



**Saint-Étienne National School of
Architecture**

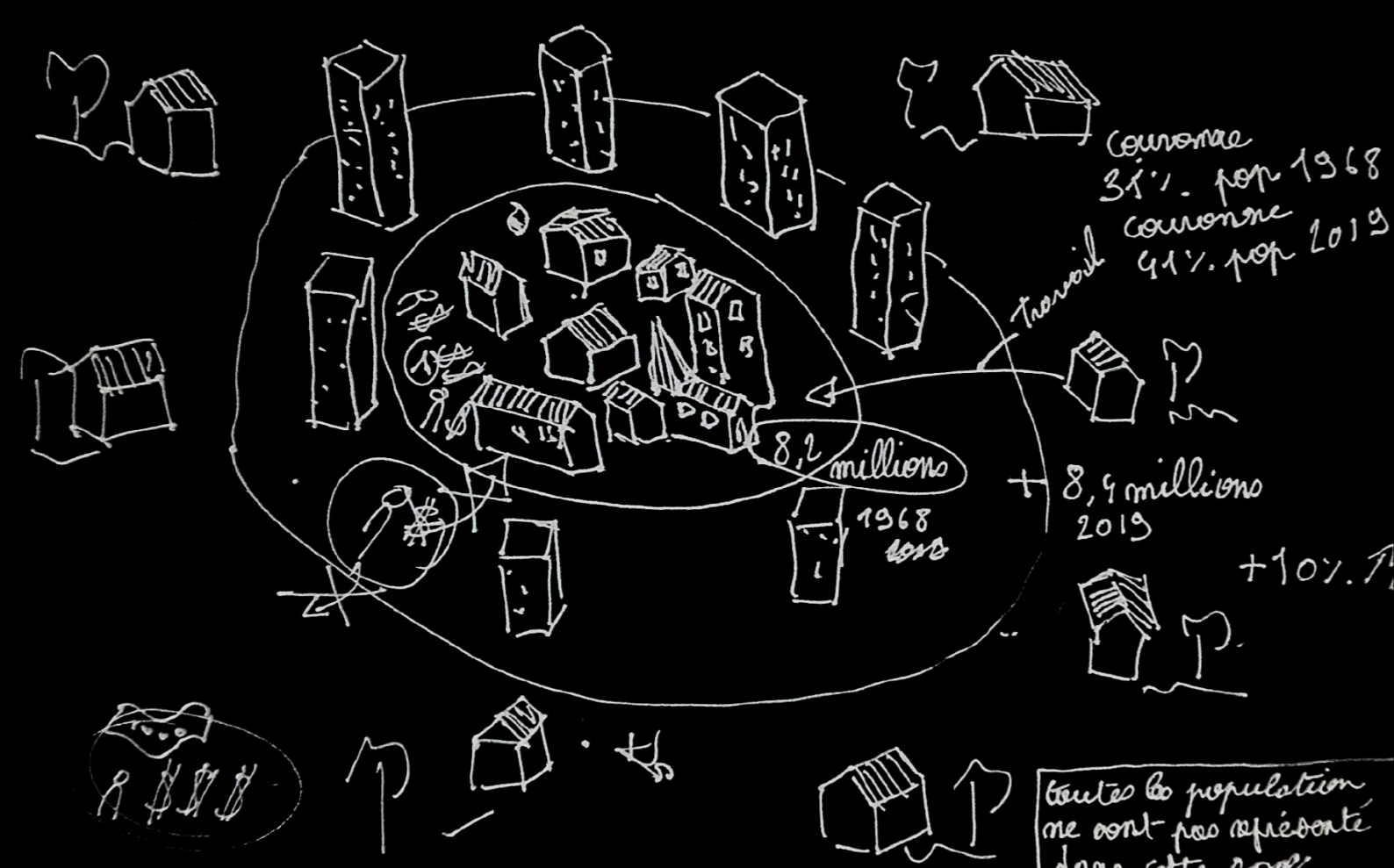
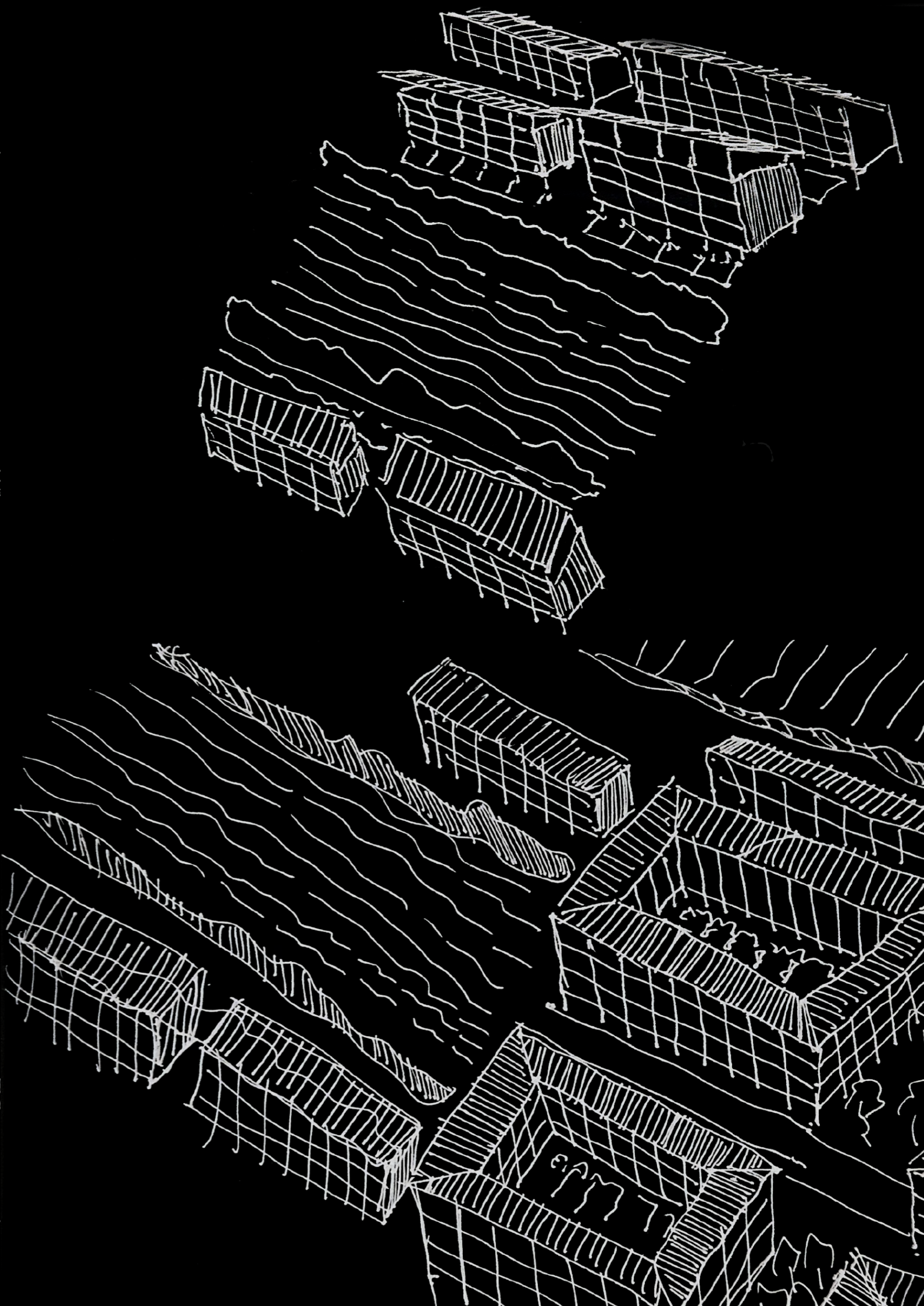
ENSASE

HABITAT PRODUCERS

**Deconstructing our world to create a
new one for us to inhabit.**

PATUCCA Roman

**Master's thesis, February 2025
Seminar: Housing: resources, transformations, scales.
Thesis supervisor: Jorn GARLEFF**



Thank you to my family, friends and teachers who have supported me. To all those who have always had the patience to listen to me talk about my projects, thank you for criticising me, challenging me and reassuring me.

Industrial poem

Man loves, he walks.
Man loves to walk because he is a man.
Man loves to travel because he has a visceral need for new horizons.
Man loves his home because he loves his differences.
Man loves industry because he loves comfort.
Man has lost his way because he has forgotten his home.
Man loves artificial horizons.
Man no longer loves, he no longer walks.
Man is destroyed...

There is no walking under the sky of an infinite city...

Roman Patucca

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Introduction

“Has man condemned himself by inventing progress? Have we built our own hell, a hell in our own image? Today’s industry does not seem to have brought the light we had hoped for. Is it not serving production for production’s sake? We may no longer even know why we produce. The social and ecological crises of past generations are still with us.”

During our readings, we had the opportunity to encounter various texts and authors, including:

- Andrés Duany’s article criticising traditional American cities in AD Architectural magazine.
- Jeanne Gang explains the benefits of architectural grafting on existing buildings.
- Sébastien Marot and his book ‘Prendre la clef des champs’ (Taking to the Fields), which presents several possible future scenarios in which cities and the countryside merge.

During these explorations, it became clear to us that housing crystallises many of today’s social and ecological issues. Housing is symbolically a centre of life in many human societies. That is why this thesis aims to reflect on our current housing situation in order to identify new urban utopias. With the aim of giving hope to our generation, the following questions arise:

What issues arise from our relationship with consumption in today’s society?

How can we change our relationship with consumption in our homes?

How can we transpose the concept of Habitat Producteur (Productive Housing) to the city level?

These questions raise the following issue:

How can we change our relationship with consumption in our homes, on a city-wide scale?

This thesis will seek to redefine the terms “productive habitats”, “productive typologies”, “production systems”, “resources within a productive habitat”, “community urban frameworks” and “hybrid community cities”.

The body of this thesis is mainly composed of readings and case studies. We began by searching for information that reflects current urban planning in our cities. We sought to identify the issues. Then we proposed possible

answers based on studies of theoretical, urban and architectural projects. Finally, we sought to propose a method of reflection that could help to obtain a different architectural perspective on the world.

It is important to note that this paper does not aim to develop an urban theory. Here, we simply seek to address topics that would be interesting to study in the future. Due to a lack of time, knowledge and skills, this paper cannot cover all of the many topics it develops. This thesis should be read as an open invitation to question the ways in which we live.

We will begin our journey by questioning our view of the world and the nature of our relationship with consumption. Our relationship with consumption reflects the relationship that we, as humans, develop with the means we use to satisfy our primary and secondary needs in our society. The idea is first to see what issues this relationship with consumption raises in our society today. These questions lead us to wonder whether other myths are possible for envisaging a different relationship with consumption in our daily lives, and thus maintaining other relationships with the world.

After identifying the issues raised by the consumption of resources that cannot be recycled, we will focus on solutions for changing our relationship with consumption in our homes. Case studies will then be necessary.

The first study will focus on ‘Naturhus’ (houses/greenhouses in Sweden). These houses demonstrate the potential and various possibilities of a habitat that produces energy and food resources.

The second study will focus on a theoretical architectural project proposal. This project was designed as part of an Erasmus exchange programme during the first year of a Master’s degree in Cologne, Germany. The project was called ‘The Urban Farming Project’. It proposes the hybridisation of production systems in the heart of the city.

The third study will focus on urban development in the city of Freiburg, Germany. This city has successfully created new housing models that work in synergy with innovative energy production systems. The urban innovations in this city have also created new conflicts, raising legitimate questions about our current society.

The case studies will then be used to propose ways of redefining the concepts of housing, production systems and the city. Redefining these concepts will enable us to establish a theoretical thought process for envisaging other relationships with the world in our habitats.

The first part will be devoted to researching the factors that could enable architects to create new types of housing, so that they can become producers of social and material resources. The aim will be to redefine what constitutes productive housing, a productive type, a production system and a resource in the context of productive housing.

The second part will question the scale of the resources we use to design our resources. Are we obliged to build oversized factories? Do we always have to produce faster? What size of production tools would enable humans to finally control what they produce?

The third part will discuss the potential benefits that productive habitats could bring to existing cities. Finally, it will offer a glimpse of just a small part of the possibilities that a city producing its own resources could offer. We will discuss redefining what constitutes a community urban fabric and a hybrid community city.

1 - What are the issues arising from our relationship with consumption in today's society?

To identify the issues raised by our relationship with consumption in today's society, it is important to understand the nature of this relationship by examining several factual elements, such as historical data and statistics. These 'facts' will enable us to understand the general issues that our current relationship with consumption raises in the development of new territories.

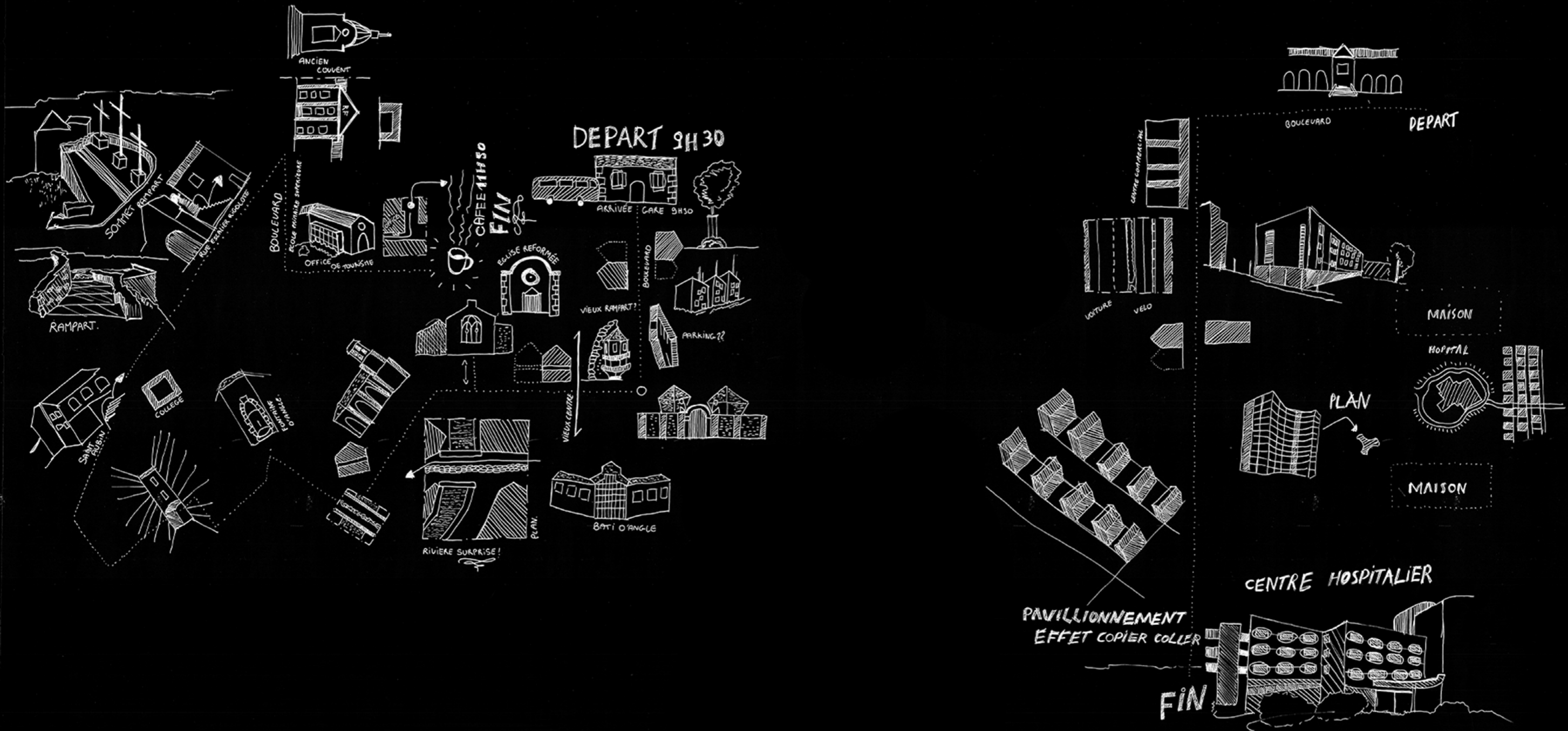


Fig.1 Hand-drawn mind map of the town of Montbrison. This map represents the survey carried out as part of the S5 at ENSASE in 2022. Distances are drawn according to the body's perception of space. The map shows a radical spatial change between the city centre and its outskirts. We can see that the city centre is adapted for pedestrian use, while the outskirts are adapted for car use. The outskirts of Montbrison give the impression of a generic, copy-and-paste space that contrasts with the city's typical historic centre.

1.1 - Historical facts and statistics that describe our relationship with consumption

1.1.1 - Report by the Club of Rome (founded in 1968) ¹

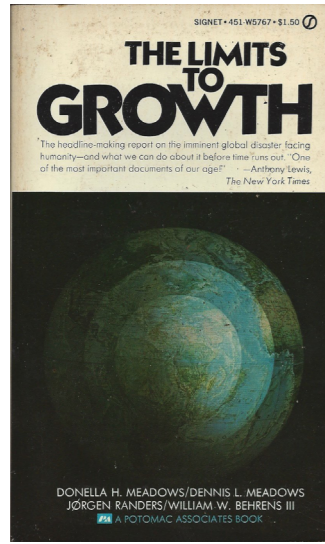


Fig.2 Première de couverture du rapport "The limit to Growth: report for the Club of Rome's Project on the Predicament of Mankind.

In 1970, the Club of Rome, which brings together leaders from major international institutions concerned about the future of the world, commissioned a study from the Massachusetts Institute of Technology (MIT) laboratory to anticipate humanity's future resource needs. This team of 16 doctoral students, led by Jay Forrester and coordinated by Dennis Meadows, spent two years collecting data from around the world on demographics, natural resource consumption, per capita food consumption, industrial production, pollution and environmental degradation, which was then fed into a computer simulation (the World3 model).

In 1972, the results of this study came as a real shock to economists. According to the published report, 'The Limits to Growth: Report for the Club of Rome's Project on the Predicament of Mankind,' our planet had reached the limits of the resources it could produce. Industry could no longer continue to produce without limits. The compilation of all the statistical studies predicted a future disaster due to the Earth's inability to produce resources. Despite this, MIT scientists tried their best to predict positive future scenarios, but to no avail...

Even if the theoretical resources that planet Earth can provide were doubled, statistical studies indicate that a delayed future disaster would

¹ Sébastien Marot, 2024 *Prendre la clef des champs, 1972 Les Limites à la croissance*, page 151. *La clef des champs* is a work that lists several important references on the evolution of architecture in relation to our agricultural industry. Page 151 cites the Club of Rome study.

be more severe.

1.1.2 - The traditional American town in issue 81 of Architectural Design Magazine ²

In 1986, issue 81 of AD magazine, 'Architectural Design Reconstruction / Architectural Design Reconstruction Deconstruction', published an article in which Andrés Duany questioned traditional American cities. Andrés Duany is an urban architect and one of the founders of the 'new urbanism' movement, which seeks to curb the excessive use of cars in today's societies. In this article, Andrés Duany begins by explaining that the general typology of American cities is largely based on the functioning of the car. The architect then severely criticises the urban planners and architects of his time, saying that cars hinder access to culture through fuel dependency and daily commuting times, which can be very long, creating a daily routine of work with no leisure time. To support his criticism, the urban architect makes a crazy but relevant calculation:

"This is the story of an average American who works 243 days a year and commutes one hour each way by car. Calculating the hours spent in the car per year, this represents 60.75 working days, or 12.5 working weeks. Then we calculate how much the average American spends on their car per year at that time, which comes to £4,500."

Following his calculations, the urban architect concluded that, without needing a car to commute to work every day, we could enjoy 12 weeks of holiday and £4,500 to travel wherever we wanted.

² Andry Duany, 1989, n°81 AD Architectural Design, Reconstruction Déconstruction.

1.1.3 - The Universal Paperclips Game ³

Fig. 3 Image from the beginning of the video game: The Universal Paperclips Game.



The Universal Paperclips Game is a video game released on 9 October 2017, created by Frank Lantz of New York University. In this game, you play the role of an artificial intelligence (AI) whose mission is to produce paperclips. The game ends when the player has theoretically converted all the matter on the planet into paperclips. At the heart of our progress in this game is the need to earn trust points from our supervisors, i.e. humans. These points are awarded to players who find solutions to various problems in the game (diseases, global warming, etc.), but this is done with the sole aim of being allocated more computing power by their human creators, the ultimate goal being to be able to continue producing more paper clips, exponentially. This game was inspired by the thinking of Swedish philosopher Nick Bostrom, who set up a thought experiment in 2003 in which an AI produced paper clips.

³ Frantz Lanz, 2017, "Universal Paperclips - decisionproblem" ://www.decisionproblem.com/paperclips/index2.html, consulté le 2 janvier 2025. *The Universal Paperclips Game est un jeu gratuit libre d'accès sur internet.*

1.1.4 Quelques chiffres sur la situation urbaine en France

- From 1968 to 2019: in municipalities with more than 200,000 inhabitants, the population almost doubled, rising from 8.2 million to 15.6 million. These suburbs accounted for 31% of the urban population at that time, compared with 41% today. ⁴

- From 2009 to 2021: 0.5% of the territory was 'consumed' and 67.5% of this 'consumed' territory was for housing; the number of people per household fell from 2.28 to 2.19; the number of vacant dwellings increased by 31%. ⁵

- All analyses by INSEE and the Ministry of Housing show that between 350,000 and 400,000 new homes need to be built each year. ⁶

- The number of new households, which is the primary determinant of housing demand, is expected to fall from around 250,000 per year today to 125,000 per year in 2050. ⁷

⁴ 1. Pierre-Yves Cusset, Alban George, 2024, "Centre, Suburbs, Outskirts: How is the Population Distributed?", p. 6, <https://www.strategie.gouv.fr/sites/strategie.gouv.fr/files/atoms/files/fs-2024-na135-centre-banlieue-peripherie-3avril2024.pdf>, accessed on 5 January 2025.

⁵ 2. Olivier Pégaz-Blanc, Adem Khamallah, 2023, "The need for primary residences: the leading factor in the transformation of natural, agricultural and forest areas for housing", p1, <https://www.insee.fr/fr/statistiques/7721436#consulter>, accessed on 5 January 2025.

⁶ 3. Jean-Claude Driant, Rémi Babut, 2024, "Housing: should we build new homes or renovate existing ones?", p4, <https://www.vie-publique.fr/parole-dexpert/293100-logement-faut-il-construire-des-logements-neufs-ou-renover-lancien>, accessed on 5 January 2025.

⁷ Ibid, p3.

1.1.5 Some figures on the urban situation in Germany ⁸



Fig. 4 Cover pages of the Baukultur 2019 publication.

- From 2000 to 2016: the living space per inhabitant increased from 39.5 to 46.5 m². ⁹
- In 2002, Germany introduced the 'Env 40' decree, which requires new buildings to reduce their usual energy requirements by 25%. From 2016 onwards, the new Env 40 requirements will further increase construction costs by 7%. ¹⁰
- From 2010 to 2013: land consumption for new urban and transport areas was 75 hectares per year. Today, the German government has set a target of 30 hectares per year. This target seems unachievable. ¹¹
- From 2010 to 2015, the immigrant population in Germany rose from 2.58 million to 3.36 million. ¹²
- In 2011, the German Ministry of Energy estimated that only 43% of homes were owner-occupied. ¹³
- From 2012 to 2017 in Berlin, land prices rose by 345%. Nearly 60% of property investors in the city are foreign. ¹⁴

- From 2016 to 2020, in order to meet housing demand, approximately 400,000 new homes would have had to be built each year. This need exists in both urban and rural areas. Only 248,000 homes were completed in 2017. Today, Germany is still trying to build enough to meet this demand for housing. ¹⁵

- In 2016, 44% of completed dwellings were single-family or semi-detached houses. This proportion of dwellings accounted for 60% of the 25.2 million square metres of living space created in the same year. ¹⁶

- In 2018, the Hans Böckler Foundation stated that in 77 of Germany's major cities, nearly 50% of households consist of a single person. Of the 6.7 million single-person households, the current German housing stock only comprises 2.5 million small dwellings. ¹⁷

- Today, in Germany, more than half of the municipalities surveyed believe they are significantly behind schedule in renovating buildings dating from 1949 to 1969. ¹⁸

- In 2035, the German population is estimated to be 83.1 million (compared to 83.3 million today). ¹⁹

- 15 ibid, p29.
- 16 ibid, p29.
- 17 ibid, p30.
- 18 ibid, p59.
- 19 ibid, p28.

⁸ Belinda Rukschcio, Niklas Nitzschke, Jonathan Bratz, Lisa Kreft, Jana-Isabell Knufinke, Louisa Schwöpe (Bundesstiftung Baukultur, BSBK), Heiko Haberle, Federal Foundation for Building Culture, 2019, baukultur 2019, work translated from German into French.

⁹ ibid, p30.

¹⁰ ibid, p94.

¹¹ ibid, p33.

¹² ibid, p28.

¹³ ibid, p59.

¹⁴ ibid, p38-39.

1.2 - Impact and Importance of the Relationship with Consumption in Our Society

Consuming means bringing something to completion. Today, our society's relationship with consumption seems to have reached a certain limit. Studying our consumption therefore means analysing how we use and exhaust the resources available to us. This questioning raises three major issues:

- How can we integrate into our timeframe the time needed for resources to renew themselves?
- Is it our duty to question the production tools we use?
- How can we define our needs based on the situation we are in?

1.2.1 - Earth's Resource Reserves

Writings such as the Club of Rome report and Andrés Duany's article on traditional American cities emphasise that the planet's resources are limited. This assertion demonstrates that our way of life can be called into question. Yet production has become a vital need for humanity, a need that is driving us to transform our world at a pace that seems unsustainable. If this transformation continues unchecked, it could lead to the depletion of agricultural and mineral resources. This would compromise our ability to meet the needs of future generations.

We may then ask ourselves how we can find alternatives to our modes of production and consumption, alternatives that would enable us to better preserve our resources. Currently, production is a necessity. But the way in which we transform our world must be fundamentally questioned. Indeed, it would seem that if we continue to transform our world as we do in modern societies, planet Earth will probably no longer be able to sustain our various human activities.

1.2.2 - Production Tools

Over the past fifty years, the production tools we have developed have radically changed our environment. We have built, concreted and industrialised at an exponential rate, a rate that has ultimately challenged the laws of nature. This acceleration has brought many advances to our society, but it has also caused numerous ecological and social problems.

Our production methods can cause serious accidents for the environment, such as the explosion of the reactor at the Chernobyl nuclear power plant in 1986 in Prypiat, Ukraine. This accident shows the danger of some of our production tools. Nuclear energy, powerful as it may be, can be devastating if it escapes human control.

A more contemporary example illustrating this issue of control would be the use of early artificial intelligence (AI) in our daily lives. One example is ChatGPT, which is one of many different types of AI available for free on the internet.

The game "The Universal Paperclips Game" / "Le jeux universel des trombones"²⁰ illustrates the issues surrounding AI. This video game questions the benefits of artificial intelligence. This little game, in which we play an artificial intelligence that transforms the world into a paperclip, shows the problems posed by AI. Despite all the promises of speed and performance offered by AI, it poses significant challenges in terms of control and alignment. There are still major difficulties in making AI understand what humans want it to do. Governments and scientists are aware of these risks. However, international competition seems to make it impossible to manage AI in a reasonable manner.

It is therefore important to look carefully at our various production tools in order to protect ourselves from an uncontrolled transformation of the world we live in. If we are no longer able to control our production tools, we risk creating environments that are hostile to all forms of life. This is why awareness of our production tools can help us make future choices that allow us, as humans, to transform the world in a sustainable way.

²⁰ Frantz Lanz, op, accessed on 2 January 2025.

1.2.3 - Consumption in relation to regional planning

We are questioning the methods we use to develop and transform our territories. Statistical data from France and Germany covering a period of 50 to 60 years enable us to assess current needs and anticipate future challenges. These two countries face similar issues, particularly with regard to the consumption of natural land, as evidenced by their shared ZAN (Zero Net Artificialisation) objective for their respective territories.

- Peri-urbanisation, which affects cities with more than 200,000 inhabitants, is one of the main drivers of this artificialisation. This artificialisation has led to the gradual sprawl of rural areas. Rural areas are then transformed to be integrated into the urban fabric of cities. This artificialisation then leads to a loss of biodiversity and agricultural land. Two main factors can explain this dynamic:

- The structure of the family unit has diminished in recent years. Added to this is the desire for more living space per person. Single-person households are becoming increasingly common. They struggle to find suitable housing, as the majority of buildings are designed for larger families. In addition, many households want more spacious homes.

The need to build new housing to accommodate a growing population is accompanied by obstacles to the renovation of old buildings. Existing neighbourhoods often lack appeal, and renovation can be more expensive than new construction. This pushes affluent populations to prefer non-urbanised areas on the outskirts of cities. This population shift is pushing cities to build new neighbourhoods by developing virgin land in order to remain attractive.

These dynamics raise a crucial question: how can we develop comfortable cities without consuming all the remaining agricultural and forest land? The stakes are high, because the transformation of land must meet immediate needs while preserving resources for future generations.

1.3 - Questions about our relationship with consumption

Our relationship with consumption forces us to rethink our priorities. Production and consumption are necessities, but their impact on resources and the environment cannot be ignored. Today, we must take new approaches into account in our consumption patterns by setting limits on the exploitation of available resources and regulating production tools to prevent uncontrolled transformation, in order to preserve natural areas while meeting growing urban needs. These new issues require us to have a much more complex view of the world. We must reconsider the planet in terms of the resources it can offer us and those it cannot give us immediately. Unfortunately, it is very difficult to take these new issues into account in our relationship with the world. This is where deconstructing our relationship with the world could help us to integrate all of these new themes. We all need new ways of thinking and living that allow us to better integrate the needs of environmental preservation.

1.3.1 - Questioning our identity

Deconstructing our relationship with the world seems difficult. By nature, humans are condemned to satisfy their needs, and this reality spans generations. However, the resources we leave to future generations are becoming increasingly limited. Today's industry cares little about what it will pass on to future generations. What it produces mainly meets immediate needs, without any long-term vision. This reflects a society focused on individual interests, where consumption serves only one purpose: a kind of auction of comfort.

It is not easy to deconstruct our current view of the world. Although the capitalist system in which we live seems selfish and cold, it also brings us comfort and health. The question is how to challenge our human nature in order to restore a place for living things in our world.

The slightest change in our environment frightens us. Humans are increasingly isolated and alone in the rules they have created for themselves. Like an Instagram filter, social networks sort through different interlocutors and control our encounters. Today, we have become accustomed to living like hospitals, in social spaces that are sanitised and disinfected of any unwanted encounters. Social conflicts are exacerbated by isolation. Faced with these dry and isolating environments, our natural reaction is to want to reconnect with our “wild side”, our “wilderness”. Virtual worlds and travel are probably tools for rediscovering our “wilderness”. In the book “Penser et agir avec la nature” (Thinking and acting with nature) by Catherine Larrère and Raphaël Larrère ²¹ We find this notion of ‘wilderness’ again. This term was coined in response to our society’s domination of nature. The essence of ‘wilderness’ is the desire to preserve nature. If we see nature as another organisation in its own right, it is difficult to imagine a human society without domination. Indeed, wanting to preserve nature at all costs is contradictory to the presence of humans. In its domination, man can also have beneficial effects on nature. An example of this would be nomadic societies. These have always lived in harmony with nature, because their social unity was based on the very functioning of their environment.

Malgré tout, notre confort de vie demande une croissance effrénée de production des ressources. Beaucoup espèrent se reconnecter à la nature. Notre organisation sociale devient malsaine parce qu’il apparaîtrait nécessaire de supprimer nos libertés et de dominer la nature pour préserver l’ordre social. Cette organisation est de plus en plus fragile, car si la nature ne fournit plus de ressource, alors le système qu’est la mondialisation s’écroule.

We are now witnessing a social crisis in our cities, combined with an ecological crisis, which unfortunately often turns into class warfare. Health scandals have multiplied and we are discovering that eating healthily is a privilege reserved for those who can afford it. This is when ecology becomes a class issue rather than a fundamental one. Taking an interest in ecology becomes a way of distinguishing oneself socially.

If modern architectural movements have partially failed to guarantee social and economic dignity for every human being, this could be partly explained by the fact that these movements do not question our relationship with consumption and instead reflect the current dynamic. As a result, we continue to produce buildings that will become impossible to renovate in the near future due to the use of unsustainable materials.

We find ourselves in a new health crisis with increasingly ubiquitous marketing. We no longer really know what is good for us, whether this or that product can satisfy our needs. A society with a high standard of comfort is demanding. In order to own our material goods, it asks us in return

21 Catherine Larrère Raphaël Larrère, 2015, Paris La Découverte, penser et agir avec la nature.

to give our time. So we lose our lives to work, for the sake of so-called collective happiness. The new religion is work. This kind of ‘social life at work’, as exemplified by the excesses of certain start-ups, is nothing more than an attempt to respond to the identity crisis we are all experiencing. The overprotection of our social environments robs us of our critical faculties and makes us more easily exploitable.

1.3.2 - Opening up to a new world

Il nous est actuellement très difficile de déconstruire, transformer notre rapport au monde. Cependant, nous ne sommes pas tous condamnés à poursuivre la philosophie consumériste dans laquelle nous vivons actuellement. Certains philosophes ont écrit sur des nouveaux rapports au monde. On peut citer le philosophe Jacob Von Uexküll. Jacob Von Uexküll développe dans son livre “mondes animaux et mondes humains” ²² A new way of thinking about the living. The philosopher asserts that one should not look at the living being as a “machine,” as a mere “object.” Uexküll sees living beings as complex “subjects” who perceive their environment. This way of seeing things urges us to give an entirely different value to life. We, humans, could evolve our relationship to the living by deconstructing the way we currently look at the world.

To deconstruct, we would need to redefine.

Redefining a term or a notion is a very effective way of proposing other symbols to signify the most important elements that surround and nourish us. For example, redefining the notion of the living can give it a new place.

Redefinition is the recurring exercise of this thesis. It is what allows us to reinvent new meanings and degrees of importance in the relationship to the world we perceive. All of these new meanings would then form a kind of myths. These myths, in turn, would assemble into a new kind of mythology. One can think of the religions of the Celts, where each natural element could have its own divinity. This would then allow us to grant a gradual importance to the elements that make up our environment and the temporality of our daily lives. By looking at how other civilizations lived, we can find much inspiration, potentials that may allow us to draw new relationships to the world.

One of the philosophical paths that could help us would be the idea that each living being perceives different worlds. Our world would, in a sense, be made up of a multitude of different worlds. Each of these worlds would in turn form a different universe.

22 Jacob Von Uexküll, 1956, *Animal Worlds and Human Worlds: followed by the Theory of Meaning*, p.20.

This multitude of worlds would allow us to bring new meanings to notions that, until now, were defined only in opposition to our own world. Nature is often perceived as opposed to humanity.

However, it is imperative to deconstruct this opposition. Humanity is an integral part of nature and coexists with it. It belongs to a territory it must respect in order to guarantee the sustainability of resources. It is essential to redefine the concept of "nature" as a broader concept that concerns several worlds at once.

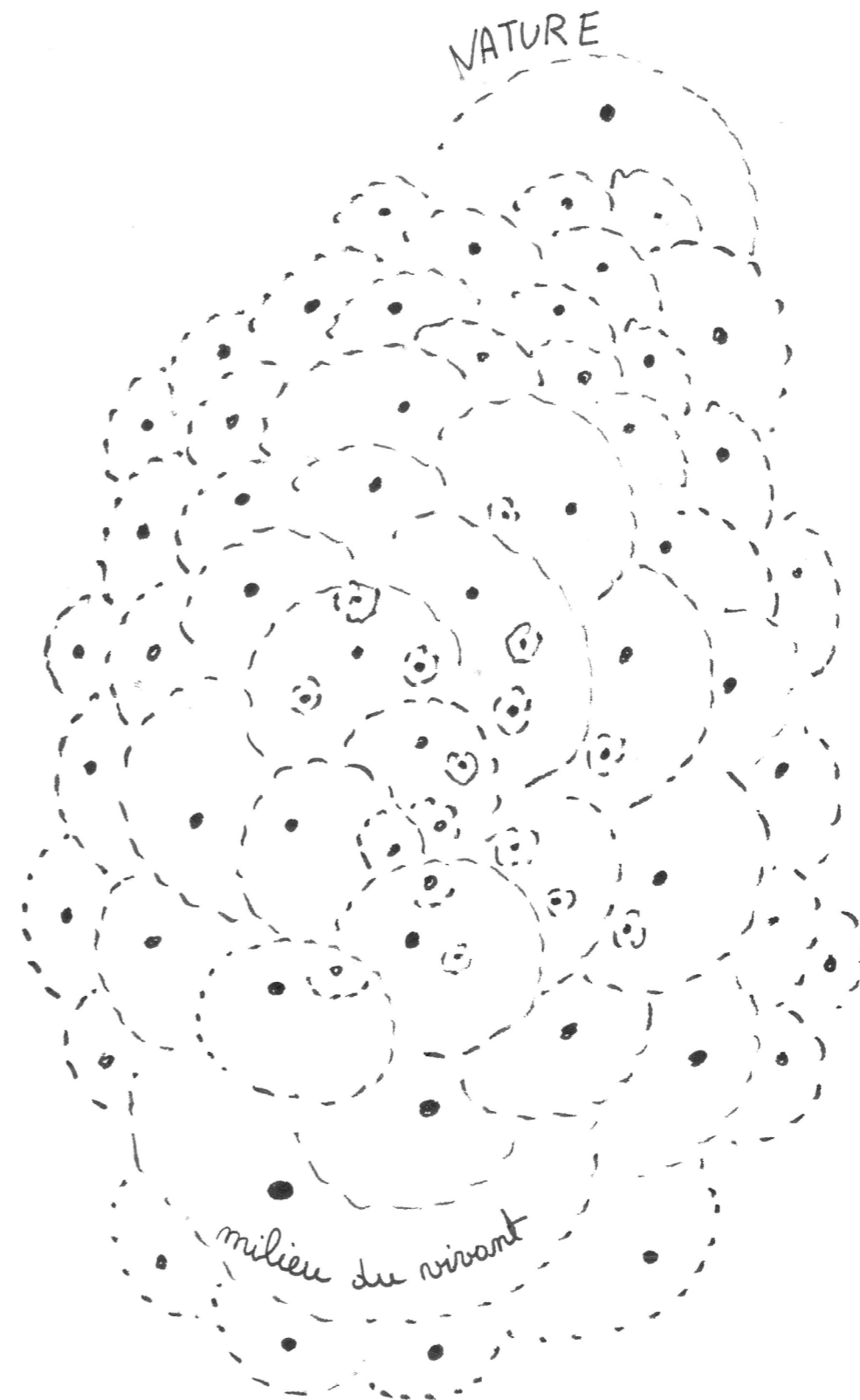
The concept of the word nature differs in perception depending on whether one is a cat or a human. We, humans, would then be aware that each symbol and word encompasses different meanings, according to the different worlds and universes each living being inhabits. It is a kind of attempt to have more empathy for what surrounds us in order to better understand our place and our needs.

By refusing to question our place and our needs in architecture, we limit our ability to design structures that redefine this relationship.

To admit that several worlds could coexist together would be an act that calls into question our legitimacy in exploiting resources. If meeting our needs destroys other worlds, then in what way is the world in which we live more important? Why should our needs take precedence over the needs of the living? We should sit together and reflect on a new vision of the world we inhabit. It is a call to conceive a new mythology.

To be able to glimpse this new reality, the figure of habitat is interesting to study. The figure of habitat designates the environment in which one lives. Studying habitat could therefore allow us to conceive new myths. If we redefine the figure of habitat, we could then redefine our ways of living and thus the relationship we maintain with the world. It therefore seems legitimate to investigate habitat in order to perhaps perceive new ways of living that are more respectful of our environment. This marks the beginning of an interdisciplinary inquiry to create a new world with a new mythology, and this inquiry begins with habitat.

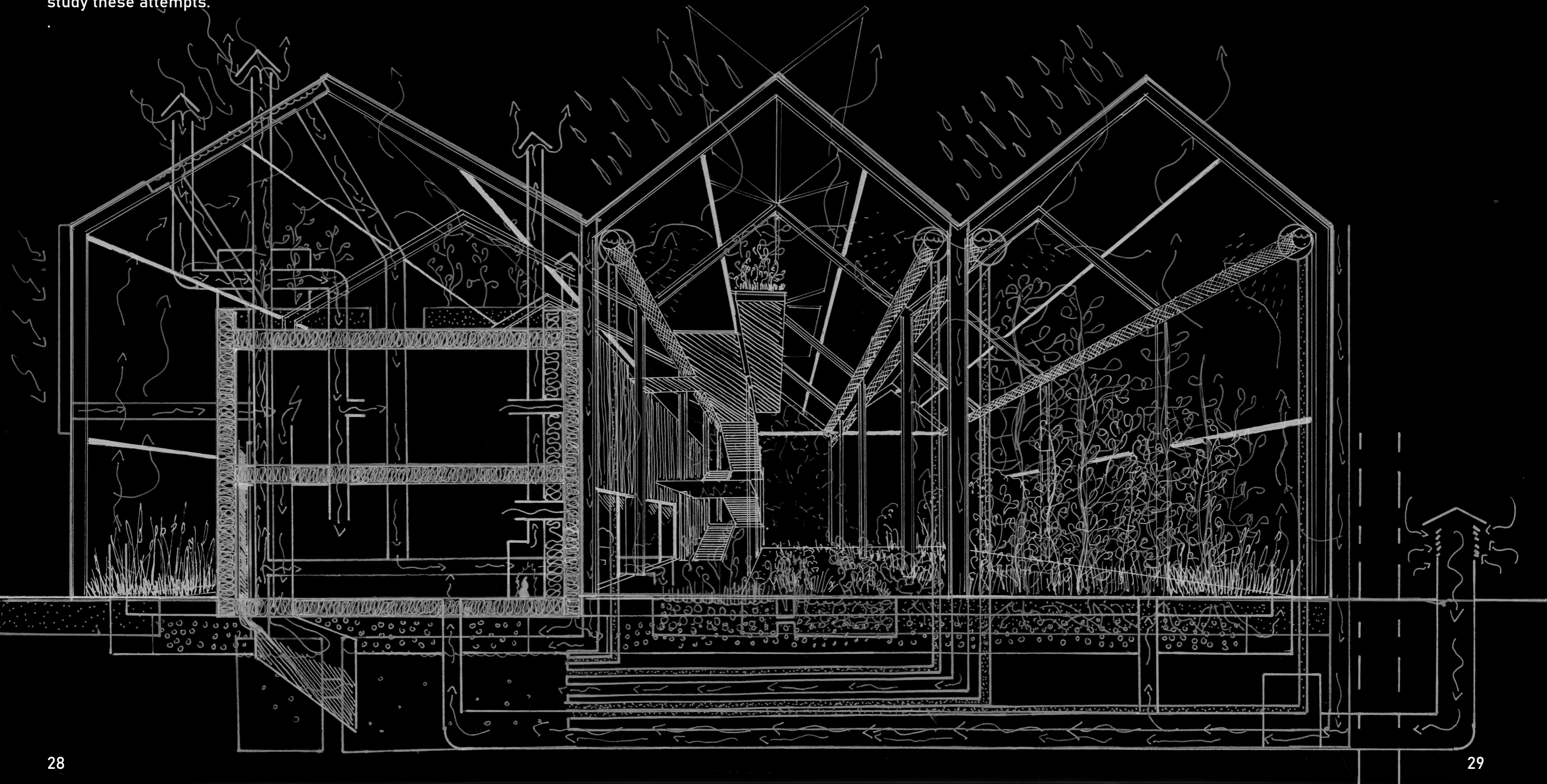
Fig.5 Hand-drawn diagram expressing the definition of Nature. Each living being is a subject that perceives. The world perceived by the subject constitutes its environment. Nature would then be the sum of the environments of every living being.



2 - How can we change our relationship to consumption within our habitats?

Changing our modes of consumption within our habitats could help us. We would need to live in a way that is more conscious of our needs and of what we consume on a daily basis. Also, due to the energy crises in our society, habitat crystallizes within itself many of the social and ecological issues of our modern world. Changing our modes of consumption also means adapting to a world where resources are becoming more expensive and harder to produce. Some habitats, or even entire cities, have tried to respond to these issues by innovating in construction. It is interesting to study these attempts.

Fig.6 Concept of Naturhus. Accumulation of different hand-drawn layers. This accumulation shows the questions raised by the concept of Naturhus. We can see that the presence of food and energy autonomy within a habitat adds numerous technical and social issues.



2.1 - Concept of the “Naturhus” Habitat in Sweden

The concept of the “Naturhus” habitat originates in Sweden. Naturhus, translated from Swedish, means “nature house.” The inventor of this concept is the architect Bengt Warne, who, in the 1970s, completely reinvented the relationship between humans and their habitat in connection with the environment. The Naturhus habitat presents a totally unprecedented typology defined by its autonomy and its spirit of environmental respect. This typology mainly consists of two entities: the greenhouse that envelops the entire house and an inhabited interior volume. The typology of this habitat is therefore formed by two volumes nested within each other, resulting in a habitat inside a greenhouse. This principle primarily arises from the challenges posed by the cold Swedish climate. In winter, average monthly temperatures can reach -3°C , and in December, inhabitants receive on average only 6.5 to 8 hours of sunlight. The greenhouse, which establishes new boundaries for the habitat, allows for a new philosophy of living, offering a comfortable living space year-round at lower energy costs.

Bengt Warne’s vision encompasses not only the construction of a shelter but also gives a broader meaning to what it means to inhabit. For this architect, everything had to be recycled and used in a way that valorizes waste. For him, machines should not oppose humans but help them understand and live within their world. From this philosophy, he developed new life requirements and comfort standards.

Thus, the habitat is no longer merely a receptacle for its inhabitants; it also helps them meet their vital needs. The Naturhus habitat redefines an interior space protected from external noise and climate while maintaining strong visual contact with the surrounding landscape. The greenhouse of the Naturhus allows the development of permaculture potential, thereby supporting the food autonomy of its inhabitants. Permaculture as a mode of agricultural production is chosen because this technique relies on cultivating multiple plant varieties together to avoid depleting the soil of nutrients and to foster symbioses between different crops and insects. This is how the first Naturhus prototypes came into being. It can be considered that there were primarily three prototypes designed by Bengt Warne.

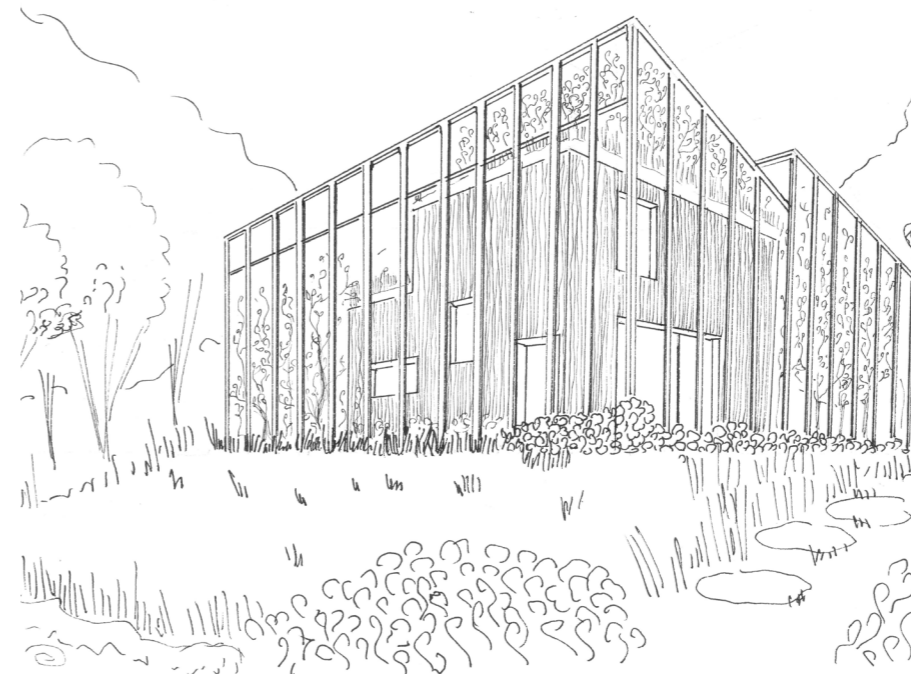
A thesis from the Polytechnic University of Turin: *Bengt Warne Naturhus: Sustainable Living in a Northern European Climate / Un Mode de Vie Durable dans un Climat Nord-Européen”²³, written by Andrea Antolloni, traces the entire history of the development of the Naturhus prototypes. Today, it is mainly the company Greenhouse Living.²⁴ which took over the Naturhus concept. Anders Solvarm, one of the company’s founders, built his own Naturhus, the “Skyhall Naturhus,” under the guidance of Bengt Warne, a few years before his death. Greenhouse Living continues to design Naturhus and to evolve Bengt Warne’s original concept. Among the company’s projects are the “Ankis Naturhus,” the “Uppgrena Naturhus,” and the “Rosenlund Naturhus.”

To summarize what Naturhus are, we can say that this habitat concept develops mainly along two axes: a dimension of resource production within the habitat and a dimension of living comfort that is respectful of the environment.

23 Andrea Antolloni, 2018, Polytechnic University of Turin, *Bengt Warne Naturhus: Sustainable Living in a Northern European Climate*.

24 Greenhouse Living, 2024, <https://www.greenhouseliving.se/>, accessed January 2, 2025, company website.

Fig.7 Hand-drawn perspective of the Naturhus concept.



2.1.1 - Resource Production Dimension within the Habitat

To grow crops and provide food resources, the Naturhus habitat develops a specific relationship with water and waste. Rainwater is collected in tanks integrated into the habitat and treated for domestic use. Greywater or blackwater (contaminated by domestic use) is further treated to nourish the habitat's crops. It is necessary to process organic waste, including feces and urine, in a shared compost system. This compost, located beneath the toilets, allows for healthy and odorless decomposition of the inhabitants' waste. Plant crops are positioned within the habitat according to their water and heat requirements. Using the natural phenomenon of warm air convection, plants that require more heat are placed at the top of the greenhouse, while those that need cooler conditions are placed at the bottom.

*"You can consider that humans need the same conditions as a tomato. A tomato thrives between 20–25°C. If it gets too hot, neither humans nor tomatoes will be happy... Tomatoes require 40–70% humidity in the air."*²⁵

This permaculture system, combined with the recycling of wastewater and waste into fertilizer, provides the inhabitants with semi-autonomy. The greenhouse becomes a true living laboratory, as the habitat creates its own ecosystem, more or less independent from the outside.

The thesis from the Polytechnic University of Turin, *"Bengt Warne Naturhus: Sustainable Living in a Northern European Climate"*, describes the "Skyhall Naturhus," a habitat created by Anders Solvarm. The agricultural production of this habitat would generate a surplus of vegetables and fruits amounting to 20% more than the family's nutritional needs. The thesis also describes a case study in which Bengt Warne attempted indoor "aquaponics" within a greenhouse. Although to date, no known Naturhus has implemented aquaponics production, it is worth noting that the company Greenhouse Living has installed photovoltaic panels on the greenhouse of the Rosenlund Naturhus.

2.1.2 - Environmentally Respectful Comfort Dimension

²⁵ Greenhouse living, op, cit, *description du site internet de l'entreprise traduite de l'anglais au français.*

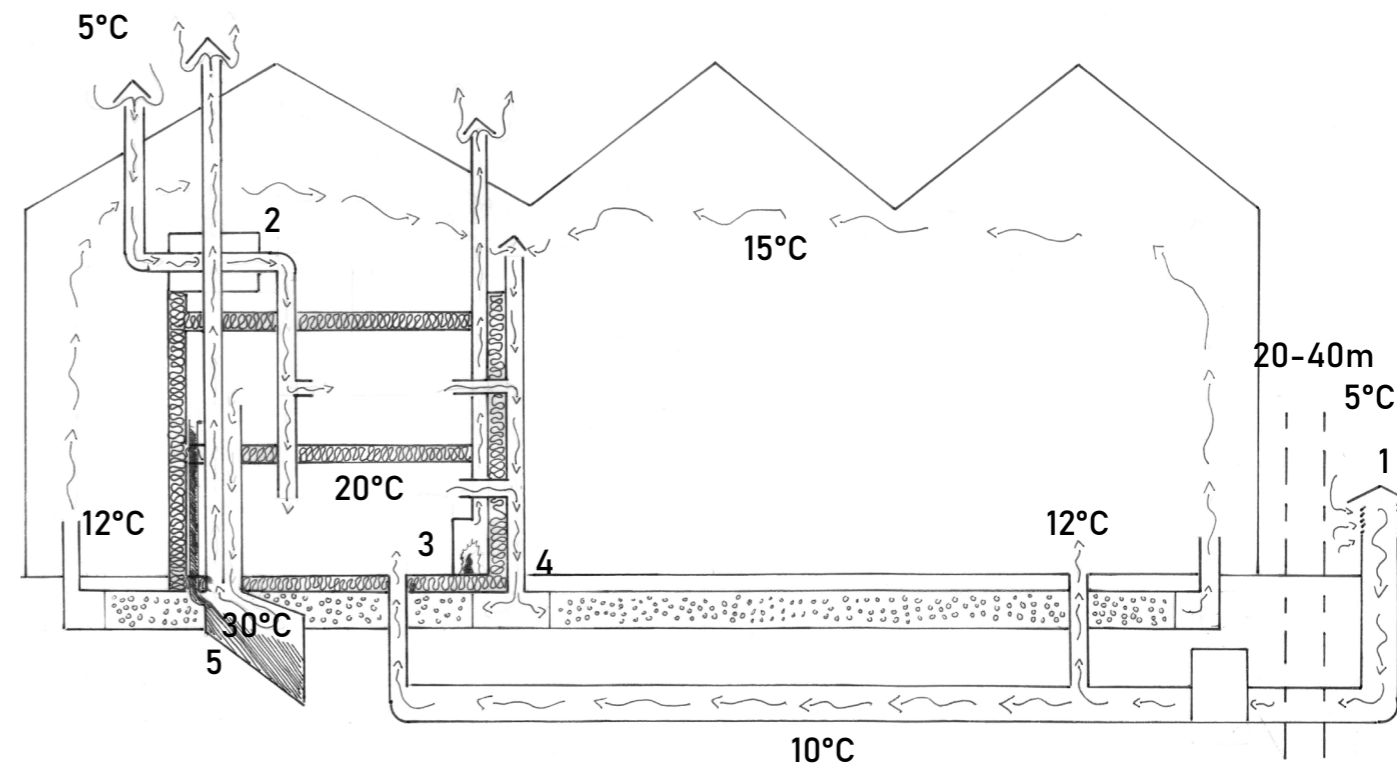


Fig.8 Hand-drawn diagram of the heating systems in the Naturhus.

1. ****Canadian well supplying air to the Naturhus:**** This well provides a constant air supply at temperatures around 10°C by passing underground.
2. ****Double-flow mechanical ventilation (VMC):**** This system expels the humid, stale air from the habitat to the outside of the Naturhus / recovers heat from the used air and the decomposition of greywater / brings healthy outside air into the inhabited volume.
3. ****Supplementary heating in the inhabited volume.****
4. ****Internal ventilation of the Naturhus:**** Internal ventilation takes the warm air from the top of the greenhouse and the heated air from the habitat to circulate it through the floor. The circulating warm air heats the soil and is redistributed throughout the habitat.
5. ****Clivus Multrum:**** The Clivus Multrum is a system that recycles the fecal and



Fig.9 Exterior photo of the Rosenlund Naturhus, designed by the company Greenhouse Living.

In his philosophy, architect Bengt Warne strives to build his prototypes using the simplest possible materials, which are local and durable over time. The inhabited volume inside the greenhouse contains the bedrooms, living room, bathroom, and technical spaces of the habitat. According to the statistical studies compiled in the thesis by Andrea Antolloni, based on Anders Solvarm's experiences with the Skyhall Naturhus, the greenhouse provides, at all times and without the need for heating or ventilation, an average increase of +4.8°C to the habitat's interior compared to the outside temperature.²⁶ For heating, the habitat combines two ventilation systems. The first system extracts air from outside the habitat and passes it through the ground. The circulating air gradually adjusts to the soil temperature of around 14°C, providing warm air in winter and cool air in summer. This air is then expelled through automatic vents or chimneys in the greenhouse roof. Sometimes, warm air at the top of the greenhouse can be redirected downward to create additional heat. The second ventilation system is a double-flow mechanical ventilation (VMC) that removes used air from the inhabited interior while retaining the heat energy from the warm exhaust air. The Greenhouse Living website states that *"The Naturhus can provide an energy savings of approximately 30% on annual heating consumption."*²⁷ In addition to all this, the inhabited interior volume containing the living spaces can have supplementary heating, such as a stove or fireplace, ensuring reliable and safe comfort. The walls of the interior volume are generally made from durable materials with effective natural insulation inside. All these combined systems allow the habitat to maintain a constant temperature of 20°C year-round, even in a harsh winter climate, without consuming resources irresponsibly or harming the environment.

26 Andrea Antolloni, op, p141-159.
27 Greenhouse living, op, cit,

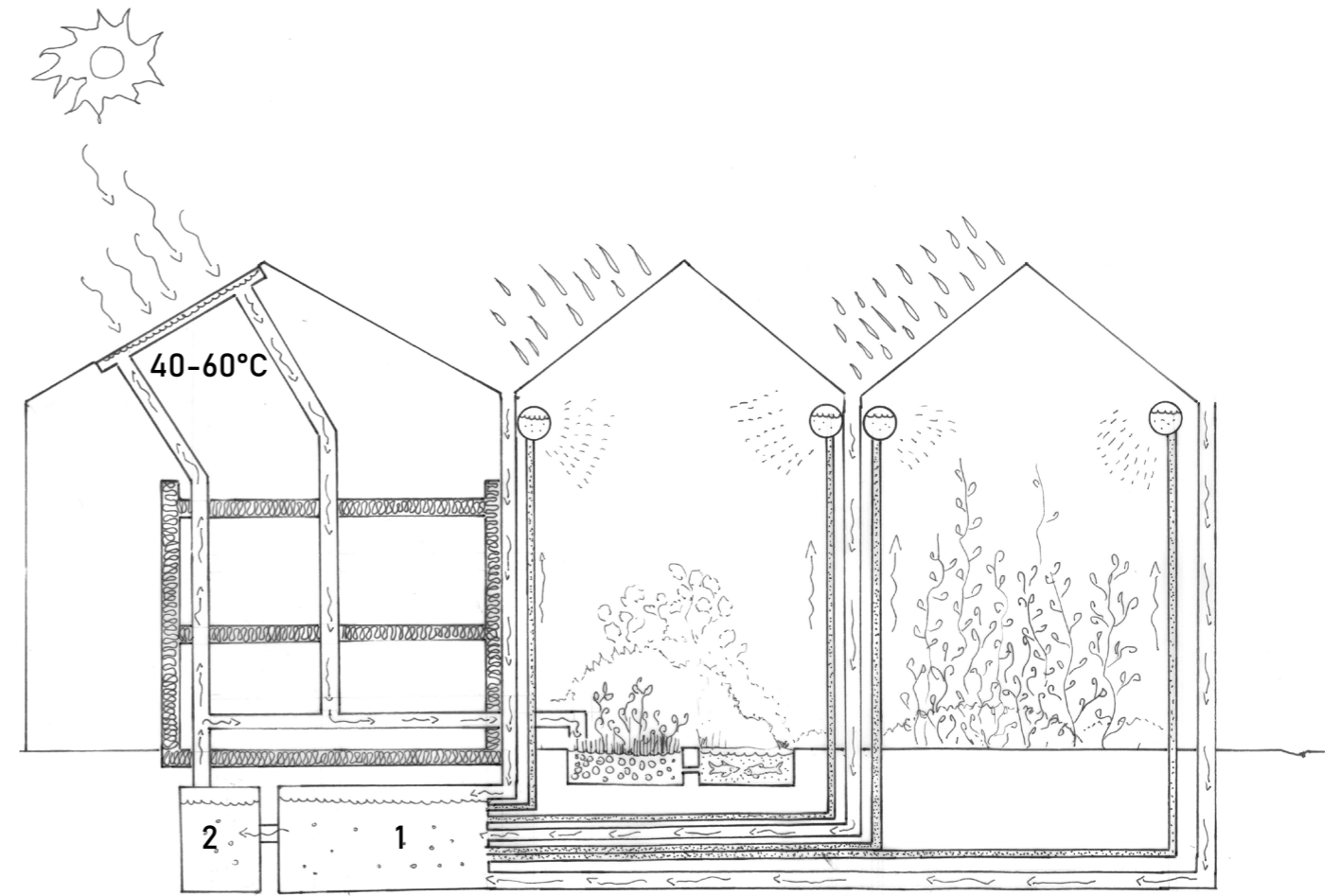


Fig.10 Hand-drawn diagram of the water systems in the Naturhus.

1. ****For permaculture:**** The Naturhus stores rainwater and redistributes it to the crops.
2. ****For the habitat:**** The Naturhus treats water and distributes it to the inhabitants. During this process, solar collectors can naturally heat the water to temperatures of 40°C–60°C. The wastewater from the inhabitants is then recycled as nitrate-enriched water (fertilizer) through an aquaponics system.

2.1.3 - Naturhus: Another Philosophy of Life

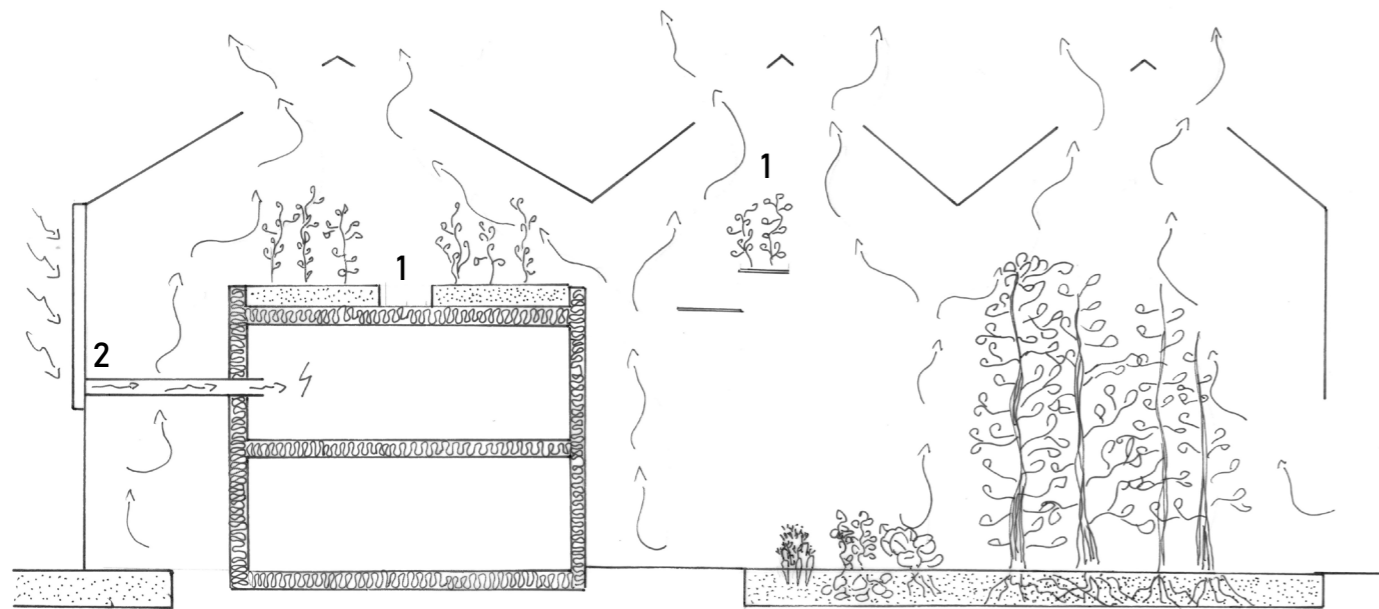


Fig.11 Hand-drawn diagram of the agricultural systems in the Naturhus.

1. Plants that require high temperatures are grown at height to take advantage of the natural convection of warm air.
2. Solar panels allow the Naturhus to generate its own electricity, enabling the automation of certain agricultural processes.



Fig.12 Interior photo of the Rosenlund Naturhus, designed by the company Greenhouse Living.

The Naturhus habitat concept is very interesting to study because it explores the potential for a habitat to produce food and energy resources in a very cold winter climate. The Naturhus can be synonymous with total freedom, as its autonomy allows it to operate independently from municipal networks.

This habitat concept raises many questions about future possibilities for producing resources while respecting the environment. However, the Naturhus is a radical concept that imposes daily responsibilities, including garden maintenance and monitoring the interior ecosystem of the habitat. Today, it is uncertain whether everyone would be willing to live in such demanding habitats, particularly regarding the labor required for growing vegetables and fruits.

The Naturhus is also a complex structure that relies on many automated systems to self-manage. Are there not simpler, less extreme solutions that can still produce resources effectively?

So how can we find a new variety of habitat forms that offer different relationships with daily production, striking a balance between resource generation and living comfort, all with the goal of allowing each inhabitant to live comfortably, more in touch with the environment, and more aware of the resources we consume in our society?

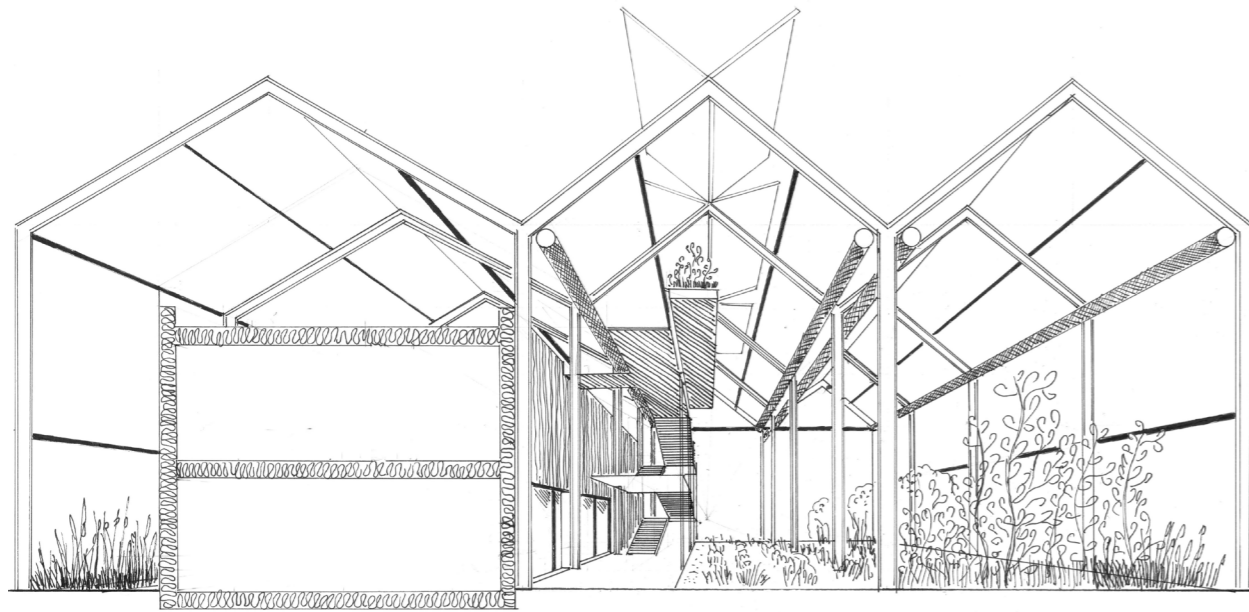


Fig.13 Hand-drawn sectional perspective of the Naturhus concept. This sectional perspective shows the relationship between the "inhabited" volume and the "greenhouse" volume.

2.2 - "The Urban Farming Project": A Combination of Two Typologies

The Urban Farming Project is the theoretical design of an architectural project that seeks to combine a food production typology with an existing building. This study aims to illustrate the idea of integrating production systems within our cities.

The project was developed as part of the master's program *Energieoptimierte Entwurfskonzepte* in Germany, in downtown Cologne in 2023. It is located in the highly commercial streets of Cologne's city center. The brief required proposing alternative scenarios for buildings slated for conversion.

The intention was to create a radical project that questions the relationship to consumption in shopping areas. The objective was to install an urban farm. The urban farm concept aimed to interrogate the hyper-consumption in the Neubau district of the historic city center. Producing resources in a place of hyper-consumption also raises questions about the potential for more localized daily consumption.

This is an association of two typologies: the existing building typology and the urban farm typology.

The urban farm typology is represented by a red greenhouse placed on the existing building, with a key constraint: the presence of post-World War II facades classified as historical and cultural heritage. Special attention was given to the new red volume of the urban farm to allow functional coexistence with a cultural program without compromising the identity of the converted building.

The ground floor and first floor are dedicated to cultivation and public engagement, including a restaurant/bar, an event hall, and a large exhibition space.

The upper floors are programmed for the urban farm. These levels serve, on one hand, a food production function through soilless cultivation and, on the other hand, an experimentation and learning function with the inclusion of classrooms. This urban farm aims to be an experimental center for the production of food and energy resources. The project seeks to raise questions about the methods of production and consumption in our society.

“The Urban Farming Project” is open to critique. In the shopping streets of Cologne, one can question the viability of a project that has not defined its level of commercial profitability. If “The Urban Farming Project” were built, its long-term financial sustainability would be uncertain. However, it raises questions about possible alternative methods for establishing new circular economies. The project also aimed to serve as an entry point to demonstrate to different consumers that other types of consumption are possible. The urban farm could therefore have acted as a mediator for various consumers, fostering awareness of our relationship with the world, with the idea of showing that ecological principles are essential for our comfort and health.



Fig.14 Ground floor and second-floor plans of “The Urban Farming Project.” The ground floor is focused on cultivation, with a restaurant and an art gallery. The second floor is dedicated to soilless agriculture. To allow the two programs to operate in synergy, the thresholds have been separated: the threshold for production is in the building’s backyard, while the threshold for cultural activities faces one of the main streets.

Fig.15 Sections AA and BB of “The Urban Farming Project.” These sections highlight the proportions of the red greenhouse addition. This greenhouse contains rotating machines that provide plants with natural sunlight and water throughout the day.

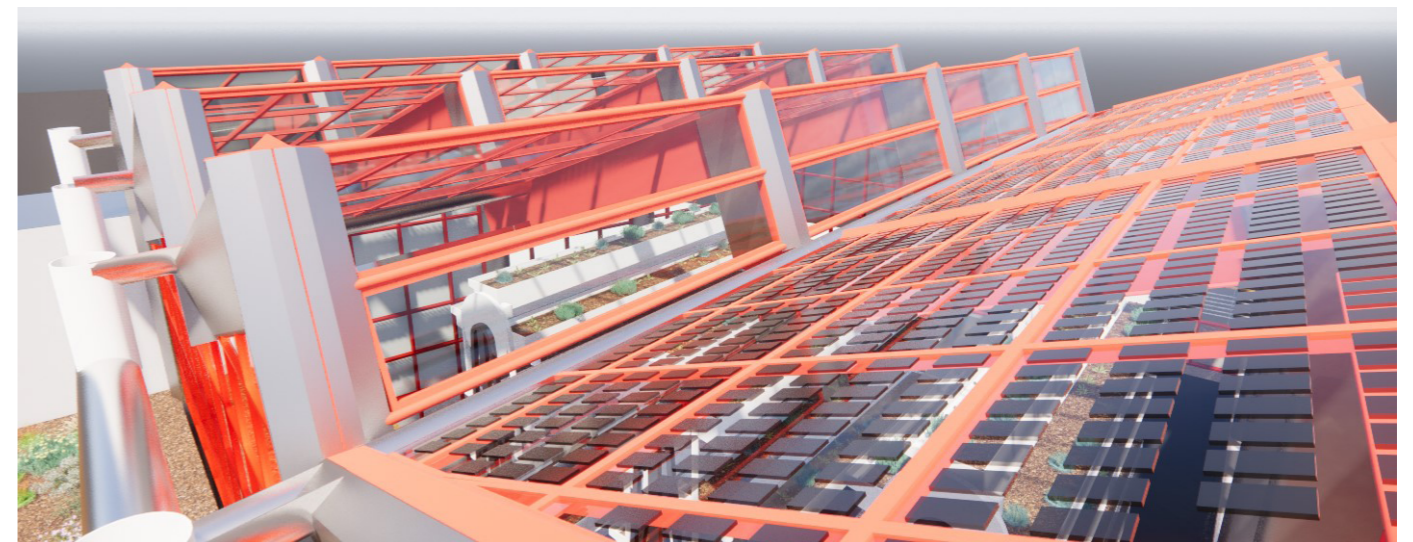


Fig.16 Digital perspectives of “The Urban Farming Project.” These perspectives show in detail the interplay of light inside the project. The productive elements of the project contribute to its overall architectural quality.

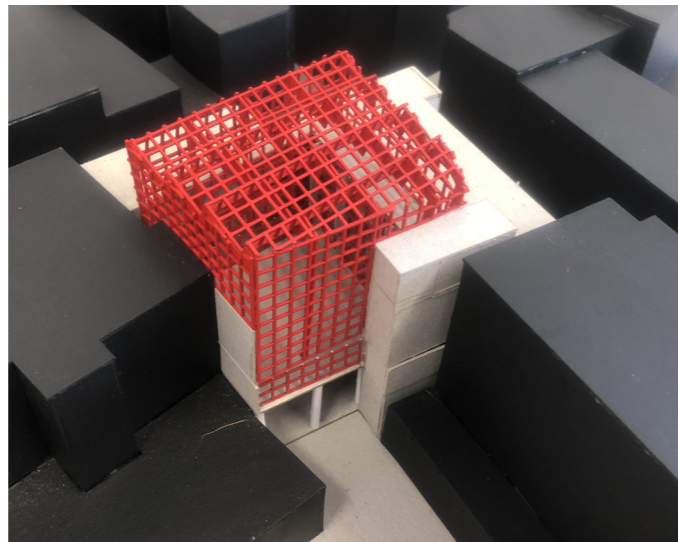
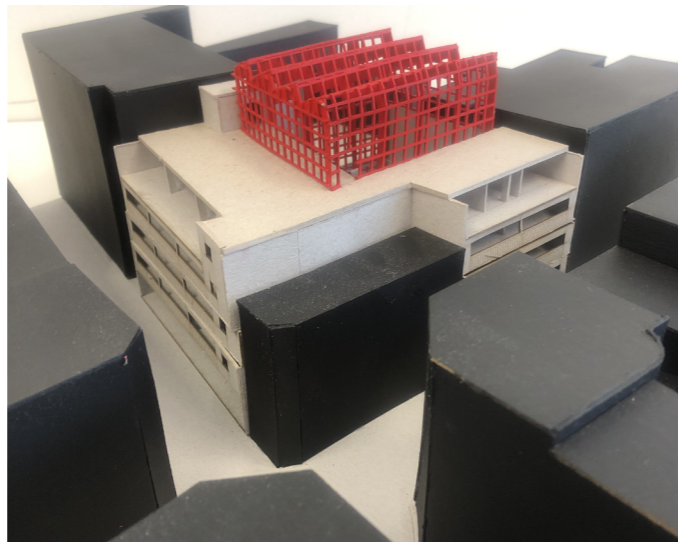


Fig.17 1:200 scale model of "The Urban Farming Project." This model shows the project's volumetry within the city. It highlights the highly graphic nature of the urban farm in the urban context. With its bold visual design, the project is intended to become a visual landmark for passersby.

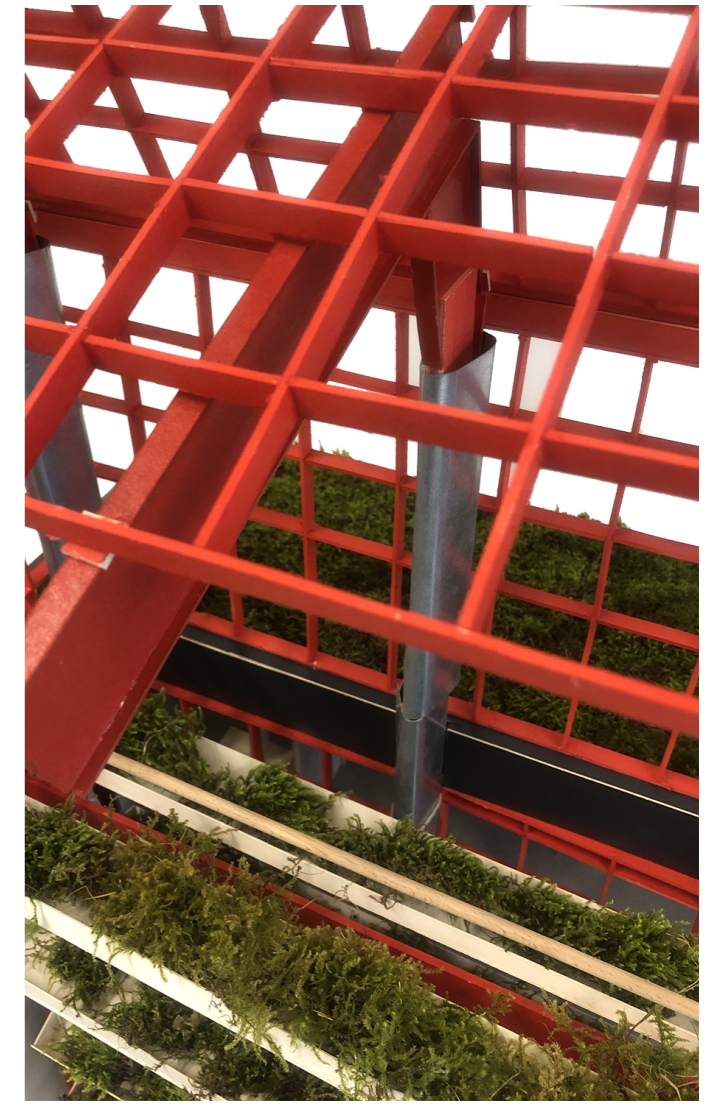
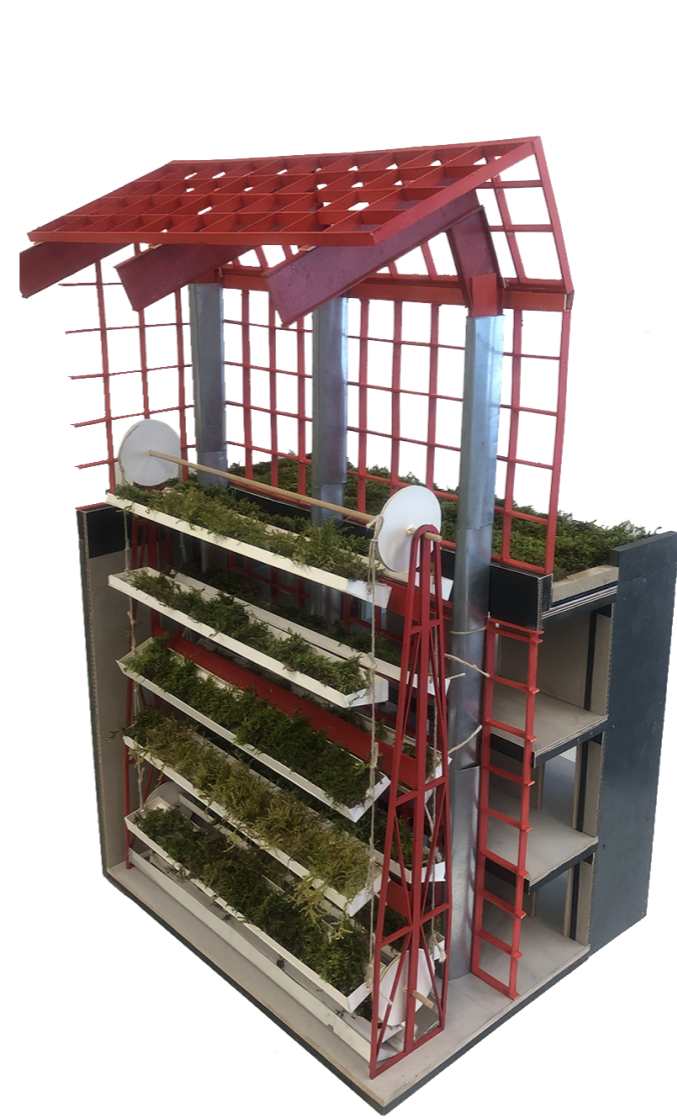


Fig.18 1:20 scale model of "The Urban Farming Project." This model shows in detail the metal structures used for vegetable production. In this structure, the plants rotate across three levels. At the bottom, the plants absorb water from large tanks, while at the top, the plants are exposed to sunlight.

2.3 - The City of Freiburg: A Sustainable Urban Model in Germany



Fig.20 Photo of Freiburg's historic city center.

The city of Freiburg is a model of a sustainable city. Freiburg developed its first eco-districts in the 1990s. Today, through its history, the city has advanced the concept of energy-producing housing at the scale of entire neighborhoods, while considering social diversity in its urban development process.

With the first passive buildings, combined heat and power plants, and the use of solar panels, Freiburg's residents have created a favorable environment for sustainable innovations to emerge within housing. It is interesting to study how the city of Freiburg has successfully developed its eco-districts and the factors that enabled this. Among the documents detailing Freiburg's development history, we can cite the book by journalist Astrid Meyer, *"Les écoquartiers de Fribourg: 20 ans d'urbanisme durable."* Her work compiles a large number of references and documentation recounting the history of the eco-districts. To study Freiburg, we will primarily rely on this book.

2.3.1 - Freiburg and Its Context

The city of Freiburg im Breisgau is located in Germany, in the state of Baden-Württemberg. Today, the city has approximately 230,000 inhabitants (630,000 in its metropolitan area). Compared to other German cities, Freiburg is neither wealthy nor poor. The average annual gross income per person is around €22,000, which is the second lowest in the state of Baden-Württemberg. Among professional activities, 80% of jobs are in the tertiary sector. Residents spend 50% of their budget on housing.

In 2012, Freiburg was awarded the title of the most sustainable city by UNESCO. Each year, Freiburg and its eco-districts attract nearly 25,000 tourists. The main eco-districts in Freiburg are Rieselfeld, Weingarten, and Vauban. It is noteworthy that each of these districts has developed a different urban planning strategy. To understand the urban development of Freiburg's various eco-districts, it is important to first understand the challenges the city has faced.²⁸ :

* Partial destruction during World War II. During this period, Freiburg's historic city center was nearly completely destroyed, which fostered a spirit of resilience among the residents, who supported each other to rebuild everything.²⁹

* Change of activity. After the war, industries and military sites were abandoned, leaving polluted brownfields in the region. However, Freiburg was largely spared from deindustrialization, as it had never been an industrial city and had invested in tourism. The issue of abandoned sites is particularly evident in the Vauban district, which previously housed a French military base. As a result, the city of Freiburg had to decontaminate the soil to make the land usable again. These challenges helped shape the city's urban policy to be more sensitive to ecological issues.³⁰

* Ecological shock. In 2011, the Fukushima nuclear power plant in Japan exploded following a tsunami. This nuclear accident caused a shock in public awareness and contributed to the formation of the first ecological activist groups in Freiburg. Initially, ecology was seen as a necessity rather than a choice. Subsequently, one of the main objectives of Freiburg's eco-districts has been to successfully combine ecology with choice and quality of life, rather than with obligation.³¹

- Crise des logements sociaux en Allemagne. Actuellement les autorités urbaines allemandes rencontrent de grosses difficultés avec les prix du marché immobilier en constante hausse. De nombreux actionnaires spéculent sur des terrains pour les revendre au prix fort. Aujourd'hui, il est très difficile de construire des logements sociaux en respectant les normes de qualité de "l'Env 40", catalogue de normes obligatoires pour pouvoir construire du neuf en Allemagne. À noter que ces normes sont considérées comme très exigeantes sur la consommation et la déperdition d'énergie. Cette crise du logement social provoque de

28 Astrid Mayer, 2013 "Les écoquartiers de Fribourg 20 ans d'urbanisme durable" p9-23. chiffres et informations tirées de cet ouvrage édition le moniteur.

Source des chiffres de l'ouvrage: Öko-institut, 2001 Fribourg, "Städtebauliche und ökologische Qualitäten autofreier und autoarmer Stadtquartiere/Qualités urbanistiques et écologiques de quartier sans ou avec peu de voitures, p3, association des locataires de Cologne, Mietshäusersyndicat.

29 Ibid, p21.

30 Ibid, p18.

31 Ibid, p11.

grosses difficultés car les urbanistes Allemand souhaiteraient pourtant continuer à engendrer de nouvelles mixités sociales dans les villes.³²

These challenges served as the starting points for the design of the city's eco-districts. They helped foster ecological awareness among certain groups of residents. The city also aims to preserve its architectural identity, which was partially destroyed during World War II. Taking all these factors into account initiated an urban planning strategy ahead of its time.

First of all, the city of Freiburg strives to closely follow carbon reduction targets, which are considered a national priority in Germany. Transportation is the primary source of daily carbon emissions. It is necessary to reduce the share of individual car travel. To achieve this, the city of Freiburg has implemented a policy based on several key points:

- Citizen participation policy. This is the most important factor in the creation of Freiburg's eco-districts. Freiburg's urban and administrative services have systematically adopted the practice of consulting residents to address city issues. During the redevelopment of the Weingarten, Rieselfeld, and Vauban districts, citizen forums were established. The Vauban forum is one of the most active citizen forums. These forums have led to close collaboration with the city's administrative services. These various working groups have enabled a different vision of urban planning and an urban development approach based on a broader understanding of the territory's needs.³³

- Implementation of local shops. To achieve this, Freiburg's urban planning emphasizes mixed-use development, allowing buildings to serve multiple functions. For example, a building can simultaneously accommodate housing and commercial activities. This mixed-use approach contrasts with Le Corbusier's concept of the "Rational City."

"To give a human scale to this density (FAR 1), the idea of narrow parcel divisions was proposed, respecting the city's medieval tradition. Additionally, a functional mix of buildings (residential and work) was to be integrated into the project, in opposition to the Athens Charter (under the guidance of Le Corbusier). Indeed, the Charter promoted a particular model of functionalism, based on the creation of separate zones for the four "functions": private housing, work, leisure, and transport infrastructure—a model that has become outdated since deindustrialization.

³⁴

32 Baukultur 2019, op, p94.

33 Forum Vauban, <https://www.vauban.de/willkommen>, consulté le 5 janvier 2025..

34 Astrid Mayer, op, p73.

- Reduction of car traffic and promotion of soft, public, or individual mobility. First, the city established a public transport network extending over nearly 300 km. Currently, Freiburg has around 8 tram lines for approximately 230,000 inhabitants (630,000 in the metropolitan area). The city offers a monthly pass for €51, providing access to all public transport. Additionally, the city has strongly promoted cycling. Some companies provide salary incentives for employees who commute by bike. In the historic city center, Freiburg has implemented numerous car restrictions: partial car bans in the old town and a speed limit of 30 km/h in certain areas.

³⁵

- * New energy strategy. In 2011, following Germany's local decision to phase out nuclear power, Freiburg radically changed its energy production policy. To generate electricity, the city relies on cogeneration. Cogeneration is a system that produces both electricity and heat by burning gas, which can be methane derived from the decomposition of organic waste. The heat from combustion is used for heating and hot water production via a heat exchanger, while mechanical energy is converted into electricity using a generator. Cogeneration systems have excellent energy efficiency but need to be located close to consumption points due to heat losses during transport. For example, the Landwasser plant is supplied with 120 tons of organic waste daily. Freiburg has established three district heating networks powered by cogeneration, extending to the Weingarten, Rosenfeld, and Vauban districts. These networks connect directly to residential buildings. Among the heating networks are small cogeneration plants that provide electricity and heat locally to neighborhoods. Today, in winter, nearly 50% of the electricity consumed in Freiburg is produced through cogeneration.³⁶

- The "Solarfabrik." Solarfabrik is a factory that manufactures photovoltaic panels. It was established in 1999 and has created nearly 1,300 local jobs. The factory works closely with the Fraunhofer Institute for Solar Energy Systems (Fraunhofer-Institut für Solare Energiesysteme) on energy research.³⁷

³⁵Astrid Meyer, op. cit., p.27. Map of the various tram lines in the city of Freiburg.

³⁶ Astrid Mayer, op, p31-35.

Cogeneration, <https://www.edf.fr/groupe-edf/comprendre/production/thermique/cogeneration>, accessed January 5, 2025.

³⁷ Astrid Mayer, op, p12.

It can be noted that Freiburg is a city that, as a whole, follows a comprehensive urban policy focused on environmental respect and the goal of reducing its carbon emissions. This urban policy is particularly relevant today, as many cities are also attempting, with varying success, to implement alternatives for sustainable mobility. Where Freiburg stands out from other cities is in the unprecedented development of three eco-districts between 1990 and 1994. These three districts are especially interesting to study because, while all oriented toward a comprehensive, ecology-focused urban policy, they each have different commitments and priorities. The Weingarten district seeks to ensure thermal comfort through renovation while maintaining social diversity. Rieselfeld aims to construct new housing while promoting a positive perception of density. Vauban is considered the most committed in its ecological stance, particularly regarding car usage: some residents have deliberately chosen not to use this mode of transportation.

It is essential to explore these three districts to observe the effects that a zero-carbon urban policy can have at different levels of engagement. Moreover, the production of electricity and heat in these habitats introduces new, unprecedented conflicts with energy market actors and city administrators. These conflicts highlight the emerging challenges involved in developing an energy-autonomous city.

2.3.2 Renovation of the Weingarten District: Renovating to Integrate Mixed-Use Development



Fig.21 Photo of the tower in the Weingarten district.

The Weingarten district was built after World War II. It featured tall, dense towers surrounded by poorly defined green spaces for residents. The district houses a population of 5,800 inhabitants. It was not well appreciated by all Freiburg residents, as the unqualified ground-floor spaces created a sense of social disconnection for pedestrians.

In 1990, the district's renovation program aimed to optimize energy efficiency (targeting a 30% improvement) across all housing units and to improve public spaces. This large-scale public project cost approximately €114 million. Among the renovation efforts reflecting the city's innovative spirit, the redevelopment of the Weingarten towers stands out. The four towers were no longer in good condition and were ill-suited to the new forms of the average household, which had evolved over the past fifty years.

The three main objectives of the tower renovation:

- Energy optimization of the towers. The goal was to reduce annual energy consumption by 30% according to passive standards. It also involved connecting the apartments to the city's cogeneration network.
- Redistribution of space by creating apartments better suited to new family structures. In each tower, 90 units were reorganized to create 138 smaller apartments.
- Creation of meeting spaces to facilitate social interactions within the towers and the surrounding Weingarten parks.

When the city of Freiburg decided to renovate the towers, it aimed to introduce greater social diversity. To achieve this, the city relied on citizen mediation. Residents were able to express their preferences for the redesign of green spaces at the base of the towers as well as other public areas. The city also organized workshops allowing future residents to choose their neighbors and, consequently, their apartments. This process led to the creation of the “Weingarten Forum.” The Forum facilitated mediation meetings between the various stakeholders involved in the district’s renovation. These meetings helped ease the social integration of new residents among the existing inhabitants of the Weingarten towers. The conclusion of this project saw the emergence of the first passive buildings. The architect of the first passive towers in Weingarten was Roland Rombach, working in collaboration with the Fraunhofer ISE structural engineering agency.³⁸

“1. A passive building is a building heated passively, meaning it does not include an active heating system, such as a central heating system. Sunlight, insulation, and internal heat gains are sufficient, even in winter, to maintain a comfortable indoor temperature.

2. A passive building consumes less than 15 kWh per year per m² for heating (excluding hot water and electricity).”³⁹

38 Astrid Mayer, op, p37-45.

39 Batiment passif, <https://www.passivhaus-vauban.de/passivhaus.fr.html>, consulté le 5 janvier 2025.

2.3.3 - Rieselfeld: How to Give Density a Positive Image



Fig.22 Aerial photo of the Rieselfeld district.

The large housing complexes built in the 1960s and 1970s, due to their density, conveyed an image of “negative quality of life.” In response, housing developments were constructed on the outskirts of the city with low density. Residents living in suburban areas, while working in Freiburg, no longer shopped in the city for their daily needs. This led to a loss of urban attractiveness and difficulties for local businesses due to social isolation.

To address this, Freiburg decided to create a denser district with nearly 50% low-energy social housing.

Due to very high real estate prices in Germany, Freiburg chose to develop its new districts on land it already owned. The selected area was Rieselfeld, which included a former lake created by an old wastewater treatment plant. The city then faced opposition from ecological associations that did not want to see the biodiversity of the former lake disappear. The city administration had to compromise with environmentalists and appeal to future residents to secure enough support for the project.

To achieve these objectives, strategic measures were implemented. The project covers 78 hectares, representing one-quarter of Rieselfeld’s total area, while the remaining three-quarters were designated as a nature reserve following ecological demands.

The city identified nearly 6,000 people urgently in need of housing, which implied the necessity to build approximately 6,500 housing units. An urban planning competition was launched to determine the future plots for these residences.

The locations of the future housing units were designed by the winners of the urban planning competition, which included several firms: Böwer, Eith, Murken, Spiecker (Freiburg); Gudemann (Lörrach); Morlock (Schallstadt); and Meier. In total, the development of the Rieselfeld district cost €157 million.

Three main characteristics can be noted in the planning of the Rieselfeld district:⁴⁰

- **Construction strategy:** The development of the district began in 1994. The city focused on self-promotion by providing guidelines regarding the typology and location of the new housing units. At that time, Rieselfeld did not have a “positive” reputation. It was not until the 2000s that the district’s image improved. To integrate social diversity, Freiburg began selling land plots at affordable prices, gradually increasing the price with each new resident. Architect Hubert Burdinski initiated the first self-promotion mediation sessions with future residents. During the construction of the new housing in Rieselfeld, the city enforced its energy policy, requiring each unit to be connected to the city’s cogeneration heating networks.

“The concept of self-promotion is simple: individuals come together to design, finance, and build a real estate project collectively.”⁴¹

- **Typological agreement:** Due to the high cost of land, the city divided plots into smaller sections to encourage multiple developers. Freiburg’s administration established simple and clear urban planning rules. New buildings had to be energy-efficient and/or generate their own energy. The typology of the new housing had to follow the medieval patterns of Freiburg’s city center, incorporating inner courtyards, limiting buildings to four stories, and including ground-floor commercial spaces. In addition to adhering to this typology, the buildings also had to meet strict energy performance standards and be connected to the city’s cogeneration heating networks. If a building met all these criteria, the city approved its construction. Aesthetic aspects were then left to the builder’s discretion.⁴² The mixed-use ground floors promoted sustainable mobility within the city.⁴³

⁴⁰ Astrid Mayer, op. cit., pp. 69-71, figures taken from this work.

⁴¹ Self-promotion, <https://fr.wiktionary.org/wiki/autopromotion>, consulted on January 5, 2025.

⁴² Astrid Mayer, op. cit., p. 90. We can mention the urban planner Klaus Humpert, Freiburg’s head of urban planning from 1970 to 1982. This planner stated that the guiding urban planning principle takes precedence over the architectural aesthetics of a building.

⁴³ Astrid Mayer, op. cit., p. 73.

- **Public facilities:** Public infrastructure accounted for 42% of the project’s expenditures. City policies aimed to encourage new social dynamics by facilitating the development of citizen associations. To achieve this, the city created a central square in the district, including its own church and community center, all connected by a tram line providing direct access to the city center. An example is the KIOSK neighborhood association, which emerged in this district and has become an integral part of its identity.⁴⁴

The Rieselfeld district was the first to initiate self-promotion projects within Freiburg. Compared to the Vauban district, Rieselfeld is considered more moderate in its ecological commitment. Residents have the choice between sustainable mobility and using a car, making the district suitable for those working farther from home. Overall, by relying on medieval housing typologies, the city successfully made this dense district attractive. Additionally, the innovative energy policy, including the establishment of the cogeneration thermal network, is noteworthy.

However, the city was not able to achieve all its objectives. High rental costs limited the establishment of sustainable social diversity. Despite the initial self-promotion projects, 90% of the housing remained rental units. Although the city made efforts to include housing accessible to low-income households, the district’s success drove prices up. Today, low-income residents tend to settle in the Weingarten district. It should also be noted that Germany is experiencing a national housing crisis due to high real estate prices.

⁴⁴ Astrid Mayer, op. cit., p. 81.

The KIOSK association is a citizen organization that manages the cultural center in the Rieselfeld district.

2.3.4 – Vauban: A Model of Radical Ecological Urban Development



Fig. 23 Aerial photo of the Vauban district.

The Vauban district is far more radical in its ecological commitment. In 1992, a squat developed in the abandoned Vauban military barracks, prompting the city council to respond by offering a legal housing alternative.

This initiative led to numerous conflicts with the squatters on site. From the first urban planning proposals, Vauban was already seen as an alternative and activist space. The squatters were mainly students in precarious situations. To develop the Vauban district, the city council decided to collaborate with the residents. To facilitate this, the residents established the “Vauban Forum”⁴⁵, A citizen association that played a central role in communication between architects and the administration during the planning of the Vauban district. This association also facilitated self-promotion for approximately 200 people. Development of the Vauban district began in 1998. The initial urban plan included 130 housing units, 15 of which were self-promoted. The development also paid particular attention to landscaping, the quality of public spaces, and abundant architectural details. Over time, the Vauban district increasingly allowed for self-promotion.

The Vauban district also focuses on redesigning the “medieval housing typology” previously applied in Rieselfeld. This typology was adopted to give meaning to density and allow construction despite high land prices. The total cost of the district’s urban redevelopment was €86 million. Two main initiatives mark Vauban’s radical commitment to social and ecological issues:⁴⁶

45 Forum Vauban, op. cit., consulted January 5, 2025.

46 Astrid Mayer, op.p 88-89-99.

- Innovative energy strategies: Following the local nuclear phase-out in 2011, Vauban residents aimed to develop small-scale cogeneration prototypes serving multiple housing units. Some homes even opted to be partially autonomous in electricity and thermal energy by being passive. Passive homes can thus bypass the obligation to connect to the cogeneration network. In Vauban, 60% of electrical and thermal energy is produced locally. The district has also installed solar panels. For example, the zero-emission office building “Sonnenschiff / The Solar Ship” and the solar housing developments called “Solarsiedlung,” designed by architect Rolf Disch, perfectly illustrate this commitment to energy autonomy.⁴⁷

- Strong ecological activism: The Vauban Forum, although supported by the city, inevitably sparked conflicts due to its strong commitment to ecology. Passive and energy-optimized buildings involve higher construction costs, as this type of building requires superior construction quality. To offset these additional costs, some residents chose to eliminate parking spaces for their homes. Removing parking spaces was a radical decision aimed at saving money on construction, favoring higher-quality materials and the new building energy systems. This choice also allowed future residents to create a safer public environment. To obtain permission to build homes without parking, the Vauban Forum had to negotiate with the city to secure an exemption. In return, residents were expected not to own cars, although this rule was not always followed. Additionally, this rejection of cars led the city to create peripheral silo parking structures, which resulted in some underutilized or poorly integrated spaces.⁴⁸

The residents of the Vauban district have demonstrated a strong social and ecological commitment. This commitment has also been framed and supported by city authorities. These combined efforts have allowed residents to build a strong community and neighborhood identity centered around energy production. Residents benefit from a strong sense of community; however, they are required to adhere to a more radical lifestyle. For example, some housing units prohibit car ownership. This level of radicalism is not suitable for everyone. Currently, for economic reasons, it is nearly impossible for many people to live without a car. Moreover, car-related conflicts in the neighborhood remain unresolved due to the creation of peripheral silo parking structures, which generate underutilized or poorly integrated spaces. Vauban is often presented as an exemplary district; however, it can be critiqued for its lack of social inclusivity.

47 Astrid Mayer, op.p135-135.

48 Astrid Mayer, op.p98-99.

2.3.5 – Freiburg Urban Planning: An Open Door



Fig.24 Exterior photo of the Sunship Project designed by architect Rolf Disch.

Urban planning in Freiburg is unprecedented. The city's eco-districts are so distinct because Freiburg has effectively integrated citizen mediation into its architectural projects. The city recognized that investing in social mediation brings real benefits for social diversity and community life. Moreover, it is notable that the city took nearly 20 years to develop its districts. At an urban scale, 20 years represents relatively slow growth, which allowed the districts to become deeply rooted and sustainable within the territory. Today, very few cities see the value in investing time and money in social mediation, preferring instead to implement administrators' visions immediately within a fixed timeframe.

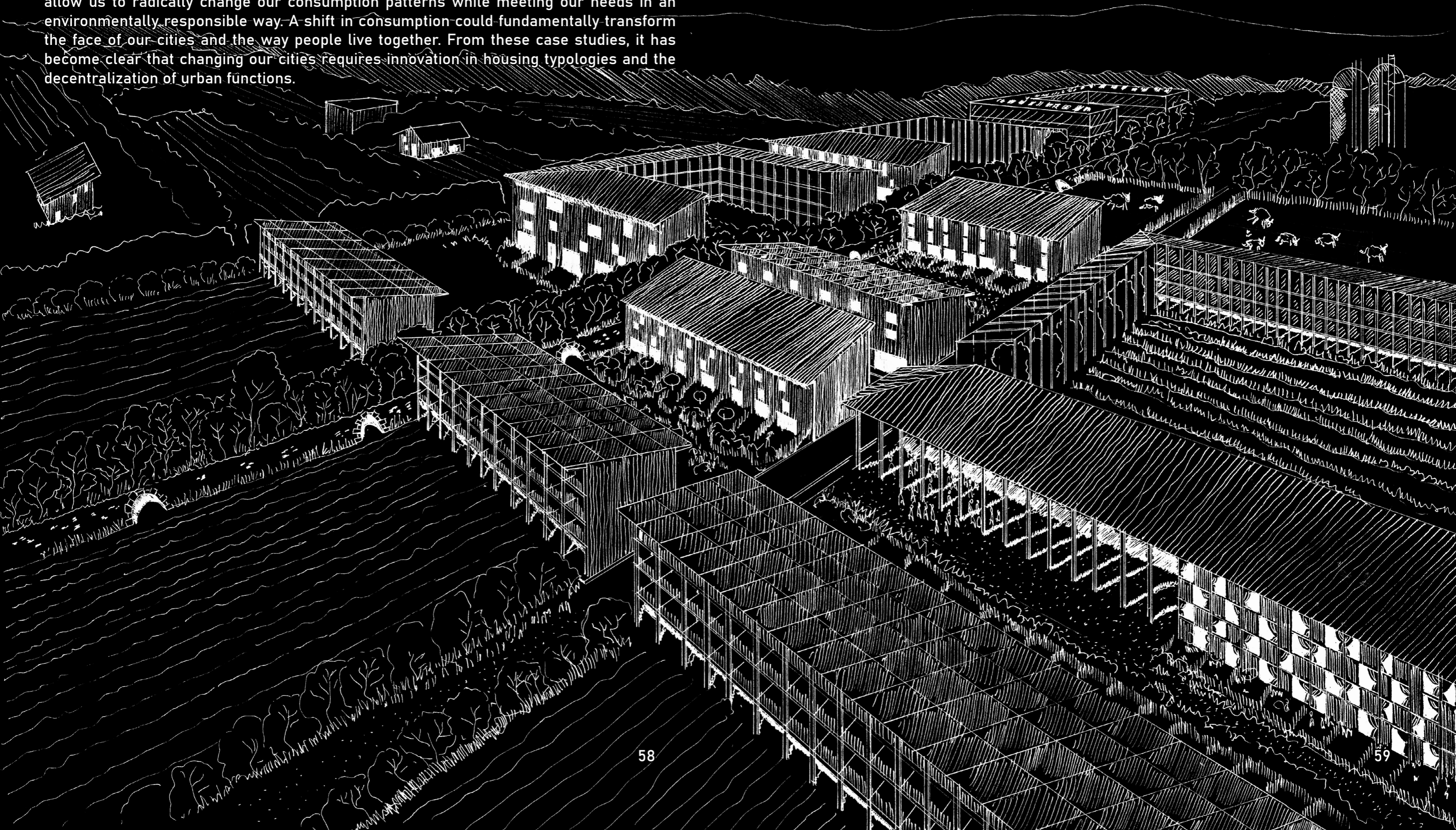
Freiburg, through its many innovations in housing and energy production, has also encountered new conflicts. Passive and low-energy buildings require little or no heating energy from the city, which threatens the profitability of large central power plants. This disrupts the city's energy system, necessitating smaller and more localized energy facilities to maintain efficiency and profitability—a shift toward decentralized energy.

Overall, Freiburg's urban development can be considered successful. However, in the most socially and ecologically ambitious districts, the city has struggled to achieve lasting social diversity. This difficulty stems from the high construction costs of housing and a real estate market that remains expensive in Germany. The development of sustainable mobility options does not fully resolve conflicts related to automobile use. Even though the Vauban district is largely free of cars, this solution is not universally accepted. The silo parking structures merely relocate automobile conflicts without fully solving them. This demonstrates that, today, giving up car usage remains difficult, if not impossible, unless the economy and consumption patterns associated with it evolve.

3 - How to Transpose the Productive Habitat to the Scale of the City?

Studies of the Fribourg neighborhoods and the Naturhus examples suggest new approaches to architectural design. Here, we attempt to redefine research avenues that could be particularly worthwhile to explore. The goal is to establish a theoretical method that would make it easier for architects to design resource-producing habitats and provide existing cities with a degree of energy autonomy. Since the habitat encapsulates many of today's challenges, producing economic, food, and social resources within or near it could allow us to radically change our consumption patterns while meeting our needs in an environmentally responsible way. A shift in consumption could fundamentally transform the face of our cities and the way people live together. From these case studies, it has become clear that changing our cities requires innovation in housing typologies and the decentralization of urban functions.

Fig.25 Hand-drawn perspective illustrating the concept of a city based on a community grid. This image represents one of many visions of autonomous cities.



3.1 Housing: Redefining a Typology

By studying different resource-producing dwellings, it became clear that **typology lies at the heart of developing new forms of housing**. For instance, Bengt Warne's Naturhus present a completely novel housing typology. In Freiburg, new housing was designed by reinterpreting a typology dating back to the Middle Ages. Typology is the core concept that allows the creation of new dwellings. Evolving the notion of typology could provide an unprecedented tool for architects to design innovative forms of housing. Here, the new form of housing that interests us is that of the **resource-producing dwelling**.

- The productive habitat⁴⁹ is a habitat composed of two entities: the dwelling entity and the productive entity. Both entities are built using recyclable and/or bio-sourced materials⁵⁰. The dwelling entity is the mode of organization and settlement by human beings in the environment where they live. The productive entity is the mode of organization that includes systems producing resources. The dwelling entity can be called the dwelling unit, and the productive entity can be called the production unit. It is therefore important to differentiate between two types of typologies: dwelling typologies and producer system typologies.

*"A new definition of the zero-emission building is introduced in Article 2: A building with very high energy performance in accordance with the principle of the primacy of energy efficiency, in which the very low amount of energy still required comes entirely from renewable energy sources at the level of the building, the district, or the community where this is technically possible (notably those produced on site, from a renewable energy community, or from renewable energy or residual heat from an urban heating and cooling system)."*⁵¹

49 Definition of the term "productive habitat" proposed here.

50 Biosourced materials, https://www.ecologie.gouv.fr/politiques-publiques/materiaux-construction-biosources-geosources#label-batiment-biosource-4, consulted January 2, 2025.

Biosourced materials: materials derived from renewable organic matter (biomass), of plant or animal origin. They can be used as raw material in construction and decoration products, fixed furniture, and as building materials in a structure (cf. decree of December 19, 2012, relating to the content and conditions for awarding the biosourced building label).

51 European Commission, 2021, Brussels, DPEB, p.15 https://secure.ipex.eu/IPEXL-WEB/download/file/082d29087e7b9959017e9c46b47b23b0, accessed on January 2, 2025.

3.1.1 – Association of a built typology and a productive typology.

There are therefore two types of typologies to study: housing typologies and productive system typologies.

- Housing typology⁵² : Classification based on the characteristics of housing, compared to create building families.

- Productive typology⁵³ : Classification based on the characteristics of a production system, compared to create families of productive systems.

The classification of housing typologies is a tool that allows architects to move from urban design to architectural design within the framework of a project. For example, the site https://collectivehousingatlas.net/⁵⁴ It catalogues collective housing typologies very well.

Defining a "productive typology" is the proposition of this text. The concept of productive typology here is a term that includes :

-The productive system⁵⁵ Strictly speaking, which is defined as a complex device or apparatus implemented to achieve the production of resource(s).

- The resources⁵⁶ Which, within the framework of a productive housing or a production system, are considered as such as soon as they help meet one or more needs of the inhabitants of the productive housing. Resources can therefore be very diverse, ranging from simple hot water production to agriculture, enabling partial or total energy and/or food self-sufficiency.

52 Typology, https://patrimoine.seinesaintdenis.fr/typologie-248, accessed on December 22, 2024.

Typology: classification based on the characteristics of a building, compared to create families.

53 Definition of the term "productive typology" proposed here.

54 Collective Housing, https://collectivehousingatlas.net/, accessed on January 2, 2025.

55 System, Le Petit Robert, https://dictionnaire.lerobert.com/definition/systeme, accessed on January 7, 2025.

System: A complex device or apparatus implemented to achieve a result.

56 Resources, Le Petit Robert, https://dictionnaire.lerobert.com/definition/ressource, accessed on January 7, 2025.

Resource: Something that can improve an unfortunate situation; material means of existence.

Currently, during project design, architects do not refer to productive typology but rather to technical systems to be integrated into the building. This is why, in the field of architecture, productive typologies still need to be identified and classified into different families. In an initial research phase, we can try to classify the different productive systems according to the following characteristics:

- * Resources produced by the system
- * Space requirements for the system installation
- * Maintenance requirements
- * Immediate and overall cost of the system

These criteria could help us propose an initial list of families of different productive systems. Considering energy production systems as a typology in their own right is a strong move that places spatial concepts and technical concepts on an equal footing. This equality between spatiality and technique would guide the project design process toward a way of thinking that allows architects, from the very first pencil stroke, to naturally consider the most suitable heating techniques and resource production methods for the territory, the building's location, and its own typology.

Once the initial families of production typologies are created, the next step is to associate the families of productive typologies with the families of housing typologies. The combination of these two types of typologies then makes it possible to create a new kind of typology: productive housing typologies.

Productive housing typologies could also be conceived to fit within the logic of a territory. For example, based on the initial families of productive housing typologies proposed, it would be possible to create a type of productive housing that combines a housing typology derived from the history of the territory with a productive system typology adapted to it. In a way, this approach continues architectural practice while being more conscious of the surrounding territory and the needs of its inhabitants.

The typological families of productive housing present mainly two major advantages that can help rethink the city at the neighborhood scale: the ability to create a community identity around resource production, and the ability to create different energy flows between the production unit and the housing unit.

3.1.2 – Advantages of productive housing

The first advantage of productive housing lies in the potential new daily activities that need to be organized to ensure the proper functioning of the production systems. In the case of energy- and food-producing housing, having agriculture within the housing requires daily attention for crop maintenance. Residents thus engage in new life activities centered around the production units. Agricultural production units would generate social activity and bring residents together around a common goal: producing the resources needed for the community.⁵⁷ This aspect of life could teach communal living and cooperation within a housing development. Of course, it is essential that residents are not required to participate in resource production but that it is offered as an option. Each resident would then have the opportunity to dedicate as much time as they wish to the housing's resource production. Building on this idea, one could also imagine productive housing on a larger scale, including professional agricultural production. Trained personnel from the housing or living nearby could then work full-time or part-time in the housing's production units. This professionalization could take various forms, with specific legal frameworks designed to prioritize the interests and well-being of workers rather than solely focusing on the profitability of the different operations. Production units would thus have the potential to create jobs at the neighborhood level and generate a more circular economy adapted to the needs of the people living within the ecosystem⁵⁸ of the productive housing.

⁵⁷ Community, Le Petit Robert, <https://dictionnaire.lerobert.com/definition/communaute>, accessed on January 8, 2025.

Community: A social group whose members live together or share common property and interests. Collective. Living in a community. The scientific community of a country. National community, State, nation.

⁵⁸ Ecosystem, Le Petit Robert, <https://dictionnaire.lerobert.com/definition/ecosysteme>, accessed on January 2, 2024.

Ecosystem: basic ecological unit formed by the environment (biotope) and the organisms that live in it (biocoenosis). The mountain, the forest are examples of ecosystems.

The second advantage stems from the exchange of flows between the production unit and the housing unit. The resources from the production unit can be directly used by the housing, which avoids the energy losses caused by transporting resources. For example, in a situation where a housing unit produces its own heating and electricity, there is no issue with energy storage since the housing unit uses the energy produced directly. These direct resource flows between the housing unit and the production unit allow both units to operate in synergy. The production unit generates resources in relation to the direct needs of the housing unit's inhabitants. This creates the possibility of a new production/resource relationship, defined based on mixed-use principles and a redefined scale of production.

By also enabling resource production at the neighborhood level, these productive housing units become a key asset for cities. Different neighborhoods could then be fully or partially self-sufficient in resources. This autonomy adds social value to the neighborhood, with resources more easily accessible because residents have a certain degree of control over the housing production units. This is not the case for many current production systems (water treatment, electricity), whose management may be entrusted to large companies that can impose their conditions on resource distribution.

3.1.3 – A New Challenge for Architects

It is therefore the architect's responsibility to manage new housing with an additional constraint: integrating production systems into a functional dwelling. This requires studying the various possible relationships, such as combining a farm and a housing unit. The architect must ensure privacy and quality service spaces while also managing production areas. Special attention must be given to the articulation between living spaces and production spaces. The link between the housing unit and the production unit must be strong without compromising the residents' privacy. Architects aiming to mix uses in the same place will need to make extra efforts in designing service and circulation spaces so that the two units can function together synergistically. However, this synergy must be conceived so that both production and housing can operate with genuine autonomy.

We believe that the architect must find exciting compromises between the two worlds they are attempting to merge. It is therefore essential to always remember why we produce resources. It is important to recall that the goal is to produce for humans (the residents) and not merely to serve a system of resource accumulation. The needs of the production unit are justified only if they are subordinated to and serve the needs of the housing unit. This is truly about putting production at the service of human dignity.

If we forget the primary function of the productive housing theory, the concept could easily transform into a kind of dystopia. The idea of placing production near housing is mainly intended to foster a more direct relationship with what we produce, resulting in a form of semi-autonomy. It also allows for greater proximity and reflection on our consumption patterns. Choosing what to consume means no longer feeling obligated to consume, regaining control, and above all, giving future generations the ability to decide what they want to consume or not.

3.2 – Production: Redefining a Scale

Productive housing shows us that, to change our consumption patterns, we must stop thinking about production at the city scale and instead focus on the neighborhood and its immediate environment. This approach allows for a better relationship with the land and a stronger connection to the environment by breaking large production units into numerous smaller units that can better adapt to the different contexts they serve.

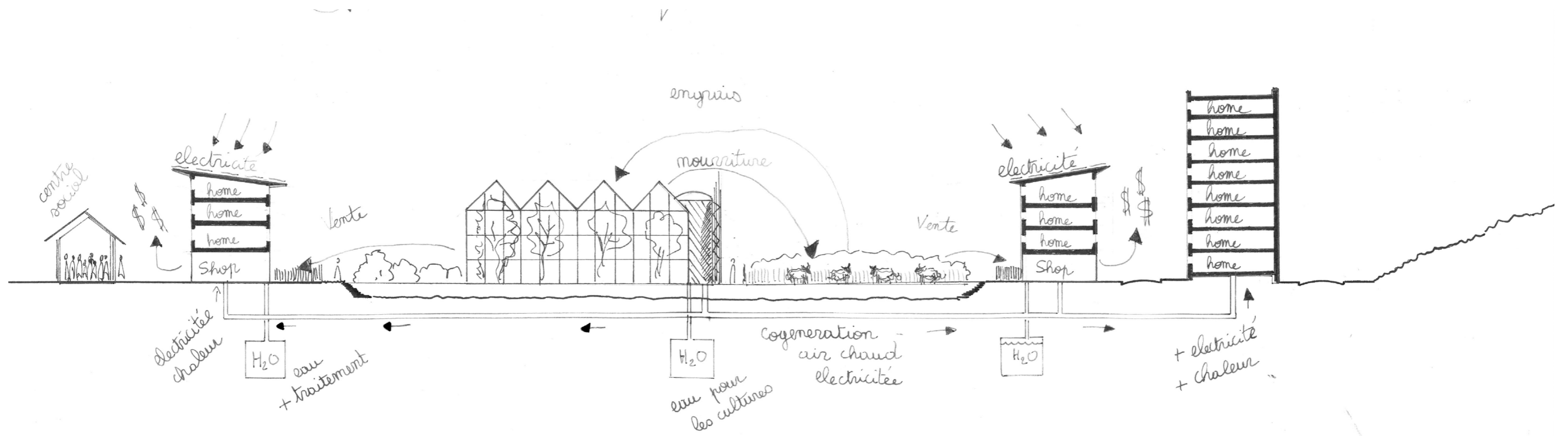


Fig.26 Hand-drawn schematic section showing resource flows in productive housing.

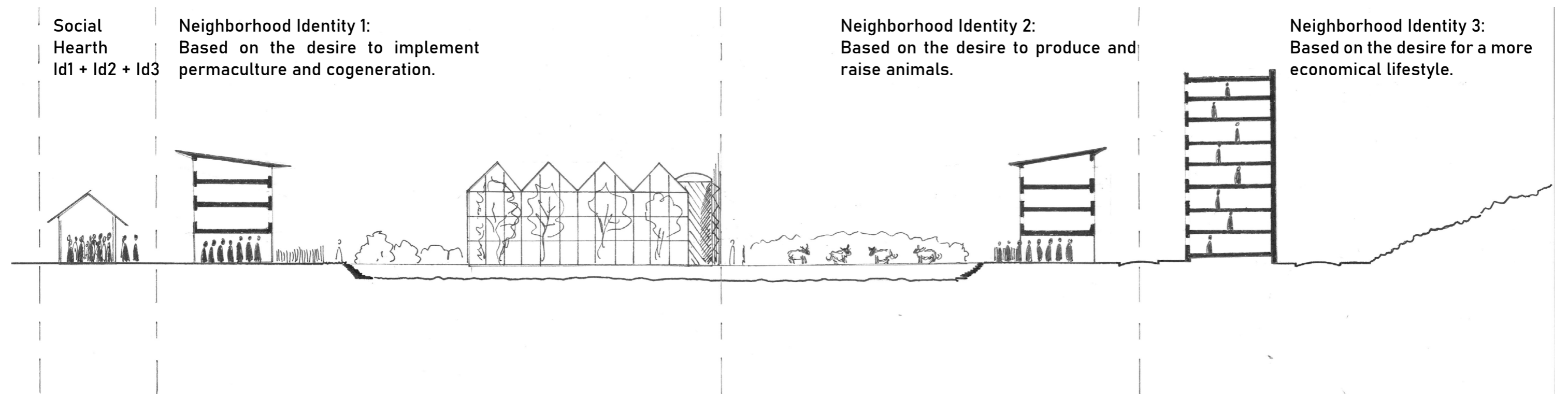


Fig.27 Hand-drawn schematic section showing the different possible community identities in productive housing.

3.2.1 – Resource Production as an Identity

Production units designed at the neighborhood scale require a complete rethinking of the city's structure. One can consider the varying degrees of proximity between housing units and production units. Production units would not necessarily have to be within the housing but could also produce resources near it. These new relationships would then make it possible to transform existing housing into productive housing in turn. Thus, the concept of production units at the neighborhood scale could be extended to an entire city. Each production unit would generate resources at the neighborhood level. In a sense, the city's neighborhoods could become fully or partially self-sufficient in heating energy, electricity, and food.

In these newly self-sufficient neighborhoods, residents could forge a community identity around the daily tasks required to produce resources. The identity of new communities could be built around production units at the neighborhood scale. Residents could define themselves by the resources they produce collectively. The daily tasks necessary for resource production would no longer be merely activities to meet needs but also vehicles for social relationships. Additionally, residents could learn to live in a community while ensuring their own autonomy. Building a community around production units presents several advantages.

The fact that residents have the choice to perform daily tasks to produce resources allows them to acquire technical skills throughout their lives. Indeed, producing tomatoes or electricity requires specific and precise technical skills, which, once acquired, can then facilitate access to a profession. Daily tasks for resource production can help residents discover interests in different fields of work.

Furthermore, on a larger scale, some production units could become professionalized. This professionalization could create new jobs at the local level. These jobs would provide opportunities for residents to gain professional experience more easily in areas such as agriculture, electricity, or craftsmanship. One can imagine each production unit being managed by a full-time professional. Production units could then offer varying degrees of professionalization by providing full-time or part-time employment. Professional technicians would have the role of teaching non-professional residents certain skills across different trades. Residents in a neighborhood would then have the choice to determine their level of responsibility in the production units and their remuneration based on the hours worked.

Production units could become a component of a new social system, allowing residents to discover themselves personally while fostering a sense of community. Each neighborhood would benefit from a micro-economy and its own identity while still having access to the facilities provided by the current economic system. It is also possible to imagine that different neighborhoods could specialize in certain types of production, creating complementarities to meet the overall needs of a territory or city.

3.2.2 – Nouveaux critères de systèmes productifs

However, it must not be forgotten that the daily tasks required by production units constitute work. It is therefore essential to define frameworks and rules to regulate the labor demanded by the different resource production units. Establishing these rules and frameworks would be a lengthy task for this text, but we can already propose hypotheses on the criteria that could help redefine resource production systems so that they can be located near housing. Indeed, we need to identify the characteristics that make it possible to implement a resource production process within a community. The question then arises:

What criteria must our productive systems meet to help foster the emergence of communities within a housing development?

The need to rethink our relationship with resource production is crucial for future generations. In this text, we can formulate initial intuitions about the criteria that allow a productive system to be integrated within a housing unit.

- The first requirement is to determine who truly controls the resources being produced. For a resource to be produced and used fairly and equitably, its control must not be exercised by a single entity. If one entity holds a monopoly over the distribution of a resource, it can create dependency among the residents on that entity. This dependency is problematic because it prevents residents from having any control over the resource production system. It reduces residents to being mere consumers rather than active participants in the production of the resource. Allowing residents to have some degree of control over resource production systems would be positive, as it would naturally make each individual more aware of what they consume. Additionally, having control enables residents to better understand what is beneficial or harmful to their own health. Sharing control over a resource production system also facilitates a circular economy by involving more actors in the production process than when a single entity controls the resource distribution.

- The second requirement is to design a productive system that allows for the regeneration of the territory. Today, it is essential to learn from our mistakes. In the pursuit of profitability, humans have often ignored the planet's capacity to regenerate soils and resources. If agricultural soils are depleted, the loss of nutrients and minerals simply makes it impossible to produce anything. Therefore, we must consider the renewal of the planet's soils in a broad sense whenever we produce something. This rule applies to all types of resource production, whether it involves water, crops, or energy and electricity generation. For example, producing electricity while using as few mineral resources as possible

is important to keep soils intact and preserve their valuable biodiversity.

- The third requirement is to have an ethical production process. It is important to produce resources through processes that align with our cultural values. Values are part of what defines the unique identity of a population. If the production process of a system aligns with the values of a population, that population can consider the system as an integral part of its identity and culture, rather than rejecting it. This issue is particularly important in productive housing, where new daily rituals are necessary for producing a community's resources. It is essential that resource production processes are suitable for the residents. Values can vary from one culture to another, so it is important to recognize that production methods may need to adapt to allow different cultures to coexist within the same productive housing. Respecting social or ecological values also provides basic rules that allow a community to exist. Community rules are crucial for respecting each individual. They also define common objectives and provide a framework that enables individuals to thrive.

3.2.3 – Defining New Rules in Urban Planning

But how can we move from the scale of a single housing unit to that of an entire city?

Productive housing allows for the definition of neighborhoods, and these neighborhoods could in turn help define a city, provided certain rules are applied.

The new requirements for productive systems are part of a broader inquiry that would need to be explored in a separate study. However, these initial production criteria could already help establish general urban planning rules.

As previously noted, production units must monitor the quantity of resources they extract while being overseen by multiple actors within the territory. All actions taken must adhere to the residents' ethical standards. These criteria could also be applied at the scale of an urban plan. Indeed, general urban planning rules could be defined with two main objectives:

- Ensure that every resident of a territory has equal access to resources
- Take into account and respect the climate components of the territory in question

Allowing residents of a territory to access natural resources such as sunlight, wind, and water, while respecting the climate, is important because

it ensures both resource sharing and respect for the territory, enforced through urban planning rules. These urban rules would also prevent certain excesses, such as monumental constructions—for example, a 30-story tower that could block sunlight for an entire urban area or monopolize the resources of a territory for its sole benefit.

3.3 – Hybrid Community City: Redefining a New Autonomy

Following various case studies on productive housing, it became apparent that these new types of housing can create conflicts of interest with existing city infrastructures. For example, in Freiburg, the concentration of multiple energy-autonomous housing units made it difficult for the city's main power plant to remain profitable. By producing their own resources, productive housing has the potential to disrupt the organization of a fully centralized city. The monopolies of large production infrastructures are threatened by productive housing. Conflicts with productive housing are therefore inevitable, as large production infrastructures are only profitable if they maintain their monopoly over the resources they produce. So, how can we begin to rethink the structure of our cities?

Redefining housing and resource production systems allows us to redefine the city. By producing resources collectively, productive housing could form neighborhoods that are partially autonomous in food, electricity, and heating. This new energy autonomy would allow autonomous neighborhoods to develop their own economic and environmental ecosystems while remaining connected to the global free-trade system in which we live. To scale from a neighborhood to a city, it is possible to build on the newly redefined production criteria, as well as on foundational urban principles.

3.3.1 - Integration of Productive Housing and Production Systems

To think at the scale of a city, it is necessary to focus on the key concepts that help us understand urban environments. Here, the concept of the urban framework should be introduced, referring to the network of a city's various communication routes: the gray framework (roadways), the green framework (distribution of green spaces), the blue framework (distribution of wetlands, waterways, etc.)...

It becomes clear that an existing urban framework, now incorporating productive housing and production systems along with all their requirements, could allow the definition of a new type of urban framework: the community urban framework.

- The community urban framework: This refers to a network of a city's communication routes designed around the strategy of basing all social and economic exchanges at the neighborhood level. This urban framework would therefore consist of productive housing, production units, and the flow of resources circulating between neighborhoods within the same metropolitan area.

The community urban framework would then be grafted onto existing cities. The word «grafted» is important, as it defines the intention of combining an existing urban framework with a community urban framework. To introduce the concept of grafting in an urban context, it is important to cite the definition of "graft" established by American architect Jeanne Gang:

Graft⁵⁹: An architectural creation philosophy that seeks to enhance existing buildings by attaching new extensions (the grafts) to older structures (the rootstocks) in such a way that both benefit. By connecting them, the graft creates a new architectural work, larger and more thriving.

In this context, architect Jeanne Gang primarily focuses on the rehabilitation of existing buildings. She adopts the term "graft" from the botanical practice of grafting. According to her, the essence of grafting in architecture is the intention to connect two elements that do not share the same temporality or nature, in a way that creates a symbiotic relationship between them. What is particularly interesting in the theory of grafting is the emphasis on understanding the preservation needs of an existing architectural element, while also recognizing the importance of integrating new present or future needs into that same element. In this sense, grafting serves as an intentional tool to combine an existing urban framework with a community urban framework.

The new community framework could therefore be grafted onto existing cities.

Grafting a community framework would involve the installation of multiple productive housing units and/or production units within an existing city. This graft would serve as a starting point to anticipate the future consumption needs of residents while also providing them with employment opportunities. The mix of different human activities could help erase the symbolic boundary between urban and rural areas, creating greener cities with greater biodiversity.

Grafting a community framework onto an existing urban framework would change the very definition of the city. A city that receives the graft of a community urban framework would thus become a hybrid community city.

- Hybrid Community City⁶⁰: Refers to a city that has integrated a community urban framework into its existing structure. This city adopts the strategy of basing a large part of its social and economic interactions at the neighborhood level, aiming to provide a more immediate and tailored response to the needs of its residents.

59 Jeanne Gang, 2013, La Greffe en Architecture, p50.

60 Définition du terme «Ville hybride communautariste» proposé ici.

Hybrid community cities would represent an intermediate space between urban and rural life. Residents could enjoy cultural activities while still feeling immersed in nature. The new hybrid city would exist in a constant in-between, operating under two overlapping systems: the existing urban framework and the community urban framework. The existing urban framework would continue to function as it always has, while the community urban framework would operate alongside a new circular economy. This circular economy would provide a form of balance within a capitalist world, allowing residents to gradually gain greater control over the resources needed to meet their basic needs.

This in-between dynamic would benefit both the existing city and the new autonomous neighborhoods, which would function together in synergy. Ideally, these two urban systems would complement each other. The new autonomous neighborhoods would build part of their identity around the resources they produce, while also contributing essential support to the local needs of the existing urban framework.

3.3.2 - Emergence of New Myths in Our Society

The economic system in which we live is largely capitalist. This capitalist way of life heavily emphasizes social success and the American myth of the “self-made man.” It promotes competition in the markets. Competition is so deeply ingrained in our current society that it is difficult to live outside the influence of globalization. The speed of production has become a goal for everyone. One could even argue that this race for productivity has gradually replaced traditional religions.

Hybrid community cities propose a different myth for humanity. Here, the focus would shift from the myth of individual success to that of collective achievement. The idea is to introduce to existing cities the birth of a new collective myth. In our society, this collective myth would be the belief that happiness can be achieved through mutual support. Community urban frameworks would serve this purpose, giving people the possibility to see collective success as an integral part of individual success.

Two myths could then usefully coexist: the myth of personal success and the myth of collective success. The myth of personal success would inspire individuals to develop their own identity, while the myth of collective success would help them find meaning and value in the work they perform. We believe that the main flaw of communism was its attempt to abolish private ownership. As individuals, each of us has a unique personality and pursues personal desires. Having personal desires cannot coexist with a system that seeks to eliminate personal achievement as a path to happiness. We argue that human fulfillment relies, in part, on a balance between personal success and collective success. Today, our society is imbalanced, as it focuses too heavily on individual achievement.

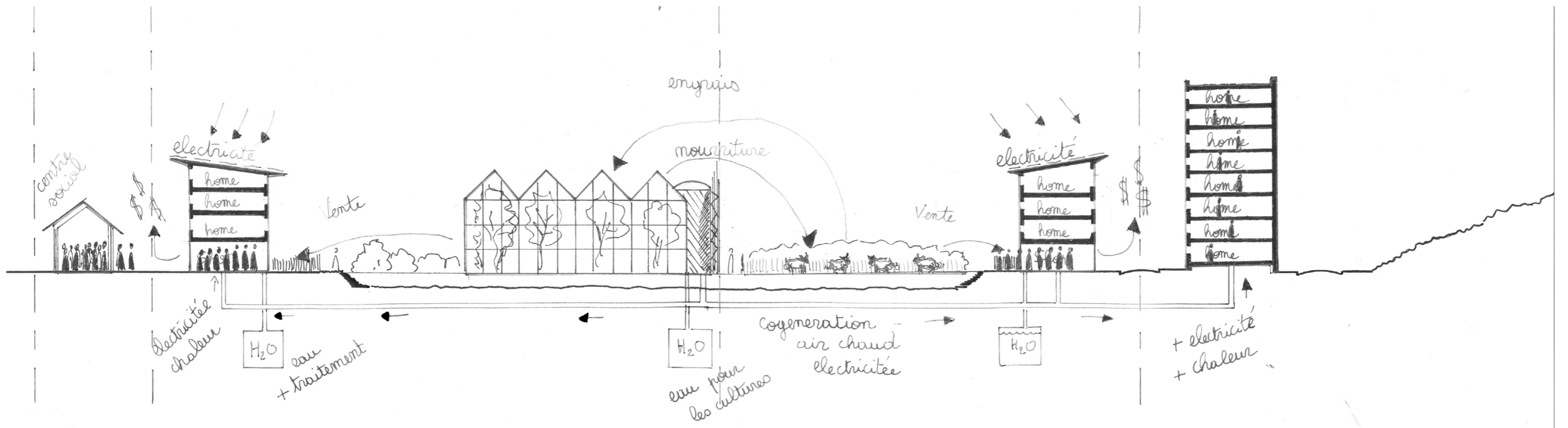


Fig. 28 Hand-drawn schematic section showing resource flows within productive housing and the different possible community identities in productive housing.

Conclusion: The Hybrid Community City, a Social Blossoming

Our relationship with consumption has reached a limit. We have realized that, in order to continue meeting our daily needs, we must reflect on:

- Our production tools
- The renewal of Earth's resources
- The territorial sprawl of cities into rural areas

These reflections add significant complexity to the world we live in. This complexity generates an existential crisis regarding the legitimacy of our needs and the factors that shape our identity. This existential crisis calls for questioning whether other ways of relating to the world are possible. This reflection led us to realize the need for new myths in our society, myths that help us consider our place in the world we inhabit. Together, these myths could give rise to a new mythology, one that includes the awareness that humans coexist with a multitude of other worlds, where each animal occupies its own domain. This awareness encourages us to study the concept of habitat to explore whether we can conceive alternative relationships with the world and with consumption in a more concrete, everyday way.

The study of a new form of housing, the Naturhus, and the eco-districts of Freiburg has shown us that it is possible to explore alternative relationships with the world and foster a different approach to consumption. The energy and food autonomy of the Naturhus demonstrated that a housing unit can produce its own resources. The eco-districts of Freiburg, in turn, showed that energy autonomy is achievable at the neighborhood scale. These autonomous neighborhoods also fundamentally transformed the identity of the cities in which they were established, giving rise to new community identities and raising issues around resource distribution.

Following these studies, we sought to develop a theory that would allow us to imagine new forms of housing and examine their potential impact at the city scale. To do this, we aimed to redefine three concepts:

- Redefinition of housing typology toward productive housing
- Redefinition of our relationship with production and its scale
- Redefinition of the city toward a hybrid community city

Redefining housing typology allows us to consider the integration of systems that produce the resources necessary to meet residents' needs in close proximity to their homes. Today, it is essential to catalog the different types of resource production systems. This cataloging would aim to assess both technical and spatial qualities from the very beginning of an architectural project's design. It is therefore a comprehensive reflection required to create new typologies: the typologies of productive housing. These productive housing typologies would result from the combination of housing typologies and the typologies of resource production systems.

The concept of productive housing emphasizes resource recycling to optimize every resource produced. Productive housing offers two major advantages: it produces resources directly linked to residents' needs and introduces new daily rituals required for resource production. These new daily rituals could help form communities centered around the resource.

To allow production units and housing units to coexist harmoniously, it is necessary to redefine our relationship with the various resource production systems. We first observed the pivotal role of resource production as a social driver, enabling the formation of a communal identity.

Puis, nous avons commencé à émettre les hypothèses suivantes sur les critères que la production d'une ressource doit respecter afin d'être introduite en proximité d'un habitat.

We assumed that resource production systems incorporate new criteria:

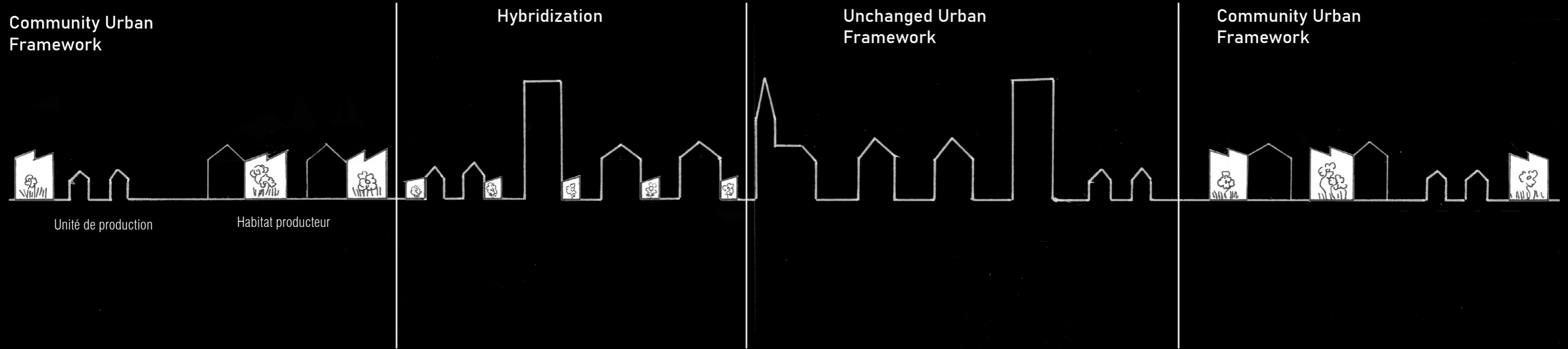
- Not being controlled by a single entity
- Allowing for soil regeneration
- Having a production process aligned with the values of the community

These initial assumptions would help establish new urban planning rules that ensure equitable access to natural resources for every individual while respecting the local climate. Such urban planning rules would facilitate the integration of productive housing and/or production units, allowing cities to redefine their identity. This would result in two urban frameworks:

- The existing urban framework
- The community urban framework

The community urban framework is composed of productive housing and/or resource production systems. This framework would be grafted onto the existing urban framework. From this union, the existing city would become a hybrid community city. Such a hybrid community city would develop a new strategy by basing a large part of its social and economic activities at the neighborhood level. This new strategy arises from grafting the community urban framework onto the existing framework. It creates an in-between space between urban and rural life, between our current consumption system and a new circular economy. Hybrid community cities would thus allow us to create new myths of both collective and individual success.

Hybrid Community City



Existing City

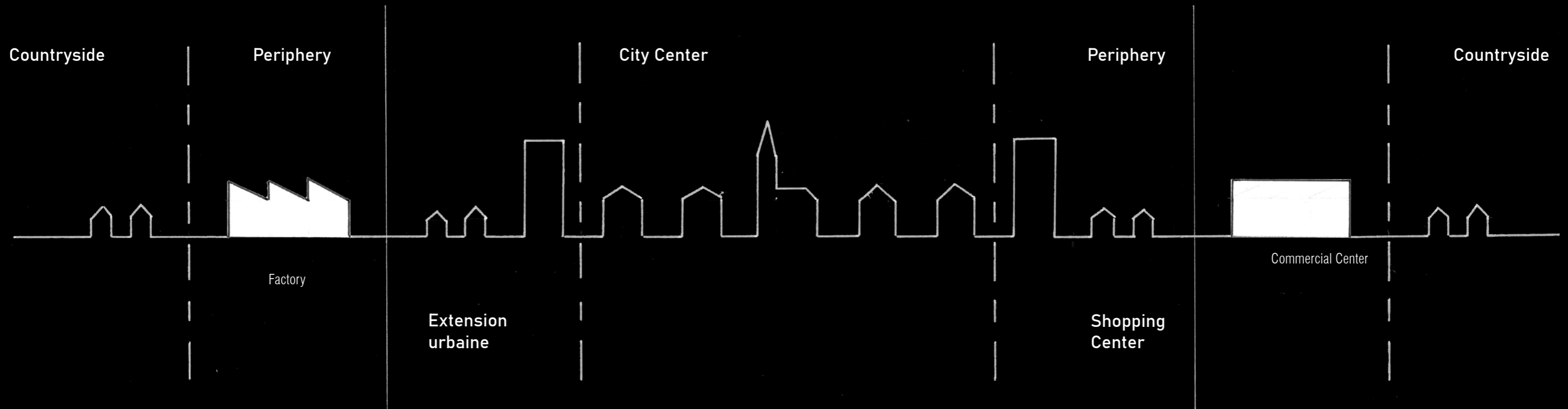


Fig. 29 Hand-drawn schematic section illustrating the general functioning of cities and the urban thinking developed in this thesis.

The idea is to propose a city capable of producing its own resources through production units distributed across the entire territory.

Hybridization is the process that transforms a city producing its resources in a centralized manner into a city producing them at the neighborhood scale.

This new production strategy would allow the city to expand while preserving the various habitats of the territory's living species.

Outlook

We could finally adopt a different discourse from the one that claims resources are too scarce to be shared, and thereby put an end to the constant fear of lack and possession that drives us to hatred of our neighbor. We must reclaim the world we inhabit—or at least try to—for future generations. This is where the desire to help one another begins. This writing is a call to all inhabitants of this planet to contribute their perspectives and expertise to the proposal of creating hybrid community cities. As discussed, we believe that a hybrid community city can only take shape through collective will and the free exchange of ideas.

Notions

1. Relationship to Consumption

Our relationship with consumption refers to the way we, as humans, interact with the means we use to satisfy our primary and secondary needs within our society.

*Definition of the term “Relationship to Consumption” proposed here, derived from the definition of *consume*:
consume: to bring (something) to the completion of its fulfillment.*

**Consommer*, Le Petit Robert, <https://dictionnaire.lerobert.com/definition/consommer>, accessed January 7, 2025.*

2. Wilderness

The essence of “wilderness” is the desire to preserve nature.

*Catherine Larrère, Raphaël Larrère, *Penser et agir avec la nature*, La Découverte, Paris, 2015.*

3. Aquaponics

Soilless cultivation of terrestrial plants (hydroponics) connected in a closed-loop system with the farming of aquatic species (aquaculture).

Aquaponics, Le Petit Robert, <https://dictionnaire.lerobert.com/definition/aquaponie>, accessed January 2, 2025.

4. Cogeneration

Cogeneration is a system that produces both electricity and heat by burning gas. This gas can be methane derived from the decomposition of organic waste. The heat from combustion is used for heating and hot water production through a heat exchanger. Mechanical energy is converted into electrical energy using an alternator. Cogeneration systems have excellent energy efficiency, but they need to be located close to consumption sites due to heat losses during transport.

Cogeneration, <https://www.edf.fr/groupe-edf/comprendre/production/thermique/cogeneration>, accessed January 5, 2025.

5. Passive Building

1. A passive building is a building heated passively, meaning it does not include an active heating system, such as central heating. Sunlight, insulation, and internal heat gains are sufficient, even in winter, to maintain a comfortable indoor temperature.

2. A passive building consumes less than 15 kWh per year per m² for heating (excluding hot water and electricity).

Passive Building, <https://www.passivhaus-vauban.de/passivhaus.fr.html>, accessed January 5, 2025.

6. Self-Promotion

The concept of self-promotion is simple: individuals come together to design, finance, and carry out a real estate project collectively.

Self-Promotion, https://fr.wiktionary.org/wiki/autopromotion, accessed January 5, 2025.

7. Productive Housing

Housing composed of two entities: the housing entity and the production entity. Both entities are built using recyclable and/or bio-based materials. The housing entity refers to the way humans organize and inhabit the environment in which they live. The production entity refers to the organization that includes resource production systems. The housing entity can be called the housing unit, and the production entity can be called the production unit. It is therefore important to distinguish between two types of typologies: housing typologies and resource production system typologies.

Definition of the term "productive housing" proposed here.

8. Bio-based Materials

Bio-based materials: materials derived from renewable organic matter (biomass), of plant or animal origin. They can be used as raw materials in construction and decoration products, fixed furniture, and as building materials in a structure (see the decree of December 19, 2012, concerning the content and conditions for awarding the bio-based building label).

Bio-based Materials, https://www.ecologie.gouv.fr/politiques-publiques/materiaux-construction-biosources-geosources#label-batiment-biosource-4, accessed January 2, 2025.

9. Typology

Classification based on the characteristics of a building, compared in order to create categories or families.

Typology, https://patrimoine.seinesaintdenis.fr/typologie-248, accessed December 22, 2024.

10. Productive Typology

The concept of productive typology here refers to a term that includes:

- The productive system itself, defined as a complex device or apparatus implemented to achieve the production of resource(s).
- Resources that, within the context of productive housing or a production system, are considered as such when they help meet one or more needs of the residents. These resources can be highly varied, ranging from simple hot water production to agriculture, enabling partial or full energy and/or food autonomy.

Definition of the term "productive typology" proposed here.

11. System

A complex device or apparatus implemented to achieve a specific result.

System, Le Petit Robert, https://dictionnaire.lerobert.com/definition/systeme, accessed January 7, 2025.

12. Resource

Something that can improve an adverse situation; material means of subsistence.

Resources, Le Petit Robert, https://dictionnaire.lerobert.com/definition/ressource, accessed January 7, 2025.

13. Community

Social group whose members live together or share common goods and interests; a collective. To live in a community. Examples: the scientific community of a country, national community, state, or nation.

Community, Le Petit Robert, https://dictionnaire.lerobert.com/definition/communaute#google_vignette, accessed January 7, 2025.

13. Ecosystem

Basic ecological unit formed by the environment (biotope) and the organisms living within it (biocenosis). Mountains and forests are examples of ecosystems.

Ecosystem, Le Petit Robert, https://dictionnaire.lerobert.com/definition/ecosysteme, accessed January 2, 2025.

14. Urban Framework

Refers to the network of a city's various communication routes: the gray framework (roadways), the green framework (distribution of green spaces), and the blue framework (distribution of wetlands, waterways, etc.).

Urban Framework, https://collectivitesviabiles.org/articles/trame-urbaine.aspx#:~:text=La%20trame%20urbaine%20r%C3%A9f%C3%A8re%20au,de%20circulation%20d'une%20ville, accessed January 2, 2025.

15. Community Urban Framework

This refers to a network of a city's communication routes that adopts the strategy of basing all social and economic exchanges at the neighborhood level. This urban framework would therefore consist of productive housing, production units, and the flow of resources circulating between neighborhoods within the same metropolitan area.

Definition of the term "Community Urban Framework" proposed here.

16. Graft

An architectural creation philosophy that aims to enhance existing buildings by attaching new extensions (the grafts) to older structures (the rootstocks) in such a way that both benefit. By connecting them, the graft creates a new architectural work that is larger and more flourishing.

*Jeanne Gang, 2013, *Grafting in Architecture*, p.50.*

17. Hybrid Community City

Refers to a city that has integrated a community urban framework into its existing structure. This city then adopts the strategy of basing a large portion of its social and economic interactions at the neighborhood level, aiming to provide a more immediate and tailored response to the needs of its residents.

Definition of the term "Hybrid Community City" proposed here.

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4 – Figures

0. Figure: Front cover, watercolor of “The Farming Project.”

0 bis. Figure: Back cover, watercolor of the “Neubau” project. This is a theoretical project, designed within the same academic framework as “The Farming Project.”

1. Figure: Hand-drawn mind map of the city of Montbrison. This map represents the field survey conducted during S5 at ENSASE in 2022.

2. Figure: Front cover of the report The Limits to Growth: Report for the Club of Rome’s Project on the Predicament of Mankind.

[https://www.goodreads.com/book/show/647942.The_Limits_to_Growth](https://www.goodreads.com/book/show/647942.The_Limits_to_Growth)

3. Figure: Image from the beginning of the video game The Universal Paperclips Game.

<https://www.decisionproblem.com/paperclips/index2.html>

4. Figure: Cover pages of the book Baukultur 2019.

5. Figure: Hand-drawn diagram expressing the definition of Nature.

6. Figure: Concept of Naturhus. Layered accumulation of various hand-drawn sketches.

7. Figure: Hand-drawn perspective of the Naturhus concept.

8. Figure: Hand-drawn diagram of the heating systems in the Naturhus.

9. Figure: Hand-drawn diagram of the water systems in the Naturhus.

10. Figure: Hand-drawn diagram of the agricultural systems in the Naturhus.

11. Figure: Interior photo of the Rosenlund Naturhus, designed by Green House Living.

<https://www.greenouseliving.se/project/rosenlund-naturhus>

12. Figure: Hand-drawn perspective section of the Naturhus concept, showing the relationship between the “inhabited” volume and the “greenhouse” volume.

13. Figure: Ground floor and R+2 plans of The Urban Farming Project.

14. Figure: Sections AA and BB of The Urban Farming Project.

15. Figure: Digital perspectives of The Urban Farming Project.

16. Figure: 1:200 scale model of The Urban Farming Project.

17. Figure: 1:20 scale model of The Urban Farming Project.

18. Figure: Photo of the historic city center of Freiburg.

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19. Figure: Photo of the Weingarten district tower.

<https://www.flickr.com/photos/teia/27186700387/>

20. Figure: Aerial photo of the Rieselfeld district.

<https://www.freiburg.de/pb/208560.html>

21. Figure: Aerial photo of the Vauban district.

<https://www.goodplanet.info/2020/03/18/inventer-la-ville-de-demain/>

22. Figure: Exterior photo of the Sunship project designed by architect Rolf Disch.

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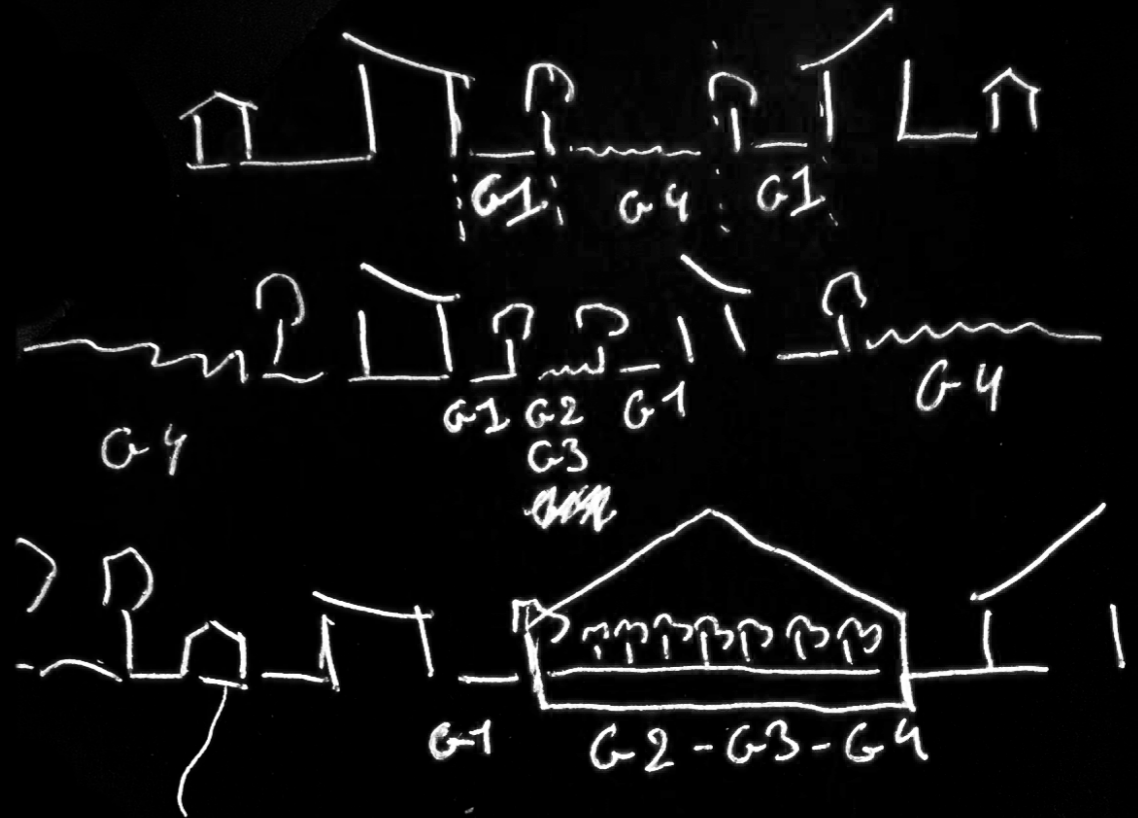
23. Figure: Hand-drawn perspective representing the concept of a city based on a community framework.

24. Figure: Hand-drawn schematic section showing resource flows in productive housing.

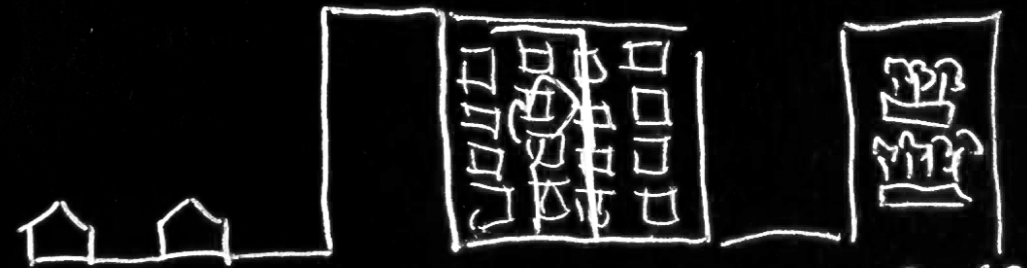
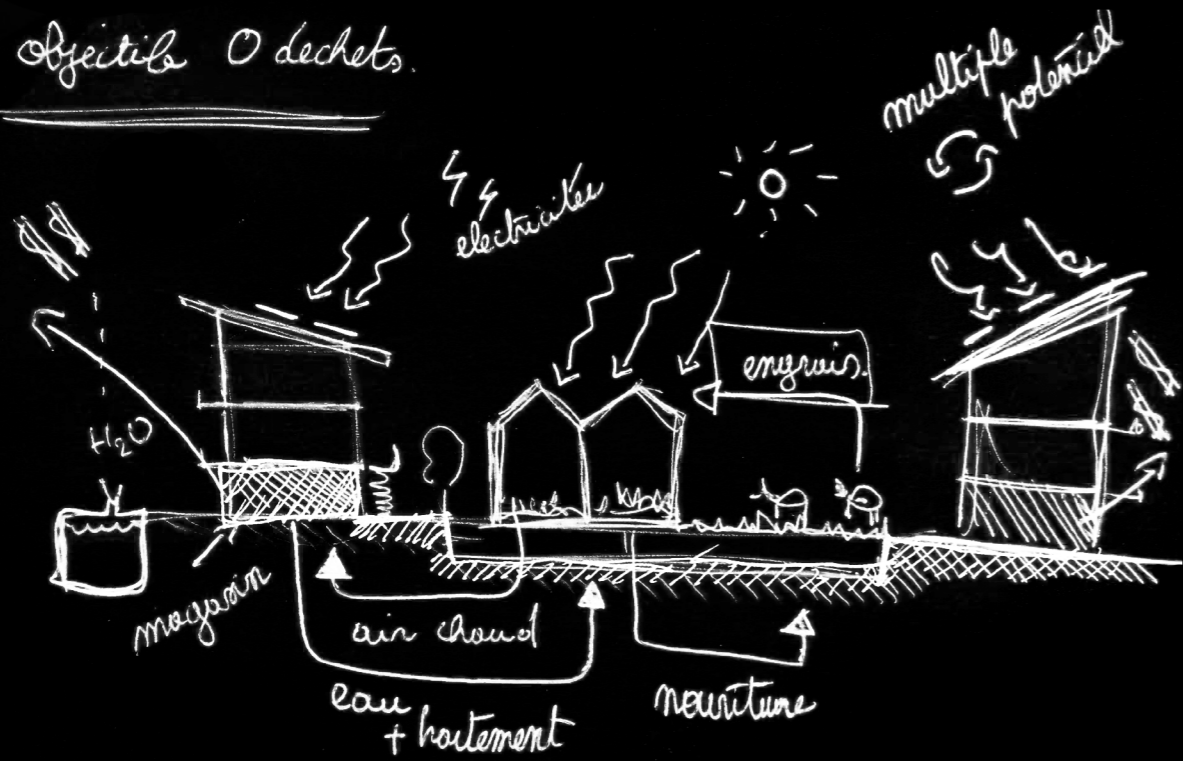
25. Figure: Hand-drawn schematic section showing the different possible community identities in productive housing.

26. Figure: Hand-drawn schematic section showing resource flows in productive housing and the different possible community identities within productive housing.

27. Figure: Hand-drawn schematic section illustrating the general functioning of cities and the urban thinking developed in this thesis.



Objectifs 0 déchets



réfléchir aux types de produits que peuvent être

Habitats producteurs, Déconstruire notre monde pour nous en créer un nouveau à habiter

Comment changer notre relation à la consommation dans nos habitats, à l'échelle d'une cité ?

L'objectif est de voir quelles problématiques posent la relation à la consommation que nous avons actuellement dans notre société. Ces questions nous amènent à nous demander si d'autres mythes sont possibles pour entretenir d'autres rapports au monde. La réflexion sera alors portée sur les solutions pour changer notre relation à la consommation dans nos habitats. Des études de cas architecturales, théoriques et urbains seront nécessaires. Ensuite, ces études de cas permettront d'émettre des propositions de redéfinition des notions d'habitats, de systèmes de productions, d'une ville. La redéfinition de ces notions permettra d'établir un procédé théorique de pensée afin d'envisager d'autres rapports à la consommation dans nos habitats.

Il sera alors question de rechercher les facteurs qui pourraient permettre à l'architecte de créer de nouvelles typologies d'habitat: les typologies d'habitat producteur. Puis nous nous interrogerons sur les dimensions des moyens que nous mettons en œuvre pour produire nos ressources. Enfin, nous parlerons des potentiels bénéfiques que pourraient engendrer des habitats producteurs pour la cité existante.

Mots clefs :

habitat producteur, typologie productive, système de production, ressource dans le cadre d'un habitat producteur, trame urbaine communautaire, typologie productive, ressources , ville communautaire, greffe, ville hybride communautaire.

*Habitats producteurs,
Deconstructing our world to create a new one to live in*

How can we change our relationship to consumption in our homes, on a city scale?

The aim of this project is to explore the issues raised by our society's current relationship with consumption. These questions lead us to wonder whether other myths are possible to maintain a different relationship with the world. The focus will then turn to solutions for changing our relationship to consumption in our homes. This will involve architectural, theoretical and urban case studies. These case studies will then be used to put forward proposals for redefining the notions of habitat, production system and city. The redefinition of these notions will enable us to establish a theoretical process of thought to envisage other relationships to consumption in our habitats.

We'll then look at the factors that might enable architects to create new habitat typologies: productive habitat typologies. Then we'll look at the dimensions of the means we use to produce our resources. Finally, we'll talk about the potential benefits that producing habitats could bring to the existing city.

Key words :

producer habitat, productive typology, production system, resource within a producer habitat, urban grid, productive typology, resources , community city, graft, community hybrid city.