plan is the link to facilitate CU for municipalities in urban redevelopment projects bridging the highlighted elements which will lead to the answer to the main research question:

How can the design of circular urbanism by Montreal Municipality be a strategic driver for sustainability in the case of the Faubourgs neighborhood redevelopment?

| 8 | CONCLUSION

The creation of a roadmap through a design thinking process made possible the application of CU to the specific case study of the south sector of the Faubourgs in Montreal, Canada. The iterative nature of design thinking and the necessary continuous evaluation and monitoring of the roadmap fundamental for its implementation, adaptation, and modification by the Montreal Municipality. The specific context of the roadmap application leads to an accurate comprehension of the available resources and the related opportunities. The implementation of the roadmap and the outcome will differ depending on the context and the municipal tool of the city applying it. Hence, the goal of the roadmap is to facilitate the design process helping municipalities identify the three types of resources on their territory (temporal, material, and spatial), understand the needs of their communities related to these resources, and create synergies between the needs and resources identified. Even though circular practices are proven key in solving the different problems identified, the complexity of finding and securing synergetic actors requires planners to fulfill an important enabling role for concertation as in many cases, unusual partnerships and collaborations are required.

In summary, the thesis aims at setting the ground for the concept of CU, building a common vocabulary, and stimulating the interest for further research on the topic, positioning circularity as a central concept for the accomplishment and promotion of sustainability in urban redevelopment projects. The roadmap can facilitate the visibility of CU and the demonstration to professional actors that circular redevelopment processes are legible. Lastly, the application of the roadmap in the case study of the Faubourgs is a way to illustrate the effectiveness of the roadmap's implementation, as well as its potential to address the neighborhood issues, while also inspiring professionals, experts, and municipalities in their transition towards sustainable urban redevelopment projects.

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