

Yoann Rouzières

Landscape & Cities

Challenges, evolutions and development of cities
around landscape and nature.

Clermont-Ferrand, France

Master's thesis in Urban Ecological Planning

Supervisor: Hans Skotte

Co-supervisor: Riny Sharma

June 2021



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Faculty of Architecture and Design
Department of Architecture and Planning



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Science and Technology

Statement of originality

I certify and that this is my own work and that the materials have not been published before, or presented at any other module, or programme. The materials contained in this thesis are my own work, not a “duplicate” from others. Where the knowledge, ideas and words of others have been drawn upon, whether published or unpublished, due acknowledgements have been given. I understand that the normal consequence of cheating in any element of an examination or assessment, if proven, is that the thesis may be assessed as failed.

25th June 2021, Clermont-Ferrand



Abstract

Cities are at the centre of the main challenges towards a more sustainable future. During the last century, the relationship between urban planning and nature has known several drastic changes. Fast-growing cities, globalisation and technological changes have been important trends and continue to be. Clermont-Ferrand, France, has not been spared from these influences. The city is settled within a highly valuable landscape part of the UNESCO world heritage. However, the last 100 years of urban development disconnected the city to its cultural landscape.

This research master thesis will present a planning proposal as a conclusion. The proposal answers to challenges and specific elements highlighted by the empirical theories as well as the case study investigation. Indeed, this master lightens the development of the relationship of nature and urban morphologies of Clermont and Montferrand.

Therefore, this project-based master thesis aims to highlight the importance of the fusion and incorporation of natural elements within cities. Indeed, through the case study of Clermont-Ferrand, I aim to demonstrate the detrimental impact of urbanisation and industrialisation on nature and landscape. The research question “*what green spaces has been lost in the last 100 years in Clermont-Ferrand? And why this has happened?*” express this will of understanding the process of “asphaltisation” of cities during the 20th century. Thus, an extensive archival research and a mapping analysis has been done so as to bring answering elements to the problematic. In addition, varied research methodologies have been applied to generate a strong base for the development of the project.

The case study is used to as an opportunity to develop a proposal based on my own investigations and history of the site regarding historic urban and natural morphologies of Clermont-Ferrand. The proposal intends to design a new landscape frame for the city as well as bringing back a strong cultural landscape to Clermont-Ferrand. Thereby, bringing a project designed with various scales -from regional to local scales- and through the interactions of all layers -history, economic, social, environmental- involved in the design.

Preface

This master thesis research stems from a fascination both for architecture and landscapes. My background in Geography and Urban Planning and Landscape Architecture as well as the Urban Ecological Planning master program that I have been part of from 2019 to 2021, resume this appreciation of the urban life and the natural environment. The research topic “*Landscape & Cities*” arises at an early stage as a potential subject to me.

Also, I would like to take this part so as to thank all the contributors that I have shared and participated to the elaboration of this master thesis, such as my supervisors Hans Skotte and Riny Sharma. A special mention as well to Myriam Mascheix for her advices and inputs during the design process of the proposal.

Finally, this thesis would not have been possible without the support and encouragements received from my relatives and friends during these particular times that we are facing, thus I want to address them my thanks.

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1 Introduction

The chapter one introduces the topic, the research question and the objectives of the project-based master thesis conducted during the spring semester 2021. The background aim to contextualise the thesis' topic as well as the case study. The contextualisation of the topic highlights the nuances and interests of the research and thus, lead to the questioning and the research question's part. Finally presenting the objectives associated to the research question.

1.1 Background

The so-called post-Kyoto metropolis -referencing to the Kyoto protocol of 1997 aiming to reduce greenhouse gas- (Chemetoff, 2011) has a real need to collaborate with its landscape and surrounding nature. The reinforcement of the link to the natural elements is a social expectation of the current urban context. Faced with ever-increasing urbanisation, it is vital not to lose contact with the natural elements within our cities. More than a purely aesthetic act, the vegetal contributes to the quality of the living environment (Astier et al., 2013).

It is generally accepted and claimed by researchers that cities are at the centre of the main challenges towards a more sustainable future. The fusion of nature and city is more than topical. The dichotomy both notions are representing is about to belong to the past. During the last century, urban planning has known several drastic changes. Fast-growing cities, globalisation and technological changes have been important trends and continue to be as the Department of Economics and Social Affairs of the United Nations (2019) has predicted an increase in worldwide urban population rising from 4,4 billion in 2020 to 6,7 billion in 2050. According to the European Commission (2010) the proportion of urban dwellers in European countries is even higher. Nowadays, almost 80% of Europeans live in cities and urban areas. Nevertheless, there is a lack of certainty due to border changes and issues about statistics when it comes to referring to the data published by these international organisations. The difficulty in defining the city arises both from a question of statistical threshold and from a problem of limits in space. Some countries adopt a demographic threshold beyond which a village becomes a city. France, for instance, defines a city as a regrouping of households of more than 2 000 inhabitants (LAROUSSE, 2019). In Denmark, however, a city is defined by the limit of 200 inhabitants (Dijkstra et al., 2020). While the worldwide urban population has been increasing, nature has yet been put to the side

and forgotten by modern industrial societies. Green cities may anticipate and support the transformation of our territories and the evolution of our population.

The Brundtland's report has been a major turn towards a sustainable worldwide mindset in 1987. The Athens charter, on the other hand, was a significant element representing the functionalism urban planning practices advanced by Le Corbusier during the 1930s'. Nevertheless, after the international convention of Aarhus 1987 and Rio 1992, most of the developed countries have implemented regulations for a greener and eco-friendly way of planning our cities and territories.

At the same time, landscape architects and urban planners, such as C.Waldheim, T.Turner or M.Mostafavi have been elaborating and developing new theories and way of developing our cities through the lance of cultural landscape and nature. Indeed, the terms of landscape urbanism and ecological urbanism have been progressively introduced in the general school of thoughts.

France is rich within its territory and enjoys a variety of climate, vegetation and unique natural entities. The place given to green spaces by urban policies since the 19th century in France has gone through several phases (Lofti et al., 2012). Three main phases may be identified. The period of the functionalist city planning, then sustainable urban planning and finally the emergence of ecological urbanism.

Clermont-Ferrand, France, is nestled at the centre of France in the historic Auvergne region and newly Auvergne-Rhône-Alpes region. The metropolis -status obtain in 2018 after the enlargement of a national decree so as to consolidate the metropolisation process that the French Government is undertaking- is well known for its architecture, nature and history. The "Chaîne des Puys" and Limagne fault are embracing the Western flank of the city. As part of the UNESCO natural heritage since 2018 (UNESCO, 2020), the volcanic chain is a high landscape and natural capital of the city which furthermore contributes to the territorial identity. Indeed, the volcanic plateau is a major component and characteristic of the cultural landscape from a regional to a local perspective. Moreover, its natural uniqueness is renown nationally and internationally. Partly due to the UNESCO classification. The implantation of Clermont-Ferrand at the edge of this natural treasure allows the inhabitants to enjoy large open green spaces.

Industrialisation and globalisation have not spared the city. Michelin (2020), one of the world larger tires company and tourist guide has been developing and implanting in the inner centre of

Clermont-Ferrand since its beginning at the end of the 19th century. The municipality enjoys an international storefront and economic impact thanks to the industry. However, the aesthetic image of Clermont-Ferrand has been deteriorated. The green spaces and the natural identity of the city has suffered from the same fate. The urban planning scheme of the metropolis has been adapted and influenced to the Michelin production and expansion following the industrialisation lobbying on land use. Therefore, the city was planned and remodelled due to technological changes and progress. Trams, public spaces and greeneries have been replaced throughout the time by a car-oriented and mineral city as the development of new technologies led to new visions of transportation practises and public spaces experiences. Furthermore, the demographic explosion initiated by the “Trente Glorieuses” period, the rural exodus and the massive repatriations from Algeria has impacted the urban development of the city and therefore, the green spaces and the connection to the territorial landscape.

The inhabitants are asking for more green spaces and natural elements in Clermont-Ferrand. The city geographical position is accentuating the climate change affects such as extreme heat waves in the urban core partially created by the ground surface and even flood risks due to heavy storm rain that may occur during the summer period. The vegetal is a living entity full of resources that we, human, are merely using to make our society more socially, economically and environmentally sustainable (Manusset, 2012).

The city council is conscious of the situation and is working to shift towards a greener city by integrating the green infrastructure as a whole in their urban planning strategies for a future Clermont-Ferrand. Tackling the grey and industrial vision that most people have of the city by reconnecting the edge landscape and nature to its urban milieu.

1.2 Research Objectives

Through this master thesis research, I aim to attain several objectives so as to answer the research question in a coherent and constructive way. Therefore, the research is based on three main objectives. Firstly, the thesis analyses and aim to understand the relationship between nature and city in the context of Clermont-Ferrand. A context framed by a generational dimension promoting car-oriented planning and technological changes. Secondly, understanding the influence and actions that stakeholders may have on green spaces throughout time. Finally, figuring out the

relevance and effects of implementing the ecological urbanism theory to the context of Clermont-Ferrand and thereby highlighting the opportunities that this approach may bring to the municipality.

1.3 Research Question

The master thesis is composed of a main research question as a base for the research. In addition to it, sub-questions are revealed all along the thesis so as to bring more reflection and questioning to the case study. Thereby, the main research question has been developed, refined and adjusted throughout the entire research and writing process. Therefore, the research question and interest of this thesis is to understand “*what green spaces has been lost in the last 100 years in Clermont-Ferrand? And why this has happened?*”

As said, the main research problematic is supported by sub-questions in order to direct and get deeper in several areas and subjects such as:

- “*What forces may have influenced this process?*”
- “*How the loss of green spaces has happened?*”
- “*What role the municipality has had?*”

The research question and objectives cover the interests of this research chronologically, starting from the early years of the 20th century so as to give the setting and gradually getting closer to our period.

Finally, this extensive research will lead to a research-based proposal for Clermont-Ferrand. The proposal has been modelled and adjusted to the context of the city as well as influenced by what could be learnt from the research and how it could be implemented to make the proposal achievable. Indeed, on the basis of the findings, a proposal for the urban planning and landscaping of the future Clermont-Ferrand has been developed.

2 Theoretical Perspective

In this chapter, we will analyse several theoretical perspectives, namely, ecological services, modern societies and the urban development as well as the ecological urbanism concept. This analysis is made to understand the relevant established knowledge and current discussion about concerned issues such as industrialisation, urbanisation, green infrastructures and the place of green spaces. In the first section major thoughts are introduced demonstrating the importance of nature and its effects on the urban environment with environmental and well-being effects. In a second section a focus is made on urban development and the modern world. Paradigms are analysed such as economy and technology change to see how these paradigms influence cities and human in the modern industrial area. Moreover, we will look at the urban form and green infrastructure definition as well as the issues that these concepts involve. Finally, in the third section we will explore the academic field of “ecological urbanism” which is a term used as a thread for the case study research and project’s development.

This research is exploring and highlighting the knowledges gained in the last decades regarding the positive effects of nature on the living environment and the human well-being. Therefore, this section wants to bring up the relevance of ecology and thus the ecosystem services offered thanks to the natural elements.

2.1 Ecosystem services

First and foremost, it seems important to define the term ecology prior to jump into ecosystem services. The term ecology was first introduced by the German biologist Ernst Haeckel in 1869. Haeckel defined ecology as *"the study of the natural environment including the relations of organisms to one another and to their surroundings"* (Odum and Barrett, 1971).

Steine (2011) defines ecosystem services as

the benefits we receive from nature: resource services, such as food, water, and energy; regulatory services, such as purification of water, carbon sequestration and climate regulation, waste decomposition and detoxification, crop pollination, and pest and disease control; support services, such as nutrient dispersal and cycling, and seed dispersal; and cultural services, including cultural, intellectual, and spiritual inspiration, recreational experiences, ecotourism, and scientific discovery.

As expressed in Steine's definition above, nature has a positive impact on the urban fabric because of different virtues. Researchers have, indeed, been able to argue that nature in the city in all its forms -fauna, flora, water, air, soil- is a multifaceted resource with a wide range of services namely regulatory, support, production and cultural (Ecologique, 2021). According to Sandrine Manusset (2012) there is a positive correlation between the presence of green spaces and the level of overall health.

Therefore, this master thesis research will focus on several ecosystem services as mentioned by Steine. These ecosystem services include the aesthetic and recreational value of the nature, the reduction of the atmospheric pollution of our cities, the temperature's regulation and the energy savings, the reduction of runoff water and therefore the enhancement of the biodiversity in the city as well as the dwellers' well-being and health. From my understanding, it is logic to highlight these ecosystem services so as to get the interest of this master thesis research and the importance of nature within a dense urban core which has been put aside by our societies in the last decades.

Maud Minaret (2013) argues that nature is often presented aesthetically. Indeed, the natural elements are frequently established with the embellishment and greening of the public spaces and may at first play an important role in the cities which:

[...] seeks to enhance its natural capital through, in particular, a national ranking for green towns. This media event involves aesthetic and social requirements as well as economic -tourism, land development, etc. Cities also stand out in their "race for the green" by the multiplication of projects [...] with a significant showcase effect. (Minaret, 2013)

Other researchers, such as Farshid Aram (2019) and Weronika Strzyżyńska (2021) promote the presence of vegetation in the city as an effective measure in terms of reducing heat islands as well as improving the comfort and quality of life of users. Nowadays, the world spends more on cooling than on heating.

Scientists and urban planners have known for a long time that temperatures in cities are higher than in rural areas. Infrastructure such as dark asphalt and concrete surfaces absorb more solar radiation, while reduced tree coverage contributes to what is called the "urban heat island effect". This means that temperatures in cities can be up to 5°C warmer than in the surrounding rural areas. (Strzyżyńska, 2021)

In summer period, the tree's foliage decreases the exposure of surfaces to sunlight radiations, which limits the rise in temperature (Aram et al., 2019).

Moreover, some studies carried out in Shanghai (Yin et al., 2011) have measured small but beneficial effects on the capture rate of fine particles as well as on the absorption of sulphur dioxide. Thus, resulting on an air quality's improvement (FEIX et al., 2017).

Additionally, Henrik and Johanna Sjöman (2018) argued that trees and natural elements have a significance when it comes to the resilience of cities. The artificialization of the soil accentuates the violence of the risks caused by heavy rain water. Soil waterproofing, indeed, continues to worsen with significant, if not disastrous, consequences for the water cycle. Likewise green spaces play an essential role in management, on the one hand through the capacity of plants to absorb and use rainwater for the exact purpose of their development and on the other through the absorption and filtration of soils (Lofti et al., 2012, Werquin, 2007). Water also participates in the thermal regulation of cities. Moist air helps reduce heat island effects. More and more development projects integrate water in different forms, recovery basins, landscaped valleys, water swale, etc.

All the previous benefits mentioned play a role on people's perception and health. Indeed, the presence of greenery in the city has an impact on people's mind and well-being. Likewise, it has been observed by researchers and scientists that sustainable development in the urban fabric influences city dwellers living near a park or a green space by having an anxiety level drop as well as exponentially increasing the well-being of the neighbourhood (Caillet, 2020 & Douglas, 2017).

The place of nature in our cities has become a sensitive subject and the centre of attention. The extensive research has shown us the ecological and human added value that green spaces may bring to an urban environment. However, this vision is recent as attested by the recent publication dates of the authors mentioned above. Landscape and nature have often been pushed aside to the detriment of other factors and forces. Therefore, in the next section we will look at the evolution of urban development of modern societies and the place of green spaces. We will seek to understand what were the paradigms and current established vision which has shaped the city of Clermont-Ferrand.

2.2 Modern world: economic system and technology change

Modern societies have played and are still playing an important role in the development of the urban areas in the last century. Clermont-Ferrand as most of the European cities during the 20's century has been influenced by major visions and forces that have shaped the city as we know it today. Therefore, this section wants to bring knowledge regarding the paradigms and the theories around urban development. Thus, I will try to draw my understanding of urban development. To do so, I will explore the concept and definition of economics system from Frontier Economics as well as the notion of technology change developed by Robert D. Atkinson (1998). These two notions are relevant as they correlate to each other and have much to do with the development process that concern Clermont-Ferrand. Afterwards, I will try to understand the green urban development through urban forms and urban green infrastructures.

2.2.1 Paradigms of the modern world

As Ehrenfeld (1997) says, a paradigm is *“a framing set of concepts, beliefs, and standard practices that guide human action.”*

The paradigms of the modern societies brought up by Ehrenfeld (1997) such as the economic/environmental paradigms or the industrial are composed by the same elements, namely, the earth is either a close or open system; a cohabitation or not between human and natural elements; the perception of technological progress; a different vision on sustainability and a position on strategy policy.

So as to understand the difference, I will present the case of Frontier Economics which has a realist description of capitalism -the dominating force in the industrialised societies nowadays.

2.2.1.1 Economic paradigm

In the view of Ehrenfeld (1997), Frontier Economics -which is a microeconomics consultancy providing economics advice- embodies, indeed, a great example of a Western society company's vision about the relationship it maintains with its environment and nature. In Frontier economics' perception, the earth is seen as a limitless resource in terms of supporting the human societies and

therefore perceived as an open system. Moreover, the current environmental problems are absent in their vision and do not promote sustainability. In addition to this environmental denial, Frontier economics, as explain by Ehrenfeld, has a strong optimism into technology as a curator for any problem. Furthermore, he highlights the fact that they see the future created through a “*price system based with unavoidable market imperfection*” (Ehrenfeld, 1997) as well as a policy strategy and a free market.

Ehrenfeld (1997) highlights that such a paradigm does not comply with the future challenges either from an ecological perspective or human as sustainability is unproblematic. The paradigm focuses only on economic profits and the management of problems from market’s imperfections.

The economic world has been and still is influencing the way our cities are developed and shaped. In addition to the economic aspect, comes the technological changes and influence. I will develop that theory based on Robert D. Atkinson who assesses the impact of technology both at a large and small scale.

2.2.1.2 Technological change and cities

According to Robert D. Atkinson (1998), the technological change or revolution has a spatial effects on jobs, people and economic distribution in an urban environment or even country. Indeed, he argues that the location of industries and people may change as technology. Technology may be particularly important to this process since it can alter the nature of the urban development of a metropolis. Robert D. Atkinson (1998) emphases that,

urbanisation has been driven by technology transitions that redefine urban hierarchies and bring new types of specialisations to the urban economic base. As a result, many urbanists argue that the pattern of urbanisation has not been a smooth evolution, it has been marked by major transformations from one form of city to another.

Therefore, it may be said that the role of technology and technological progress influenced the cities and the way they have been built in reaction to the technology impact. Robert D. Atkinson raises the importance of the consequences of technology on urban cores as for instance with the automobile. Richard D. Atkinson emphasizes on that point by stating that “*cities were reshaped by the automobile*” (Atkinson, 1998). The rise of the automobile is a great example for the case

study as Clermont-Ferrand is known of being a car-oriented city due to its historical, industrial and eventual economic development.

2.2.2 The green in the urban development

In order to correlate with the preceding principles, it is primordial to understand the urban development and forms in modern societies. It will, afterwards, make us more aware of how the urban development of Clermont-Ferrand has been established, by which process and why. Therefore, it will make us understanding the challenges and the theory behind the development of a green city.

2.2.2.1 Urban form

Prior to proceeding to the assessment of urban form in terms of green infrastructure, it is important to present a scholarly outline of the urban form definitions that is displayed in the literature.

The concept of urban forms, according to Tsai (2005) comes up with indicators such as compactness and monocentrality which are opposed to polycentricity and sprawl as explained by Tsai. A proper interpretation of urban form starts with the identification of the variables that may assess either one of the indicators: compactness and sprawl.

The quantifying variable of urban form are of two distinct natures, namely the physical and geographical variable indicating the spatial structure and the scale of the city (Hillier, 2009). As well as the socio-economic one, which indicates the population density and activity in terms of land use (Bettencourt et al., 2007) (Cottineau et al., 2017).

Therefore, according to Scott and Storper (2015) the urban land link is *"the extensive expression of agglomeration and in modern society is molded to a significant degree by the behavior of firms seeking locations for production and households seeking living spaces."* In other words, defining an urban form as monocentric or polycentric would entail describing *"the spatial distribution and concentration of jobs and residences"* (Engelfriet and Koomen, 2018).

In the past century, cities around the world had to face economic, social, and environmental challenges, as well as fast urban changes with rapid population growth and social-spatial changes. These factors have had a compelling impact on urban areas in France.

These factors have been influenced by different forces. Authors, such as Sevtsuk (2012) and Rasoolimanesh, S et al. (2011) have highlighted the fact that cities are shaped due to forces as they refer to the social, political, economic, energetic and geographical forces. From my perspective, the political and economic forces have influenced the presence of green spaces in most of European cities, due to a pressure brought up due to a strong land use pressure and industrialisation process.

The urban development of cities has yet entailed in a loss of urban green spaces within urban cores and peripheric of city.

2.2.2.2 Urban green infrastructure

The notion of urban green infrastructure gained considerable standing responding to the Industrial Revolution's social and ecological impacts and subsequent rise in urbanization (Young, 2009). For this master thesis, I am going to base my understanding of green infrastructure with Benedict and McMahon (2012) who define green infrastructure as,

an interconnected network of natural areas and other open spaces that conserves natural ecosystem values and functions, sustains clean air and water, and provides a wide array of benefits to people and wildlife.

Therefore, green infrastructure correlate to the ecological services provided by natural elements and green spaces. Furthermore, the green infrastructure definition includes the notion of green spaces. According to the green space's typology below -figure 2.1- green spaces refer to either the public sphere or the private which then are divided into specific categories.

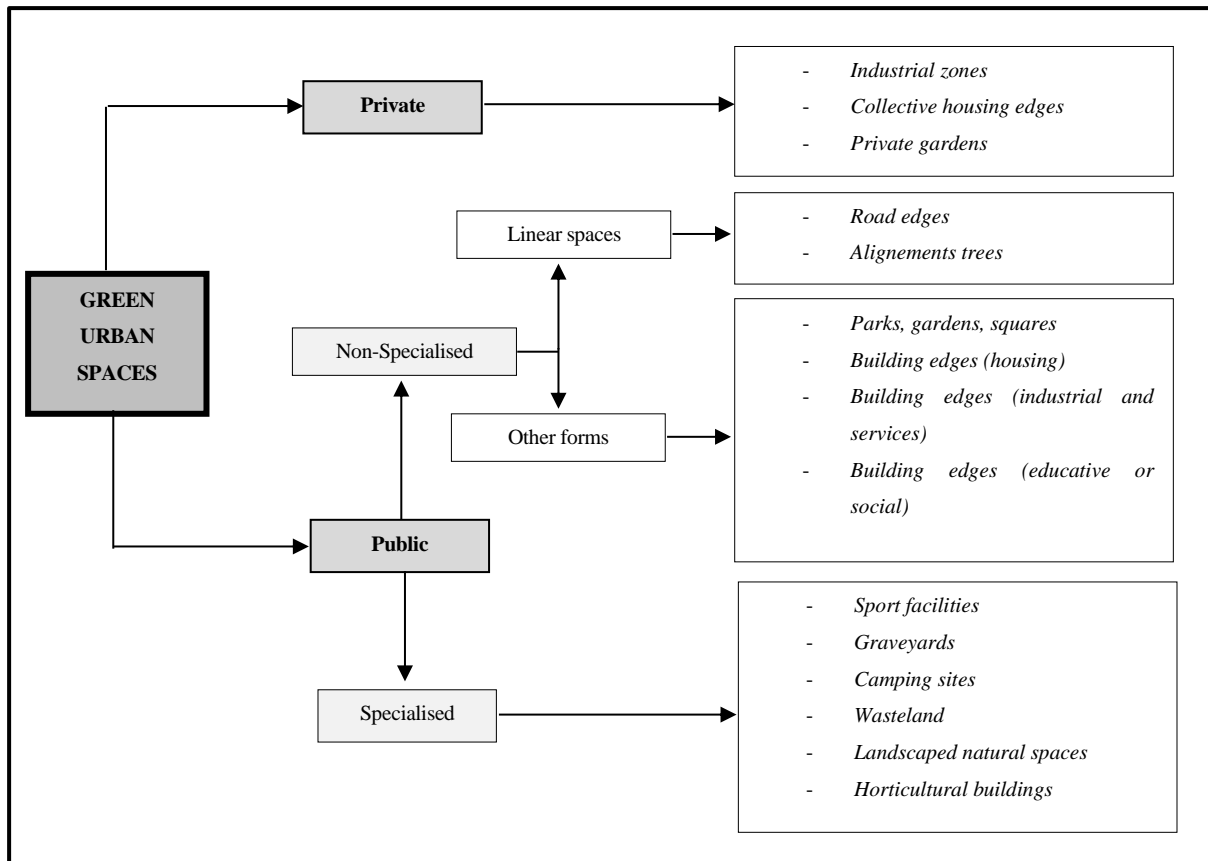


Figure 2.1 Green urban spaces typology according to AITF (2004)

Moreover, the green infrastructure notion integrates green and blue corridors as part of an interconnected network of natural spaces as explained in the Benedict and McMahon definition (2012).

The understanding of green infrastructure definition and its development within the political, social and economic spheres is of a great importance as to consider the future urban forms and development of cities.

Indeed, green spaces as explained in the precedent sections has an extensive pressure for the reason that of various forces and urbanization process. Therefore, losses of green spaces can be explained by removal of greeneries such as parks and street trees to make way for housing, industrial areas and grey infrastructure without other greening measures.

In addition to this loss, researchers (Pauleit et al., 2005, Kabisch, 2013 #164) have showed that infill development and compactness has led to a decrease in both private and public green space by 5% of green spaces in chosen towns. Pauleit (2005) adds that gardens and tree cover were lost, while other open space in already more densely built areas were lost due to redevelopment influenced by an economic-political and demographic pressure.

2.3 Ecological urbanism

Ecological urbanism is the theory on which I am basing my research and the aim for the proposal. Furthermore, I am going to explain and demonstrate how ecological urbanism allows a combination of the previous theories by having a joint perspective of nature and economic-technology sustainable development.

From my point of view, ecological urbanism is the combination of the role of nature -referring to the ecosystem services- plus the influence of technology, urban development and economic in the development of the cities.

2.3.1 Landscape urbanism

Charles Waldheim (2016) establishes the fact that urbanism is at a turning point. He argues that landscape urbanism is taking over as a practise where the landscape replaces architecture as the foundation of contemporary urbanism practice. Moreover, he explicitly says that “*landscape has become both the lens through which the contemporary city is represented and the medium through which it is constructed.*”(Waldheim, 2016)

Furthermore, Tom Turner (2015) says that “*landscape urbanism is an approach to the design of cities, and their components, which aims to make good places through a creative integration of natural, human and cultural process layers.*”

The concept highlights an interest in aesthetical and urban design in the urban form with the landscape view as a medium to develop a territorial project. Therefore, making the landscape and nature a dominant principle.

It appears that landscape urbanism offers a “*way to consider the complex urban condition*” as well as a “*framework [...] that stems from a sense that landscape can be used as a model and basis for urban initiatives, and a lens through which to examine our cities.*” (Gray, 2011)

The way of thinking of landscape urbanism concerns mostly the territorial project scale approach and design aspect, and therefore promoting the landscape architects, making the paradigm to be developed by technocrats mostly. Recently, a more advance concept following the landscape urbanism vision has been developed. By combining the design aspect and a strong attachment to ecological values, the Ecological urbanism seems to be a powerful concept for this thesis.

2.3.2 Ecological urbanism

Mohsen Mostafavi (2010) says that “*ecological urbanism must provide the necessary and emancipatory infrastructures for an alternative form of urbanism, one that brings together the benefits of both bottom-up and top-down approaches to urban planning.*” He also mentions that “*The need for differentiation demands that ecological urbanism not take the form of fixed rules but promote a series of flexible principles that can be adapted to the circumstances and conditions of a particular location.*” (Mostafavi, 2010 #143)

Ecological urbanism has several fundamental characteristics which distinguish it. According to Mostafavi (2010), ecological urbanism encourages the overlay and intermingling of natural systems. Indeed, the paradigm in the view of Mostafavi, has an impact “*beyond its immediacy and inherent global relationship*” which for instance may have an impact on global climate and environments. Moreover, ecological urbanism tempers the economics of capitalism or other economic regimes. This current does not provide neither a vertical nor horizontal approach, therefore putting on the side the common top-down urban planning vision of modern society and capitalism. Finally, according to the author, ecological urbanism helps to reinforces the coherence of a place by analysing layers namely history, topography, ecology, etc.

Waldheim (2016) concludes that an

...ecological approach to urbanism promises to render a more precise and delimited focus on ecology as a model and medium for design. This has the dual benefit of avoiding some of landscape’s luggage, whole rebooting the now two-decades-old intellectual agenda of landscape urbanism.

Therefore, it can be said that ecological urbanism opens up new urban design opportunities by merging the ecological aspect with a good design benefiting for both the human and other living species in the urban fabric. Moreover, it includes social aspect by promoting participatory methods, thus tackling the technocratic approach of the landscape urbanism. The perspective of ecological urbanism has a strong potential for application to the urban development of Clermont-Ferrand.

2.4 Theoretical platform

This thesis will use the ecological urbanism concept to explore how it is integrated in the decision making when it comes to urban development in Clermont-Ferrand by the different forces and actors and how this paradigm may help to build the city in a way that all parties could get benefits from it.

Ecology and the ecosystem services will be used in the development of the proposal as a basis for the establishment of a new perspective for including nature, green spaces, and the landscape into planning processes as it benefits both for the human and species well-being.

The economic system has been influencing cities whose Clermont-Ferrand regarding their urban development and therefore the way they have been shaped during the centuries. The modern society which has been shaped by the economy did not give value to nature and was unable to appreciate the value that nature holds for human until recently.

Ecological urbanism is the combination of nature and its ecosystem services with the economic and technology perspective so as to create a greener and more sustainable city.

3 Methodologies

In the chapter three, I introduce the different methodologies that were used in the research process as well as explaining their usefulness. Indeed, this chapter investigates in the techniques of analysis of the subject through quantitative and qualitative research methods. In addition, throughout this chapter I explain my research choices as well as the reasons that prompted me to take these directions. The methodology chapter also allows me to reflect and interpret the work that I was able to provide during my research period and thus explain and justify my method's choices. Finally, I introduce the reasons of carrying out a case study and the site selection for the research.

3.1 Research methodologies

3.1.1 Theory study

The beginning of the research has been based on theory studies to ratify the already existing theories on the topic. Indeed, a targeted theory study taking stock of the state of knowledge in the field of the question makes it possible to justify the subject and its orientation. Moreover, it allows to advocate the choice of the field of study as well as to pose the elements of knowledge likely to justify the methodological choices made and to lead the discussion (Urquhart, 2012).

This methodology has been carried out at the beginning of the research in order to base the research on the most relevant theories as well as gaining theoretical knowledge and ideas on the subject. This accumulation of data and knowledge has been done through reading books, articles, urban planning documents as well as discussions with different contributors, namely, supervisors, professionals and other people related to the research which includes some interviewees.

The theory study allowed to draw my understanding of the research topic and the way I interpret it in the master thesis. Furthermore, it allowed me to master the basic concepts and theories on the subject. Thereby, identifying ways of approaching the subject. Moreover, it allowed me to analyse the results obtained. Finally, the theory study helped to identify whether the theories and results show point to convergences or divergences between authors.

3.1.2 Case study

In order to answer the research question, I decided to implement a case study. The case study helps to understand the site's specificities as well as giving an opportunity to get concrete findings. Case study is a great method for detecting "black swans", meaning discovering hidden problems that are not perceptible at first sight. Indeed, a case study is a research approach that is used to generate an in-depth, multi-faceted understanding of a complex issue in its real-life context (Gagnon, 2012). On the one hand, the intrinsic case study is typically undertaken to learn about a unique phenomenon. The researcher has to define the uniqueness of the phenomenon, which distinguishes it from all others. On the other hand, the instrumental case study uses a particular case -some of which may be better than others- to gain a broader appreciation of an issue or phenomenon (Gagnon, 2012). The case study that I am elaborating is yet not necessarily exclusive to a certain category. Indeed, I undertook an intrinsic case study to investigate the issue of green spaces in Clermont-Ferrand and the forces that influenced these spaces. However, it developed into an instrumental case study as some of the generating findings may be transferable to other urban contexts within France or Europe.

A case study may be used to explain, describe or explore a phenomenon. Moreover, the case study approach helps to capture information on "what", "how" and "why" questions (Crowe et al., 2011). This research methodology may enlarge the insights into "*what gaps exist in its delivery or why one implementation strategy might be chosen over another.*" (Crowe et al., 2011).

So as to implement a proper case study research methodology, a meticulous defined research question has to be set as well as a pre-designated boundary in order to clarify the nature and/or time period covered by the case study, the targeted social groups, the geographical area of interest and the priorities for data collection and analysis. (Crowe et al., 2011)

Therefore, I chose the city of Clermont-Ferrand, France, as my case study for this master thesis as it involves a unique scenario when it comes to its urban form and landscape.

3.1.3 Limitation of the study area

In an intrinsic case study, the case is selected in its own worthiness. It is, in fact, selected for its uniqueness and not for its representativeness it may have to other case studies. Therefore, creating an interest for the research.

The designated case study shall give access to the targeted social groups, the organisations, the Geographical Information System (GIS), and other research process that may contribute to the data collection and realisation of this master thesis (Gagnon, 2012). Therefore, access is a major consideration. The case study site as to be well known so that it adduces great inputs to the research and answer in the preferred way the research question.

3.1.3.1 The city

Even though I decide to focus on one case study in this thesis, Clermont-Ferrand's territory is larger than its municipal boundaries. The urban area of Clermont-Ferrand gathers no less than 182 municipalities (INSEE, 2019) for an approximate population of 500,000 inhabitants. Making it too vast as an area to explore and imply a deep research. Zooming in, the Clermont Auvergne Métropole which gather 21 municipalities for 300,000 inhabitants and covering an area of 300,000km² (INSEE, 2017b) still represents a broad territory to imply a rich research. Therefore, spatial limitation for the study is important to be established from the beginning. This is why I decided to focus only on the inner limits of Clermont-Ferrand when it comes to the urban context in order to target on the purpose of the research and gather valuable data. Thereby, the thesis research is not going to invest what has happened in the other neighbouring municipalities.

Nevertheless, I do consider to take into account and briefly analysis the territorial natural landscape of the municipality as it seems important to not forget the link it had and has. In fact, the study of the larger landscape gives clue to the research question when it comes to the natural evolution and contextualisation of the site.

Clermont-Ferrand, as briefly presented in the background part, is an interesting and unique case study because of its history and geographical position. The city has been shaped through the industrial implantation of Michelin. Making its urban spaces car-oriented. Nowadays, the society

and Clermont-Ferrand's inhabitants are showing a strong interest of reintroducing the nature in the metropolis.

The choice of limiting the area of the case study concurs with the data availability and relevance as the city is providing a multitude of tools and documentations when it comes to past events and GIS data.

3.1.3.2 The nature

As the area limitation, the natural element has to be framed so as not to scatter. Nature is a broad notion. The typology may vary. However, for my research I based it according to the figure 2.1. It allows to understand the different categories of the green urban spaces. For this study, I want to bring my attention to the selected green space on the figure 3.1. Therefore, I do take into consideration both the private and public sphere. In fact, industrial zones and private's gardens are important elements of the project and research. However, this research is not going to zoom-in into building edges. When it comes to the public area, each natural spaces are considered expect from the graveyards -which do not include much plants and greeneries in a French context- sport and camping facilities.

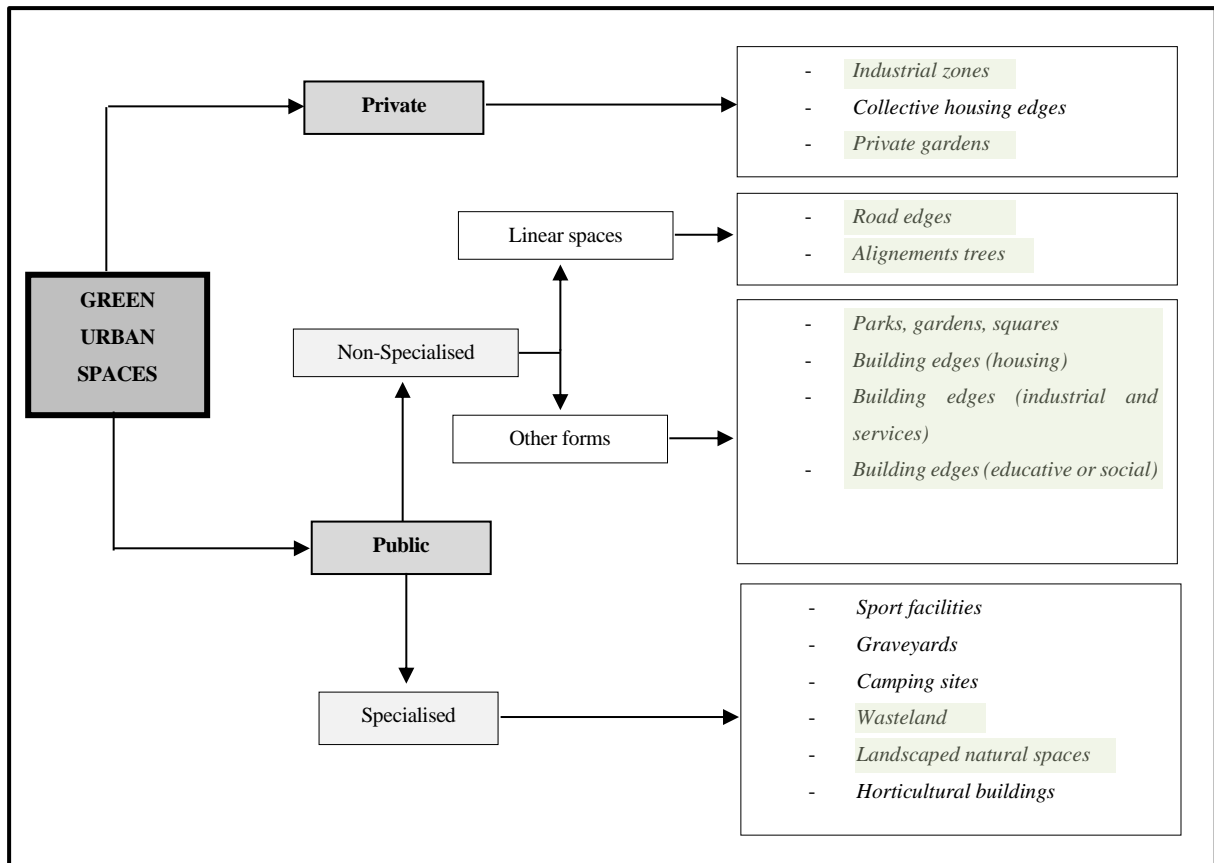


Figure 3.1 Focus green spaces. Green space typology elaborated by the AITF (2004) and modified by the author's (2021)

3.1.4 Organisation and analysis of data

3.1.4.1 Case study analysis

The information attained from mapping methods, archival records and from other sources are organised according to the topics and chapters. Stakeholders' analysis, walking methodology and summit participation have been done during the research period so as to get a wide accumulation of perspective and results regarding particular themes.

3.1.4.2 Revisiting the theories and the methods

Even though a theory study has been done from the start of the research, a revisiting of the theory all along the data gathering and writing part has been needed in order to comply with the assumption's coherences and their appropriateness.

The case study approach usually associates the collection of several sources of testimony, using a range of quantitative methods such as questionnaires, audits and analysis. As well as qualitative methods with interviews, observation and participatory methods. The use of various sources of data has been advocated as a way of increasing the internal validity of a study (Crowe et al., 2011).

Case study findings can have implications both for theory development and theory testing. They may establish, strengthen or weaken historical explanations of a case and, in certain circumstances, allow theoretical generalisation beyond the particular cases studied.

3.1.5 Timeline

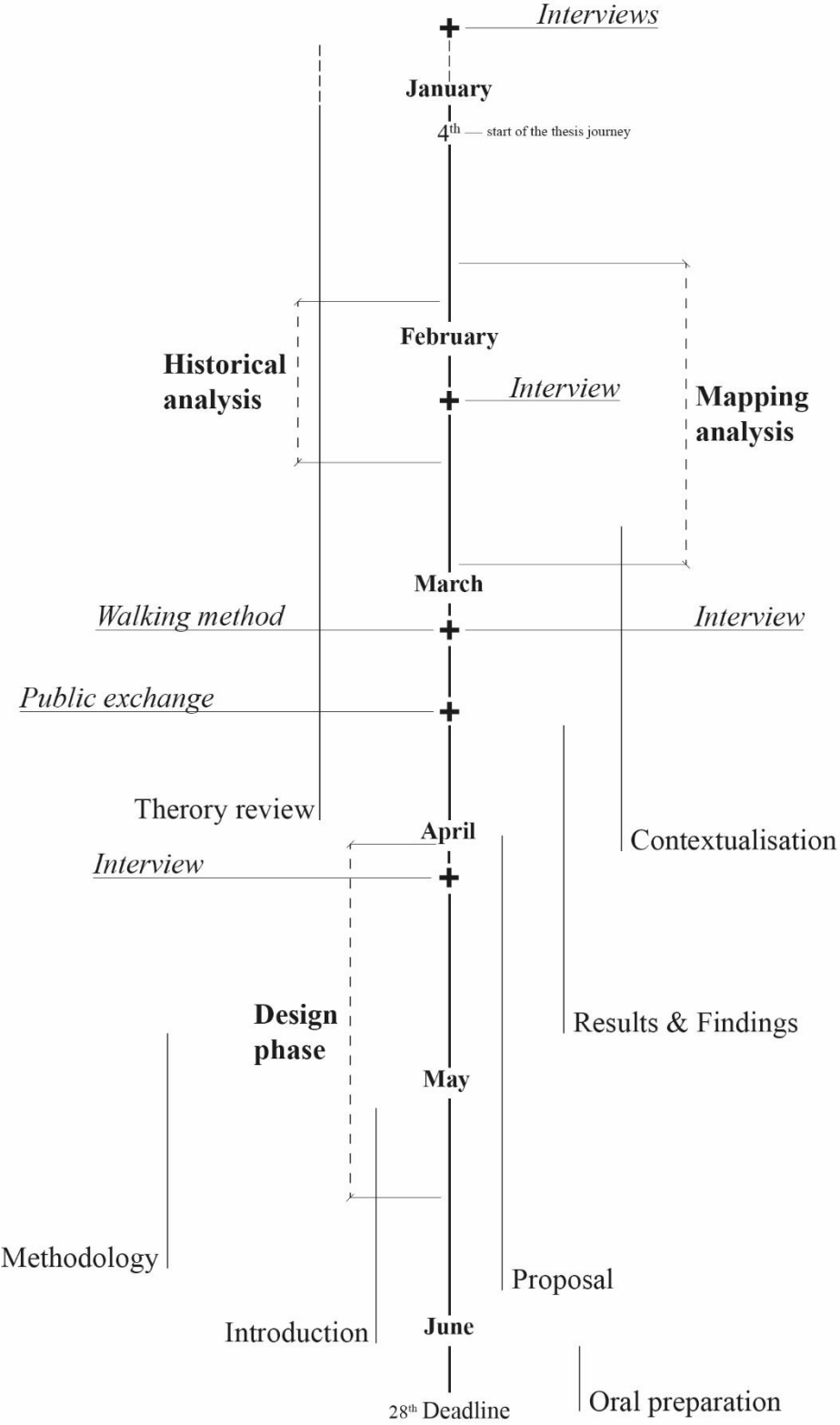


Figure 3.2 Timeline of the thesis (Author’s illustration, 2021)

In order to control my research time as well as the development of the project, I have established a timeline -figure 3.2- so as to frame each step of the elaboration of this master thesis. An important amount of time has been dedicated to the theory review as well as the development of the proposal.

Indeed, it clearly appeared to me that theory has to be consistent and well framed. Thereby, it would be aligned and be the support for the progress of my project in regards to Clermont-Ferrand contextualisation.

The proposal was the other important aspect of the thesis as my master thesis type is a project-based master thesis. Therefore, the elaboration of a coherent proposal to the case study was primordial.

3.1.6 Summary of findings

This part was one of the last stages of the research. It helped to frame the conclusion and thereby my proposal. It influenced the way I designed my project and the orientations taken.

When reporting findings, it is important to provide the reader with enough contextual information to understand the processes that were followed and how the conclusions were reached (Crowe et al., 2011).

3.2 Data collection methodologies

To obtain the needed data in order to answer the research question I aimed to have a pre-selection of data collection methods before starting the fieldwork and project development. The principal strategy for assembling primary data seems to be according to literatures the in-depth interviews with the major stakeholders, namely, representatives, architects and urban planners involved and concerned by the topic “Nature in Clermont-Ferrand”.

3.2.1 Documentation and archival records

Literature review has been the first phase of the research. Documents from governmental institutions has been a great tool to learn more about France's strategies regarding sustainability as well as the urban planning scheme that cities aim to implement for the future. Additionally, the local media coverage about the subject of the research has been a great tool to find out other perspectives and valuable data.

3.2.1.1 Media articles

The local newspaper namely, "La Montagne", as well as the national and wider newspaper such as "Le Figaro", has been a great interface to get knowledge and the nuances of the case study. The media were an interesting mean to gather information regarding past events as some recent articles were dealing with precedent events that have occurred in Clermont-Ferrand from a hundred to twenty years ago as a historical reminder of what the city went through.

Moreover, the newspaper was interesting thanks to its input on the current context and the expectations of the dwellers regarding today's issues about environment and city.

3.2.1.2 Official documents

The government has a large palette of documents regarding sustainability, planning strategies and urban planning laws that applies for the French territory. Therefore, it was interesting to dig into these documents as to capture the previous governmental orientations for its territory and cities and therefore witness the swift in the State mentally when questioning sustainability.

Moreover, when zooming on the case study of Clermont-Ferrand, it was interesting to go through the diverse urban planning's documents elaborated by the city. Even though some of them started to become old and needed to be revisited. Nevertheless, it gave a great overview of Clermont-Ferrand's current planning strategies and the goal they are aiming to achieve.

3.2.1.3 Archives

The archives have been a great tool for the research. Indeed, has the research question is questioning what has been shaping Clermont-Ferrand for the past century, the archives had a lot to offer. Thanks to this tool, I have been able to collect data, images, maps and elements that were not brought up by the newspapers or official documents.

3.2.1.4 Books

Few authors have been writing about the historical evolution of Clermont-Ferrand as well as the industrial context of the city during the last 100 years. Therefore, they were valuable resources of information embellish or adduce results to my research and thereby giving a deeper and more valid answer to the research question.

3.2.1.5 Photos

The analysis of ancient clichés and postcards have been a great tool to understand the land use of the city as well as giving a vision of how things looked like and were organized at the time. Moreover, it helped to comprehend the use and place of green spaces in the municipality, especially the private gardens as very few statements have been made in the literature about it.

3.2.2 Fieldwork

The fieldwork has been conducted from January to April 2021. However, because of the sanitarian situation with the COVID-19, the fieldwork research method has been more challenging than expected. Especially when implementing participatory methods.

Thereafter, are the main qualitative methods that have been used during the fieldwork.

3.2.3 Interviews

Interviews is a useful technique to meet and have a direct interlocution with the people interested by the topic of the research. Stakeholders involved in landscape and nature in Clermont-Ferrand has been definitely the main source of valuable information during the fieldwork.

I have been conducting interviews based on a semi-structured format (Guion et al., 2001) allowing the interviewees to have more freeness to speak with more details about the topic as well as giving me information that I would not have thought about. The interviewee might declare and express his opinion including new problems and the major challenges. The interviewed person might feel more comfortable during a face-to-face interlocution rather than via an electronic device. Therefore, telling some of their life story which may be interesting in some cases and at the end provide unique information that are not referenced yet, such as future urban planning projects or plans (Holstein and Gubrium, 1995). However, the semi-structure interview format is relevant if a pre-plan has been written in order to follow a frame.

During the data collection phase I have had several interviews with different stakeholders such as representatives, urban planners, landscape architects, the inhabitants, and in both genders. Throughout the research, I will introduce the views of the main stakeholders to capture the different challenges and expectations.

Thereafter the list of the person I interviewed during the fieldwork:

Table 3.1 Interviewees during the research

Interviewees	Their role/profession
Mr. Nicolas BONNET	2 nd deputy major of Clermont-Ferrand Actions on: <ul style="list-style-type: none"> - Nature in city, - Air quality and active mobility, - Agriculture, - Alimentation and restauration
Mr. Grégory BERNARD	6 th deputy major of Clermont-Ferrand Actions on:

	<ul style="list-style-type: none"> - Architecture, - Urbanism, and city planning
Mrs. Myriam MASCHEIX	Architect and urban planner from Agence Réalité, Clermont-Ferrand, France
Mrs. Karin HELMS	Landscape Architect – Europe and France
Mrs. Chantal GENESTINE	Major assistant at Sayat’s municipality Dweller of Clermont Metropolis and retired communal agent in a nearby town.

3.2.4 Direct observation

Observation is a technique widely used in qualitative studies (Albuquerque et al., 2014) and allows an analysis of the reality: it allows to describe behaviours, places, situations and emotions that are witnessed as an observer. As an observer, I captured through pictures, fieldnotes the ambiances and nuances perceived from the different public spaces and streets in Clermont-Ferrand. However, the direct observation approach was not the main method used during the fieldwork for gathering data. It was mainly used as said to capture the sensations of the space and thereby influenced afterwards the proposal’s development.

3.2.5 Spatial analysis

Spatial analysis has been an important method in the process of researching and understanding the evolution of space on Clermont-Ferrand’s territory. Indeed, spatial analysis is a set of approaches that aim to describe the structural organization of space and the ways in which it is occupied. According to Arnaud (2008) the use of spatial analysis in urban history is based on two assumptions about how space is constituted. On the one hand, he says that “*the differences in the distribution of a phenomenon do not result from chance*” (Arnaud, 2008). On the other hand, he argues that the distribution of a phenomena in space is not neutral in the way that they evolve and change.

The main objective of spatial analysis is to highlight differences and show that space is not isotropic but that it is made up of multiple territories resulting from varied histories and influences.

3.2.6 Cartographic analysis

Cartography is the set of scientific and technical studies and operations involved in the establishment of maps or plans. This foundation is made from the results of direct observations or the use of pre-existing documentation (Brossard and Wieber, 1984 207). A map is a plane geometric representation, simplified and conventional, of all or part of the earth's surface, in a suitable similarity ratio called the scale (Brossard and Wieber, 1984 207).

During the cartographic study, I have been analysing the territory of Clermont-Ferrand on different scales. The study began with a scale of 1:200,000 in order to understand the interactions maintained on Clermont-Ferrand's space, between the city and the territorial landscape. Subsequently, a more focused study on the municipal boundaries of Clermont was developed at a scale of 1:20,000. Using this scale, I was able to analyse old military maps of the Etat-Major from 1875 as well as more recent maps. Thanks to this analysis, I was able to bring out the important elements regarding the problematic of the thesis. Finally, a cartographic analysis at a scale of 1/100 was carried out in the last phase of the thesis. Indeed, when the project was being developed, I was interested in a more targeted scale in order to give the atmosphere and ambiance that my project could give to the city through sections.

3.2.7 Situational analysis

The situational analysis helped to collect information about the case study and its surrounding. A variety of data may be gathered through the elaboration of a situational analysis such as geology, climate, urban typology, access and transportation network, history and cultural heritage, etc.

Thereby, this method gave a full insight on the case study. Which was therefore helpful for the elaboration of the contextualisation chapter as well as the proposal's design.

3.2.8 Stakeholder identification

The stakeholder identification method has been used as to categorise the influence and force that each stakeholder has had on the on the evolution of the green spaces in Clermont-Ferrand during the last 100 years.

Hereafter is the list of the identified actors that has had an influence regarding green spaces in our case study:

Table 3.2 Stakeholders' identification

Michelin (rubber industry)
Bergougnan (rubber industry)
The municipality and the representatives
The French Government
The inhabitants
SNCF
Farmers
Private investors / Real estate

3.2.9 Participatory research

Participatory research has been used during the research period so as to get different visions and insights. However, participatory methods are not the major data collection method for this thesis. First, due to the sanitarian situation and the different restrictions implemented by the Government. Secondly, the previous stated methods gave already a large panel of results.

3.2.9.1 Walking methods

Throughout the case study research period I have been using the walking methods. This method allows to get insights and perceptions from the population. As Hannah Macpherson (2016) mentioned “*walking methods or accompanied visits are increasingly being used to investigate people’s encounters with landscape*” (Macpherson, 2016). The will focus on the current situation of Clermont-Ferrand in the context of the research topic as well as the people’s perceptions. Thereby, integrating the dwellings’ feelings seem relevant to have a larger panel of thoughts and therefore not based the research only on the main stakeholders and written documents.

Moreover, the development of the proposal is based on the ecological urbanism theory which takes into account participatory method as a tool to design spaces and therefore implementing a bottom-up approach. Thus, the walking method was needed to get the social aspects of the case study and consider what local people’s views are.

3.2.10 Summit participation and Q&A interface

During the process of data collection, I involved myself in summits so as to get a wider perspective of professionals from different cities and companies across France and Europe.

I have been attending an online summit “*HUB Summit – Sustainable cities*” at the start of September 2020. It allowed me to gather information on the Government’s vision for implementing sustainable and smart cities on the French territory. The major French metropolis as well as medium size cities were involved in the summit. Showing off their current action plans and the future of their municipality toward a greener future.

Afterwards, I have been participating in a municipal live Question and Answer (Q&A) through a digital platform set up by Clermont-Ferrand’s townhall with Olivier Bianchi, major of Clermont-Ferrand. The Q&A allowed me to asked my questions when it came to urban planning strategies and nature in the city.

However, only one of my question has been selected and answered during the Q&A. Moreover, it seems important to keep in mind that this live between the major and the inhabitants is

politically oriented and has to show the positive and the best of the major mandate. Therefore, the answer received may be questionable in terms of critical perception from Oliver Bianchi.

3.2.11 Treatment of data

Treatment of the data was carried out all along the research process and data collection. So as to ensure transparency regarding the information I found, a list of reference has been developed at the end of the thesis as well as the elaboration of a appendices where collection of documents from organisations and interviews conducted during the research period may be found.

Moreover, I have been following the Norsk senter for forskningsdata (NSD) regulation on the use of personal data as well as the French regulation. Therefore, all the interviewees gave their consent for the use of the information collected prior to start the interview or phone calls. Yet, I did not have the time to collect all the written consents. I decided to still keep the name of the interviewees for two main reasons. First, having the name of the interviewees give a more tangible approach as well as making the research stronger. Secondly, the French regulation do not ask specifically for written consents. Therefore, I have been too late for collecting written consents for NSD. Some of the interviewees did not replied to my emails regarding this purpose.

4 Clermont-Ferrand: from a national to a local context

This chapter aims to contextualise the case study and Clermont-Ferrand regarding its history, geography and socio-economic aspects. Moreover, this chapter will underline the French planning strategy that I have been influencing the territory and therefore how it has shaped the different cities whose Clermont-Ferrand. By revealing the context in which Clermont is set, it will help to have a better understanding of the characteristics from an architectural, economic and environmental point of view. Furthermore, this first approach will bring to the surface elements that are relevant for the furthest phases of the research.

First of all, it is important to see Clermont-Ferrand within its national and regional context so as to understand the relative size of the city, its density and the influence that the government exercises on Clermont-Ferrand urban planning's strategies. The national contextualisation will also bring elements that will help to comprehend the urban development of the city over the years before introducing the historical analysis. Afterwards, I will go deep into a geographical analysis by revealing the major natural entities and the current relationships the city maintains with its landscape and surrounding nature. Finally, I will explain the socio-economic profile of the city in which Michelin and the technologies play an essential role.

The chapter will by the end give an idea of the current situation and what has happened to the city in the last century and therefore attempt to give leads to what has impacted the loss of the nature in Clermont-Ferrand.

4.1 Clermont-Ferrand in the national context

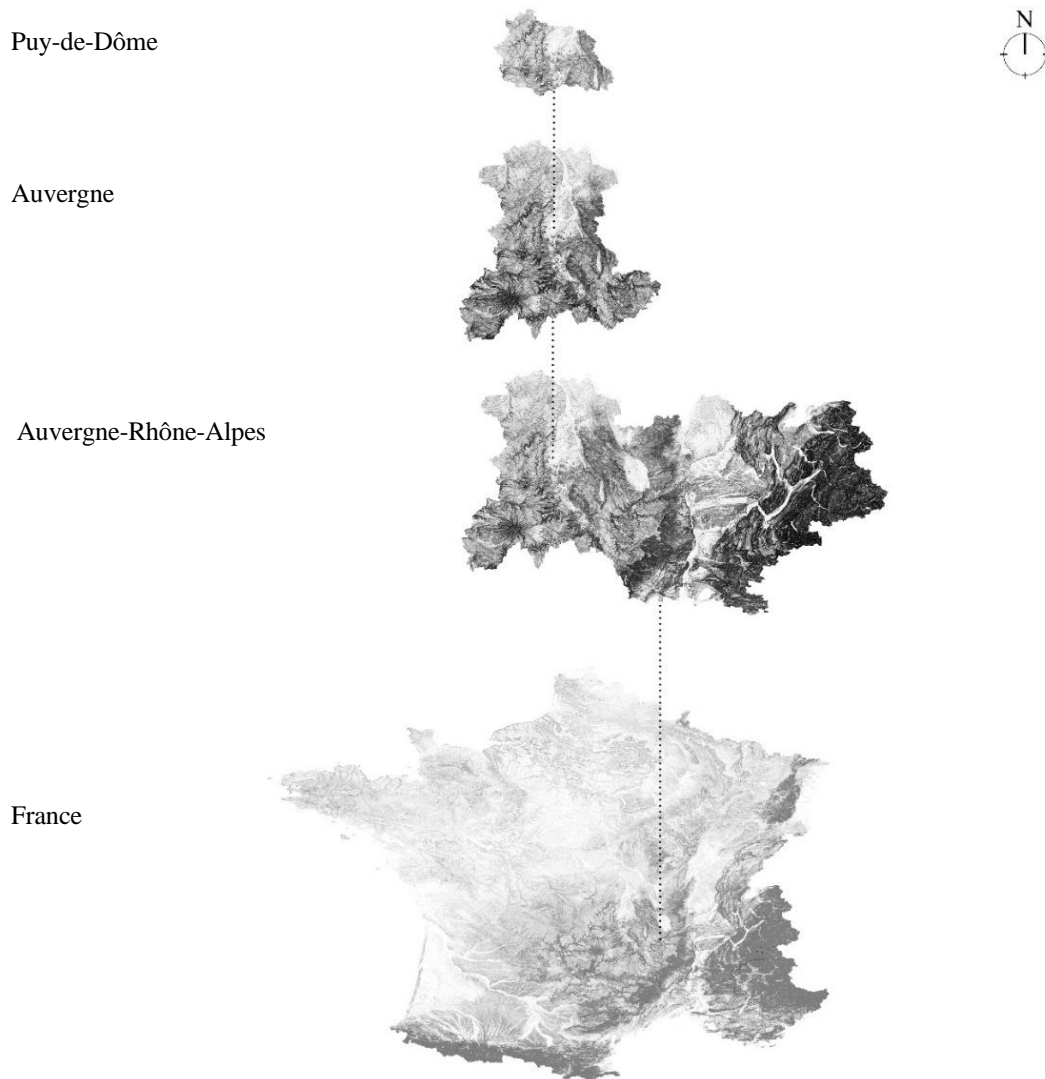


Figure 4.1 Diagram locating the administrative divisions (Author's illustration, 2021)

Clermont-Ferrand is a city of 145,000 inhabitants -considered as a large city because of its administrative function (INSEE, 2017a)- in central France located in the Massif Central and the Auvergne-Rhône-Alpes region since 2016, where Lyon is the capital. It is the historic capital of Auvergne and the capital of the Puy-de-Dôme department as you may see in figure 4.1.

Since the end of the 20th century, France has launched a process of metropolisation of its territory in opposition to the national and centralized policies of the “Trente Glorieuse” -term referencing to an economic prosperity of France during the post-war period from 1945 to 1975. This notion

of metropolisation is defined by an *“urban translation of globalization, with a process of population concentration and directional activities in the largest cities.”* Bassand (2007)

This process brought about the emergence of metropolises on French territory by the law of December 16, 2010 to affirm the role of large agglomerations as engines of growth and attractiveness of the territory. Indeed, the government puts forward the regional metropolises to rebalance the territory in relation to the centralized power that Paris exercises from an economic, administrative and demographic point of view.

According to the French government (2021), a metropolis

is a public establishment of inter-municipal cooperation which brings together several municipalities [...] within a space of solidarity to develop and lead together a development project and economic, ecological, educational, cultural and social development of their territory in order to improve its competitiveness and cohesion.

As a result, the State invests and develops provincial cities. Transport infrastructures will be developed to link the metropolises together and to link them to Paris. As part of the metropolisation process, Clermont-Ferrand -which has long suffered from its location away from major European transit routes and in particular from competition from the nearby Rhône axis- has seen the quest to open up thanks to State’s investments. Part of the geographical heart of the “diagonal of the void” -term referring to a part of France where population densities are relatively low compared to the rest of the territory; This space goes from North-Est to South-West France, as the figure 4.2 shows with the population density- has led to the planning of an East-West and North-South motorway links crossing France with Clermont at its centre as the nerve centre.

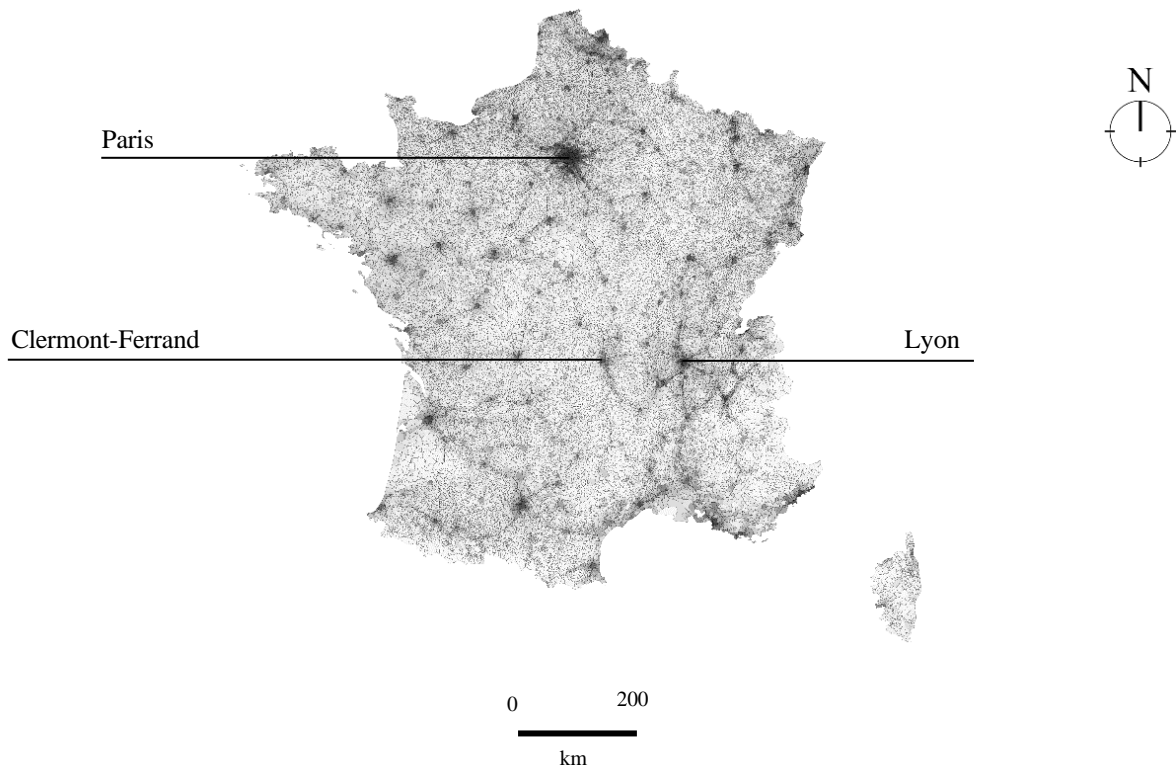


Figure 4.2 Population density of France (Author’s illustration, 2021)

The metropolis objectives are to enhance the metropolitan economic functions as well as its transport networks and to develop university, research and innovation resources. It also ensures the international promotion of the territory (Gouvernement, 2021).

In 2017, the National Assembly signed a new law promoting the development and establishment of a new metropolis by reviewing the minimum population thresholds to qualify for status. As a result, the status of metropolis is accessible to agglomeration communities of more than 400,000 inhabitants in an urban area of more than 650,000 inhabitants. Because of this enlargement, 7 new cities may claim metropolitan status, including Clermont-Ferrand. The city obtained the status on January 1, 2018.

The first part, which has introduced Clermont-Ferrand within its national context and explain the different urban planning processes that have been initiated on the French territory. Therefore,

increasing our knowledge on the objectives, role and influence that the State and the metropolis of Clermont-Ferrand have to play on their respective territory.

4.2 Historical review of Clermont-Ferrand

At present, a historical analysis will be done in order to understand the urbanisation process over the years that Clermont-Ferrand went through. It will also bring elements on what was the trigger that has eventually primed the loss of the nature in the city.

4.2.1 Medieval Clermont-(Mont) Ferrand

Throughout the Middle Ages, Clermont experienced a fairly limited expansion and was confined within its ramparts -figure 4.4- (Sangoï, 2001). The city administered by its bishop saw the realisation of many religious buildings including a Romanesque church which will subsequently be replaced by the current Gothic cathedral -figure 4.18- as well as the Basilic Notre Dame du Port -part of the UNESCO world heritage (UNESCO, 2020).

In opposition to the episcopal power, the counts of Auvergne -region in which Clermont is located, figure 4.1- will create in the 12th century a "new town" nearby: the city of Montferrand (Sangoï, 2001). An orthogonal bastide also surrounded by ramparts. The city is experiencing a certain boom especially commercially and became a great rival for Clermont.



1 km

Figure 4.3 Military map of 1875 and the old cores of Clermont and Montferrand (Source: Archives départementales Puy-de-Dôme, modified by the author, 2021)



Figure 4.4 Clermont in Medieval times (Source: Archives départementales Puy-de-Dôme, 2021)

4.2.2 From the Renaissance to the industrial age

In 1551, Clermont became -following the intervention of Catherine de Medici, countess of Auvergne- a royal possession to the detriment of the bishop. This protection ensures it a broad administrative autonomy which will be reinforced six years later by its new status of capital of Auvergne at the expense of Riom -another major city in Auvergne, located 15km North of Clermont. Then, by the merger of Clermont and Montferrand by a first edict in 1630 followed by a second one in 1731 (Astier et al., 2014).

However, the urban development was still relatively weak and was even hampered on its outskirts by the installation of many religious establishments.

It was only from the 18th century that the city underwent major transformations with the demolition of the ramparts which then became new traffic axes – such as Rue Ballainvilliers or Boulevard Trudaine.

Yet, it was the French Revolution (1789 to 1799) that truly provided Clermont with the means for its expansion. Indeed, the sale of the properties of the clergy allowed the city to free itself from the land holdings of religious establishments. The demolition of which generates a new urban opportunity and boom.

4.2.3 In the 19th century

Due to a lack of funding and demographic dynamism, the developments were rare in the first part of the 19th century. The outlines of the circular boulevards were starting to take shape but no major urban restructuring work took place as in most large French agglomerations.

On the other hand, the second half of the 19th century saw significant transformations on the outskirts of Clermont historic centre. The city saw major infrastructures created such as the Hôtel Dieu -hospital- in 1871 (Marec, 2016), the train station in 1855 and the 92nd Regiment of The Infantry -military institution- in 1881 which has initiated a physical merger of Clermont and Montferrand and therefore the beginning of the urbanisation of the “in-between cities” (Astier et al., 2014). Moreover, the two entities of Clermont and Montferrand were connected by the first electric traction tram in France in 1890. The latter also served Chamalières and Royat to the West thanks to their thermal installations opened in 1856 as illustrated on figure 4.5.

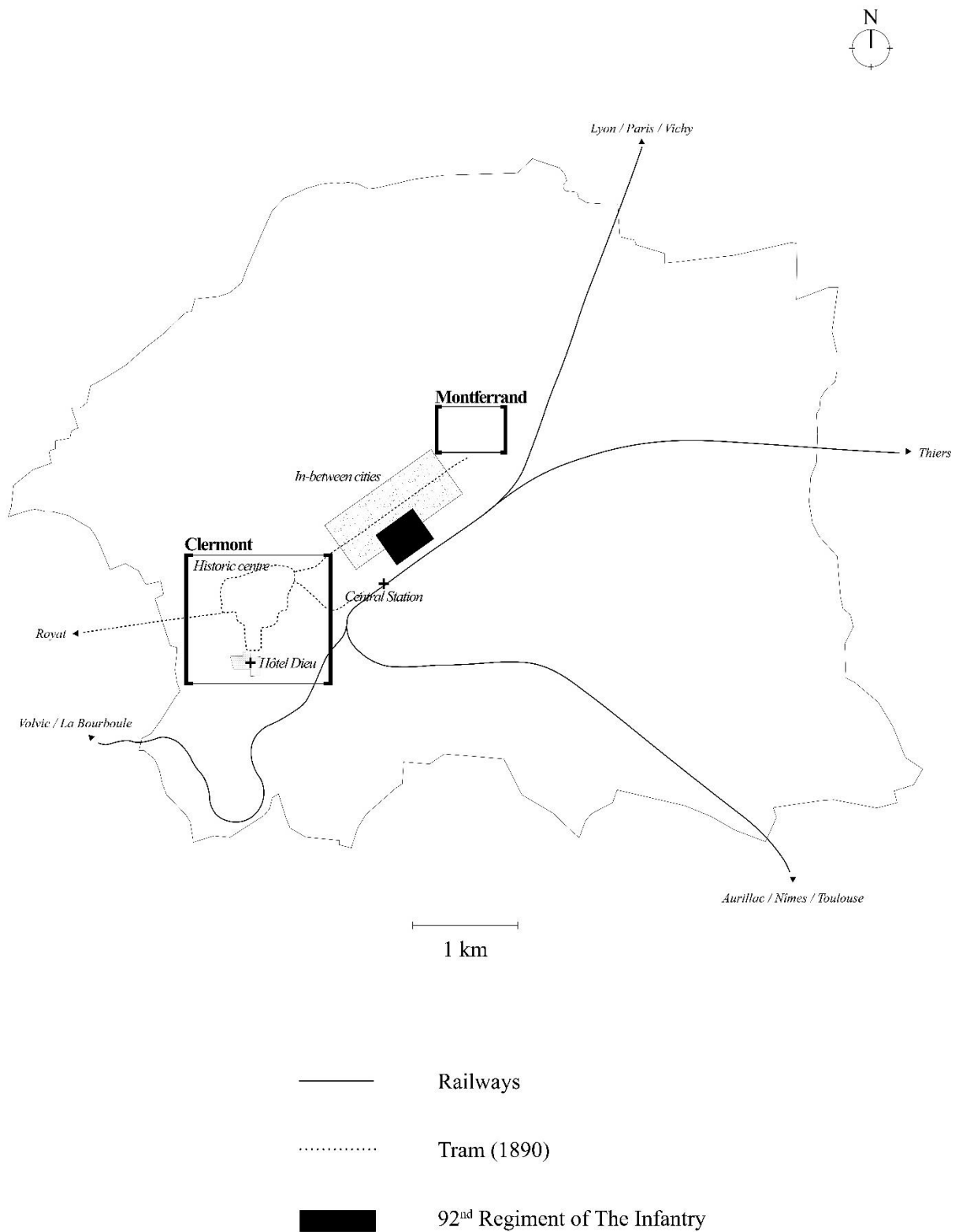


Figure 4.5 Diagrammatic map of Clermont-Ferrand in 1890

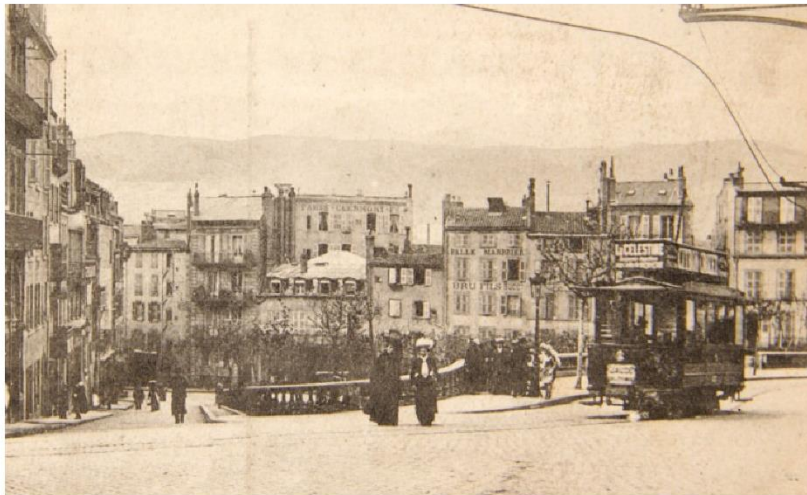


Figure 4.6 Photo illustrating the tram in 1890 and 1906 (top and middle) and the train station (bottom) (Source: Annuaire Mairie, 2020)

4.2.4 An industrial city

At the start of the 20th century, Clermont was mainly an administrative, military and commercial city with small industries. These industries strongly developed and permeated the urban structure around an industrial specialisation: the rubber technology, under the impetus of the Barbier-Daubré workshops -future Michelin (Zanetti, 2012).

The installation of the rubber industry seems to be a combination of circumstances. Indeed, the development of the rubber comes from a family story of two Parisian cousins, Aristide Barbier and Edouard Daubrée who decided to invest and develop a business -at first in the beet sugar industry- in the rubber fields due to family knowledge on the rubber production coming from Daubrée's wife family side.

The progressive industrialisation of the region around the rubber does not seem to have close links with its environment, on the one hand in terms of the geographical origin of its investors, on the other hand with regard to the tropical location of its fundamental raw material (Zanetti, 2012).

Other important industries related to the rubber were flourishing such as Bergougnan -figure 4.7- Torrilhon and Ollier. Also joined by the printing houses of the Banque de France in Chamalières.

Bergougnan and Torrilhon were the two competitors of Michelin. Due to the post first war crisis, Michelin will acquire Bergougnan and Torrilhon and therefore expands its monopole.

The urban development of the East side of the city was correlated with Michelin's activities. From the historic site of Les Carmes built in 1889 -figure 4.8- Michelin invested the space between Clermont and Montferrand with the factories of Cataroux in 1921 and Estaing in 1913 – as shown on the illustration, figure 4.9- as well as the construction of a first company town for workers along the Rue de la République -street linking Clermont and Montferrand, located between Cataroux and Estaing's site productions.

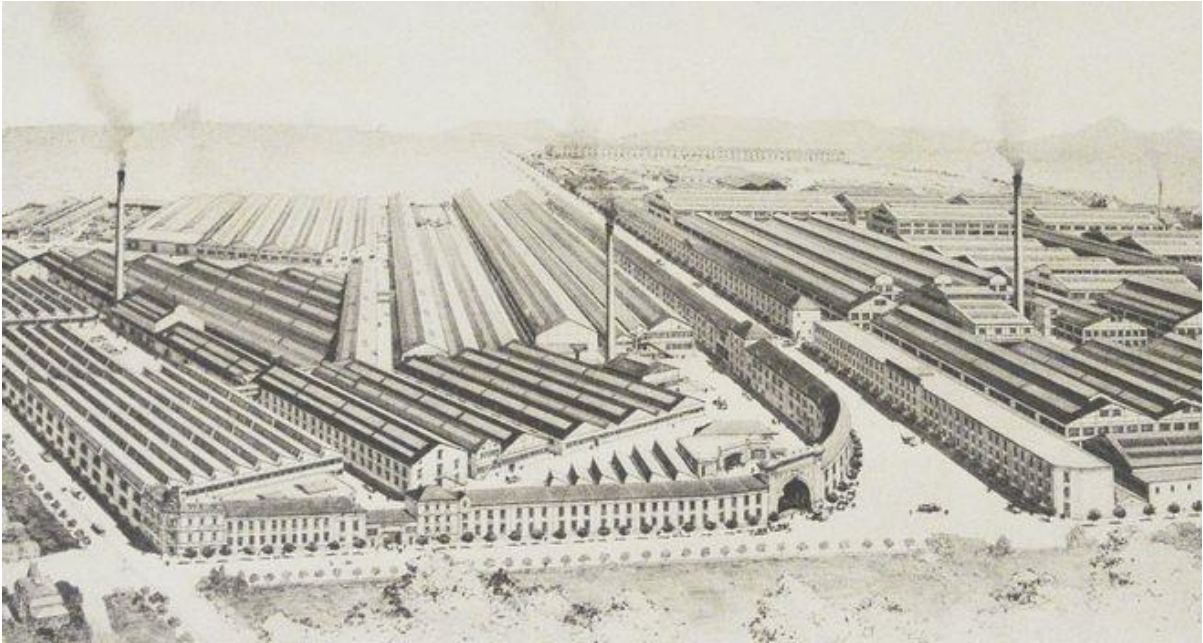
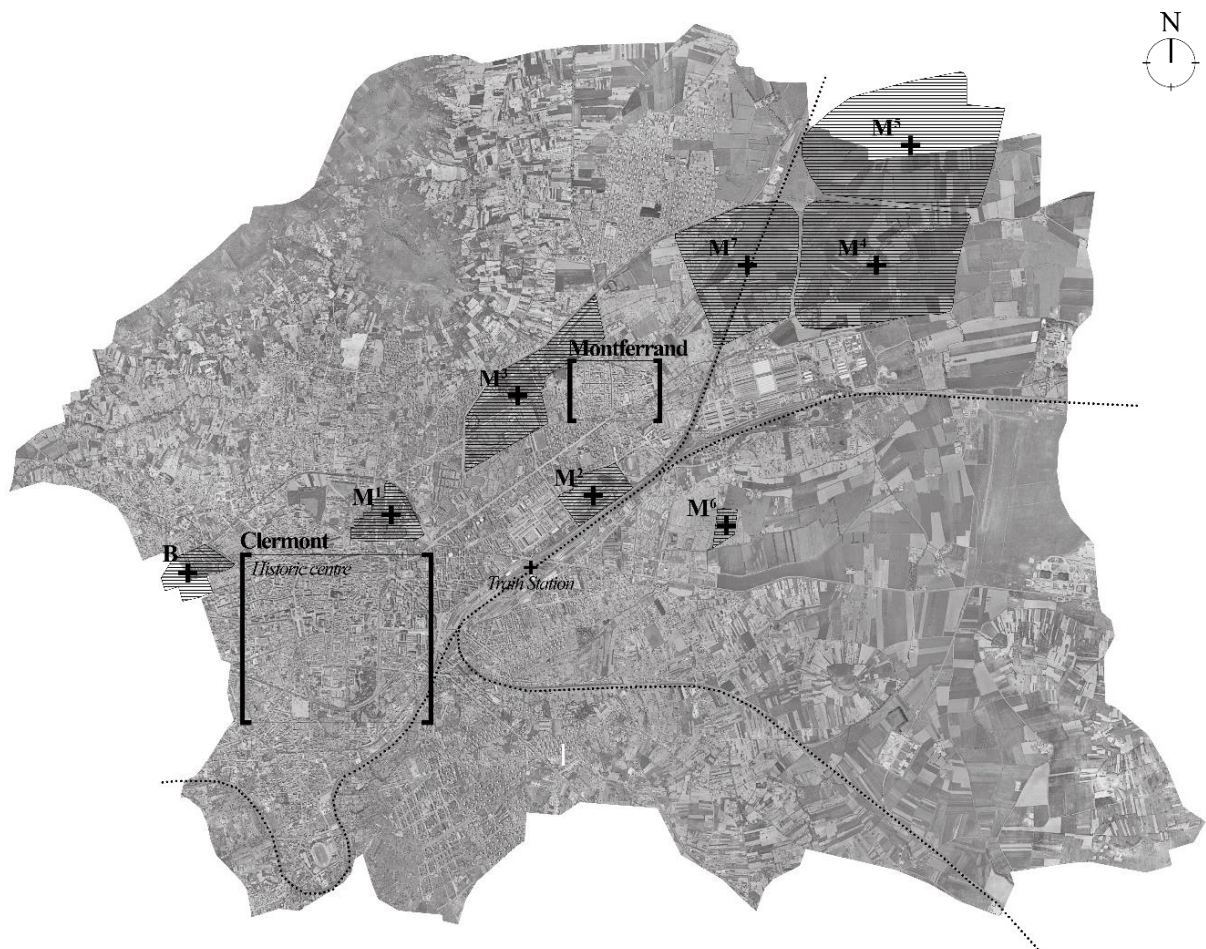


Figure 4.7 Bergougnan factory (Source: La Montagne, 2019)



Figure 4.8 Michelin factory "Les Carmes" (Source: Aventure Michelin, 2021)



1 km

B+ Bergougnan factory

M+ Michelin production sites

- M¹** Les Carmes (1889)
- M²** Estaing (1913 - 2009)
- M³** Cataroux (1921)
- M⁴** La Combaude (1960)
- M⁵** Chantemerle (1972)
- M⁶** Brézét (1987)
- M⁷** Les Gravanches (1990)

Figure 4.9 Location of Bergougnan and Michelin production sites in Clermont-Ferrand on top of a 1950 aerial photo (previous page) (Author's illustration, 2021)

However, it was during the 1920s that industrialisation accentuated the demographic and urban growth of the city. The population rose from 50,000 inhabitants in 1900 to 110,000 inhabitants at the end of the 1920s as represented on figure 4.10. In order to absorb this flow of workers arriving in the city, several Michelin's towns emerged without any real continuity with the existing city (Zanetti, 2012). At the same time, constructions were developing along the axes of the suburbs of Clermont-Ferrand.

4.2.5 Urbanisation from the post-war period to the present day

In the early 1950s, the city still had voids and interstices which did not prevent a certain urban sprawl with the beginning of the occupation of the hillsides by individual houses. But it was above all the construction of large residential complexes that marked the urbanization of the city until the end of the 1970s. This process is marked by the creation of the "zone d'urbanisme prioritaire (ZUP)" translated as priority urban planning zone. During the "Trente Glorieuse" period, France faced a housing crisis in cities due to rural exodus and the industrialization of cities. As a result, the government launched the ZUP in 1958 to finally counter this problem and therefore built large housing estates to alleviate the urgent need for housing (Monnier and Klein, 2002).

It is mainly the northern districts that will accommodate the main urban extensions with successively the large housing estate of Gauthière -end of the 1960s- Champratel and Vergnes during the 1970s. To the south, the social housing districts of Saint-Jacques and Fontaine du Bac were joined by the construction of large modern facilities: the CHU Gabriel Montpied -hospital- and the Cézeaux campus. These new urban functions did not prevent a certain decline of the city from the second half of the 1970s. At the same time as the drop of industrial activities (Zanetti, 2012). The city lost 20,000 inhabitants between 1975 and 1990 -figure 4.10.

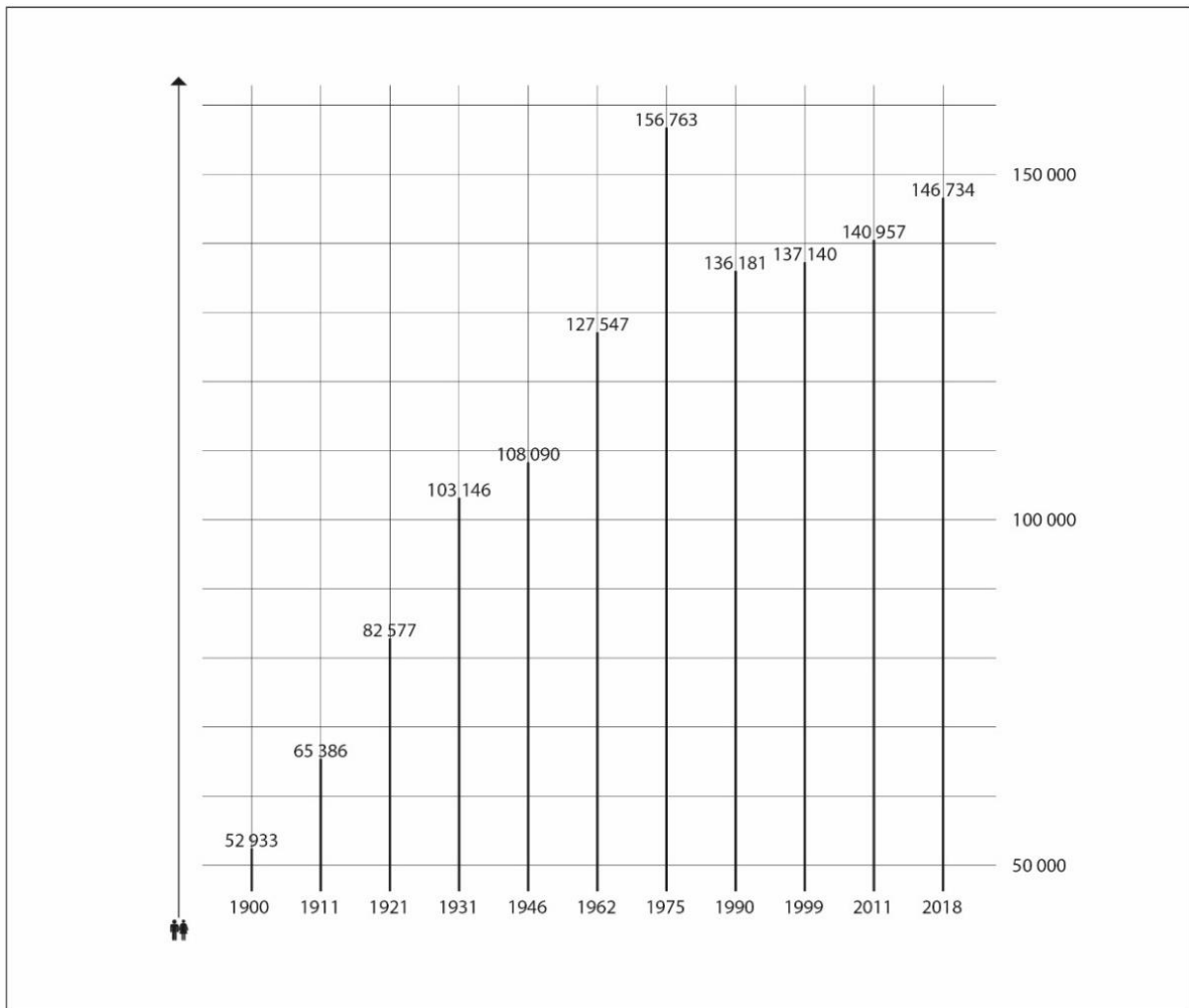


Figure 4.10 Population of Clermont-Ferrand from 1900 to 2018 (Author’s illustration using INSEE data (2018), 2021)

The 1990s was marked by the completion of urban expressways and the emergence of large shopping centres on the outskirts. The beginning of the 2000s will see the beginnings of a reconquest of the “in-between cities” with the demolition of the Michelin town located Rue de la République and the reconquest of industrial land for the construction of the new hospital Estaing on top of the previous Estaing factory of Michelin as shown by the figure 4.11.

1950



2019



500m

Figure 4.11 Evolution of the Estaing production site of Michelin from 1950 to 2019. From industrial (top picture) to tertiary purposes (bottom picture) (Author's illustration, 2021)

The different stages of the urbanization of Clermont have created an urban fabric that is both heterogeneous -with the succession of neighbourhoods with well-defined urban forms, diversity of urban heritage and architecture- and relatively conducive to urban renewal -with voids, interstices, industrial land in the city (Astier et al., 2014).

The historical analysis has given so far, a better understanding of the evolution of the city throughout the centuries. It started to elucidate the relationship that Clermont-Ferrand has and has had with the management of its land as well as the relation with its strong industrial history.

4.4 A particular geographical setting: the volcanic land

Therefore, now it seems natural to explore and put Clermont-Ferrand within its landscape and natural surrounding so as to gain knowledge on the relationship between the metropolis and nature.

A city and its landscape

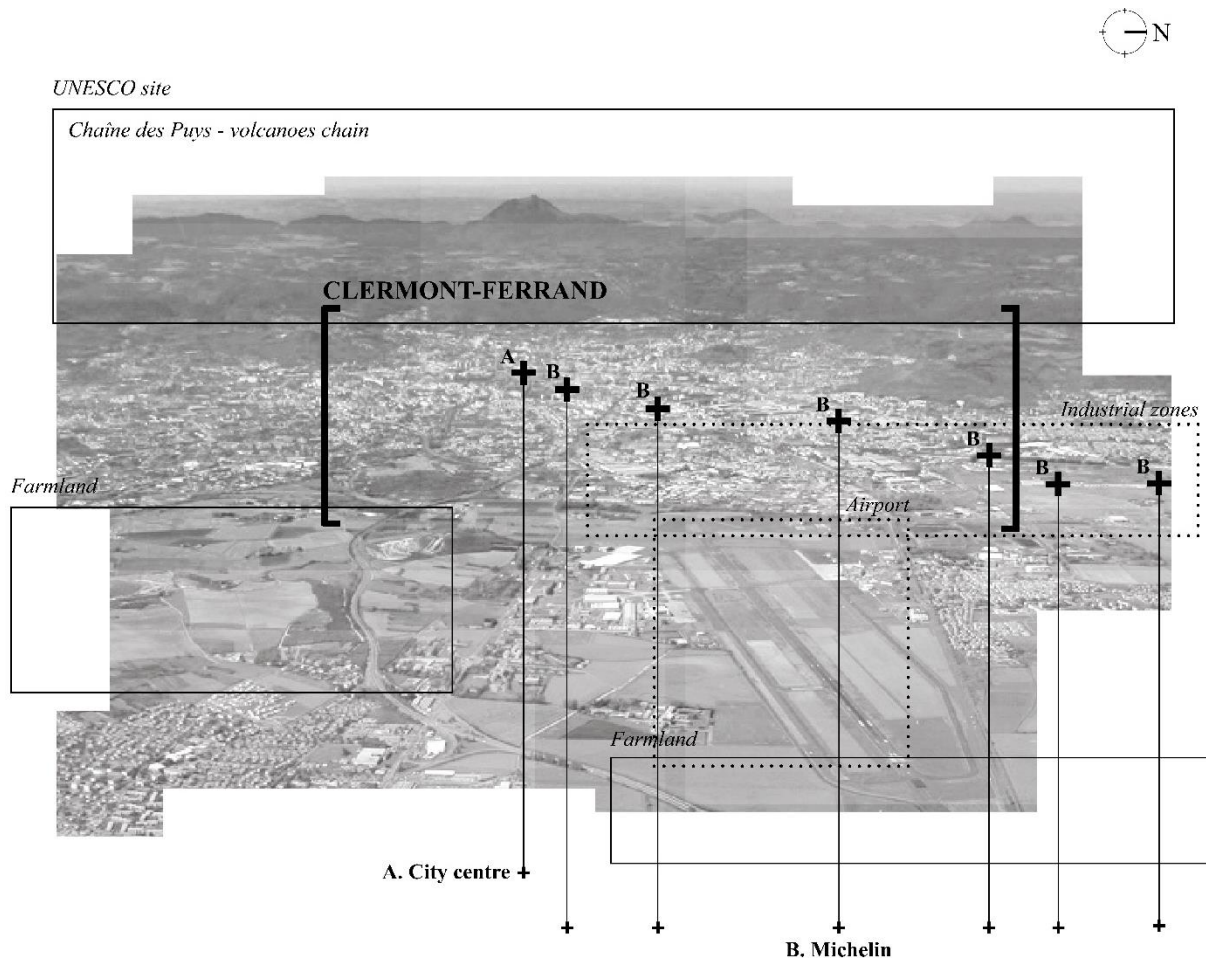


Figure 4.12 Contextualisation of Clermont-Ferrand (Author's illustration, 2021)

Clermont-Ferrand is nestled between major natural entities -figure 4.13-, such as volcanoes, agriculture plain, plateaus and rivers. The relief of Clermont-Ferrand is strongly marked by the Chaîne des Puys which announces the Massif Central with the Puy-de-Dôme as the dominant silhouette on the horizon- figure 4.12.

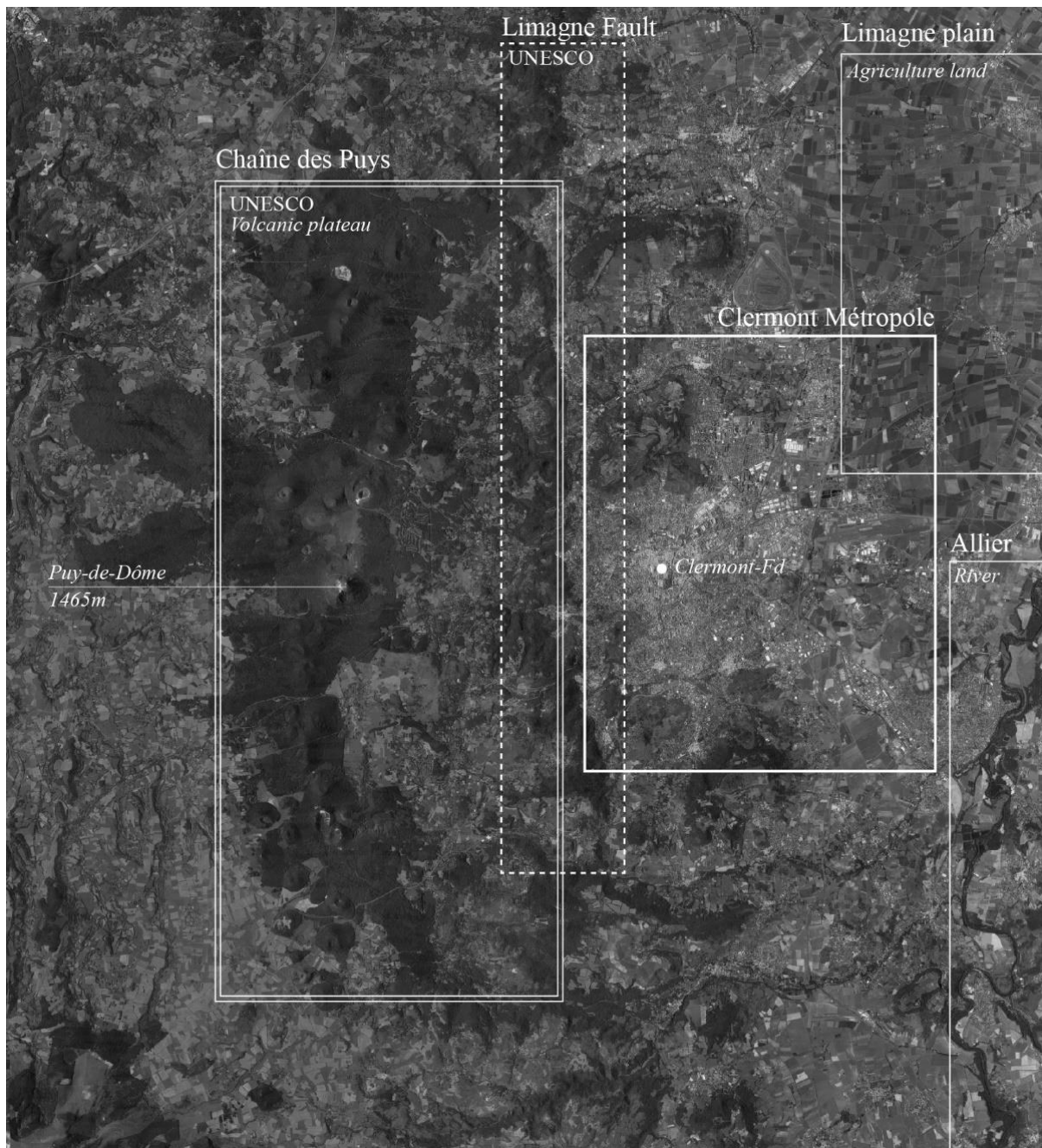


Figure 4.13 Clermont-Ferrand and its surrounding (Author's illustration, 2021)

The Chaîne des Puys is a major volcanic plateau composed of approximately 80 volcanoes -as the landform figure 4.15 is revealing- forming a 45km long chain with the last eruption 8 500 years ago (Boivin et al., 2017). The Chaîne des Puys is part of the UNESCO World heritage since 2018. The highest point is the Puy-de-Dôme culminating at 1465m.

In addition to the large reliefs, the city also maintains a special relationship with the microreliefs. More subtly, they infuse the Clermont-Ferrand plain with slight inflections which have guided the urban establishment over time (Clermont-Ferrand, 2016a). Today, it is clear that construction techniques have made it possible to overcome the constraints associated with slopes.

Microreliefs are the manifestation of the unchanging flow of water. From the heights of the Massif Central towards the Val d'Allier -figure 4.13 and 4.15- the streams have gradually carved their furrows in the ground until they form small valleys which give the slopes of the Chaîne de Puys their characteristic festoon.

Clermont-Ferrand has a variety of rivers through its communal limits, such as the *Tiretaine* - which is the dominant river- the *Artière*, the *Sarlièvre* or the *Bédât*, and others less known such as the *Ru des Roches* or the *Ru des Blandas*, illustrated on figure 4.14.

These small rivers, even if they are largely invisible and channelled, have shaped the landscape of the city and created several hills which can be important in the urban landscape by creating over time a plain that undulates and disorients with the succession of thalwegs and plateaus.

Today water is absent from the urban landscape of Clermont-Ferrand and everyday uses. This disappearance on the surface causes a form of oblivion with mainly the recklessness of flood risk which is increased by the waterproofing of soils, the reduction of infiltration and the acceleration of runoff. Nowadays, this oblivion of the water and the increasing of permeable surfaces in the city is an issue that the municipality has to deal with.

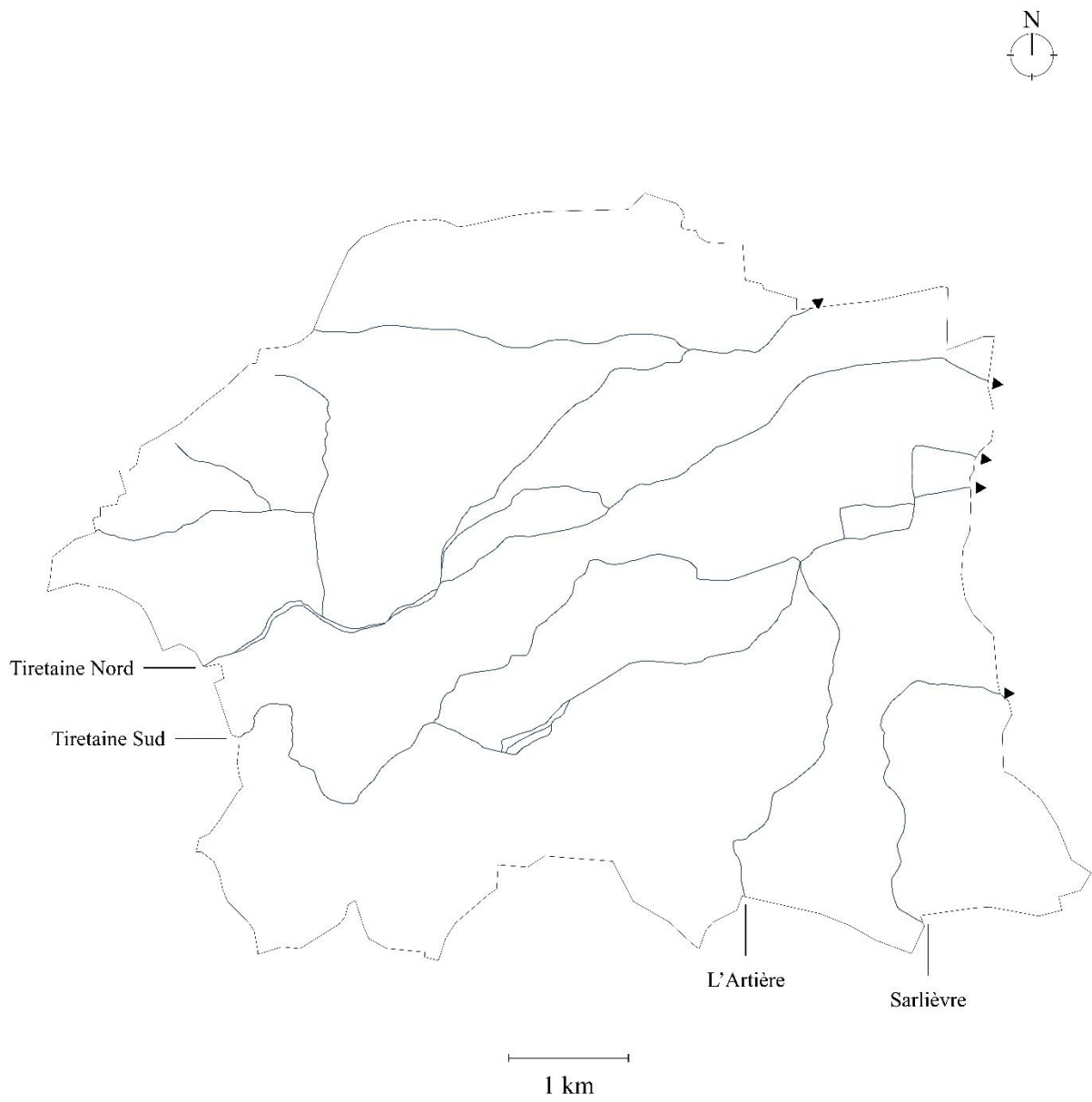


Figure 4.14 River's network in Clermont-Ferrand (Author's illustration, 2021)

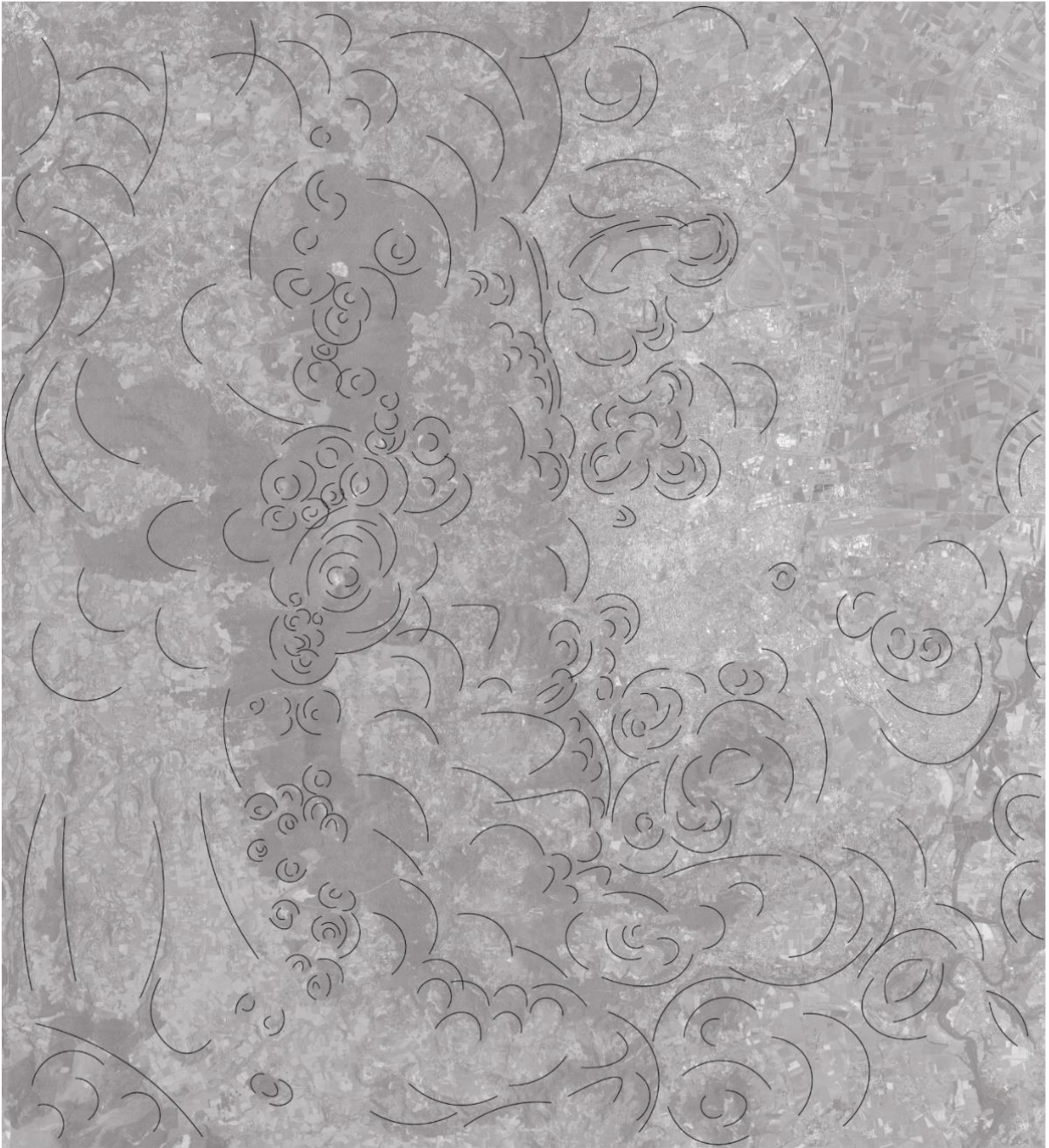


Figure 4.15 Landform of the Chaîne des Puys and Limagne Plain (Author's illustration)

4.4.1 City-Nature relationships

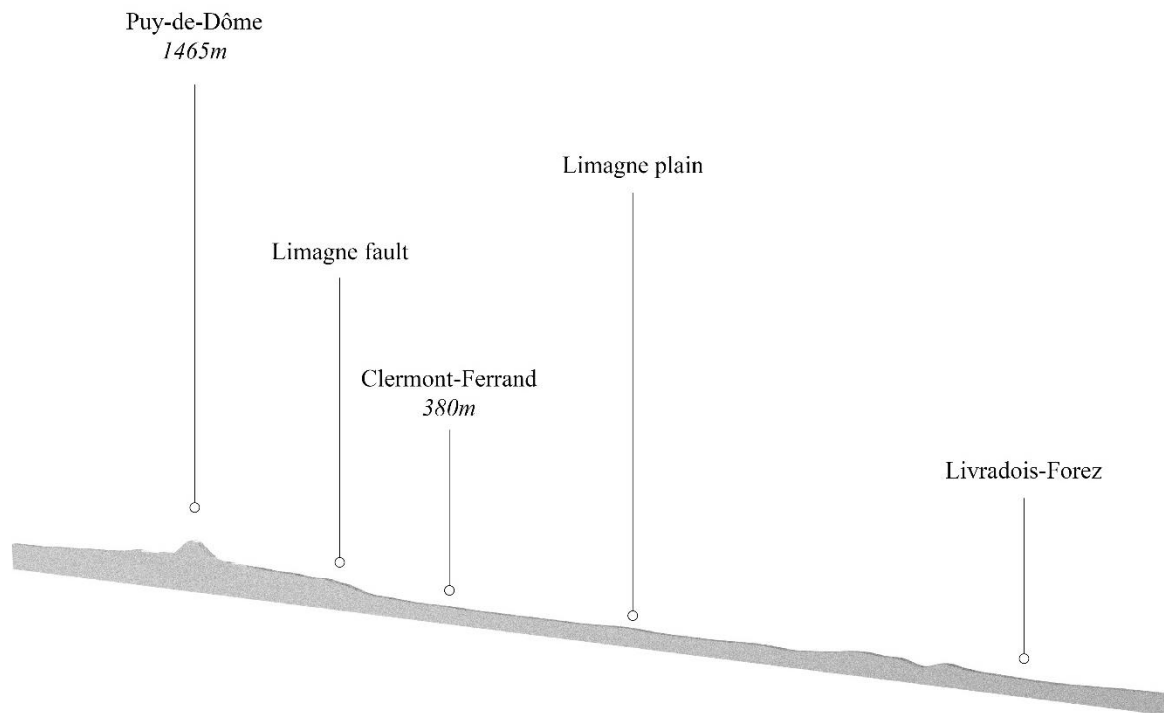


Figure 4.16 3D cross section (Author's illustration, 2021)

The recognition of the natural heritage of the territory gives Clermont-Ferrand its image of a city in nature. Indeed, a large part of the city's image today rests on the geographical and natural setting of the Auvergne region and the Chaîne des Puys with its proximity to nature, the wide-open spaces, and its geomorphic/ecological values (Boivin et al., 2017).

These landscape related qualities are recognized on a national and even international scale as it has been classified as World Natural Heritage by the UNESCO (UNESCO, 2020). The World Heritage Convention is one of the most relevant international tools to recognize the world's most extraordinary natural places, characterized by their biodiversity, ecosystems, geology or remarkable natural phenomena. Regarding the Chaîne des Puys and Limagne Fault, it has been classified as Natural Heritage with the criterion vii, which “*represent natural phenomena or areas of exceptional natural beauty and aesthetic importance*” (UNESCO, 2020) (appendix 1).

However, the inner-city do not fully enjoy of these qualities. Indeed, the natural qualities are lacking in the city. Clermont’s public spaces offer little room for both flora and fauna (Clermont-

Ferrand, 2016a). The public spaces associated with the street are relatively sparsely provided with vegetation. The streets and avenues are frequently planted with alignment trees. However, the treatment of the soil, mineral and largely devoted to the car, imposes a low permeability (Bernard, 2018). This characteristic is a powerful brake on the presence of nature in the city.



Figure 4.17 Chaîne des Puys (Source: UNESCO, 2020 ; credits to Denis Pourchet)

4.5 The socio-economic aspect of the metropolis

Clermont-Ferrand can be associated with its industrial excellence and its economic dynamism, attracting companies and investors. However, it can also convey by default the image of an industrial city, black and polluted.

The city tries to use the tourist dimension of the Michelin company, through its guides in order to disseminate the image of a city of the “art de vivre”, of a heritage and of gastronomy (Tourisme, 2021). However, the link with the company and the city remains mainly that of industrial history.

Nowadays, the city and Michelin are working together to promote technologies and innovation (MICHELIN, 2016). Indeed, the multinational firm is investing and reinforcing the headquarter place of Clermont-Ferrand. Michelin has been building a new innovation and research centre at the outskirts of the city while modernising its headquarters of “Les Carmes”. The employer is decreasing its manufacturing production in the metropolis but at the same time repatriates its executives. Therefore, placing the city at the centre of a vast international network.

Clermont-Ferrand has at the same time invested in new urban facilities and infrastructures to make the city more liveable and attractive for the executives, shareholders or special guests of Michelin. The municipality has been investing in facilities such as two new hotels -4 and 5 stars-, a new tram, international fair-trade structure, business terminal at the airport, etc (Zanetti, 2012). Therefore, it can be said that even though from a touristy point of view the city has difficulties to get rid of the industrial, polluted and black metropolis, it still enjoys from the presence of Michelin on its territory for the promotion of innovation and the development of quality urban infrastructures.

In opposition to the great outdoors, to the green immensity of the Auvergne landscapes, the historic centre of Clermont is associated in the collective imagination with the darkness of the volcanic stone of Volvic, relayed by the monumentality of its gothic cathedral -Notre Dame de l’Assomption- symbol of the city and its dark and narrow streets -figure 4.18.



Figure 4.18 Cathédrale Notre-Dame de l'Assomption (Crédits: Florian Brioude, 2021)

Yet, Clermont-Ferrand has always and continues to polarize the Auvergne region, both through its employment area, historically the engine of rural exodus, and its major university, hospital and administrative functions. Through these urban functions, it fully plays its status as a metropolis within the new Auvergne-Rhône-Alpes region.

Indeed, the city may offer 100,000 employments within its municipality limits and more than 150,000 in the agglomeration. These employment opportunities are supported by industries such as Michelin, which is the largest employer of the city, as well the Banque de France, the aeronautic maintenance centre -AIA-, Trelleborg, SNCF -French national rail company-, public hospitals, etc.

Moreover, Clermont is considered as an important university city, hosting no less than 40,000 students distributed within the different fields proposed by the University Clermont Auvergne - UCA- and the different private schools such as Architecture, Art, Polytechnic, Economics, etc.

Finally, the residential geography of Auvergne has changed significantly over the past decades with constantly increasing peri-urbanization. The stagnation or abandonment of rural areas and medium-sized towns in Auvergne is opposed to the strengthening of peri-urban population around the Vichy-Brioude axis, with the Riom-Issoire axis as its heart, of which Clermont-Ferrand metropolis is the pivot -figure 4.19. This dynamic is reflected mainly by suburban extensions in all the municipalities of the axis. More than a city network, it is a succession of territories which tie into Clermont's area of influence and which go far beyond the limits of the metropole.

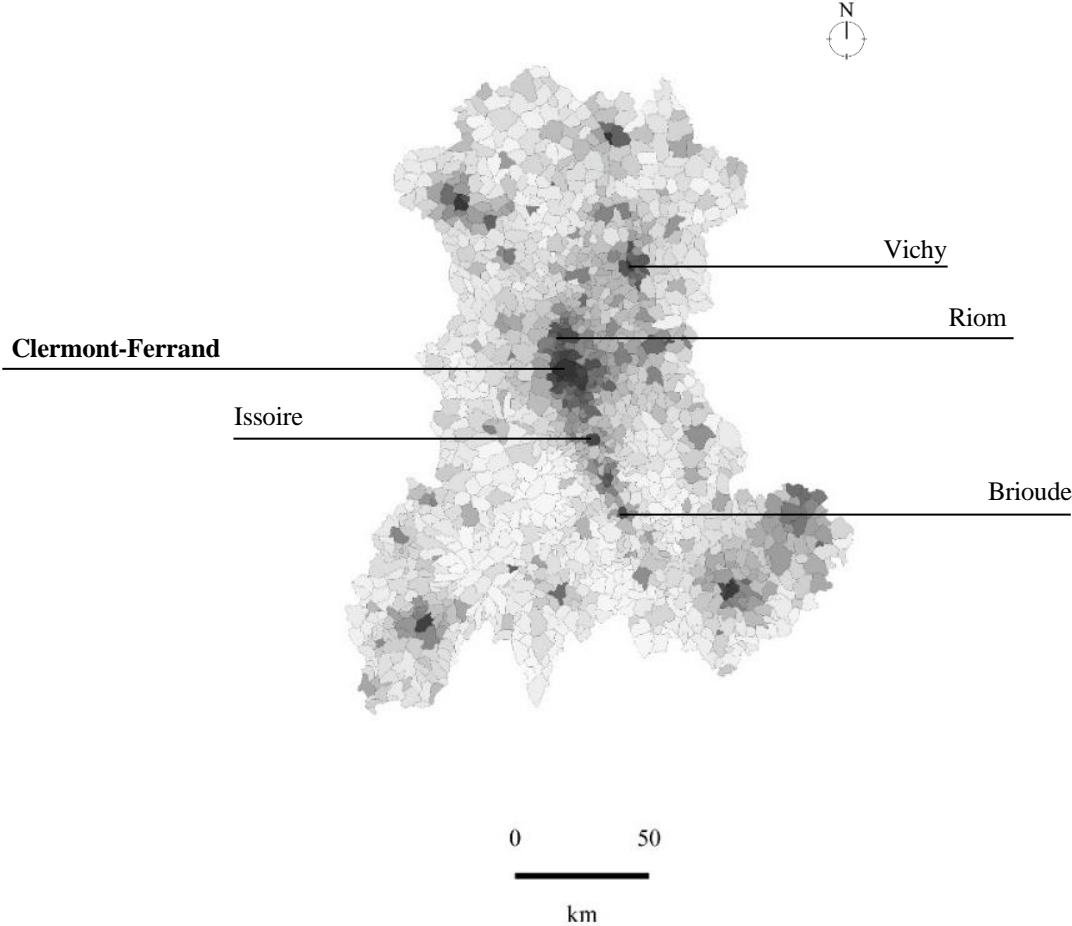


Figure 4.19 Population density of Auvergne (Author’s illustration, 2021)

6 Disappearance of green spaces in Clermont-Ferrand

The establishment of a strong contextualisation gave a greater understanding of Clermont-Ferrand's situation regarding the economic, geographic and historic perspectives. From that, I deepen my research in order to answer the question: *“What urban green spaces have been lost in the last 100 years in Clermont-Ferrand? And why has this happened?”*

To answer the research question, I have been looking at the different forces (part 3.2) that have been related to the loss of green spaces in Clermont-Ferrand. According to the contextualisation chapter (chapter 4), major actors and forces emerge, namely, Michelin and the rubber industry, the municipality and its urban planning strategy and finally historical events.

This fifth chapter will first give an historical comparison of the green spaces' presence in the municipality and with its surrounding landscape. Therefore, giving a concrete view on what was there before and how the land was used 100 years ago. From that historical and mapping analysis as well as interviews, I will present the major natural entities that existed on Clermont-Ferrand territory.

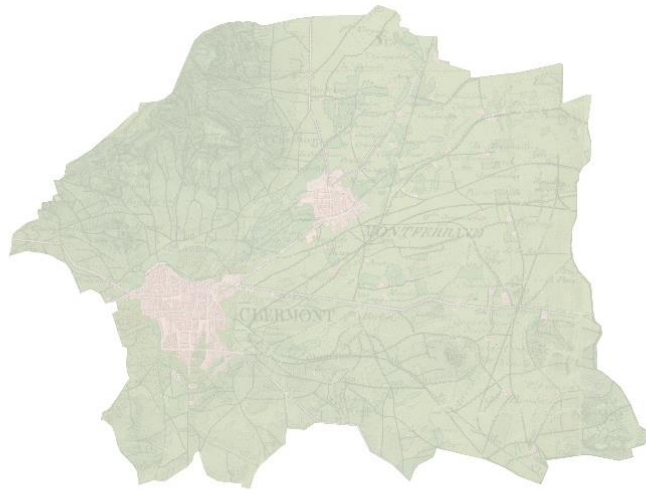
Afterwards, I will go through each force that had influence on the nature and answering “how” and “why”. This will allow me to comprehend what has happened in the city and therefore give an answer the research question. Finally, from that chapter, I will be able to develop a last chapter with a proposal presenting the pre-conditions and establishing a landscape plan for a renewal of the natural element in Clermont-Ferrand.

6.1 Evolution of green spaces

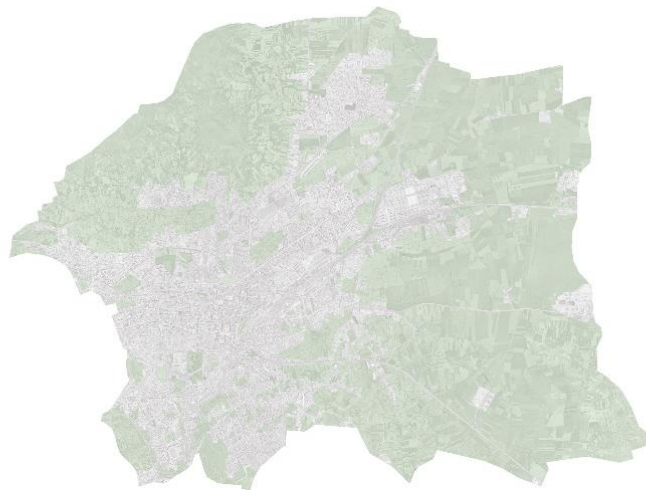
As most of the European cities, Clermont-Ferrand has been influenced by major events and paradigms when it comes to urban development. Throughout the last century, the cities have experienced tremendous changes. This did not spare Clermont-Ferrand. Indeed, technological influence, economics and historical events have rapidly transformed the city and therefore impacted the land use. Going from an agricultural or gardening purpose to residential and economical purposes.

The historical analysis carried out during the case study research highlights this land use shift phenomenon. Moreover, it allows an understanding of how the different actors exercised pressure on the natural spaces -figure 5.1-. It brings to perspective the strong influence of urban form and function and its evolution in the context of Clermont-Ferrand.

1875



1950

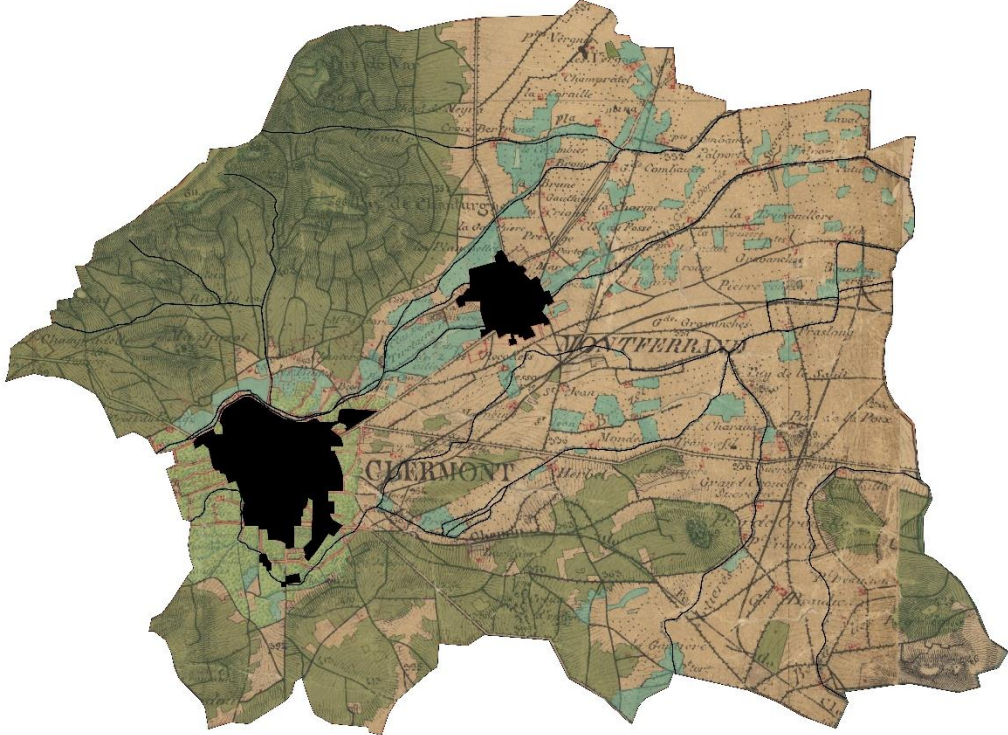


2020



Figure 6.1 Evolution of nature within Clermont-Ferrand in the last 145 years (Author's illustration, 2021)

6.1.1 A variety of natural elements



1 km

-  Old urban core
-  Private gardens
-  Swamps
-  Forest
-  Rivers

Figure 6.2 Presence of nature in Clermont-Ferrand in 1875 (Author’s illustration, 2021)

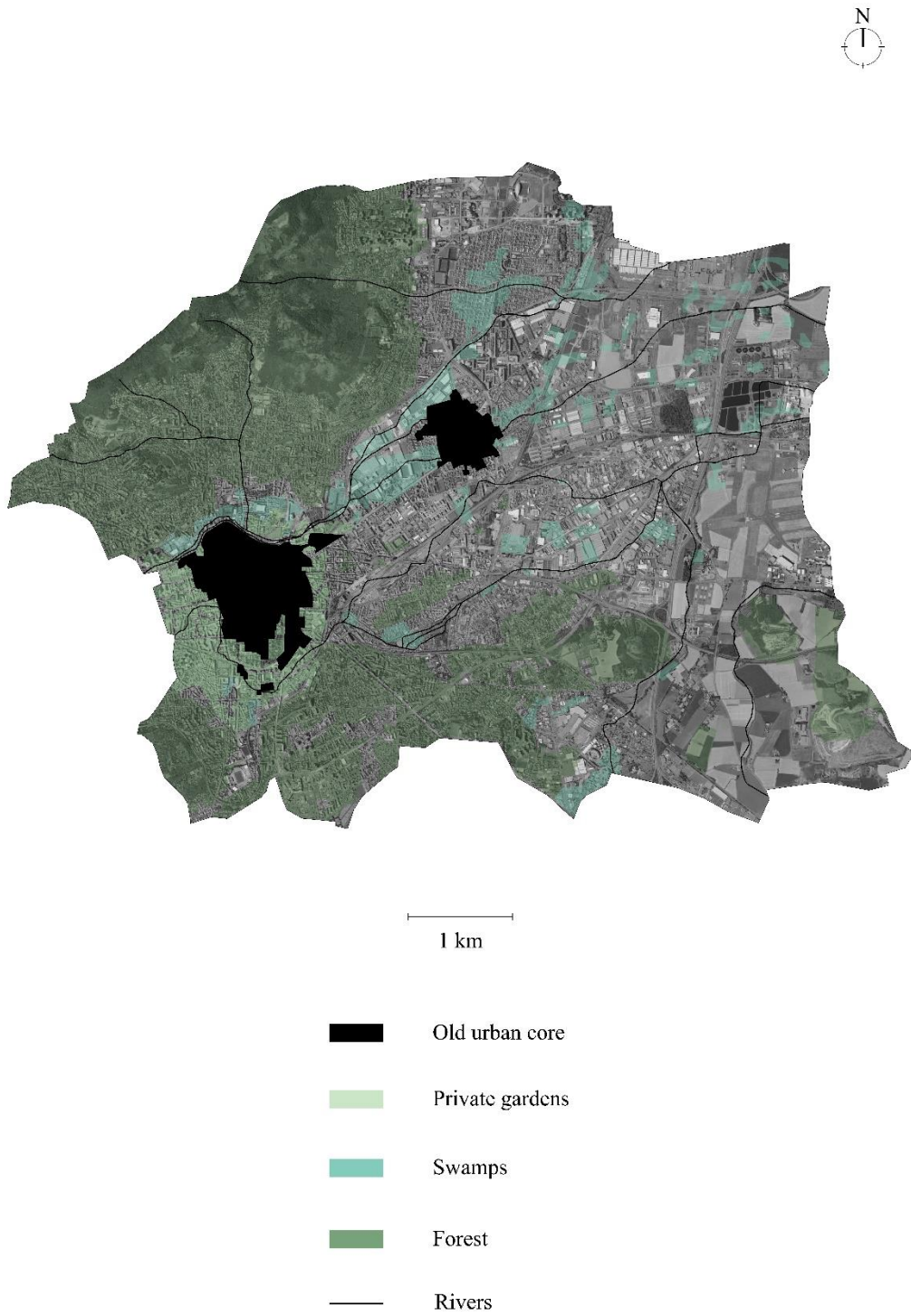


Figure 6.3 Overlay of 1875 natural elements on top of a 2016 satellite image of Clermont-Ferrand (Author's illustration, 2021)

6.1.1.1 Private Gardens

Back in years, Clermont-Ferrand was enjoying of a green belt formed by private gardens around the historical centre of Clermont as mapped out on figure 5.2. These private gardens flourished for a long time. They supplied the dwellers with vegetables, fruits and flowers. Indeed, the interview with Chantal Genestine approves that

the gardens were used for the personal production of families. At the time, people used to feed themselves from their private garden, due to low household incomes and a much smaller food supply compared to what we know today. (Genestine, 2021)

At the beginning of the century, the wine-grapes were still spread out on the hills, North of the city centre. At the edge of the municipality and the urban core of Clermont, flowers were grown “*as far as the eye could see*” (Tardieu, 1870). These gardens were proliferating at the edges of the main boulevards and even penetrating further in the urban core through the disposition of several small gardens in the suburbs.



Figure 6.4 Postal card of the private gardens in 1940 (Source: Geneanet, 2021)

The Auvergne region, Clermont-Ferrand and the confectioners knew how to multiply this wealth, multiplied by the arrivals of apples, pears, strawberries and especially apricots from the neighbouring villages. Their jams and candied fruits were renowned for centuries, as Ambroise Tardieu (Tardieu, 1870) underlines. He also mentioned that "*no other city is better placed than Clermont for the confectionery industry*" (Tardieu, 1870).

Over time, the private gardens were expanding and growing at the West outskirts of Clermont and South of Montferrand, in the area of “Herbert”, “La Pardieu” and towards “Crouël” -figure 5.16. These gardens were much more than just a cultivating ground. These lands represented a cultural and family tradition for the local population. “*Going to the garden was the Sunday outing.*” (Genestine, 2021), demonstrating the place of gardens and their participation in the social and cultural life of the time.



Figure 6.5 Postal card of the private gardens in 1928 (Source: Geneanet, 2021)

6.1.1.2 Forests

The forested areas around Clermont were once at the edge of the private gardens and the urban core of Clermont and Montferrand –figure 5.2 and 5.3. The residential areas were concentrated on the old part of the city with a limitation of the urban expansion. Therefore, the pressure on the forest stayed relatively limited at the time.

6.1.1.3 Water

Unlike other large French or even European cities, Clermont-Ferrand does not benefit at its centre from a major waterway such as the Rhône, the Seine or the Loire which crosses the major cities of the French territory. The most important watercourse on the outskirts of the city being the Allier -figure 4.13- located about fifteen kilometres East of the town.

However, Clermont-Ferrand was benefiting from a network of small rivers, streams, large wetlands on its territory. “*The Limagne plain enjoyed several water nets*” (Guinard, 2017). The Tiretaine, which is the main river within the municipal limits was used by the local population for washing clothes and artefacts. The river used to protect Clermont and Montferrand as its ramparts was following the river bed -figure 4.4 and 5.2. Nevertheless, over the decades, like the rest of the city's natural spaces, the blue element has disappeared from the metropolitan landscape which has been channelled due to high land use pressure.

Even though Clermont-Ferrand did not have a large waterway in its territory, it used to have large wetlands, swamps and ponds within the municipal limitation as Myriam Mascheix mentioned it during the interview I had with her.

When I was young, my grand-mother used to tell me that she used to do canoe with her dad in the city centre of Clermont-Ferrand, nearby Les Salins. There was a large pond, where people gathered and enjoyed their weekend. However, it disappeared with the time because of the urbanisation. (Mascheix, 2021)

In addition to the recreative purpose of the ponds and swamps, it had a huge ecological value for the living environment. Moreover, it connected the volcanic plateau to the plain through the blue link. Starting with the river on the plateau then spreading as swamp areas and finally connecting to the main river Allier to the East.

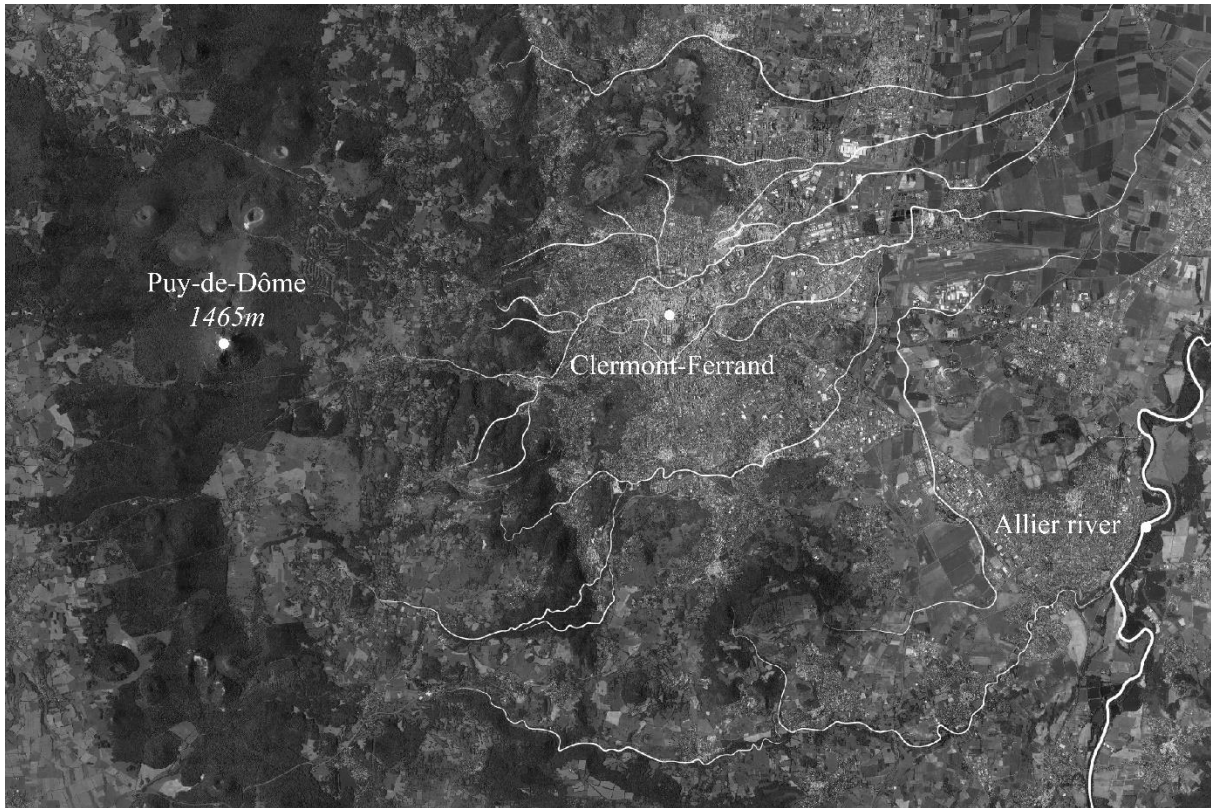


Figure 6.6 Blue links between the volcanic plateau towards the Allier River (Author's illustration, 2021)

6.1.1.4 Agriculture land

Agriculture lands were proliferating in the municipalities. *“Sixty years ago, there were a lot of meadows and fields around Clermont. Fields dedicated to cows and sheep.”* (Genestine, 2021). Cattle breeding and arboriculture were largely present on the territory of Clermont-Ferrand.

Nowadays, these areas have practically all disappeared, replaced by more profitable crops, such as the cultivation of cereals, tobacco or sugar beet with high yields. The Limagne plain is one of the most fertile plains in Europe (Martin, 2002). This is also due to a domestication of the plain by the inhabitants, who over time have drained the wetlands in order to be able to fully exploit the plain.

Indeed, nowadays, the plain has lost its natural value. A point that has been brought up by Myriam Mascheix while interviewing her.

Before the land consolidation and the mechanisation of the fields, the Limagne plain was composed of small parcels demarcated and supported by hedges and thereby continuing the link volcanoes, hills, city and agriculture land. Nowadays, this setting would be found in ecological agriculture. (Mascheix, 2021).

Since the industrialisation and mechanisation process in the campaign, the ecological benefits that was offered from the hedges has been abducted in favour of machines and larger plots (Mascheix, 2021). In addition, ancestral agricultural practices and the transhumance that existed allowed a link between the plateau and the plain. A movement that today no longer needs to be.

6.2 Metropolitan landscape

6.2.1 Green and blue corridor

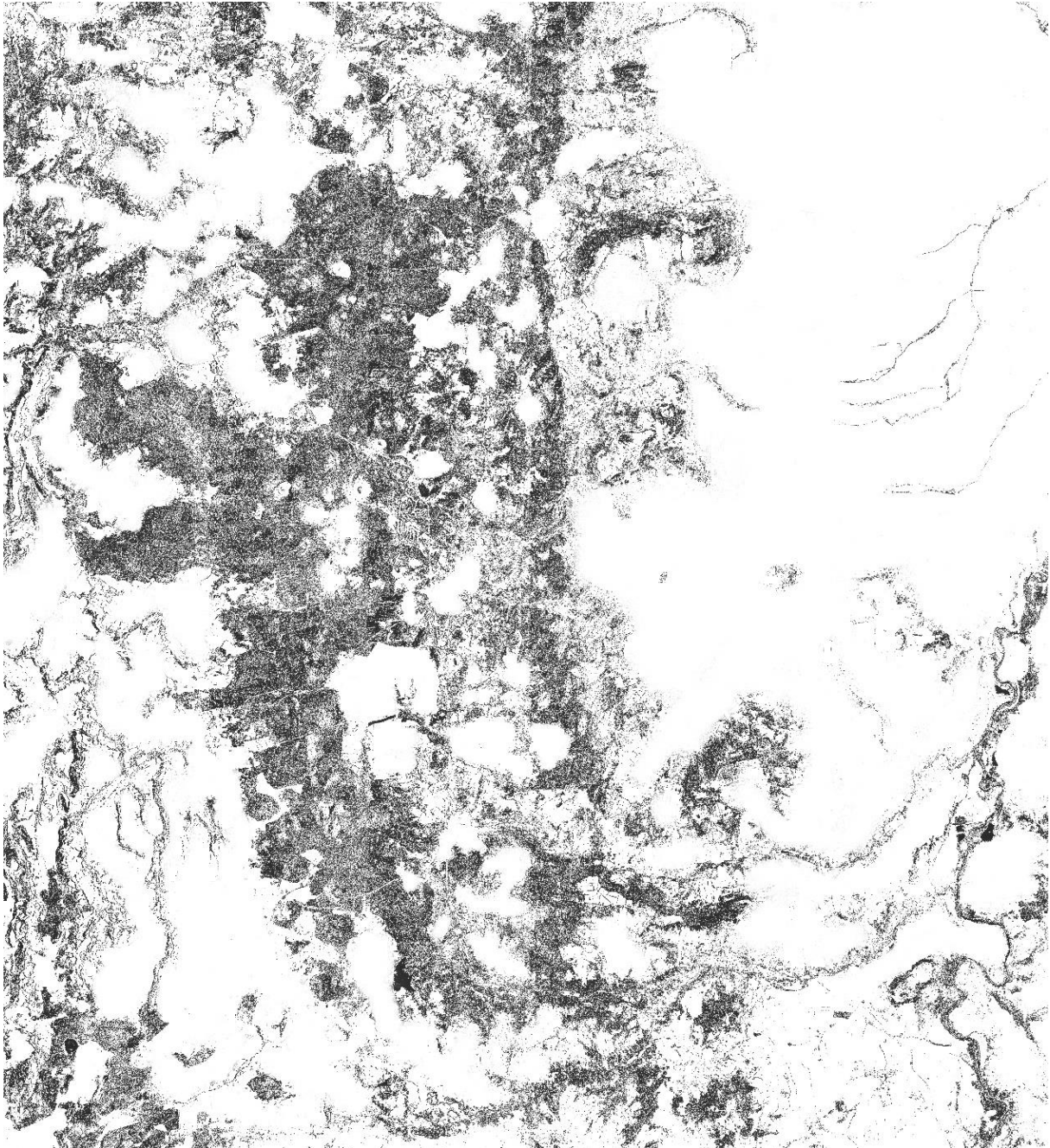


Figure 6.7 Forest pattern of the Chaîne des Puys and Limagne plain (Author's illustration, 2021)

Clermont-Ferrand was once acting as a green and blue connector between the plateau and the plain by the extensive private gardens and the dominant swamp areas. However, the situation has

changed over time and nowadays the ecological paths between the different natural entities are weakened or vanished. The current wooded pattern highlighted on figure 5.7 around Clermont-Ferrand shows some disconnections. Green corridors are perceptible on a North-South axis following the volcanic edifices and the Limagne fault -figure 5.7- at the limit of Clermont-Ferrand's residential areas. The West-East link, however, appear fragmented or even cut off by the presence of urban areas. Indeed, the metropolis is acting as a cut-off factors of the green and blue elements. The continuity of these paths has been lost due to human actions on the land and therefore made vanish the link that once existed between the volcanic plateau and the fertile plain with Clermont in its centre.

The question being why and how this larger landscape got disconnected to Clermont-Ferrand in term of green and blue corridors. The city was benefiting from a variety of natural entities, with humid zones, gardens, several rivers, within the municipal boundaries. It is therefore interesting to understand why and how the city lost this importance of nature in its perimeter. Thus, fascinating to perceive how it lost the connection it maintained with its surrounding landscape, in addition to connecting two natural entities between them namely the plateau and the plain.

6.3 Industrial holds and Michelin influence

6.3.1 The industrial land lobbying

The specific context of Clermont-Ferrand with a lack of homogeneous urbanisation and an abundance of agricultural land, vineyards and private gardens, at the beginning of the 20th century, offers considerable land opportunities. Especially as the available land is for the most part easily constructible due to its topography. (Zanetti, 2012)

Due to the existence of little or no urbanised areas in Clermont-Ferrand, the company -Michelin- will purchase many plots of land exploited in the form of vines on the North hillsides, or devoted to cereal cultivation in the plain (Zanetti, 2016). The peasants and small landowners of the "in-between city" are the privileged target of the land acquisition policy implemented by Michelin, which offers advantageous prices, likely to convince the most reluctant owners: *"This is how a small farm holding earning 1,500 francs a year was paid 25,000 francs by Michelin, or 10 francs*

per square meter. The owner, Doctor Bellet, sold without discussion, knowing that such an offer would not be made to him by a private individual.” (Couderc, 1955).

This acquisition action by Michelin is proving to be advantageous both for the sellers and for the company in view of the terms of sale. The price of the purchased plots is generally low. Despite a few exceptional refusal situations, Michelin easily acquires land devoted to farming, but also land belonging to the municipality or to the city's hospices. Certain sectors of the city were facilitated by the presence of large estates. The firm's land appropriation system will give rise to a grouping effect when successive purchases of small plots have been made in order to expand the industrial production.

It is important to specify that the areas acquired by Michelin are then allocated on the one hand to industrial buildings. The productive act having the fundamental constraint of requiring a lot of space. On the other hand, to residential areas composed of “Michelin towns” or/and collective facilities -the first Michelin towns appear before the First World War. Pierre Boulanger was hired by Edouard Michelin in 1919, and became his direct collaborator. His first mission was to carry out the construction program for the Michelin houses in the 1920s (Michelin and Clermont-Ferrand, 2016). This differentiated appropriation of space therefore implies a dual strategy of location depending on the use of the land. Depending on whether the areas acquired are devoted to the material projection of production or to the constitution of housing units. Therefore, impacting the natural elements of the land plot in a different way.

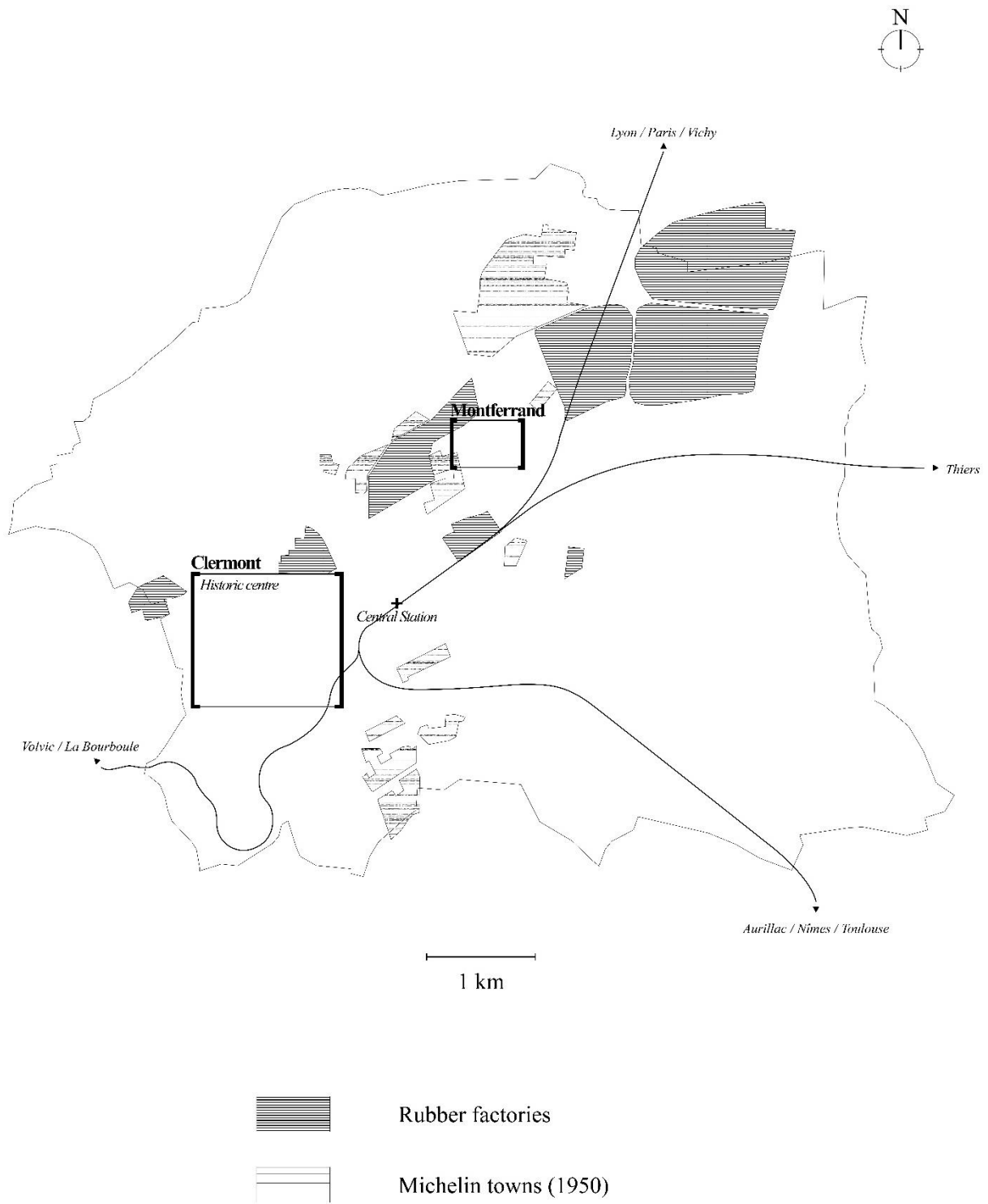


Figure 6.8 Location of the rubber factories and the Michelin towns in 1950 in Clermont-Ferrand (Author's illustration, 2021)

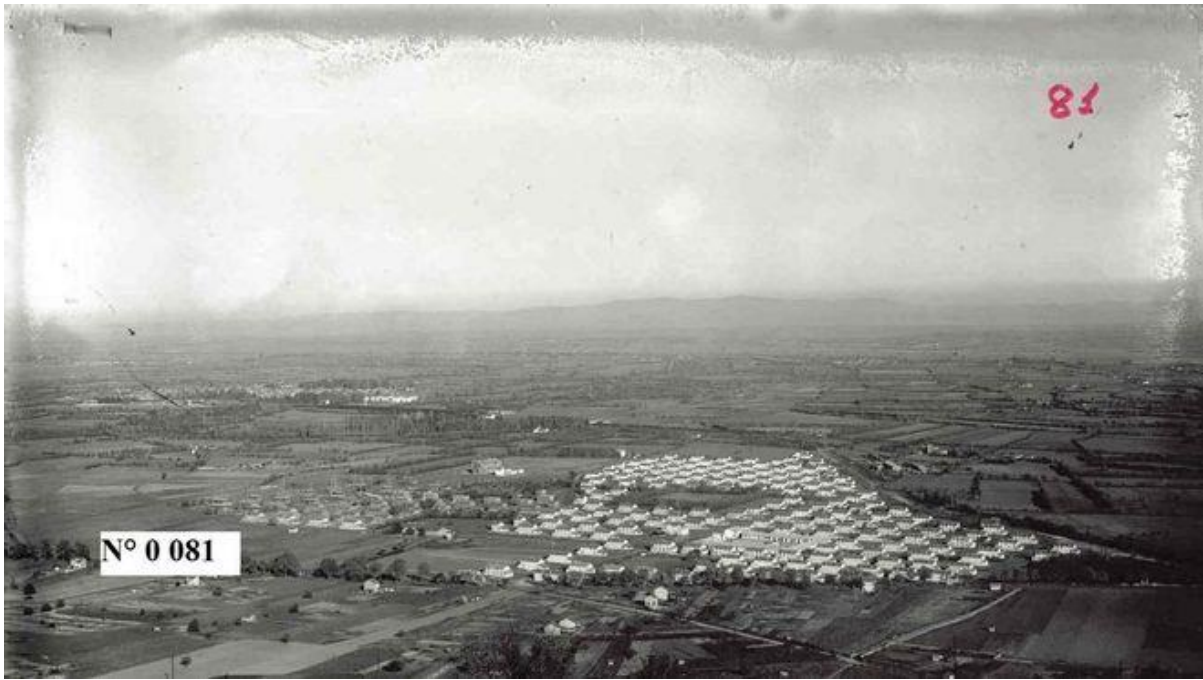


Figure 6.9 Michelin town of “La Plaine” (Michelin and Clermont-Ferrand, 2016)

Over time, Michelin has become the owner of a total area of around 180 hectares, with more than a third -65 hectares- being allocated to production sites. The Michelin surface represents around 4,5% of Clermont-Ferrand area -figure 5.8. Thereby, the private actor sees himself as the main urban builder. The one who, taking the place of public power, leaves its mark on the existing landscape by transforming the use of space: *“What used to be the market-gardening suburb of Clermont tends more and more to be included in the city. The agricultural function is retreating from the urban sprawl brought about by the recent progress of the industrial function”* (Allix, 1931).

This phenomenon of domination of the firm in the urban space will contribute to accentuating the autonomy of the factory within the city, so that in certain sectors, in particular in the North and in the East of the municipality -figure 5.8 -, it will end up with a Michelin exclusive as a spatially delimited universe characterised by its isolation from the public domain. As a result, the phenomenon of land acquisition generated by the society provides a first explanation for the disappearance of cereal, wine-growing and private gardens in Clermont-Ferrand over the past decades.

Therefore, the process of industrialisation and land-owning actions by Michelin, is one of the reasons for a decline and loss of natural spaces within the municipality delimitation.

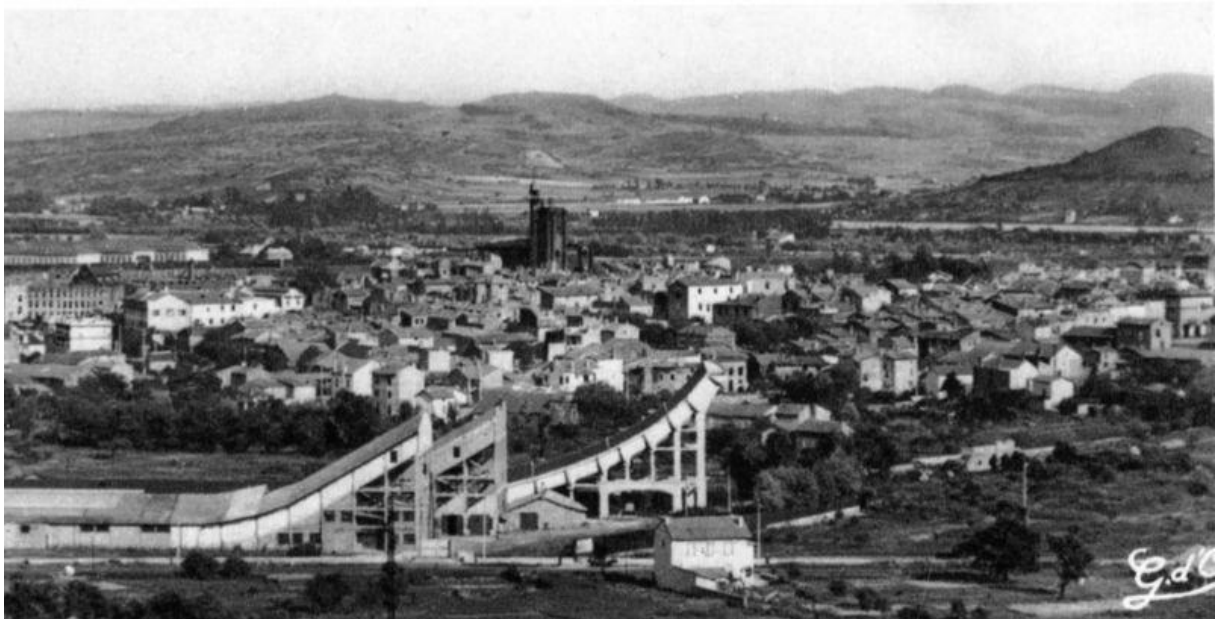


Figure 6.10 Cataroux factory and Montferrand- background (Source: www.monmireille.com, 2011)

6.3.2 Michelin as a city planner in Clermont-Ferrand

By purchasing the land, Michelin is therefore asserting itself as the main planner in Clermont in the first third of the 20th century. Indeed, Michelin has produced a total of 1,752 housing units (Zanetti, 2012). The whole is then dominated by the appearance of several company towns. In 1930, the company owned 3,443 housing units in Clermont-Ferrand, or nearly 10% of the total housing stock. But it also tends, in view of the concern for hygiene which governs the construction of cities, to maintain the workforce in good health.

Insufficient housing, overcrowding as well as the lack of hygiene lead to high mortality in lower-income neighbourhoods, where Michelin employees lived in large numbers in the first decade of the twentieth century. The worrying sanitary condition of homes in the historic centre adds to the quantitative deficit a profound lack in terms of comfort. The old urban fabric of Clermont-Ferrand is severely undersized in the face of the influx of new populations, attracted by the concentration of industrial production (Zanetti, 2012).

Michelin strengthens its paternalistic system by setting up a series of institutions which compensate for Clermont's urban failings by allowing the absorption of the surplus population, the spatial fixation and then the social reproduction of the working-class workforce. The firm is also building a series of facilities necessary for collective urban life, while those existing in the city are generally undersized, if they are not simply absent (Blanchard, 2003).

Finally, the company makes an essential contribution to the general health improvement of Clermont-Ferrand. First through its medical or hygiene infrastructures and then through its supply cooperatives, especially in a context of the considerable rise in the cost of living following the shortages caused by the war. The company therefore played a decisive role in the creation of collective services and facilities relating to Clermont's urban infrastructure.

The emergence of a large middle class in the French society is accompanied by the rise of individualistic lifestyles. The Trente Glorieuses therefore created a new type of city in France and overturned traditional urban forms (Fourastié, 1979). In addition to having a purchasing action in Clermont-Ferrand, Michelin had an unprecedented influx in the development of the city's infrastructure as well as the construction of housing to accommodate the company's workers.

6.4 Clermont-Ferrand, between pressures and actions

6.4.1 Housing crisis and lack of infrastructures

At the dawn of the 20th century, Clermont-Ferrand experienced a housing crisis. Indeed, from 1901, the situation was particularly critical in the old nucleus of Clermont, which experienced overcrowding and where the accommodation no longer represented the comfort standards of the time: *"there is not such thing as a healthy house"* (Montagne, 2020).

This housing crisis affecting Clermont-Ferrand and other French cities is due to national legislation aimed at regulating the use of homes and rents, initiated at the turn of the century. The legislation will also be tightened during the war, causing a *"serious and persistent delay"* (Verret, 1995) in construction throughout the country. The national policy adopted, notably through the moratorium limiting the level of rents and the obligation imposed on builders to comply with new hygiene constraints, has the consequence of slowing down public and private investments, thus leading to a crisis in the construction and housing sectors.



Figure 6.11 Densification and urban sprawl of Clermont-Ferrand in 1980 (Source: www.cpauvergne.com, 2016)

Population densities were very high in the historic centre of Clermont. The mayor of the city, Philippe Marcombes, thus evokes in 1926 the *"ignoble slums, the single rooms where up to five, six or eight people are crowded"*. Indeed, the municipal campaign of 1919 wanted an improvement in the sanitary condition of Clermont-Ferrand (Montagne, 2020). We are gradually seeing a differentiation appear according to the different geographical areas of the city: *"The overcrowding was especially reinforced in the South, with an average of fourteen inhabitants per house, whereas it was only eight in the East canton"* (Moulin, 1997). Thus, showing the differentiation between the dwellings built by Michelin, promoting modernity and comfort, and the rest of the city and mainly the historic core of the city.

In addition to the unbalanced development of the agglomeration, Clermont-Ferrand is also poorly served by the rail network at the time. Therefore, slowing the daily migrations of employees to the industry who were forced to settle in an already overcrowded city centre. In a context of concomitant development of the urban-industrial world and the practice of hygiene, the aim is to

rationalise space by organising a fluid relationship between popular housing and collective facilities. Green spaces, however, are not the priority of the town hall. The hygienic movement will be reflected by the widening of streets, in order to create new arteries to allow air and light to penetrate (Montagne, 2020). This expansion will be further amplified by the arrival of the car in French households and therefore in the streets of the city.

In terms of housing, the public authorities have therefore favoured the supervision of private builders' actions, especially since the generally small size of the old vineyard or market garden plots did not facilitate large ensemble projects. Finally, on the date of the approval of the 1926 urban plan, its scope of implementation had already been exceeded by the urbanisation movement of "company towns" having been built by Michelin beyond its limits.

From the post-war period, Clermont-Ferrand's municipal action focused heavily on equipping the city with infrastructures, which concentrated 25% of the expenditure entered in the 1947 budget. The city of Clermont-Ferrand quickly found itself faced with an urgent need for housing and urban infrastructure. The town hall requested from the early 1950s the assistance of the State for the establishment of an urban infrastructure plan and the acceleration of construction through construction projects of ZUP -priority urban development zone.

Indeed, this period opens in Clermont-Ferrand a long cycle of urbanisation framed by the State according to a conception which reinforces the previous structuring of the "Michelin area". The large town planning operations carried out on the outskirts of the city illustrate the high degree of centralisation of procedures and the influence of the imperatives of economic capital on their definition. While the era of the "company town" is over and Michelin takes less and less responsibility for the urban fabric, *"the action of the State allows the monopolies to effectively offload the management of the reproduction of labour power at the same time as it reinforces the tendency to separate the process of production from that of reproduction"* (Castells et al., 1974). The entire urban system therefore continues to be structured according to a productive logic and industrial interests still control the general organization of space.

6.4.2 Urban planning orientations

The absence of any real orientation of urban development beyond the proximity of the old core of Clermont could then be explained by the presence of notable elements of opposition to any transformation and first of all the urban strategy led by Michelin.

As a result, Clermont-Ferrand continues to grow following the maintenance of migrations from the surrounding rural world and the progression of foreign immigration, a phenomenon which increased during the 1960s and 1970s. Leading to an uncontrolled urban sprawl and a disintegration of the agglomeration (Semmoud, 2008). In addition to the impact on the urban form of the city, this lack of planning had an equally important impact on the green spaces of the city given the lack of legislation and control regarding the preservation of major natural spaces that shaped the territory.

In addition to the Michelin influence on the urban planning orientation of the city and the continuous rural exodus, an important historical event has been impacting France and its cities. Indeed, in 1962, after a furious war with Algeria -who was fighting for its independence from the French colonial empire- a massif exodus started. Thus, in four months, there were as many refugees as in five years for previous migrations linked to French decolonization. Nearly 650,000 people left Algeria to fall back in the majority to France (Moumen, 2010). It was in a climate bordering on anarchy that the unforeseen exodus of the French from Algeria took place. Therefore, the French Government undertook investments so as to create neighbourhood so as to welcome the new population and thus reintegrate them into the French society.

Housing was therefore the central issue of urban public policies after the Second World War (Préteceille, 1998). The objective of the French state during the Trente Glorieuses is to adapt the absorption capacity of cities to the movements of people who have come to occupy the new jobs that are created there. Therefore, to give the cities the necessary tools to support the rural exodus. As a result, the government is relying on the realization of several real estate projects, from the Fourth Plan which results to the construction, in Clermont-Ferrand agglomeration, of 1,650 housing units between 1962 and 1965. The effort is continued in the Fifth Plan, with the construction of 2,300 annual housing units between 1966 and 1970. In addition to the construction of these housing units, the State is adding realisations of large housing projects of the low-income

housing types (HLM) with the destruction of the most dilapidated housing units, in large numbers in the old centre of Clermont or with the destruction of certain industrial sites.



Figure 6.12 Saint-Jacques' neighborhood and the HLM project (Source: www.cpauvergne.com, 2016)

The town hall establishes an urban policy with a qualitative treatment of the oldest spaces. The most emblematic project of this movement is that which affects part of the Clermont-Ferrand hyper centre. The place where the private gardens thrived.

At the end of the 1960s, there were several unsanitary blocks around the old core of Clermont-Ferrand. The built environment of which had not changed since its construction. The main operation of urban renewal in Clermont therefore aims at a restructuring "*essential for the survival of the centre*" (Zanetti, 2012). Considered unsuitable for modern urban functions. On thirteen hectares, the project provides for the establishment of public buildings, offices, community facilities, various shops, social and luxury housing, underground parking, in order to constitute an attractive business centre that meets the new standards of collective consumption.

The aim of developing the Clermont business centre was to consolidate its structuring role at the metropolitan and regional scale. This urban renewal and modernization program, if it has been identified as strategic by the State services and if it benefits as such from a subsidy of 17% of its total cost, constitutes one of the main town hall projects during the 1970s (Zanetti, 2016).

However, the project does not in any way mention the creation of green spaces for the local population. The loss of natural spaces is therefore even greater due to the city's lack of investment in parks or the creation of public green spaces.

Indeed, in Clermont-Ferrand, the infrastructure and modernization of the city responds above all to Michelin's industrial imperatives, by solving a series of urban problems formerly assumed directly by the company, and which can penalize economic activity: housing shortage, saturation of communication infrastructure, poor supply of technical training.

The main areas for the development of urbanization must be located: in a first phase, to the north of the agglomeration, in the immediate vicinity of the agglomeration's main employment centre -Michelin des Carmes and Cataroux factories- [...] in a second phase, on the southern plateaus and hillsides, where urbanization begins of its own accord and is accompanied by the construction of major public facilities - university campus, CHU, Saint-Jacques district. (Zanetti, 2016)

The city proudly shares the figures illustrating the modernisation and facilities of Clermont-Ferrand in response to its industrial and urban growth since the Liberation with 10,000 building permits issued, 100 kilometres of renovated streets, 50 kilometres of new sewers or the improvement of water supply. During the following decade, the municipal action continued to invest heavily in the areas of roads, housing, network infrastructures in order to meet the quantitative needs caused by population growth and multiplies urbanisation projects which represent on average 30% of municipal expenditure (Zanetti, 2016).

Public planning then serves an objective of spatial management of the reproduction of the collective labour force which the modification made by Michelin for housing in public programs also illustrate. The management of the spatial dimension of the "Michelin territory" is thus designed according to the previous urban organization developed by the company.

Finally, to summarize the action of the town hall and the state on the territory of Clermont during the last century, it is important to note the impact of the welfare state making a decisive

contribution to the organization of the city through the financial assistance provided by subsidies as well as urbanization plans to counter a significant housing deficit on French territory. The planning of Clermont-Ferrand urban growth by the State therefore appears through the sectors of housing, industrial and economic development, and transport, to be largely favourable to economic interests. Essentially constituted in Clermont-Ferrand by the company Michelin. Local public authorities, for their part, have little autonomy faced with an authoritarian definition of urban planning operations at the central level.

6.4.3 Sanitation, hygiene and the Tiretaine river

Measures in favour of public health and the constitution of technical networks -transport, electricity, water and telephony- constitute the third priority area of action of municipal policy, despite the weakness of the technical and human resources available to Clermont-Ferrand in beginning of the 20th century (Lorrain, 1991).

Indeed, the interventions of the town hall come up against its budgetary limits. This weakness in financial autonomy which the municipality has will cause problems until the first mandate of Gabriel Montpied -mayor of the city from 1944 to 1973- concerning the resolution of urban issues.

The city of Clermont-Ferrand, despite the weakness of its budget, continues to make improvements and build the facilities necessary for its development. The main objective is to contain the levels of fiscal pressure and public debt.

In addition, the Clermont-Ferrand agglomeration is seeking to have a monopoly on water in order to create, on the one hand, new public revenue -an approach which, however, involves the systematic buy-back of all the existing concessions in this particularly strategic sector for industrial production- and in a second part to *“domesticate or even humanize the Tiretaine. [...] The trend of the time being hygienic, the municipal water nets were straightened and sprayed.”* (Montagne, 2017 178). Indeed, as early as the municipal campaign of 1919, demands were made for an improvement in the health status of Clermont-Ferrand. However, depriving a watercourse of light results in both its biological loss and a disruption to the circulation of species. These

aspects were not taken into account at the time. The town hall favoured the aspect of cleanliness and sanitation, as the interview with Chantal Genestine confirmed this hygiene process:

There was a general consensus to pipe the Tiretaine for reasons such as odor and visual pollution. The Tiretaine was infested with rats. Which did not give a good image to the city and which in addition could spread diseases to the population. There was also a concern about flooding, especially towards Saint-Alyre, on the edge of old Clermont. (Genestine, 2021)

The Tiretaine has become in Clermont an open sewer where in certain districts of the city we feared the miasma of marshes or muddy streams. The river was a significant concentration of the city's garbage (Blanchard, 2003). In order to alleviate the city's sanitation problems concerning water, Clermont-Ferrand has launched projects to switch to "all-sewerage". This project turned out to be a quick solution to control the water through the abduction of this one as the illustraton

of figure 5.13 are revealing. In other words, towards the conduct of water to treatment and then redistribution facilities.



Figure 6.13 Abduction of the Tiretaine river in Clermont-Ferrand (Montagne, 2017)

6.4.4 Organisation of the urban space and the automobile

Around 1950, the urban form of Clermont-Ferrand will once again be challenged by technological change. The automobile arrived on the market and households start to invest in it. Moreover, at the same time the tram system -that the city was enjoying for half a century- started to be seen as obsolete, nosy and inconvenient regarding the bike accidents occurring due to the tracks. Therefore, the public transport system of Clermont-Ferrand shifted in 1955 with the inauguration of the bus network and the demolition of the tram (Blanchard, 2003).

This also got influenced by a generational vision of the population as well as a lobbying process carried out by Michelin and its specialization in automobile tires. The objective of the firm being to defeat the railway in terms of means of travel (Ribeill, 1989). Michelin's presence in Clermont-Ferrand gave birth to a strong automobile spirit with major projects in Clermont-Ferrand and its surroundings -such as the Charade racing circuit which at the time was the most important racing circuit in the world in a mountain setting (Genestine, 2021). The circuit was funded by both the Michelin company and the city of Clermont-Ferrand.

It is therefore the road network, to the detriment of the rail network, which is retained for the connections between the city-centre and its suburbs. All of that in a context of increase of the displacements and the progression of the automobile infrastructure of the households. Between 1954 and 1962, the daily mobility of the population of Clermont has indeed experienced a strong increase up to 32%. (Zanetti, 2012 100)

Like other regional capitals, faced with the urgency of deterioration and the risk of complete suffocation of the city centre, the municipality of Clermont-Ferrand asked the facilities services' branch to provide it with a circulation plan leading to development proposals, in conjunction with urban space development projects. (Dujardin and Lorgeoux, 1977 191)

This circulation plan, drawn up in 1971, contains several incentives to improve the situation of Clermont-Ferrand's centre with the development of crossroads and improvement of the communication network which no longer meets the needs of the city. The solutions adopted are diverse but seem to favour the automobile as a priority mode of transport on the scale of the agglomeration. The boulevards were then extended to form a protective ring road. Then, in 1966, a viaduct was built to allow the junction between the plateau of Saint-Jacques -neighbourhood

with a tremendous number of HLM, large housing projects and company town- and the hyper centre of the city.

In addition to these important road works, the streets of Clermont were at the time cobbled. However, they got metamorphosed due to major works to tar the streets of the centre for the benefit of cars and buses. This change was made mainly because of the pressure from Michelin. *“It was said, and still said, that it was Michelin that made the city move forward. Most of the decisions were made with Michelin. Which is still the case.”* (Genestine, 2021 174)



Figure 6.14 Place de Jaude in 1980 (Source: www.amusidora.fr, 2019)

The exponential presence of the car in the city has certainly benefited the mobility of the population. Nevertheless, nature was put aside or even suppressed to be able to make room for the new infrastructure that the car needed. In fact, travel before the car arrived was by bicycle: *“People mostly got around on foot or by bicycle. At the time, we mostly stayed in our neighbourhood. Mobility was not the same as it is today.”* (Genestine, 2021). In addition, this transition led to the disappearance of private gardens around houses and buildings. The houses

had a lot of green space on their land, favouring gardening and the cultivation of fruits and vegetables. This disappearance is explained by the construction of garages for cars. The streets of Clermont-Ferrand being narrow, did not allow parking for cars in the street (Genestine, 2021). Clermont's private gardens have been razed to the detriment of building densification as well as the transformation of space driven by the car.

6.5 Clermont-Ferrand and the nature in 2021: a result of influences

6.5.1 Green spaces and nature in the municipality



1 km

- Green spaces
- Tree alignments

Figure 6.15 Green spaces and tree alignments in 2021 in Clermont-Ferrand (Author’s illustration, 2021)

Nowadays, the city of Clermont-Ferrand offers only a limited area of green spaces and quality public spaces to the local population. This observation is made after the analysis that was carried out beforehand thus showing the influence of the forces on the territory of the city and their impact on land use.

This historical analysis has revealed how much Michelin and the rubber industry have had an unprecedented influence on the development of the city. Both in terms of benefit to the city itself and negative from the point of view of biodiversity and the natural spaces of Clermont-Ferrand.

Indeed, Michelin, by virtue of its rapid development and being a major economic actor for the territory, was able to take advantage of the weak intervention of the city hall on the plot in the 1920s to develop as it pleases. Michelin thus took this opportunity to buy land from small farmers or from individuals in order to expand without making a request to the town hall. The purchase of these lands was subsequently used by Michelin for the most part for the construction of its production sites. This was obviously done to the detriment of green spaces.

Michelin having mainly installed its production sites -figure 5.16- around Montferrand for the simple reason of the presence of water with the Tiretaine, to nevertheless dry up the land and used a large quantity of water. What resulted in the disappearance of the wetlands which were located around the old core of Montferrand.

In addition, to this aggressive development in Clermont-Ferrand, Michelin was able to exert pressure on the municipality in order to develop the city's public space in favour of its industrial production when the factory decided to specialise in automobile tires.

As a result, the city, which benefited from a substantial tram network for its size at the time, as well as public spaces with a social vocation and beautification, saw itself metamorphosed in the 1950s, with the massive arrival of cars in the post-war period as well as Michelin's force of action to convert the city. Clermont-Ferrand undertook major works to make the public space functional for the automobile to the detriment of inhabitants and trees.

However, Michelin was not the only actor to have had a considerable influence on green spaces. Indeed, although the town hall was in retreat on the issue of Michelin's development during the

first half of the 20th century, it was an important stakeholder in the post-war period. Indeed, the city has invested heavily to equip the city with infrastructures to meet the strong growth of the population. Important projects have thus emerged on the outskirts of the city centres of Clermont and Montferrand. Thus, putting pressure on the gardens and cultivations around the historic centres. The pressure having been so important that it resulted in the total disappearance of these green spaces. In addition to the disappearance of the green element, the water has also undergone a lot of modification on the territory of the city. In fact, the Tiretaine, because of the real estate pressure and for a question of sanitation was buried and channelled. This action has to do with a perspective of control and humanisation of nature by mankind who seeks to control his space.

In addition to the elements stated, there was a question of budgetary problem at the city hall of Clermont-Ferrand. As the municipality has a fairly limited budget and weak finances, a choice was made to prioritise coverings that are easy to maintain and less expensive for the city (Bernard, 2018). Thus, the metropolis has favoured tar or smooth surface style coatings, less expensive than grass surfaces, which require more maintenance and more time.

As a result, the city has mineralised over the decades, thus losing the great variety of green spaces on its territory. Today, the city offers only two medium to large size parks to the inhabitants of the city, namely the Jardin Lecoq -5 hectares- and the Parc Montjuzet -26 hectares.

The Jardin Lecoq is a traditional French garden, which was intended for an ornamental function. It is a historic park of Clermont-Ferrand. The park was part of the green belt around the old town of Clermont and is fully integrated in the old urban core -figure 5.2 and 5.16.

As for the Parc Montjuzet, it was developed by the socialist mayor Quillot in 1981. This park project was carried out by the mayor for a purely personal reason. Indeed, during the interview with Myriam Mascheix, she pointed out that *“the mayor lived on the coasts of Clermont. His house is still near the entrance to the park. He had this park developed because he did not want to have a neighbour.”* (Mascheix, 2021)

Nowadays, the park is surrounded by individual houses and villas and is under daily real estate pressure. Despite its important place in the landscape of Clermont-Ferrand, the park is being eaten away by property developers who seek to make the land profitable and build more and more.

Apart from the rare parks and squares hidden in a few places in the city, the rest of the green spaces are located on the edge of the municipal limits. The fringes are indeed places more conducive to nature, even if real estate pressure and the development of transport infrastructures tend to nibble on the city's natural and agricultural green spaces. As with the development of the motorway connecting Paris to Montpellier and its widening to switch to 2 x 3 lanes in Clermont-Ferrand or as the implantation of large selling workshops such as IKEA -78,000m² of plot surface.

On the northern coasts of Clermont-Ferrand, real estate development continues and is taking ground on the vineyards, even though the area is protected by a decree (Clermont-Ferrand, 2016b). This phenomenon is accompanied by a financial question for real estate developers who see the enormous potential of the “Côtes de Clermont” with full southern exposure, a view on Clermont’s emblematic cathedral, Montferrand and part of the Chaîne des Puys. As a result, we see the emergence on the hillsides of villas of large sizes and for households with high financial resources.

The situation of the tree alignments in the city of Clermont-Ferrand is put in a complicated situation in terms of space and diversity. The streets having been developed for the car the place of the pedestrian and nature has been greatly reduced. As a result, the space to be able to plant new alignment of trees is limited, if not impossible - if all the urban planning regulations are followed. The issue of the space allocated to nature and to tree alignments is still relevant today. Indeed, the large boulevards have sought to delimit the space for several uses, namely, the automobile, the space dedicated to public transport -bus or tram-, cycle paths and space for pedestrians. Thus, the place of the trees is restricted and is only thought of after delimiting the previous functions.

Finally, when it comes to the choice of tree species used for tree alignments, Clermont-Ferrand has chosen to plant mainly plane trees -*Platanus hispanica*. This does not promote ecological and tree diversity in the city. As it could be the case 100 years ago with a great variety of species ranging from fruit trees, to flowering bushes or forest trees.

In addition to being restrictive in terms of the diversity of plantations along the main arterial roads, the city finds itself in a position which can turn out to be very unfavourable. Indeed, if a disease were to develop and be transmitted to the plane trees, this would lead to the massive cutting of the plane trees in the city (Helms, 2020) and therefore accentuate the harmful effects

of a lack of nature in the city. This situation was observed in Lyon where a large part of the plane trees had to be felled due to disease. Today, the city of Lyon favours the diversity of species to be used (Helms, 2020). Thereby, my proposal highlights the resiliency of Clermont-Ferrand in term of plant diseases spreading and takes into account the mistakes that has been made elsewhere so as not to replicate the same errors in Clermont.

This loss of green spaces and landscape identity in Clermont-Ferrand must be rethought. This is why in the next chapter, I propose a new landscape framework for Clermont-Ferrand. Reviving the identity of the city through its landscape while reconnecting the different landscape and natural entities of the metropolis.

CLERMONT-FERRAND

Central map

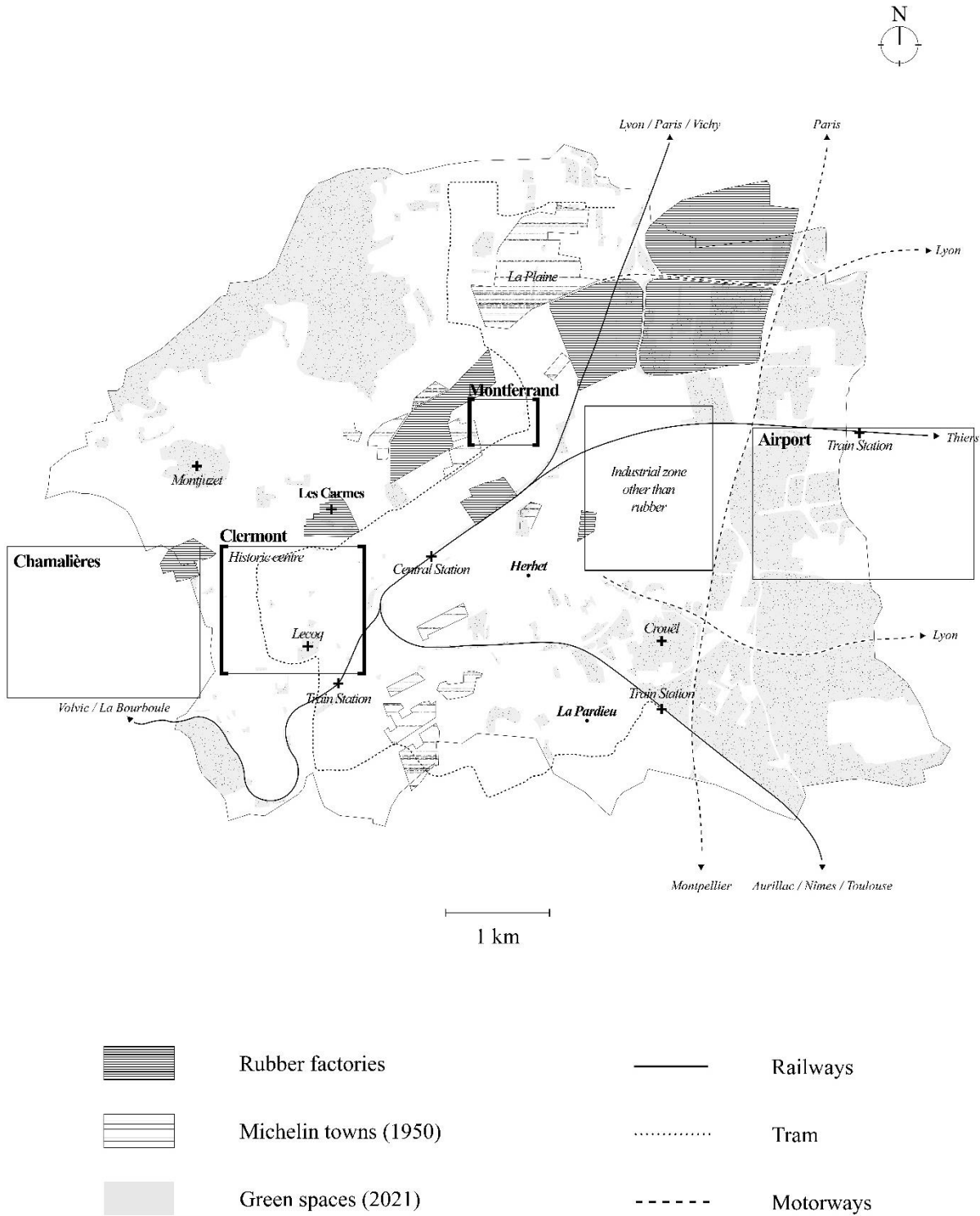


Figure 6.16 Central map representing all the spatial information (Author's illustration, 2021)

7 A new landscape frame

This last chapter aims to conclude this master thesis research. In addition to sum up the research and the findings, I am going to present and defend my proposal for a new landscape structure for Clermont-Ferrand. Indeed, after having analysed and understood the “what, how, why” questions on the evolution of the green spaces in Clermont-Ferrand, I have been able to come with a plan for the greening of the municipality while reconnection the larger landscape entities together.

Thereby, I am going to display maps, diagrams and illustrations that are showing the general concept of the project as well as details and pre-conditions for the establishment of this landscape structure.

7.1 The orientations and general guidelines for implementing a greener Clermont-Ferrand

The research undertaken during the case study as well as taking into account the thoughts of the local population regarding the presence of nature in Clermont-Ferrand, revealed points of fractures between the population’s expectations and the current situation of the presence of green spaces within the metropolis.

Indeed, the inhabitants, as well as Nicolas Bonnet -deputy mayor for sustainability, nature in city and air quality- pointed out the fact that Clermont-Ferrand is a rather mineral city (Bonnet, 2018) with a lack in urban ecosystems with risks and nuisances such as pollution, noise and flood risks. This lack of natural spaces in the city hinders urban quality and therefore affects the metropolis from an economic, social and environmental point of view.

This lack of qualitative public spaces is mainly linked to the orientations taken by the municipality during the last decades. Promoting and making the most of public spaces to the service of the automobile. As a result, Clermont's public spaces are faced with the fact that these spaces mainly have a road functionality.

In order to tackle this nature deficiency and qualitative public spaces in Clermont-Ferrand, I am going to present the main orientations of my proposal as well as guidelines that I think should be

followed and implemented so as to get the most of my proposal. These orientations and guidelines include spatial and land use directives as well as plant and nature orientations.

7.1.1 The main axes of connection between city and nature

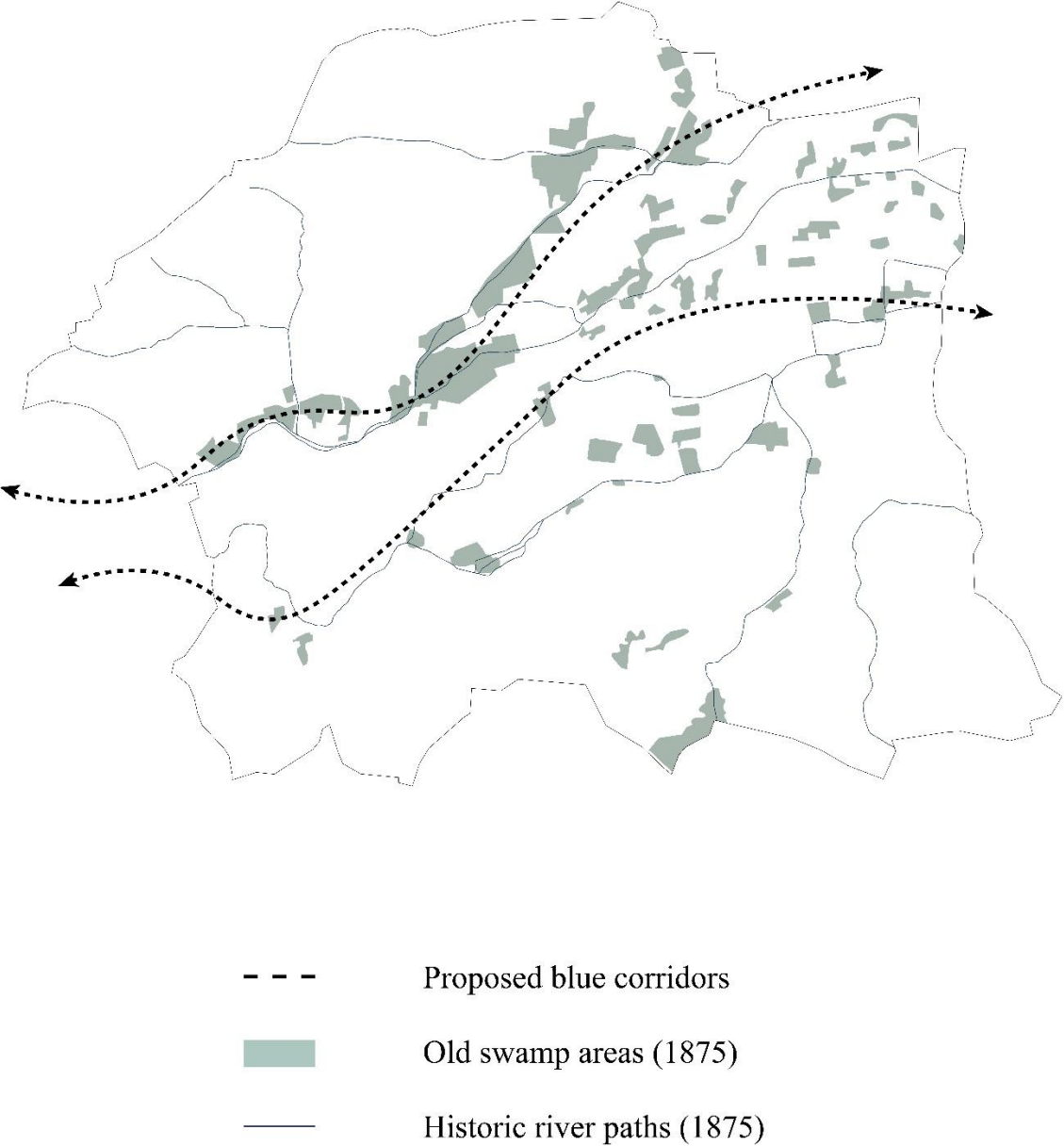


Figure 7.1 Diagram representing the blue corridors (Author's illustration, 2021)



Figure 7.2 Diagram representing the green corridors (Author's illustration, 2021)

The first phase of the project has been to identify paths to reconnect the territorial landscape and nature with the urban milieu.

The main axes connecting nature to Clermont-Ferrand which have been identified on figure 6.1 and 6.2 start from the natural and agricultural fringes and irrigate the urban fabric by connecting large natural spaces.

Two types of axes were determined during the design process. Green corridors on one side and blue corridors on the other side. It is important to point out, however, that these ecological corridors will be established and linked together in order to maximise the development of nature in the city and not to establish a fragmented landscape structure.

Thus, the arrangement and orientations of these axes are based on several factors and influences.

First of all, through this project, I want to strengthen the continuities of the existing green network in the public spaces. These continuities are today essentially made up of rows of trees. This reinforcement will be accompanied by an enlargement of the green space at the level of the tree bases in order to recreate a forest edge allowing a smoother transition between mineral space and space allocated to trees. This enlargement and creation of support for the tree alignments will be accompanied, for instance by planted strips, shrub hedges, etc.

Another essential point of the project in the development of these corridors was the consideration of the historical aspect of the city of Clermont-Ferrand, from an agricultural and landscape point of view. Indeed, I intend to reappear the Clermont landscape identity which thrived on the territory through gardens, wetlands, rivers and agricultural practices. These particular characteristics of the city's landscape have been determined and identified by a historical study of the evolution of the city's plant spaces as well as a study of land use -see chapter 5. Clermont-Ferrand benefited from a large sample of green spaces highlighting a great diversity of plant species and varied typologies while imposing a cultural landscape. In addition, the central districts of Clermont-Ferrand are identified as strategic for the reconquest of nature in the city with regard to their strong mineralisation and their location allowing a link between the "Côtes de Clermont" -West side of the city- and the Limagne plain -East side. The idea is to reconcile a strong urban concentration with a requalification of public spaces and plant innovation in construction projects.

In order to set up and develop these green and blue corridors in the metropolis and thus connecting natural spaces, I relied on the city's rail infrastructure. This includes both the train and the tram infrastructures.

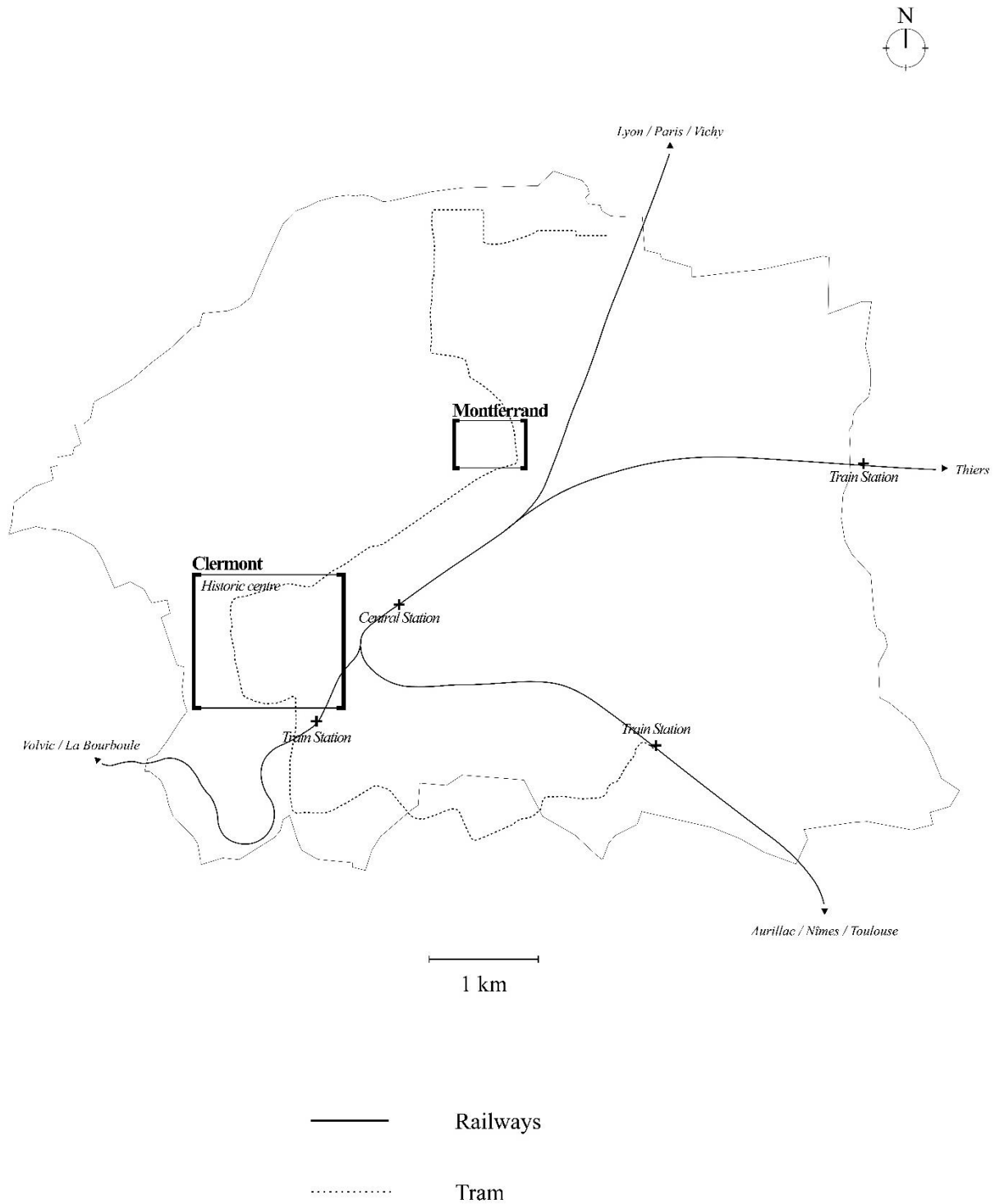


Figure 7.3 The rail infrastructure in Clermont-Ferrand (Author's illustration, 2021)

The train infrastructure, operated by the SNCF has a strategic position in the city -figure 6.3. The rails are crossing the city and connecting the North, South, East and West points of Clermont-Ferrand. In addition, this infrastructure is increasingly neglected by the services of the SNCF,

focusing mainly on the high-speed lines (TGV). Clermont-Ferrand and the Auvergne region do not have on its territory the TGV. The rail network of the region is mainly composed of small, unprofitable lines. Which explains the closing of rail routes in Clermont-Ferrand and the neglecting of the infrastructure. Therefore, I intend to include the reinforcement of the railway infrastructure in my project as a major support to reconnect the four cardinal points of the territory from a vegetal point of view. Thus, the railway embankments for plant use must be strengthened, with also an opportunity to create new public spaces in areas disused by the SNCF. Mainly around the central train station of the city. This part of the proposal as mainly been inspired by the High Line of New York and the reuse of an old elevated rail track transformed into a promenade meandering between the high rises of the city.

Moreover, the tram path is a great support to amplify the North-South axis and reinforcing nature towards the city centres of Montferrand and Clermont.

The establishment of blue corridors is based on the entities already present and therefore to be strengthened as well as on the historic place of marshy areas, wetlands and the multitude of rivers within the boundaries of Clermont-Ferrand. Thus, the route of these two axes aligns with the Tiretaine river encircling on both sides the ancient heart of Clermont and then finishing their way towards Michelin, Montferrand and finally to the Limagne plain.

Finally, these axes cross strategic districts for the entry and diffusion of nature in the city. Thus, in order to ensure the prosperity of these axes, new construction projects will have to take care to limit the breaks in the continuities of nature with the neighbouring private or public green spaces. Indeed, it is a question of proposing establishments and arrangements favourable to the circulation of biodiversity with regard to the existing vegetation on the neighbouring plots while avoiding the fragmentation of green spaces.

7.1.2 Developing biodiversity in public spaces

7.1.2.1 The plant palette

In addition to a new landscape structure by the establishment of green and blue corridors in Clermont-Ferrand, I also offer a new vision for the development of a plant palette for the city.

The plant constituting the road and public spaces will be qualitative. Based on endemic species, as well as on tree species native to the Mediterranean and Atlantic coasts.

This desire to create a mixture and to introduce plant species native to the Mediterranean basin comes from a reflection on the climate changes that the earth is undergoing. Indeed, the plant rises in latitude as the years go by. Therefore, by introducing non-endemic species, I intend to prepare the ground for these species and thus see how they acclimatise to the territory of Clermont.

This practice is widely used by landscape architects who offer a greater mix of plants in their urban projects. Such as in Oslo with the Dronninga Landskap agency (DRONNINGALANDSKAP, 2020 201). Indeed, with the development of its project on avenue Dronning Eufemias gate -located along the famous Barcode towers- the agency has introduced a great diversity of plants, with 312 trees and 54 species -coming from Asia, North America or the Mediterranean basin. As a result, this axis of Oslo has become an urban arboretum (Helms, 2020).

Thereby, the plant palette developed for my project is based on several orientations and a typology of spaces that is intended to vary. However, clear guidelines must be put in place in order for the project to retain its initial strength.

First of all, the meadows that will be created within the municipal area of Clermont-Ferrand will be one of the first elements to promote biodiversity in the city. It is important to emphasise that a so-called rural meadow is richer in plant and animal species than an ornamental lawn that is regularly mowed. A distinction between lawns and meadows must be made. The lawns will be used for relaxation and play areas. These spaces will be able to withstand trampling and public accessibility. The meadows will be spaces for ecological purposes promoting the city's green connections which may be located on road edges. The meadows will allow the development and strengthening of the pioneer flora of the territory.

Subsequently, importance must be given to the choice of plant species. Shrub, perennial and ground cover species will therefore be chosen from a rational management perspective. In addition to amplify the identity of the Clermont-Ferrand landscape and revive the orchards and old fruit varieties that surrounded the old centre of Clermont.

7.1.2.2 Sustainable reasoned management

Sustainable reasoned management is a maintenance practise for green spaces. It consists in applying an adaptive maintenance to green spaces depending their usage and utility. This sustainable reasoned management of green spaces, indeed, adapts the frequency and type of interventions to the use and vocation of the site (Aggéri, 2010).

The green spaces are classified from ornamental to natural areas, passing through intermediate areas. Several types of management can coexist in the same space. This reasoned approach to the management of green spaces is in line with current aspirations, it is betting on more environmentally friendly management without loss of quality (Aggéri, 2010), therefore aligning itself with the ecological urbanism theory.

7.2 The establishment of a landscape identity for the metropolis

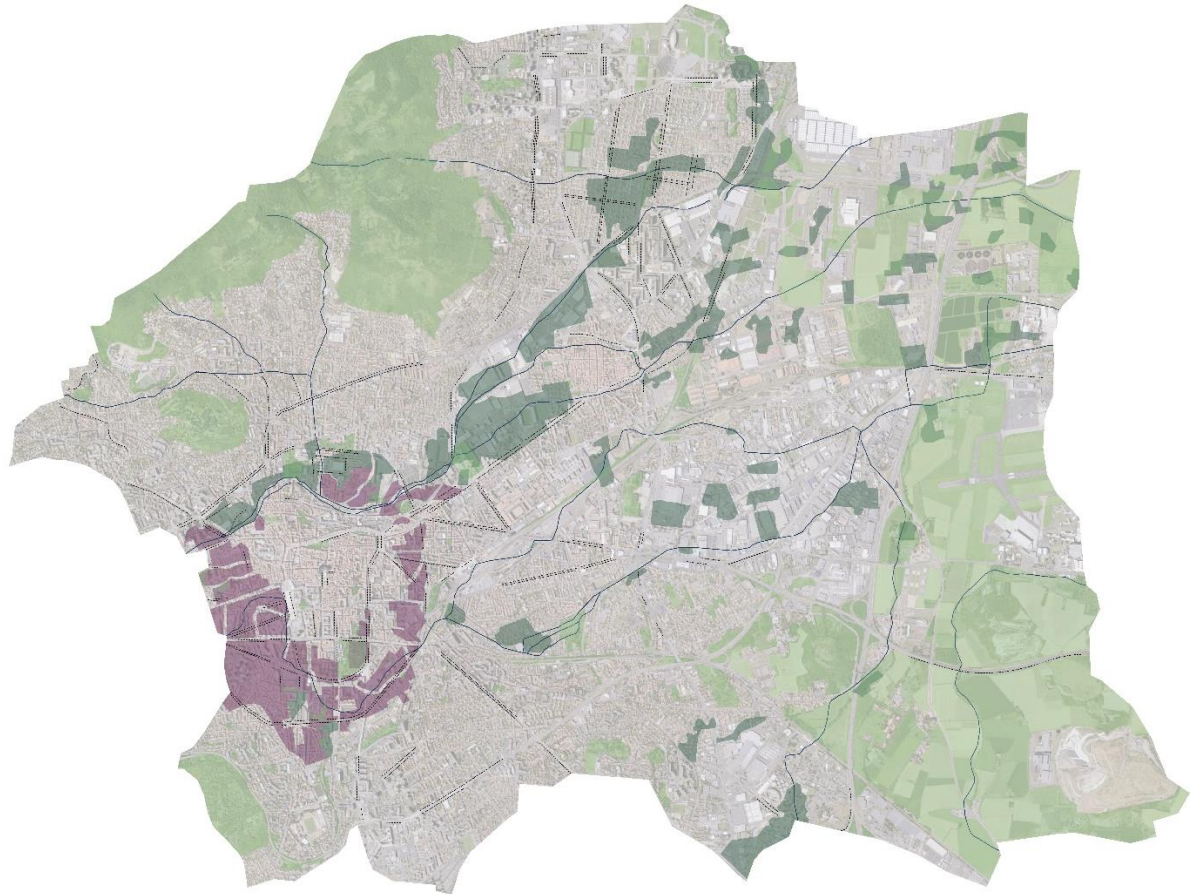
It seems important to remember that the project has been based on the ecological urbanism and urban green infrastructure theories explored in the theory chapter.

Indeed, the development of the project has been following these theories as a base for a more sustainable and greener Clermont-Ferrand. With the perspective of these paradigms an important part has been given to the ecosystem services and biodiversity, which I am going to explain afterwards.

The history of green spaces in the city and the proximity to a high valuable landscape with the volcanoes create an immense identity and characterises the territory. However, as I have been presenting in the previous chapters, the connection to the territorial landscape and the variety of natural elements that Clermont-Ferrand used to enjoy has been erased and pushed to the limits of the municipality due to urbanisation and land use pressure.

Because of this uncontrolled urbanisation in the early part of the 20th century and the demographic explosion of the Trente Glorieuses, the landscape and the natural identity that was brought by the private gardens and their fruits and flowers harvesting as well as the blue elements and the agriculture land has disappeared. With this disappearance, the plant palette variety has been drastically reduced which therefore do not promote biodiversity.

Thereby, through this project I have been willing to give and bring back the territorial identity and characteristics of Clermont-Ferrand. Following the green and blue corridors paths determined in the previous part on figure 6.1 and 6.2. For that, I first mapped and overlaid the current situation of the city with the historical presence of the water, forest and private garden areas which is revealed on figure 6.4.



1 km






- | | |
|---|---|
|  Green spaces |  Old private gardens (1875) |
|  Tree alignments |  Historic swamp areas (1875) |
| |  Original rivers (1875) |

Figure 7.4 Overlay of the 1875 natural elements with the current green spaces' presence in Clermont-Ferrand (Author's illustration, 2021)

This analysis allowed me to identify the issues and directions I want to take for the project. As presented in the previous part, my project is based initially on the establishment of green and blue corridors crossing the city in order to reconnect the natural spaces. Thus, the major framework for the development of the project is based on the creation of connecting links.

In addition, the analysis of the superposition of historical layers with the current urban context allowed me to identify guidelines for certain areas of the city. Indeed, I want to follow the current landscape structure while giving an identity to the city by the natural elements that shaped it in the past -figure 6.5, 6.6, 6.7 and 6.8

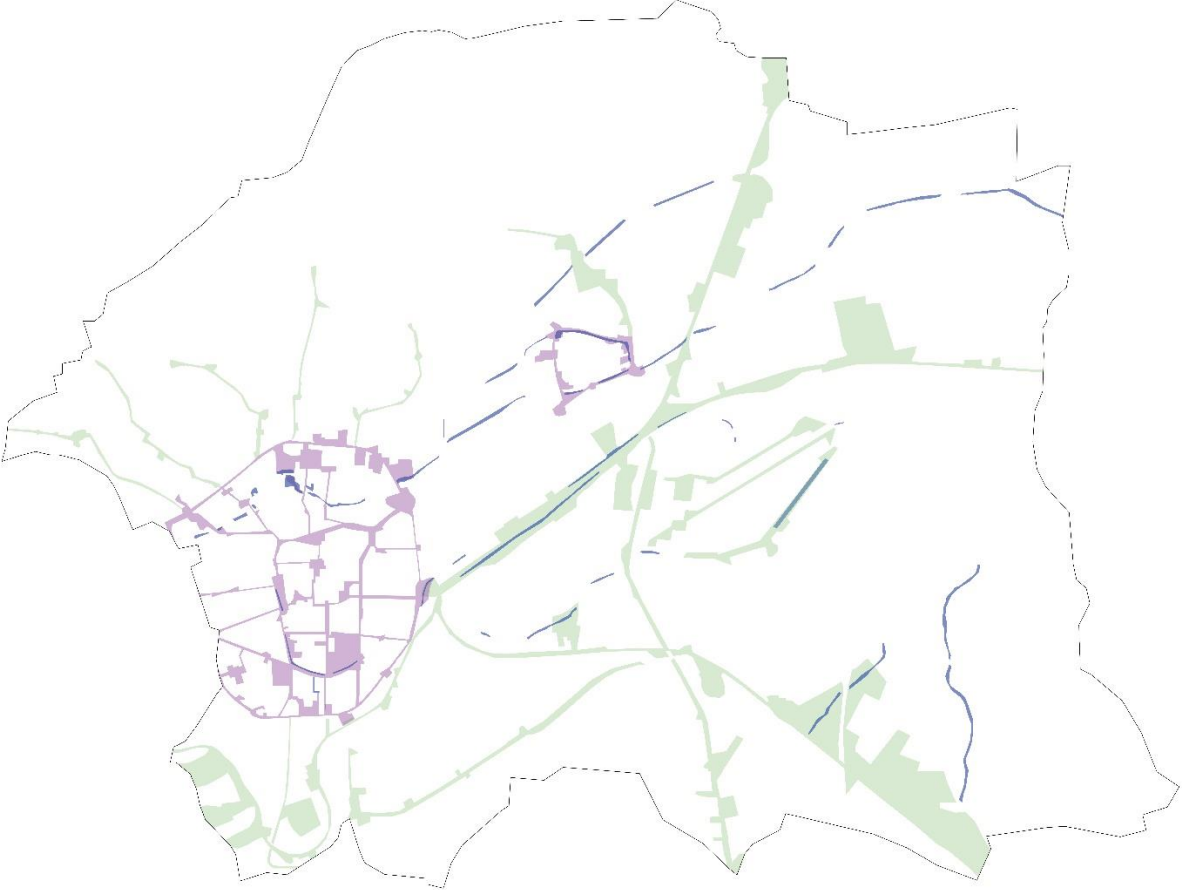


Figure 7.5 Diagram of the new proposed landscape structure (Author's illustration, 2021)



Figure 7.6 Diagram of the new proposed landscape structure and the current green spaces situation (Author's illustration, 2021)



1 km




-  Green spaces
-  Themed planting ring
-  Open up of the river

Figure 7.7 Landscape structure proposal (Author's illustration, 2021)



1 km




-  Green spaces
-  Themed planting ring
-  Open up of the river

Figure 7.8 The proposed landscape structure with the current green context of Clermont-Ferrand (Author's illustration)

7.2.1.1 Revival of a historic identity

In order to restore the landscape identity of Clermont-Ferrand from the 1900s, I am proposing a “revival of the past”. To establish this principle, I therefore propose the creation of a themed plant rings around the old centres of Clermont and Montferrand.

These themed vegetated rings are characterised by the planting of trees, flowers and shrubs that once made up the private gardens of the inhabitants. As a result, I intend to solve several major problems that were revealed during the research period through interviews with elected officials of the municipality as well as the people of Clermont.

Firstly, I aim to block out the city's mineralisation and its hard surfaces. This type of land use does not allow biodiversity to find a place in the cores of the city. In addition, waterproofing floors bring other disadvantages. It increases the risk of water runoff and flooding in certain neighbourhoods during heavy rains, as well as an increase in ground temperature and ambient air compared to more vegetated areas.

As a result, the reintroduction of trees, shrubs and flowers follows a logic of increasing biodiversity, promoting qualitative public spaces while fighting against the problems linked to global warming and sustainability. Plus, these themed plantation rings bring the history of the city and all that characterised it.

Thus, I made a sample plant palette -figures 6.9 and 6.10- for the trees, shrubs and flowers that can be planted for the establishment of these themed plant wreaths, reminiscent of the atmosphere of private gardens and small agricultural plots of the time.

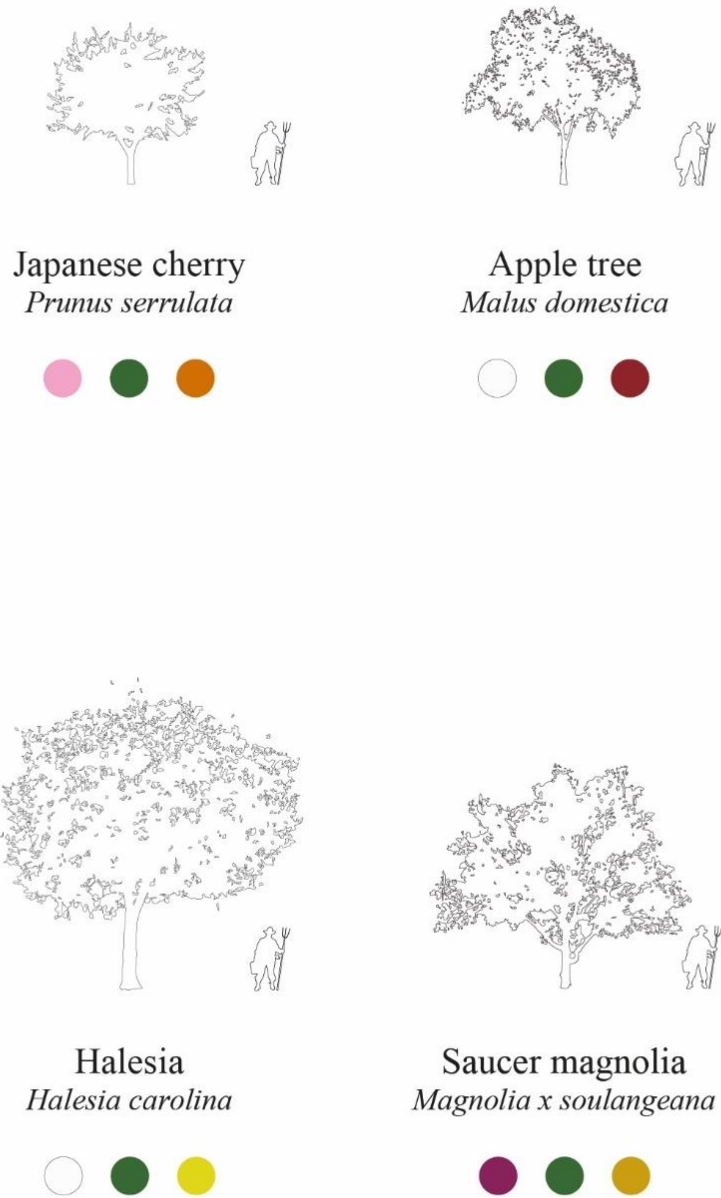


Figure 7.9 Plant palette smaller species for theme planting ring (Author's illustration)

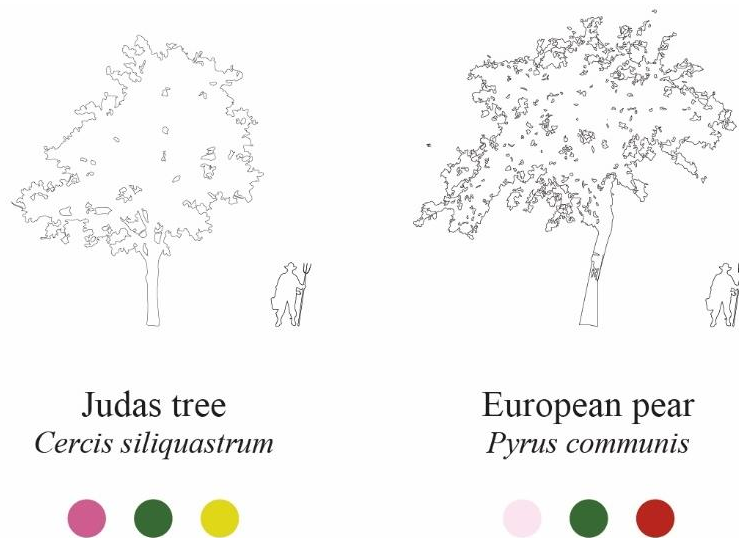


Figure 7.10 Plant palette smaller species for theme planting ring (Author's illustration)

The choice of plant species was based on several points. Given my desire to give back a place to the history and identity of the city, I initially opted for tree species that were cultivated in the private gardens of Clermont-Ferrand, namely, apple trees, pear trees and cherry trees. Secondly, I had a reflection on the seasonality of each proposed species -figures 6.9 and 6.10. Indeed, the choice of trees was also influenced by the color of their foliage and flowers as well as their flowering period. Thus, in addition to having a mix of plants in the area, I am creating a dynamism and a variation of colors which therefore design a space for a visual emancipation. This dynamism created by the flowering period and the colors of the foliage and flowers makes it possible to restore a notion of temporality and diversity in the city.

In addition, I would like to point out that some streets, due to their narrowness, cannot accommodate new tree plantings. In order to remedy this problem, I was inspired by what I observed during a trip to Copenhagen. The Danish capital is renowned for its relationship with

nature and its management of sustainability challenges. Indeed, the streets of the city, even narrow, welcome flowers and climbing plants on the facades, such as rose bushes -figure 6.11.



Figure 7.11 The green urban frontage in Copenhagen (Author's cliché, 2018)

Therefore, I find it interesting to develop this principle of participatory management with green urban frontage in Clermont-Ferrand. This will allow the city's population to be included in the greening operation by embellishing their facades.

Finally, the streets in the city centres of Clermont and Montferrand will benefit from an unprecedented improvement in public spaces, from an aesthetic, social, economic and environmental point of view. Indeed, the introduction of flowering trees and plants has an effect of attraction on the population and therefore can have positive repercussions on businesses and on the attractiveness of the city for new populations as well as tourists. Thus, it will generate

increased income for the municipality and the local population, contributing to the local economy. In addition, the species offered have ecological benefits for the animal and plant environment. The flowers allow polinisation and the increase of exchanges between green spaces. It also allows for better soil quality since insects interact between the soil and the air. Finally, it fights against the mineralisation and waterproofing of the city centre' streets, playing a sponge role during heavy rains -figure 6.12. (appendix 6 to see the section in full page)

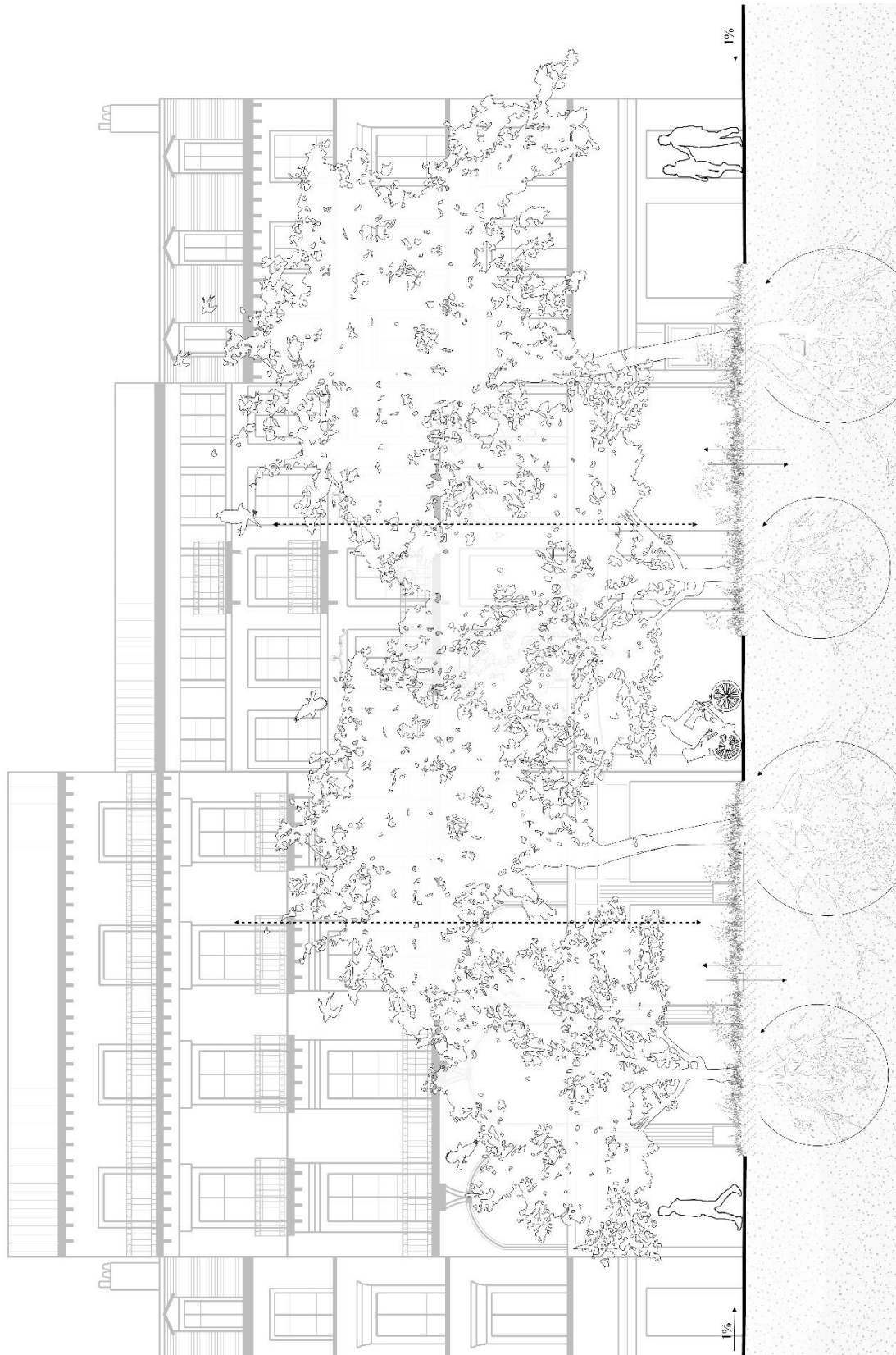


Figure 7.12 Section representing a street from the “themed planting ring” and its ecological values (Author’s illustration, 2021)

7.2.1.2 *The inhabited wood*

The second aspect of my project focuses on the increase and intensification of tree rows and green spaces in Clermont-Ferrand in the outskirts of the city centres of Clermont and Montferrand as well as in the industrial districts -figure 5.16.

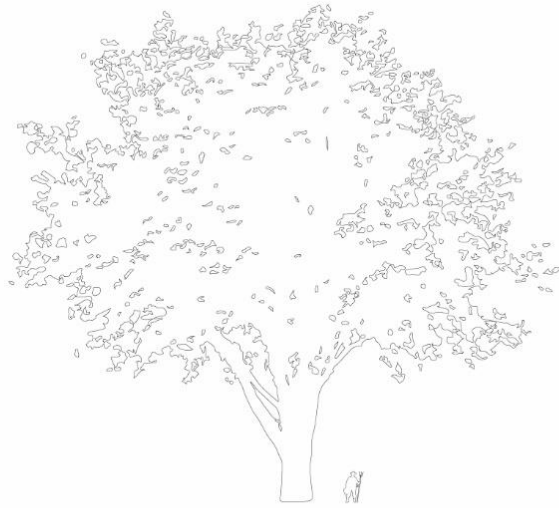
The railway structure will be the backbone of the project as a major support for the connections of green spaces between the different districts of the city. However, a secondary reinforcement must be developed in order to expand the presence of plants in the streets of Clermont-Ferrand.

The concept and idea that I have for the establishment of these new vegetated streets and green spaces is based on the principle of “Bois Habité”, translated to “inhabited wood”, developed by Agence TER in Lille -France (Bava et al., 2018 209). This project was part of a major urban planning operation in Lille. The “Inhabited Wood” project represented a double commitment. Initially, the concept of "wild" nature-city and secondly, the creation of an urban living environment where the interior-exterior relationship has been redesigned to amplify the symbiosis between buildings and nature as represented on figure 6.16 (appendix 8 for full page section). Finally, the “Bois Habité” project also included a concept of planted and generous public spaces where the pedestrian finds himself master of the surface -by placing parking spaces in the building’s underground- and with a constant relationship with living things -figure 6.15 (appendix 7 for full page section).

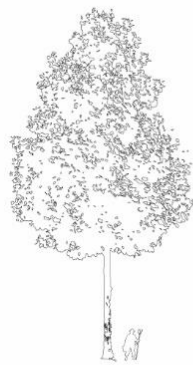
This type of concept will be mainly developed in the wider streets of Clermont-Ferrand so that the trees can fully blossom and so as not to plunge the narrow streets into complete darkness. For narrower streets, smaller species of trees may be planted as well as a staggered planting pattern to allow greater light penetration into the apartments.



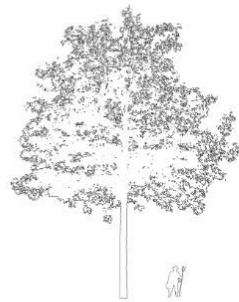
White poplar
Populus alba



Sycamore maple
Acer pseudoplatanus



Tulip tree
Liriodendron tulipifera



Cork oak
Quercus suber



Figure 7.13 Sample of tree species for the inhabited wood and tree's rows (Author's illustration, 2021)

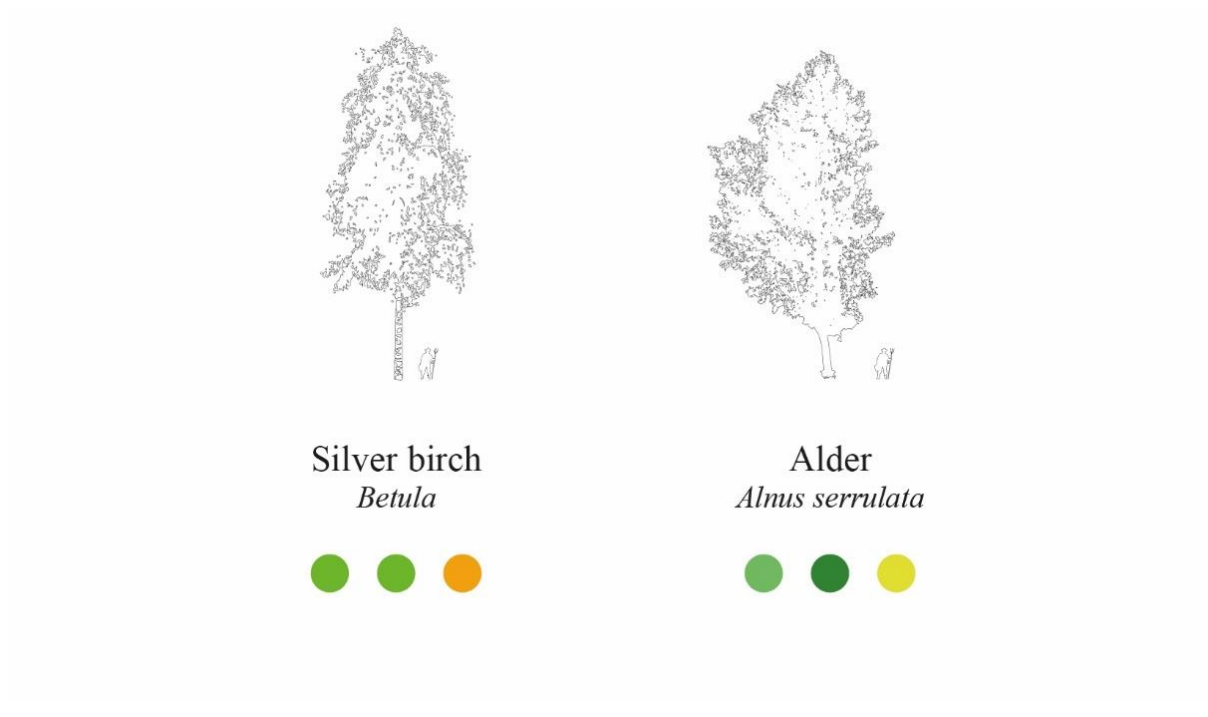


Figure 7.14 Sample of tree species for the inhabited wood and tree's rows (Author's illustration, 2021)

The development of a plant palette seemed important in order to create a diversity of species that can be planted on the territory. This diversity is supported by the tree's species as well as their forms. In fact, I have been willing to have a variety of canopy's form and seasonality with different autumnal colours -figures 6.13 and 6.14. Thus, by establishing this sample of plant palette I propose to solve the problem of the modest diversity of alignment trees proposed by the municipality of Clermont-Ferrand. Indeed, as explained in the part 5.5, the city has chosen to bet on the planting of plane trees - *Platanus hispanica* - on most part of the city. As a result, Clermont-Ferrand faces the problem with communicable diseases within the same tree species.

Through the heterogeneity that I intend to establish, I reduce the risk of disease and therefore of massive slaughter of plane trees, as well as creating a more dynamic and prosperous living environment for living species.

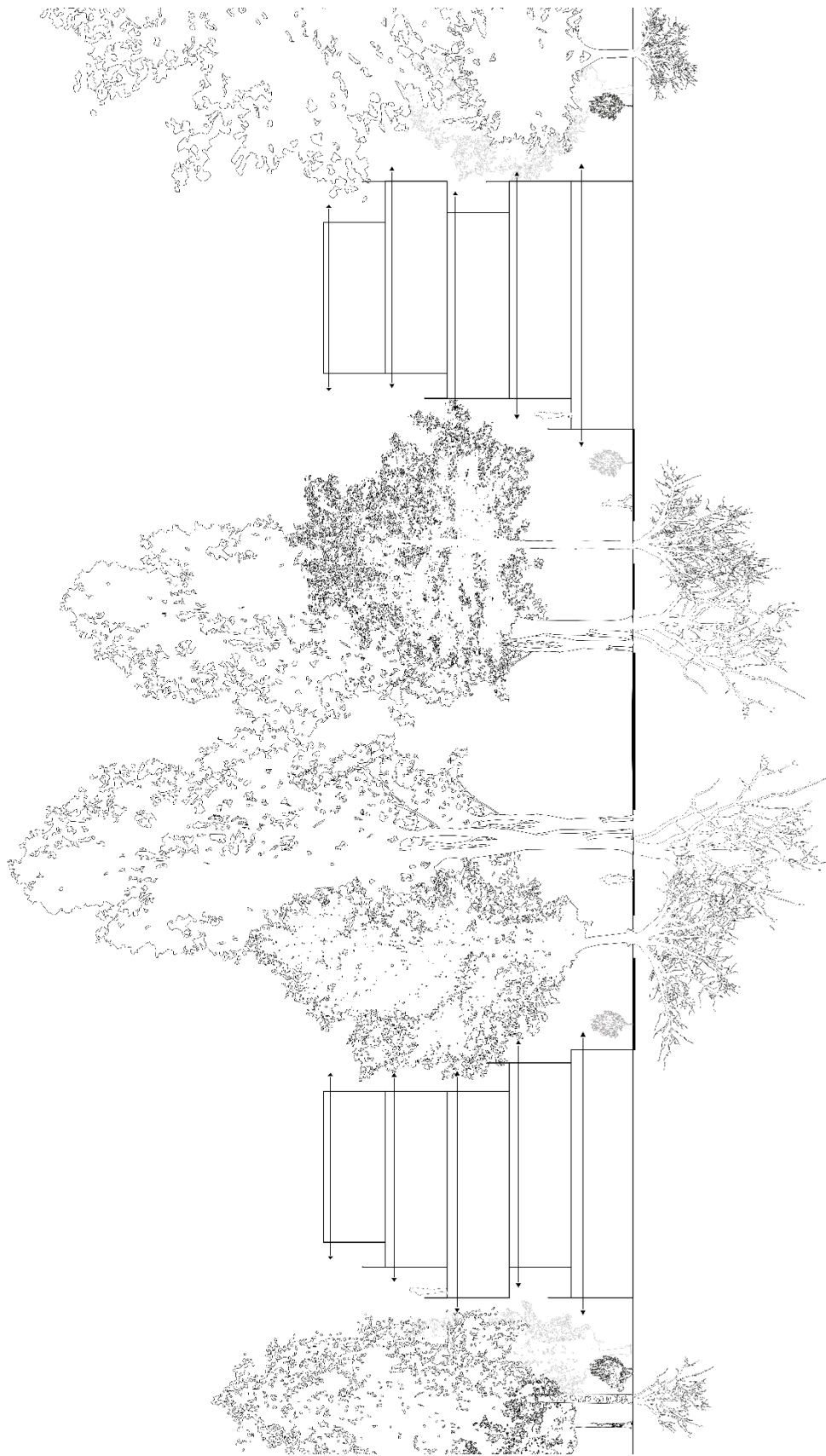


Figure 7.15 Section representing the inhabited wood concept (Author's illustration, 2021)

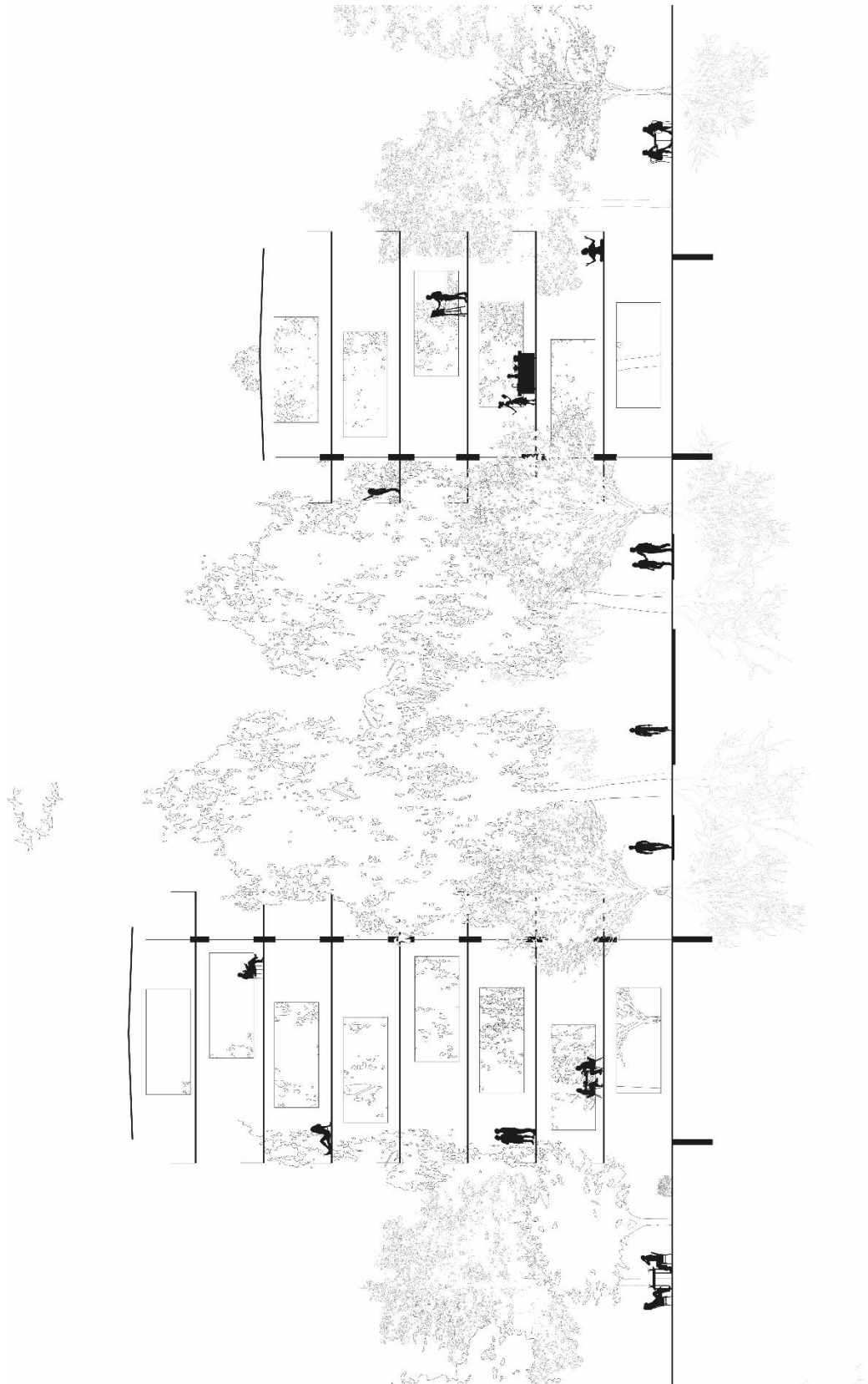


Figure 7.16 Conceptual section representing the inside/outside relationship (Author's illustration, 2021)

Finally, in addition to the “Bois Habité” concept and the intensification of tree’s alignments, I want to develop “pocket parks”. This idea emerged in the Greek capital of Athens. The design proposed in Athens intend to tackle air pollution and heat island effect in the inner city, by transforming small plots that were not used into green spaces (Kyvrikosaios, 2021). Therefore, making the capital city greener, cooler and improving dwellers’ quality of life.

The development of such a concept in Clermont-Ferrand may happen, especially in the industrial areas where a large number of plots are abandoned or not fully used. These areas area also designed for car users primarily. Thereby, by filling the unused plots with greeneries and making attractive pocket parks for residents of the surroundings, that would potentially increase the usage of the space by pedestrians. However, it is important to identify upstream the potential areas where a such project could be viable. Moreover, a green master plan for this part of the project would need to be developed, following the concept of park system designed by Frederick Olmsted in Boston with the Emerald Necklace Park (appendix 9). This landscape precedent is relevant as it provides a place to which people can come for healthful relief from the pollution, noise and overcrowding of city life. While at the same time creating an ecological corridor for plants, water and animals. Thus, reducing interactions between pedestrians and automobiles, making it safer and more enjoyable for the pedestrians.

7.2.1.3 Awakening of the water

The last point of my project that seems essential to me is the lack of water in the city of Clermont-Ferrand. Indeed, as Karin Helms argued during our interview, "*water is the element bringing life*" (Helms, 2020 199). On the one hand for the fauna and flora but also for the mankind with an effect of attraction and therefore creation of a meeting point with water as a central element.

Water plays an unprecedented role in regulating ambient air and increasing biodiversity. Thus, I propose areas to the open up of the Tiretaine river. An important river in the history of the city. In fact, this river was first used by Clermont and Montferrand as a protection’s tool during the Middle Ages. The river encircled the two ancient cores, following the path of the old protective ramparts. Ramparts which no longer exist today. Therefore, by reintroducing the water to its

original trace, I try to highlight the ancient history of the metropolis by the bias of the blue element.

In addition, the reopening of the river would make it possible to awaken the people of Clermont about water issues as well as reconnect the population to its landscape. Indeed, the new generations and new dwellers to the city are unaware of the marshy history of the city and of the presence of water on the soil of Clermont-Ferrand. So by resurfacing the Tiretaine river, I recreate a link between the blue element and the local population. In addition to these links, the reopening of rivers would allow the creation of new green and public spaces from which the population would benefit.

Finally, so that the water in the rivers remains as pure as possible during their journey through the Clermont-Ferrand metropolis, before going to the Allier, I suggest the use of phytoremediation. In fact, the phytoremediation *“is the use of plants and their associated microbes for environmental cleanup”* (Pilon-Smits, 2005 210). Moreover, it is said that *“phytoremediation is an efficient cleanup technology for a variety of organic and inorganic pollutants”* (Pilon-Smits, 2005 210). This technique may be very useful in the case of Clermont-Ferrand, as the Tiretaine is passing through high densely populated areas as well as industrial zones -Michelin sites for instance.

Therefore, I developed a phytoremediation plant palette that have cleanup properties for the water illustrated on figure 6.17.



Soft rush
Juncus effusus



Cattail
Typha



Water hook-moss
Warnstorfia fluitans



Bonfire moss
Funaria hygrometrica

Figure 7.17 Phytoremediation plants and mosses (Author's illustration, 2021)

7.2.1.4 Proposal's sum up

Michelin and the rubber production have played an important role in the growing process that occurred in Clermont-Ferrand. By providing employment, great housings and facilities, the company attracted new residents. The development of the Michelin town and large production sites in Clermont-Ferrand have influenced the natural elements of the territory. The lack of orientations and management from the municipality has led to an uncontrolled urban development.

However, after the World War II, the municipality started to implement urban planning strategies so as to reconstruct the country and absorb the population coming from the nearby rural areas. Therefore, the city of Clermont-Ferrand has seen a rapid development of large projects, without taking into consideration the territorial and local landscape.

The project that I aim to implement for the territory of Clermont-Ferrand is a territorial urban planning project. The proposal has been developed through the lens of the research and based on findings of the case study research. Moreover, the proposal for a new landscape frame of Clermont-Ferrand, has been elaborated by taking into account several layers, namely, history, environmental, morphologies, etc. Thereby, establishing a stronger cultural landscape retracing the history of the territory. It is, therefore, a multi-scale approach based on the geographical arrangements of a site to, ultimately, serving as a framework for the invention of urban morphologies adapted to the context. Thereby, the landscape becomes the founder of the city-territory. Actions in large areas cover very long periods of time. This is why my project can be perceived today as an utopian project and difficult to achieve in view of the current situation in Clermont-Ferrand. Nevertheless, utopias build and fabricate the future. What seems utopian today will most certainly be the basis for building our societies in some years from now. Even though it may be perceived as utopic for now, the landscape-planning proposal presented is based on already existing morphologies. Thus, my project may happen and I want it to be considered, yet in a long-term strategy.

Along with major planning projects, concrete and targeted actions from the population may led to new urban projects. Citizen involvement is now measured by the more sustained engagement of all urban stakeholders, including designers, in the consultation process.

Finally, I think that the development of my landscape project for the city of Clermont-Ferrand aligns with the directions that the city is trying to take through its urban planning plans. In addition, Michelin, over the years, replaces its industrial production with managerial positions within the metropolis. As a result, the brand delegates its land either to the municipality or to private investors. This gradual withdrawal of Michelin's production functions from Clermont-Ferrand is a real opportunity to anchor and develop a strong landscape structure that identifies with the city while keeping the industrial history of the site and the city.

7.3 Reflection

This last part is going to bring my thoughts and reflection towards the elaboration of a project-based master thesis within the Urban Ecological Planning master program. At the same time, it is going to conclude the thesis journey.

Throughout this 2020/2021 academic year, I have completed two simultaneous projects. First, writing my master thesis and graduate from NTNU and the Urban Ecological Planning program. Secondly, validate my first year of my second master degree in Landscape Architecture followed at the Arkitektur- og designhøgskolen i Oslo (AHO).

The combination of two masters has been possible because of the world sanitary crisis. I have, in fact, taken the positive side of the COVID-19 with the establishment of digital learning.

Looking back at the master thesis journey that I have been through this semester, makes me realise what I learnt and the way I approach project today compare to a year ago.

The elaboration of this project-based master thesis has allowed me to solidify and put into practice what I learnt during my master's years. Thus, the development of this thesis clarified the way I see urban planning as well as the design process that occurs with it.

When reflecting on the semester, I may say that I enjoyed writing and elaborating a proposal for this master thesis. Even if the theory analysis has been for me quite challenging, it nevertheless, anchored in me strong knowledge regarding the notions treated. However, I have to say that the most exciting and interesting part for me was the analysis chapter and the mapping work as well as the design of the proposal for my city. I have the tendency to think that I am, in fact, more a

designer rather than a researcher. Therefore, it explains my appreciation and motivation I had to develop a project-based master thesis.

Moreover, the result of an in-depth landscape and field analysis, comes from the interaction from both masters. With on the one hand, the urbanistic and theoretical contribution of UEP and on the other hand, the landscape and conceptual visions of AHO.

Furthermore, I may say that this thesis made me realise how important it is to interrogate the site before proceeding to the design process. I have learnt how to design with scale. From the regional to the local one. As well as through scale. Thereby, taking into account all the components that may affect the site and make the layers (history, nature, economic, etc) interact between each-others. I have, thus, understood and learnt to implement a territorial landscape-urban planning. Indeed, I have now fresh eyes and a new analytical vision of how to start a project and taking more seriously into account elements as well as proceeding them before starting the design process. Which allows me to build unique project proposals, aligned with culture and identity depending of the site. Conversely to a copy-paste strategy or fast urban planning.

The time limit of the master thesis has yet limited me to push even further the design process and come with even more precise drawings and plans for specific streets or places in Clermont-Ferrand.

Time management was the major element in the successful completion of this master thesis. Indeed, planning my time and the steps to be validated throughout the preparation of the thesis allowed me to manage my two masters at the same time and therefore have a good overview of my advancement.

In addition, good planning allows you to better anticipate unexpected changes that may occur in the writing process. Indeed, the spring semester 2021 was complicated from a sanitary point of view due to the global pandemic. Indeed, the imposition of significant restrictions by the French government for daily travels, meetings and exchanges have been impacted the writing and research process. However, the COVID crisis taught me to be more flexible and thus find solutions to carry out my thesis.

Finally, the complementarity between landscape architecture and urban planning is an unprecedented asset. This is why I decided to combine these two disciplines in order to have

additional knowledge. Thus have a wider range of action. The alliance of landscape architecture and urban planning is more than an interesting combination to address the issues that our societies and cities are confronted with today. Indeed, as my proposal is showcasing, the development of urban planning through the lens of conceptual landscape architecture, allows a revival of a territorial culture and emancipation of nature combine with human activities.



Figure 7.18 Panorama on Clermont-Ferrand and the Chaîne des Puys (Source: RAWvergnat, 2017)

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Appendices

Appendix 1. The Criteria for Selection (UNESCO)

To be included on the World Heritage List, sites must be of outstanding universal value and meet at least one out of ten selection criteria.

These criteria are explained in the Operational Guidelines for the Implementation of the World Heritage Convention which, besides the text of the Convention, is the main working tool on World Heritage. The criteria are regularly revised by the Committee to reflect the evolution of the World Heritage concept itself.

Until the end of 2004, World Heritage sites were selected on the basis of six cultural and four natural criteria. With the adoption of the revised Operational Guidelines for the Implementation of the World Heritage Convention, only one set of ten criteria exists.

Selection criteria:

- (i) to represent a masterpiece of human creative genius;
- (ii) to exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town-planning or landscape design;
- (iii) to bear a unique or at least exceptional testimony to a cultural tradition or to a civilization which is living or which has disappeared;
- (iv) to be an outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates (a) significant stage(s) in human history;
- (v) to be an outstanding example of a traditional human settlement, land-use, or sea-use which is representative of a culture (or cultures), or human interaction with the environment especially when it has become vulnerable under the impact of irreversible change;
- (vi) to be directly or tangibly associated with events or living traditions, with ideas, or with beliefs, with artistic and literary works of outstanding universal significance. (The Committee considers that this criterion should preferably be used in conjunction with other criteria);

- (vii) to contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance;
- (viii) to be outstanding examples representing major stages of earth's history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features;
- (ix) to be outstanding examples representing significant on-going ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals;
- (x) to contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation.

Operational Guidelines (year)	Cultural criteria						Natural criteria			
2002	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(i)	(ii)	(iii)	(iv)
2005	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(viii)	(ix)	(vii)	(x)

The protection, management, authenticity and integrity of properties are also important considerations. Since 1992 significant interactions between people and the natural environment have been recognized as cultural landscapes.

Appendix 2. Interview transcript of Gregory Bernard

Présentation :

Je suis adjoint à l'urbanisme depuis 2014, élu en 2008, j'avais moins de 30 ans quand j'ai été élu ; plus jeune élu de la ville. Délégation sur les questions de l'urbanisme, auprès de l'adjoint. Très tôt j'ai travaillé sur des sujets d'urbanisme. Dans le civil j'enseigne l'histoire et la géographie. On peut dire que l'aménagement n'est pas mon métier, je ne suis pas un pro, mais je pense que c'est une bonne chose, lorsque se ne sont pas les pro lorsqu'il y a des choix à faire. Mais au travers la géo, j'ai un regard sur le territoire et de l'espace par le prisme de la géo. En 2014, je deviens adjoint et j'ai déjà une vision, de ce qui marche, ce qu'il fonctionne ou non, ...

La dimension générationnelle a une importance ; la génération des 30 Glorieuses a vécu dans un imaginaire de la voiture, du supermarché, ... construit autour de l'automobile, particulièrement fort dans cette ville. La dimension générationnelle existe, car je suis de la génération d'après. Je suis un urbain d'aujourd'hui donc qui n'a plus vraiment besoin de sa voiture, je me déplace en transports en communs, vélo, à pied ... en soit le principal de ma vie se passe dans le centre-ville. Mes attentes sont différentes que celle d'une personne qui prend tous les soirs sa voiture pour rentrer dans son lotissement. La notion de nature en ville, passe par qui l'on est et d'où l'on vient. Dimension générationnelle et sociologique existe.

Conviction (politique) forte sur la question du Développement Durable ainsi que sur l'équilibre entre l'Homme et Nature. Idée que sur l'écosystème urbain, la nature, à un rôle, et que c'est un élément de co-construction de la ville. C'est une énergie qui est utilisable, avec des points avantageux qui sont loin d'être négligeables. La nature est souvent présentée sous **l'aspect esthétique**, avec l'embellissement, le verdissement. On a le risque du greenwashing généralisé, on ne fait que peindre en ville, dimension esthétique importante car elle il ne faut pas la mépriser, car ce qu'il se joue **c'est l'image de la ville** (qu'est-ce qu'est une belle ville, ... ?), question sur **la santé des habitants** (écosystème qualité de l'air, ...). Le végétal apporte du positif. La nature dans la ville a un autre avantage, avec la **température** de la ville ; on lutte contre les ilots de chaleur urbains, Avec des relevés que l'on a faits on a remarqué une variation de température de plusieurs degrés à l'échelle d'un quartier. Dans un moment où l'humanité dépense plus pour

rafraichir que chauffer. La climatisation représente plus de dépense que le chauffage à l'échelle mondial, c'est une vraie chance que de pouvoir utiliser la nature dans la ville. Autre avantage, ombre, biodiversité, on peut développer encore les avantages, mais **le principal c'est la température, la cadre de vie, esthétisme, un bien être urbain**. Les habitants désirent le retour de la nature dans la ville, et lorsque l'on fait des espaces verts, il se sente bien, etc. On amène de **la sociabilité**, les enfants y vont jouer, le jardin que l'on cultive ensemble, la nature dans la ville a tous ces avantages.

Clermont-Ferrand est une ville très minéral dû à l'automobile, c'est lié, avec des autoroutes urbaines, ..., cela explique que le piéton à un espace limité, donc l'espace ou l'on pourrait mettre du végétal est limité. On veut renverser la tendance. Il y a une approche générationnelle, et personnelle, et une conviction politique par le PLU.

2 aspects : urbanisme de projet / la place de la nature dans la ville : remarquable dans ce document.

Pourquoi à Clermont-Ferrand c'est plus difficile ?

Il faut reprendre l'histoire de la ville avec la présence de Michelin, ainsi qu'**approche économique**, qui va dans le sens d'une **ville hygiénique**, peu couteuse à entretenir, plus simple. C'est un élément important à prendre en compte ; ça coute plus cher d'entretenir de la terre qu'un m² de goudron, on l'on passe juste le jet d'eau, donc important aspect économique, et un aspect hygiénique dans la représentation d'une ville.

Comment développer la nature dans la ville ?

PLU va loin mais dans un champ privé, car il ne régleme que ça, il ne régleme pas l'espace public, car opposable aux constructions, régleme qui permet d'aménager une parcelle mais privé. Projet d'aménagement doit respecter les règles du PLU. Puis signature du permis d'aménager, permis de construire. Voilà à quoi sert le PLU.

PADD est un vrai document pour une vision, une projection, qui va plus loin. L'usage du PLU, ce a quoi il sert, c'est d'autoriser tels ou tels constructions/aménagements. Au travers de l'article 4, avec la question des espaces verts urbains privés. De ce point de vue, c'est un document remarquable ou l'on peut voir les résultats dès à présent. Il y a une différence dans les permis

d'aménager d'aujourd'hui et ceux dit il y a 5 ans. On a renversé le paradigme qui avant donner du droit à construire (coefficient d'occupation du sol) ; aujourd'hui le coefficient des sols a été remplacé par le coefficient de biotope, un devoir de préserver ; il dit que sur une parcelle de tant de m², tant doit être pour la préservation de la biodiversité. Une nouvelle biodiversité, par le biais des toitures, murs végétalisés.

La règle de l'urbanisme a de vraies importances dans la réalité, c'est elle qui fait la matérialité de la ville, ce qui se construit, la forme que prend la ville au travers des règles que l'on prend.

Autre bien fait de la nature en ville, c'est la **vulnérabilité aux risques**, aux risques d'inondations, plus de nature donc moins de vulnérabilité ; l'artificialisation des sols accentue la violence de ces risques. Stratégie de réduction du risque en ville.

Par rapport à votre question, c'est l'angle mort car c'est ce qui est le plus dur à traiter ; plutôt qu'espaces verts publics, c'est **la question du vert dans les espaces publics**. C'est-à-dire, les espaces verts aux sens parcs et jardins, me semble une notion dépassée, nous avons besoin de parcs publics, de différentes tailles. C'est évidemment important dans une ville, on pourrait se poser la question de nouveaux parcs dans la ville. Carte isochrome, pour voir la distance pour « rejoindre » un parc [...].

Le plan vert, il y a des zones d'ombres, et dans ces zones on va créer des parcs. Pour le moment pas le temps de mettre cela en place. Car bcp de chose à gérer mais dans un coin de ma tête, avec le droit au parc. Très intéressant. Le négatif de la carte isochrome, c'est le plan vert qui doit programmer la création d'espace vert.

La nature dans la ville n'est pas que les espaces verts publics. La place du vert doit prendre bcp plus d'ampleur.

Par le terme « vert » vous entendez quoi ?

Il ne faut pas être trop précis, car il doit se développer par toutes ses formes. Sur des places, nous devons les arborés, ... La limite c'est que l'on n'a pas choisi de le faire de façon réglementaire ; nous aurions pu faire une OAP sur les espaces publics, pour contraindre nos aménagements. On le fait sur les gros aménagements mais moins pour les petits aménagements de rues.

Sur les grands aménagements on le fait, comme sur l'aménagement de la future scène nationale et de la piscine Coubertin. [...]

Zone de rencontre créer entre piéton et automobile

Fermeture de la voirie

Création d'espaces verts entre la piscine et la scène nationale

C'est travaillé dans le cadre d'un aménagement public, dessiner par notre bureau d'étude interne.

Appendix 3. Interview transcript of Nicolas Bonnet

Présentation :

Nicolas Bonnet né à Clermont-Ferrand, 37 ans, adjoint au dvlpt durable, de l'eau et de l'assainissement. Elus depuis mars 2014, adjoint depuis septembre 2014. Ingénieur informatique de formation à L'ISMA des Cézeaux.

La place des espaces verts ?

En proportion sur les rues végétalisées, il n'y en a peu. On n'a pas fait en frontage c'est en projet. Cf. Grégory. Sur les rues avec arbres, il y en a mais insuffisamment. La vision de la ville par les habitants c'est la nature autour mais pas dedans, très minérale, de progrès à faire dessus. Niveau parc, il y a des squares, des fois un peu trop minéraux dans certains cas.

Répartition ? (Ne répond pas à la question, car n'a pas pleinement connaissance de tous les espaces verts)

Fait référence à Grégory.

Quantité et qualité ?

Sur l'espace public c'est insuffisant, il n'y a pas photo.

Des progrès à faire ?

Classement refuge LPO, de Monjuzet et Creux de l'Enfer. On va couper moins souvent, voir laisser les herbes monter bcp plus haut, pour avoir une meilleure biodiversité.

Revue les façons de traiter sur les espaces publics avec les produits phytosanitaire. Moins entretenir la partie végétation de l'espace publics.

Les apports ?

En termes de qualité de vie, flagrant lorsqu'il fait chaud en été, avec les canicules, et il y en a de plus en plus. Lorsque l'on a une ville bitumiser, on remarque qu'il fait plus chaud avec la réflexion de la température (effet de l'îlot de chaleur), alors que la terre émet davantage de fraîcheur. La

verdure apporte de la fraîcheur, que la terre peut « relarguer », expliquer par des scientifiques du PIAF (laboratoire de Clermont-Ferrand).

Une conséquence de la qualité de vie, donc rend attractif.

Mouvement de proximité de la nature, ne pas forcément avoir besoin de sortir de la ville pour trouver de la nature. Développement des transports en commun pour sortir de la ville, avec les côtes de Clermont, ou il y a très peu de bus. C'est un ONS. Un espace vert à valoriser, c'est le poumon vert de la métropole, et on pourrait développer le fait d'y aller plus souvent, en développant les transports en communs.

Projet de parc s'intégrant dans la trame bleue, dans le quartier de Fontgièvre. Avec la création d'un bassin d'orage pour limiter les inondations (risque).

Les usages ? Pourquoi aller dans les rues végétalisées ?

Contact avec la nature peu détendre et faire diminuer le stress. Il y a un impact sur l'humeur lorsque l'on est dans des espaces verts. Pour prendre l'air, s'aérer, faire courir les enfants dans la nature, espace de détente et de loisir. Lieu de convivialité. Lieu de rencontre.

L'espace vert qui représente la commune ? espace vert idéal ?

Le plus sauvage et agréable, Monjuzet. Plus petit et agréable, le square Amadéo, parce qu'il a un format généralisable, une taille plus restreinte, square de proximité. On ne peut pas faire des jardins lecoq partout mais on peut faire plus de square amadéo dans la ville.

Les manques et points négatifs ?

Nombre insuffisant d'espaces verts.

Plus flagrant dans les rues où il y a un réel manque. On doit reprendre de la place sur la voiture, pour donner plus de place aux piétons et aux vélos ainsi que pour les végétaux.

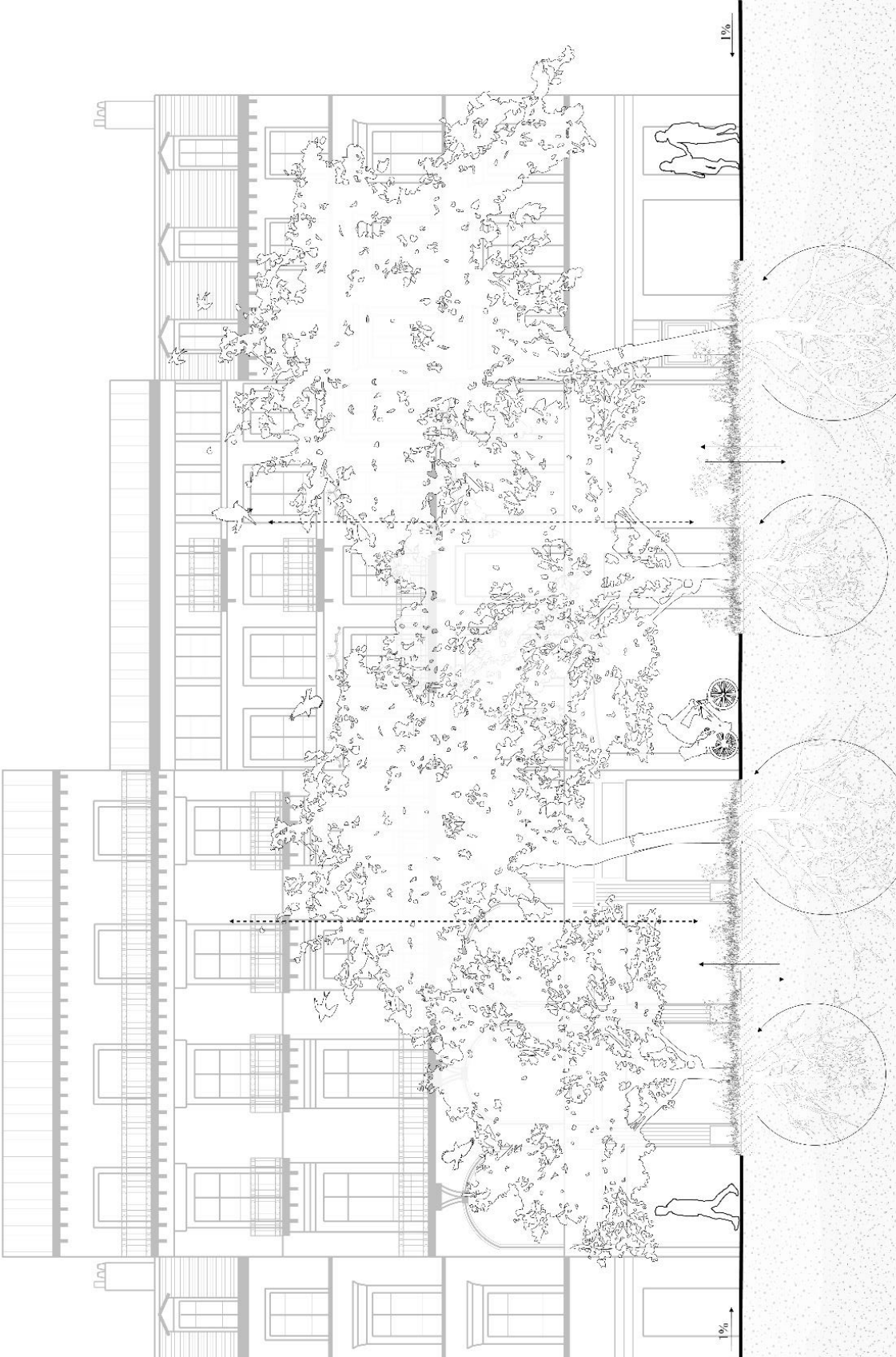
Des projets d'espaces verts ?

La question de l'éco quartier de Trémonteix.

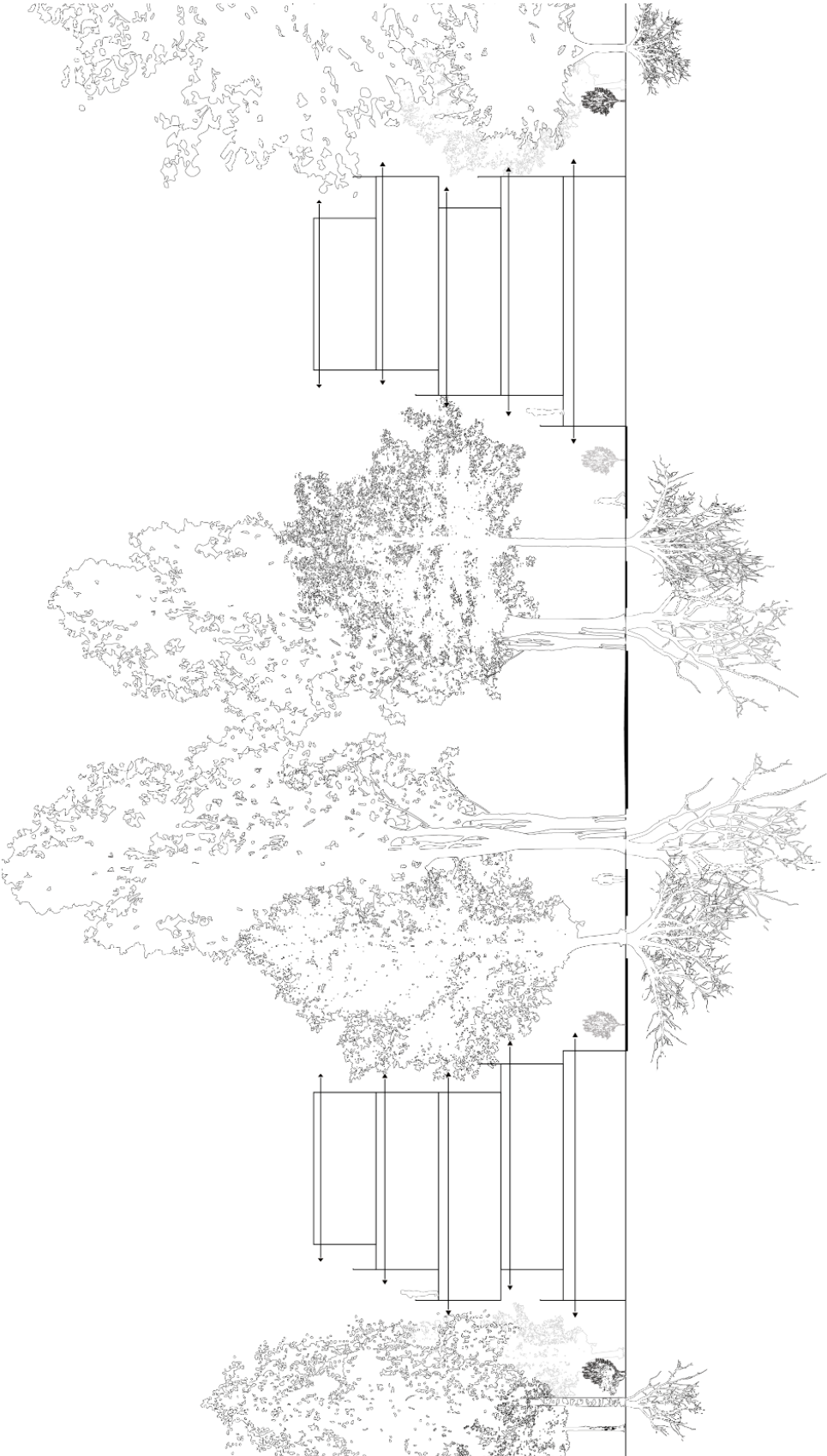
Y a-t-il un réel apport sur les espaces verts ?

Pas énormément, davantage un mode de vie. Que l'éco quartier soit le plus écologique possible, limiter l'impact de l'utilisation de la voiture, des bâtiments à faible consommation voire à énergie positive. Des commerces de proximités. L'insertion d'arbres ou d'espaces verts n'est pas le facteur premier.

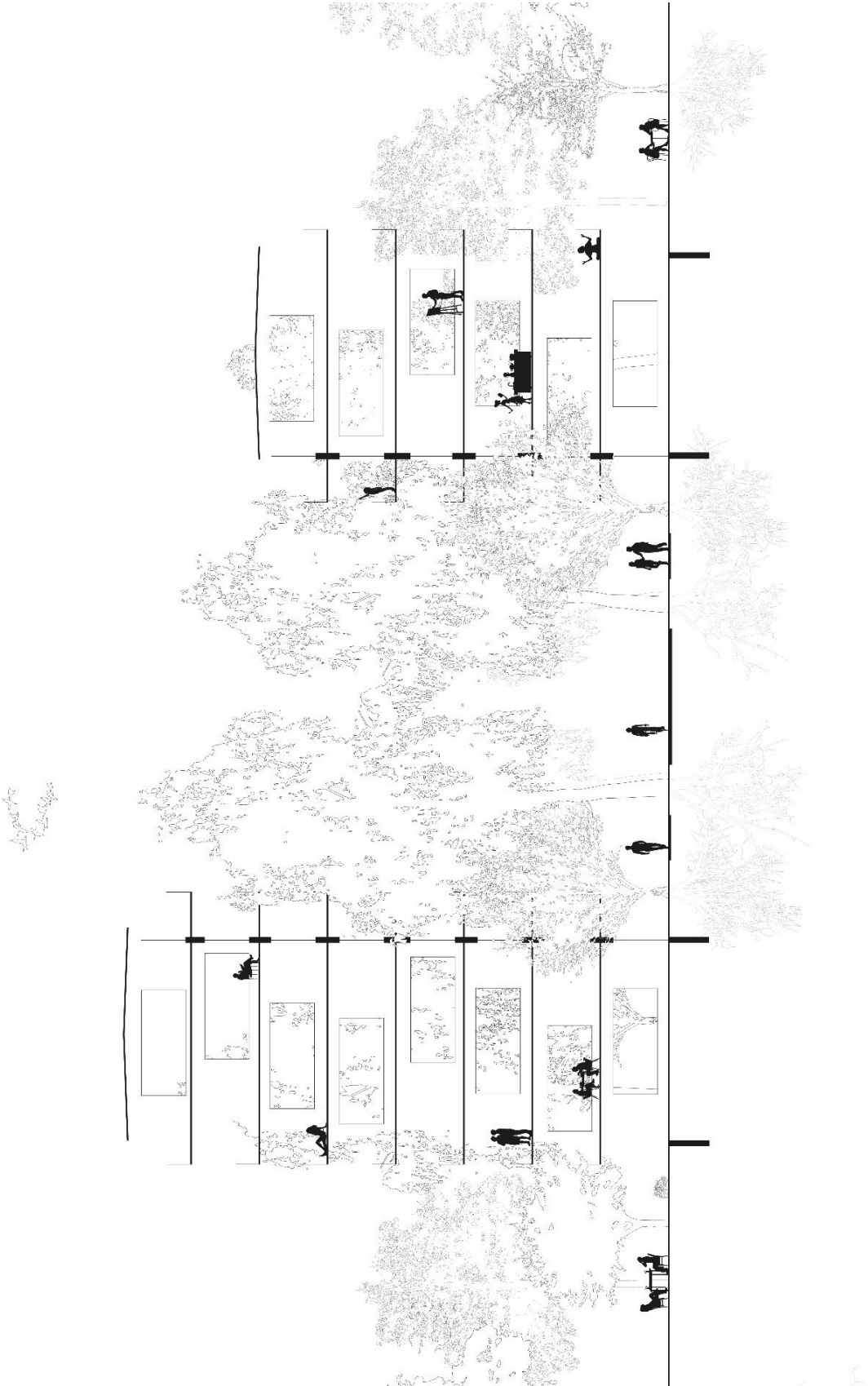
Appendix 6. Section full page



Appendix 7. Section full page



Appendix 8. Section full page



Appendix 9. The Emerald Necklace park system: the plan

