Project description

What if: A future urban model as a self-regulatory biological organism. The use and abuse of the mechanism.

Today we are facing greater accelerations of climate change, pollution, soil degradation, depletion of natural resources than previous generations before us. In this project I look at emerging technologies, particularly artificial intelligence(AI), as a way to safeguard our civilization from the catastrophic consequences of climate change, unsustainable development and resource depletion. The project presents a thought experiment that asks what if sustainability goals, along with human needs, would organise our cities?

The project presents an urban model which works like a biological organism with multiple systems with unique functions co-operating in real time. AI and data enable a city to be self-aware and dynamically reconfigurable in real-time or near-real-time as any changes to the state of the system are continuously monitored and are thus analogous to the way biological systems operate and respond to their environment. Cities generate vast troves of data which, as an aggregate, provide a representation of human relations to their urban environment.

This speculative urban model seeks to answer how new technologies can make cities sustainable and beneficial to the people who live in them and to the environment. A real-time operating system transforms a city into a self-regulating, living organism, turning the linear and unsustainable management of resources into circular flows, commonly known as circular urban metabolism. This process is unavoidable for future urban evolution, in order to reduce human impact and to facilitate better, more efficient resource management.

The project asks: How can a city be fully sustainable and not to deplete or destroy critical resources? How could the neighborhood, as an urban unit, become more self-sufficient and embody alternative energy sources, while reducing pollution and harm to the environment? How could a city be fully sustainable and contribute to the health of the planet and the population of the future, how could it be both pollution neutral and resource neutral? In a second stage of the project the urban model is implemented in a physical location.

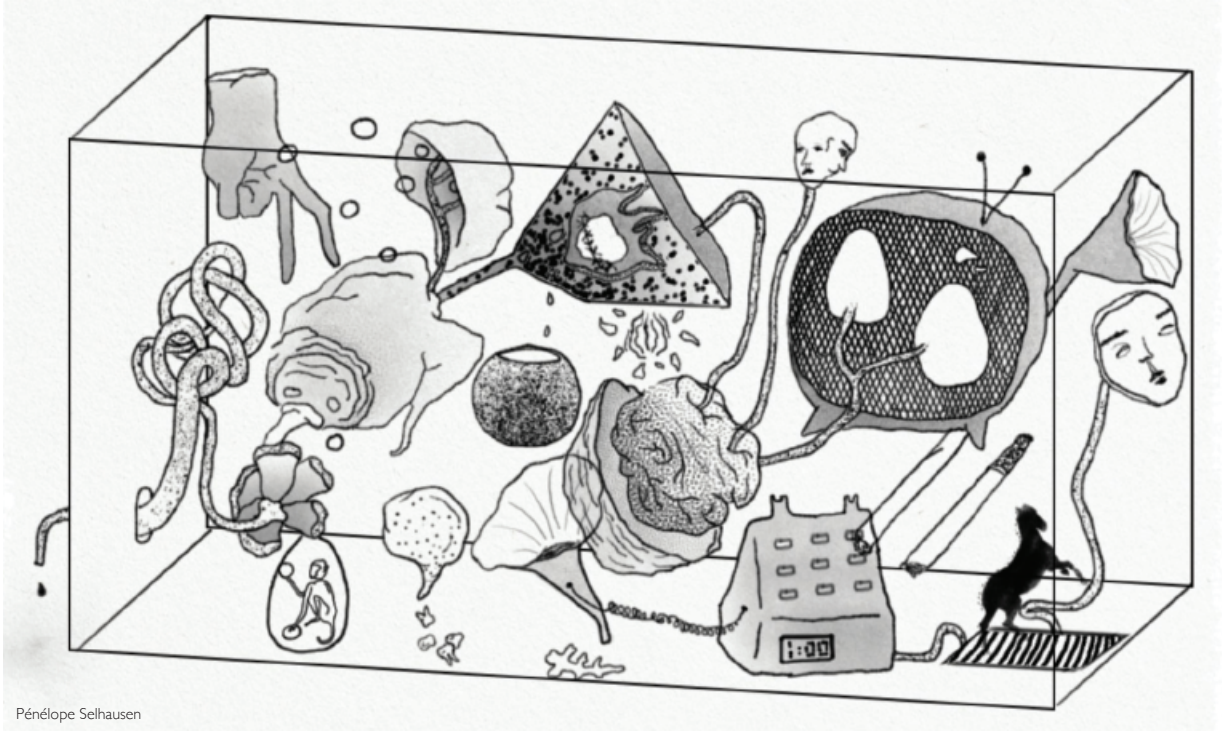
The project imagines a scenario in which Norway abandons its commitment to the fossil fuel industry and explores the re-appropriation of the once deserted industrial area of Forus in Stavanger. The concept of the urban model here appears as a transformation diagram in this site to imagine and speculate how AI might have operated in such an old industrial site.

This part of the project envisions how this industrial area is transformed into a sustainable neighborhood that supports a healthy society and environment. The neighborhood is partly shaped by public policies proposed by experts. The project looks into what this policy, combined with the urban model presented in the video work would mean for this neighborhood. The decisions and transformations in the neighborhood are based on this policy, which artificial intelligence strives to maintain within ideal parameters.

The third part of the project looks at possible abuses of the urban model.

Project program

NOTE: This is a project program from February 7th.
I started with one intention for this project but during the process it developed to be differently.



Pénélope Selhausen

DIPLOMA PROGRAM
Lina Dovydenaite

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Tutors: Andre Fontes (APP) Charlotte Erckrath (DAV)

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Project description

What?

My main goal is to create a scenario and an urban transformation diagram for the post-fossil fuel society scenario where industrial Forus district is transformed into a sustainable self-regulating natural ecosystem enabled by big data and artificial intelligence. Where artificial intelligence is the controlling power fueled by data and human inputs. A self-sufficient neighborhood where artificial intelligence would be able to control all its components.
At the moment, I want to create an architectural animated film that presents a speculative scenario of the future where the city district acts as an organism, where the skeleton is urban architecture, the muscular system is mobility, the senses are sensors, the eyes and ears are data collectors, and the digestive system is waste management. And so on. And artificial intelligence is the brain that controls everything in the system.
The project "Imaginary Urbanism in the Age of Data and AI" will focus on a future speculative scenario where a real-time operating system can embody the district as a living organism.

The project will use the "plug-in" concept, where this type of neighborhood can be "plugged-in" anywhere in the world.
In this project, I chose the concept of a sustainable "autopoietic neighborhood".
The goal of the project is to create a speculative self-creating neighborhood that is able to rebuild and sustain itself through real-time feedback enabled by artificial intelligence that contributes in addressing human impact on Earth's geology and ecosystems.

Why?

By doing this project, I want to answer how artificial intelligence can make our cities sustainable and beneficial to people and the environment.

During the current Anthropocene era—the geological epoch which has had significant human impact on Earth's geology and ecosystems—we have developed technological capabilities that have enabled us to greedily use limited natural resources for economic profit [1,2]. This ruthless capitalist practice not only brought about anthropogenic climate change, but also caused socioeconomic inequalities to soar globally [3].
Many see emerging technologies, particularly artificial intelligence (AI), as a way to safeguard our civilization from the catastrophic consequences of climate change [4], biodiversity loss [5], natural disasters [6], unsustainable development [7], pandemics [8], and so on.
At this particular moment in time, perhaps one of the several major paradigm shifts in human progress, we have a moment to pause before plunging headlong into the new reality that is at our threshold: a reality led by new technologies that are already beginning to transform every aspect of our contemporary life as we understand and experience it. This new reality, if managed ethically through private-public-people partnerships, guiding the convergence of technology with natural and social systems to form self-regulating governance platforms, will potentially be the solution to what humanity has constructed as our current demise, the overpopulation of cities, socioeconomic inequality and injustice, exploitation of our natural resources and the destruction of earth's ecosystems.

I look into the scenario where we move away from our current fossil fuel based economy towards a new era of AI- enabled sustainable development and where we realize a city as a harmonious, self-regulating ecosystem which is never static, is dynamic and increasingly difficult to trace as a linear process where activities, events, and programs can organically play themselves out.

Where?

Forus, Stavanger

In this transition from fossil fuels to renewable energy sources, Forus industrial area will undergo significant changes, nowadays around 50% of district consists of a fossil fuel-oriented companies.

Fossil fuel companies in Forus are accountable for contributing to climate change and planet damage for the past 50 years.
Fossil fuel companies have known for decades that their products—oil, natural gas—cause global warming. During those 50 years, Forus area has become negatively charged.

During this transition period, decisions should be made for the Forus area, aiming to change its local identity and trying to offset the damage done to the planet.

In the future development, I see Forus as a connecting point between the Gandafjord and the North Sea and between Stavanger and Sandnes.

How?

-In the animated axonometric video, the transformation of an industrial district would be presented more as an abstract scheme of urban planning.

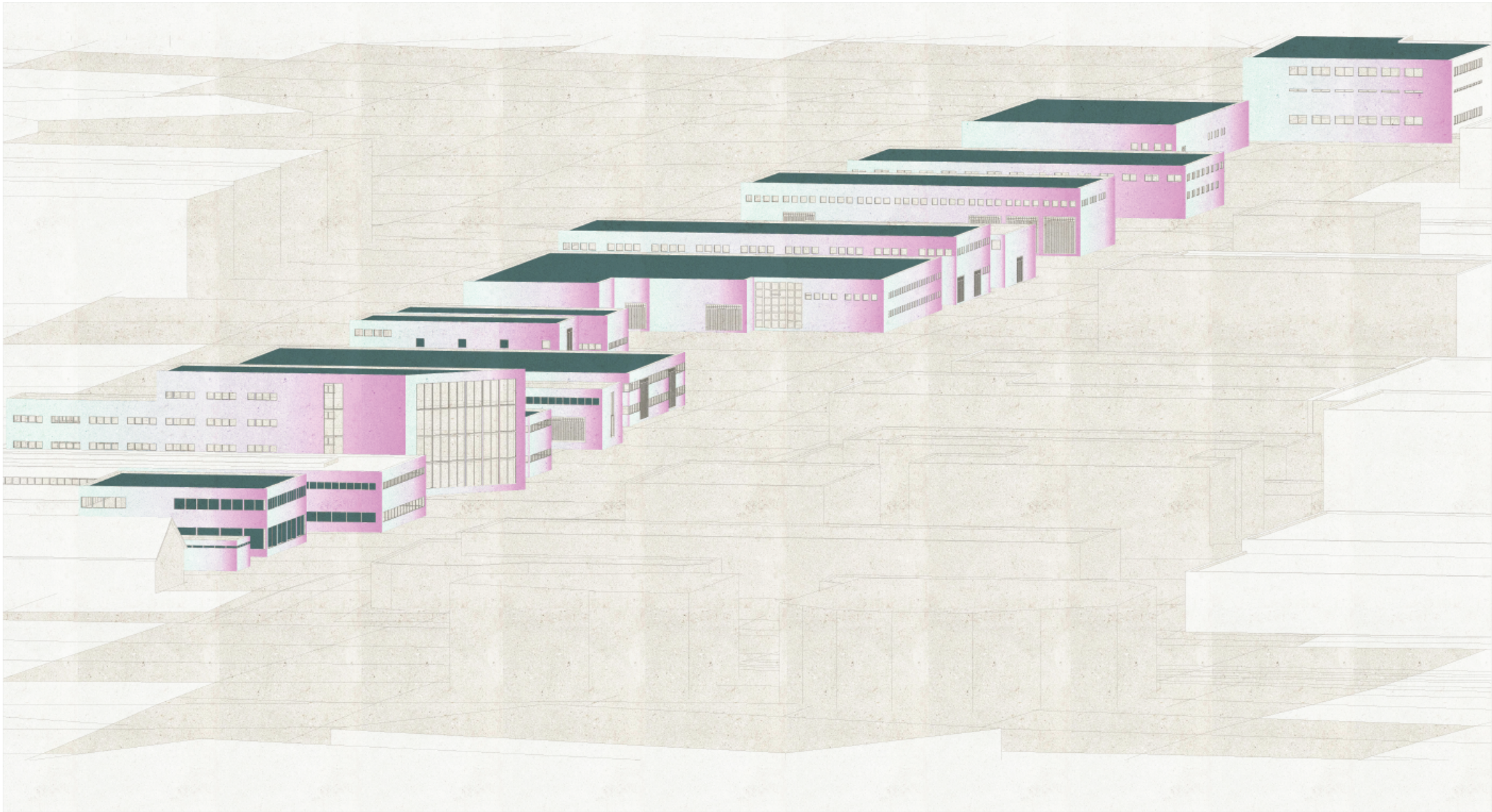
- The project will potentially be developed in consultation with experts in various fields, such as computer science, social sciences, data science, political science.

-I will speculate what kind of data could be available in the city/district, that helps to have more informed urban planning. I will map out some of the data and speculate on correlations, and see how it would help for district development.

-I will be researching for the components to implement in the AI driven sustainable neighborhood.

-In this project, I will present a new neighborhood model that works in line with the policies proposed by the experts.

What kind of community could be created using existing industrial buildings?



Excerpts from essay

In my essay I looked into the idea how AI can help for city to become more sustainable and how with the help of big data and AI city can be as a self-regulatory ecosystem.
The name of my essay is "Artificial intelligence as a means to achieve urban self-regulation as part of the natural ecosystem".
The starting point for me writing this essay was two questions that I was asking experts in anthropology and social science: how do you think we should use the data that AI systems are able and will be able to gather and process from the city? And second question. What cities of the future would you like to see and achieve?

For this essay, I tried to answer these questions myself and explore the contradiction between the ethical problems and the potential for big data and AI to contribute to addressing the significant human impact on the planet.

Excerpts from essay

I also explored the possibility of new technologies bringing us closer to nature.
"In ancient times, humans were more connected to the natural world with direct relational awareness of universal biorhythms. As we have evolved with the use of technology, we have moved away from this direct connection with nature and have lost the capability of sensing nature instinctively. In the process of the mass migration and overpopulation of urban centers, humans have exacerbated the interrelationship with nature and compromised earth's balance. In this new stage of development, AI will enable us to achieve a collective intelligence that has the potential to create a critically needed interface between humans and the natural world. [24] "
I looked into different concepts of how new technologies can benefit people and the environment.

I looked into so called Artificially intelligent city where algorithms are the dominant decision-makers. When potentially "…economic, societal, environmental, and governmental activities are based on sustainable practices driven by AI technologies, helping us achieve social good and other desired outcomes and futures for all humans and non-humans."

I explored the possibility of self-creating Autopoietic city allowing people to co-create their environment. I was interested in this concept of how people can be an active part of an autopoietic city by participating directly with human input.
"AI-enabled real-time feedback allows the city to become autopoietic through the participation and interaction of all entities operating within the urban ecosystem."

So in the way auto-poetic city recognizes person's right to participate as an influencing member of a community"

Excerpts from essay

Also, I been writing in my essay about the concept of City as self-regulating system.
Where city is compared with ecosystem where natural processes recycle and wastes nothing and also self-regulate.

Where "In nature, chaos is governed by natural feedback leading to self-regulation through positive and negative feedback that allows systems to self-regulate and to perpetuate as a living organism."

Also, I explored AI ethics and it's impact on society where it seams if done well, AI can help us tackle some our most complex urban challenges.

Scott Burleigh, software engineer wrote, "Advances in technology itself, including AI, always increase our ability to change the circumstances of reality in ways that improve our lives. It also always introduces possible side effects that can make us worse off than we were before. Those effects are realized when the policies we devise for using the new technologies are unwise. I don't worry about technology; I worry about stupid policy. I worry about it a lot, but I am optimistic; in most cases I think we eventually end up with tolerable policies."
So if to sum up the issues the right question to ask would not be 'What will happen?' but 'What will we choose to do?'

Writing this essay helped me to decide that I want to construct future speculative district based on ideas in the essay of sustainable self-operating city.
It helped me to crystalize my project concept into a project about a new imaginary form of a district that is managed and optimized by urban algorithms with the sustainability as a goal.

Concept model

The concept model is called "The organism" where everything is connected to everything else. Where the skeleton is an urban architecture, muscular system is mobility, senses are sensors, eyes and ears equals data collectors, where digestive system equals waste management. And so on. And AI is the brain that is in control of everything all the processes within the system.
This concept of a city as a metaphorical body I came across when writing essay.
I wrote about it in the section Cities as organisms:

"Cities operate similar to the human body with multiple functions that work together as a holistic system responding to internal and external conditions requiring an orchestrated reaction. Given the right balance of diet, exercise, and meaning, the body takes care of itself. The city, however, depends on the cooperation and collective intelligence of its people and its smart systems."

This idea of City as organism or as natural ecosystem leads me to making self sufficient district where AI is in control of all components as it would be one organism. Where I gonna address food production, energy production, mobility and others necessary components of the organism.

Concept model

The site

A BRIEF HISTORY OF FORUS

Forus is an industrial district in the city of Stavanger which lies in the southwestern part of the large municipality of Stavanger in Rogaland county, Norway.

Stokkavatnet is a former lake, which was located where
Forus is located today. The lake was one of the largest in Nordjæren
about 4 km2. The surrounding landscape was primarily
wetlands and was known for a rich bird life.
Drainage plans were started in the 1860s, but were first
approved in 1906. The drainage of the former 4-square-kilometre (1.5 sq mi) lake Stokkavatnet and the surrounding marsh area, from 1906 and onwards, added 4.5 square kilometres (1.7 sq mi) of new land for the nearby farms.

In 1940, at the start of World War II, the German occupants initiated construction of Stavanger Airport on this site. The area was later developed mainly for industrial purposes.

In Forus area Forus Business Park was founded in 1968.
Forus Business Park spans geographically across the boundaries of 3 municipalities.
The large construction activity at Forus today takes place within the guidelines that each municipality has set for the buildings in their individual municipal plans and local plans.
The oldest buildings are purely functional warehouses, while the newest are to a greater extent office buildings where the design is part of the marketing.

About 1/5 of the total Norwegian value creation (2012) takes place in companies at Forus with
a turnover of over 1000 billion. The Equinor headquarters are located at Forus.
50% of the workers in Forus is in the oil and gas industry.

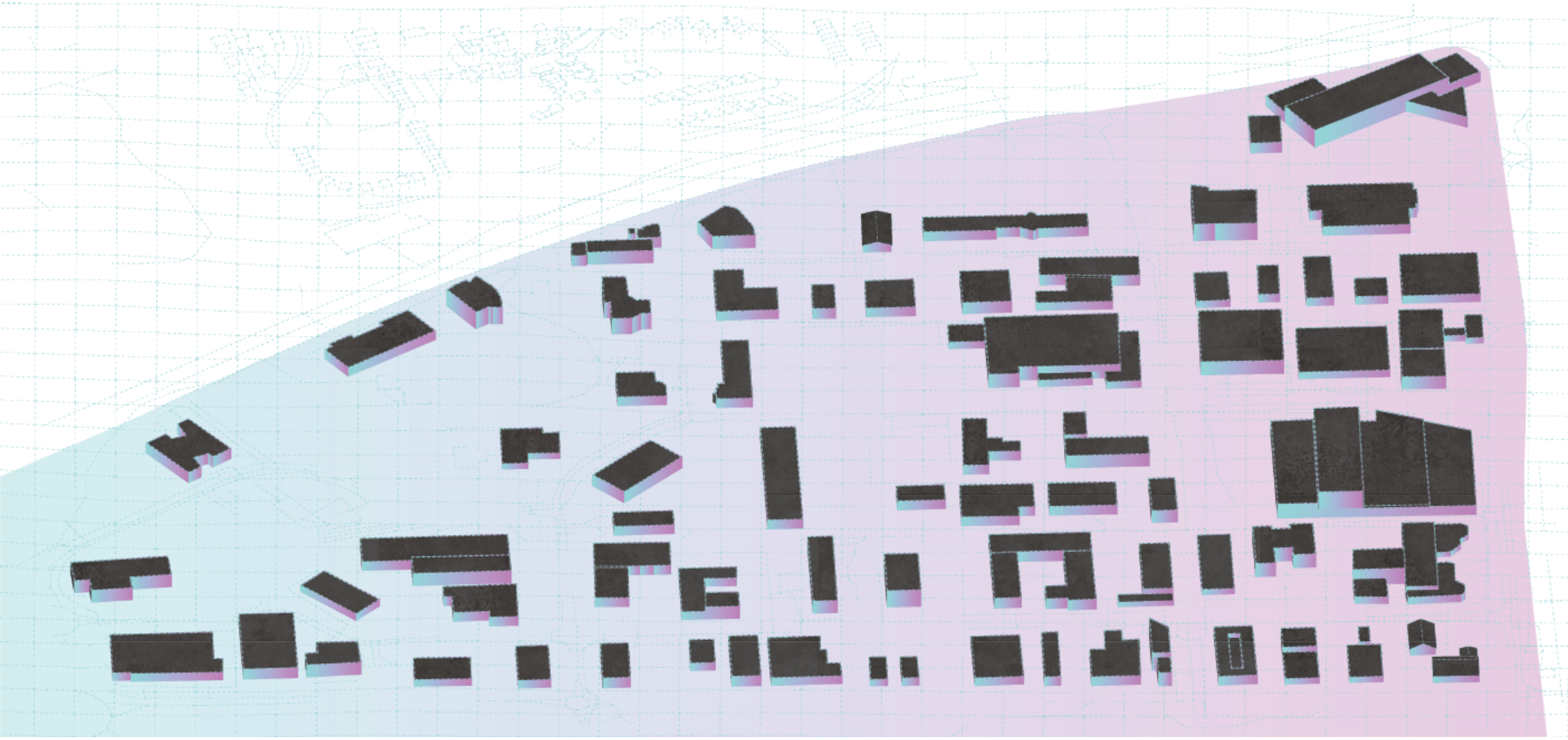
Site pictures

Site pictures

In the selected part of Forus, many of the buildings act as a warehouses.

Many buildings has stone crete plaster facades

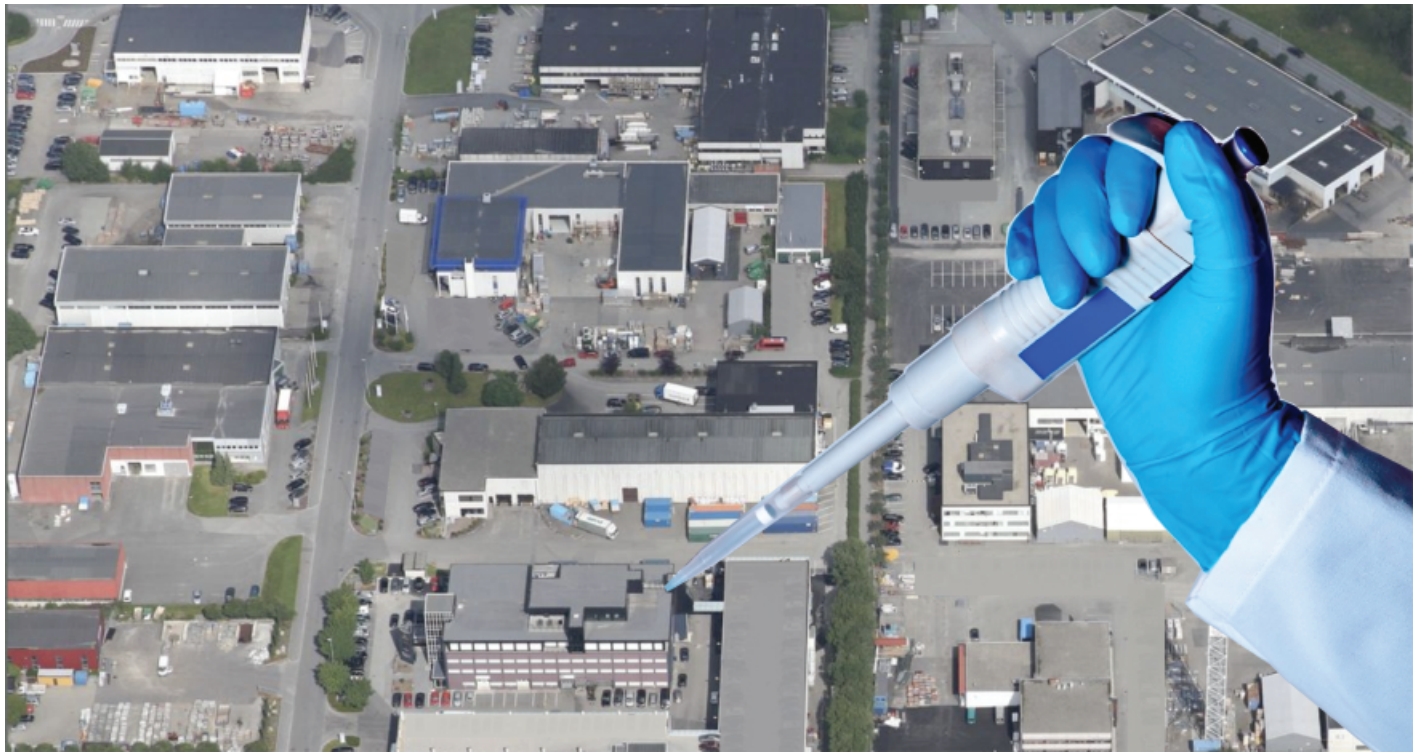
3D model



Area: 0,804 sq km

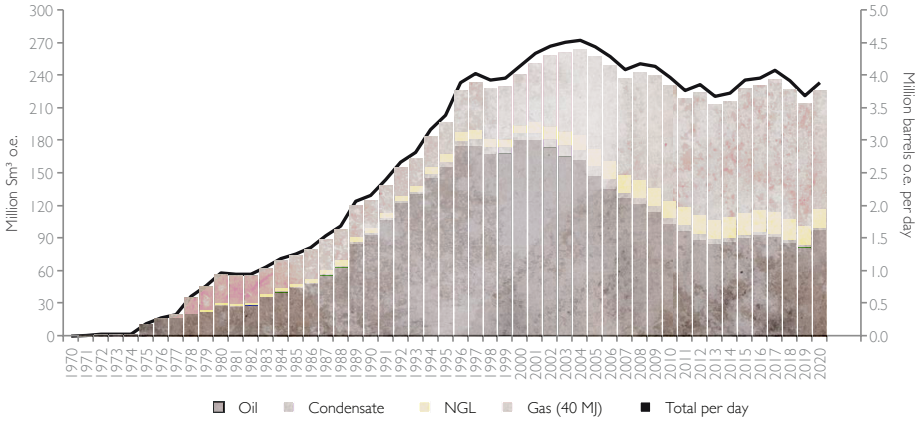
Existing buildings on the site.

I want to look at Forus district from the future perspective as it has transformed into a real-time social and environmental experiment.

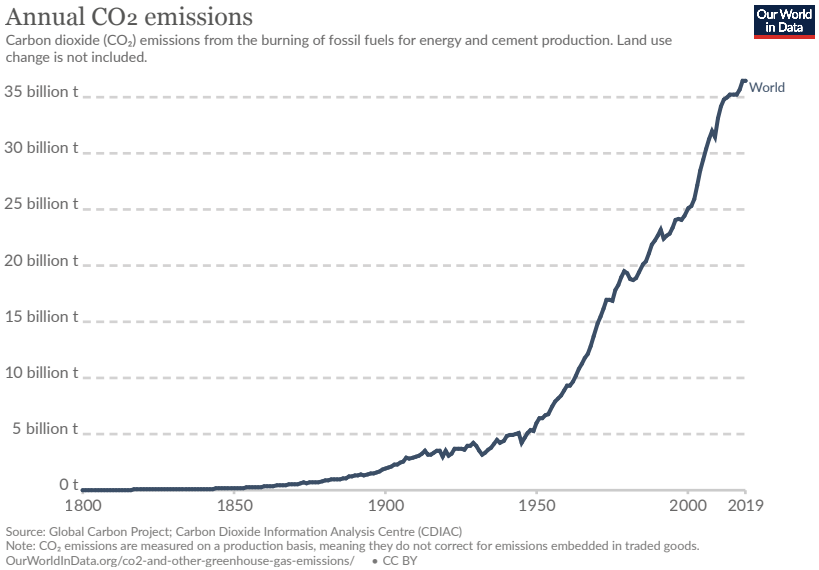


EARLY INVESTIGATIONS:

Norway is a small player in the global crude market with production covering about 2 percent of the global demand. Norwegian production of natural gas covers approximately 3 per cent of global demand, however, as an exporter Norway is a significant country. Nearly all oil and gas produced on the Norwegian shelf is exported, and combined, oil and gas equals about half of the total value of Norwegian exports of goods.
Norway is embarking on a challenging process of fundamental transformation. Its climate targets include reducing greenhouse gas emissions by at least 40 % by 2030 and becoming a low-emission society by 2050.
In 2019, CO2 emissions per capita for Norway was 8.89 tons of CO2 per capita.



Historical fossil fuel production in Norway



EARLY INVESTIGATIONS

Big Data breaks silos, creates direct bridges between policy-makers and citizens and supports real-time views of a particular city.
The use of Big Data offers tremendous opportunities for urban planners and designers. By all means, the use of data in design and planning is not new but the volume of data that is today being produced through satellite imagery, social media, mobile phones and sensor networks reinforces and diversifies the possibilities for evidence-based spatial planning.

Social sensing, through the exploration of social media in cities with high digital penetration such as Singapore, can help to understand people's behaviours in urban areas, for example the use of public spaces or the interactions between people and nature in cities. In the developing world, mobile phone data can be used as a proxy for census data and help plan for infrastructure development, whether transportation or energy network systems.

Big Data becomes more powerful when it is voluntarily shared by the citizens. The use of Big Data has become increasingly sensitive because of the recent abuses and misappropriation of digital information.
Finally, the use of Big Data has become a governance question. Like any other urban systems, such as energy, water, transport, the management and regulation of data is a major issue. Not only because no single urban authority can claim access to all the data that is being produced (municipalities need to work with industry players, start-ups, academia..) but also because the use of data reshapes current governance models. It breaks silos, creates direct bridges between policy-makers and citizens and supports real-time views of a particular city. This has clear consequences on how a municipality takes decisions and plans for the future. Urban data management and urban governance are two interrelated dimensions that inform each other.

Process - data

I will research on what kind of public spaces should be implemented in the district (based on speculated data about the district/city population?
(dog parks, sports fields, plazas etc. ?)

I will speculate what kind of data could be available in the city/district, that helps to have more informed urban planning. I will map out some of the data and speculate on correlations, and see how it would help for district development.

DATA:
What? How much? Where? + correlations
Demography:
For example:

How many people has depression, anxiety (percentage + people)
How active they are? walking (steps), cycling(km), working out(hours), hiking(hours)
How much do they participate in cultural events? (amount)

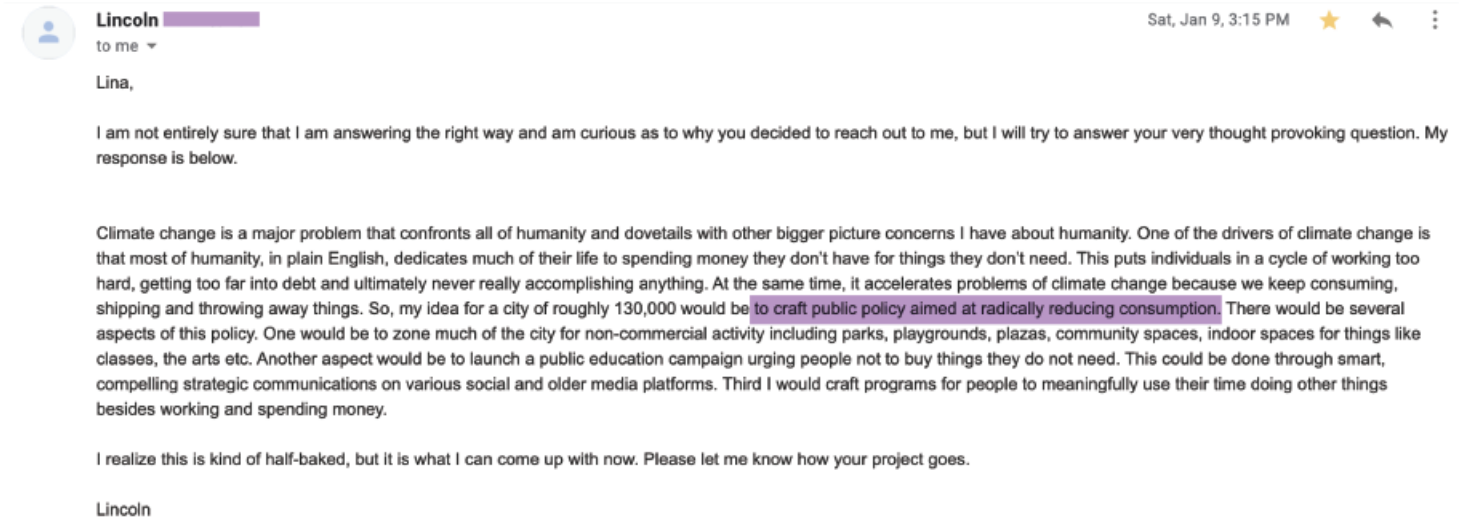
Biodiversity:
For example:

Where do most birds live in the fabric of the city?(locations)
Locations of different types of trees in the city/district.
What different types of animals lives in the green areas of the city?

Others:
For example:
Locations where people had illegally obtained guns
Topographic map, of social media check-ins.
Mapped cultural events
Maps with data highlighting businesses such as gambling, drugs, and prostitution.
The types of noises in public spaces, whether chaotic, calm, monotonous, or vibrant
Mapped damage after hurricanes, as well as the extent of the damage.
The map with data showing the number of reports asking for assistance after the earthquake or other natural disaster.
Air quality: Carbon monoxide measurements and other.
Radiation measurements
ect.

Highlights from the process

Sustainable self-operating district would be combined with experts proposed policy/inputs of zero-emission and zero-waste economy. Also combined with public policy aimed at radically reducing consumption and with policy of no cars or fast transportation over the ground. I want to look how those ideas could be implemented in practice and how policies could be transformed into urban planing.



Lincoln [redacted] Sat, Jan 9, 3:15 PM

to me

Lina,

I am not entirely sure that I am answering the right way and am curious as to why you decided to reach out to me, but I will try to answer your very thought provoking question. My response is below.

Climate change is a major problem that confronts all of humanity and dovetails with other bigger picture concerns I have about humanity. One of the drivers of climate change is that most of humanity, in plain English, dedicates much of their life to spending money they don't have for things they don't need. This puts individuals in a cycle of working too hard, getting too far into debt and ultimately never really accomplishing anything. At the same time, it accelerates problems of climate change because we keep consuming, shipping and throwing away things. So, my idea for a city of roughly 130,000 would be to craft public policy aimed at radically reducing consumption. There would be several aspects of this policy. One would be to zone much of the city for non-commercial activity including parks, playgrounds, plazas, community spaces, indoor spaces for things like classes, the arts etc. Another aspect would be to launch a public education campaign urging people not to buy things they do not need. This could be done through smart, compelling strategic communications on various social and older media platforms. Third I would craft programs for people to meaningfully use their time doing other things besides working and spending money.

I realize this is kind of half-baked, but it is what I can come up with now. Please let me know how your project goes.

Lincoln

Process

I will be gathering statistics and looking how it will determine the project.

For example:

What is the area required to fullfill the basic needs for a one person per year? (space for energy production, for food production, water storage, home)

How much electricity do you need per year for 1 square meter of growing area in vertical farm?

How much water do you need per year for 1 square meter of growing area in vertical farm?

How many people can you feed per square-kilometer of farmland? (Hydroponics, Aeroponics, Conventional Farming)

How much energy can 1 acre of solar panels produce in Norway?

How much energy can 1 acre of algae farm produce?

etc.

Fabrikkveien 38
3941 m²

Fabrikkveien 24
2291 m²

Fabrikkveien 8
1792 m²

Fabrikkveien 29
1885 m²

Fabrikkveien 15
14419 m²

Lagerveien 23
530 m² + 1558 m²

Lagerveien 6
1385 m² + 459 m²

Lagerveien 19
1602 m²

Maskinveien 26
750 m²

Maskinveien 10
886 m²

Fabrikkveien 36
2837 m²

Fabrikkveien 22
341 m²

Fabrikkveien 6
1444 m²

Lagerveien 25
4709 m²

Fabrikkveien 11
1654 m²

Lagerveien 24
805 m² + 1941 m²

Lagerveien 10
764 m²

Lagerveien 13
8653 m²

Maskinveien 24
1168 m²

Maskinveien 8
551 m²

Fabrikkveien 34
972 m²

Fabrikkveien 20
317 m²

Fabrikkveien 4
1002 m² + 137 m²

Fabrikkveien 27
2614 m²

Fabrikkveien 9
1647 m²

Lagerveien 20
3055 m²

Lagerveien 2
15 919 m²

Lagerveien 9
4000 m²

Maskinveien 20
1843 m²

Maskinveien 6
1041 m²

Fabrikkveien 32
1159 m²

Fabrikkveien 18
1917 m²

Fabrikkveien 2
946 m² + 541 m²

Fabrikkveien 25
1775 m²

Fabrikkveien 7
1644 m²

Lagerveien 18
668 m²

Maskinveien 9
2105 m²

Lagerveien 7
3811 m²

Maskinveien 18
1496 m²

Maskinveien 4
543 m²

Fabrikkveien 30
1034 m²

Fabrikkveien 14
648 m²

Fabrikkveien 43
2097 m²

Fabrikkveien 23
1469 m²

Fabrikkveien 3-5
5029 m²

Lagerveien 12
2088 m²

Maskinveien 30
2470 m²

Lagerveien 1
3281 m²

Maskinveien 16
1268 m²

Maskinveien 2
3048 m²

Fabrikkveien 28
892 m²

Fabrikkveien 12
1717 m²

Fabrikkveien 37
1371 m²

Fabrikkveien 21
1150 m²

Kontorveien 15
1913 m²

Lagerveien 14
1438 m²

Lagerveien 21
997 m²

Maskinveien 28
1060 m²

Maskinveien 14
1454 m²

Maskinveien 22
1119 m²

Fabrikkveien 26
1092 m² + 522 m²

Fabrikkveien 10
685 m²

Maskinveien 1
8132 m²

Maskinveien 7
3971 m²

Kontorveien 12
2657 m²

Lagerveien 12
1483 m²

Maskinveien 18-12
786 m²

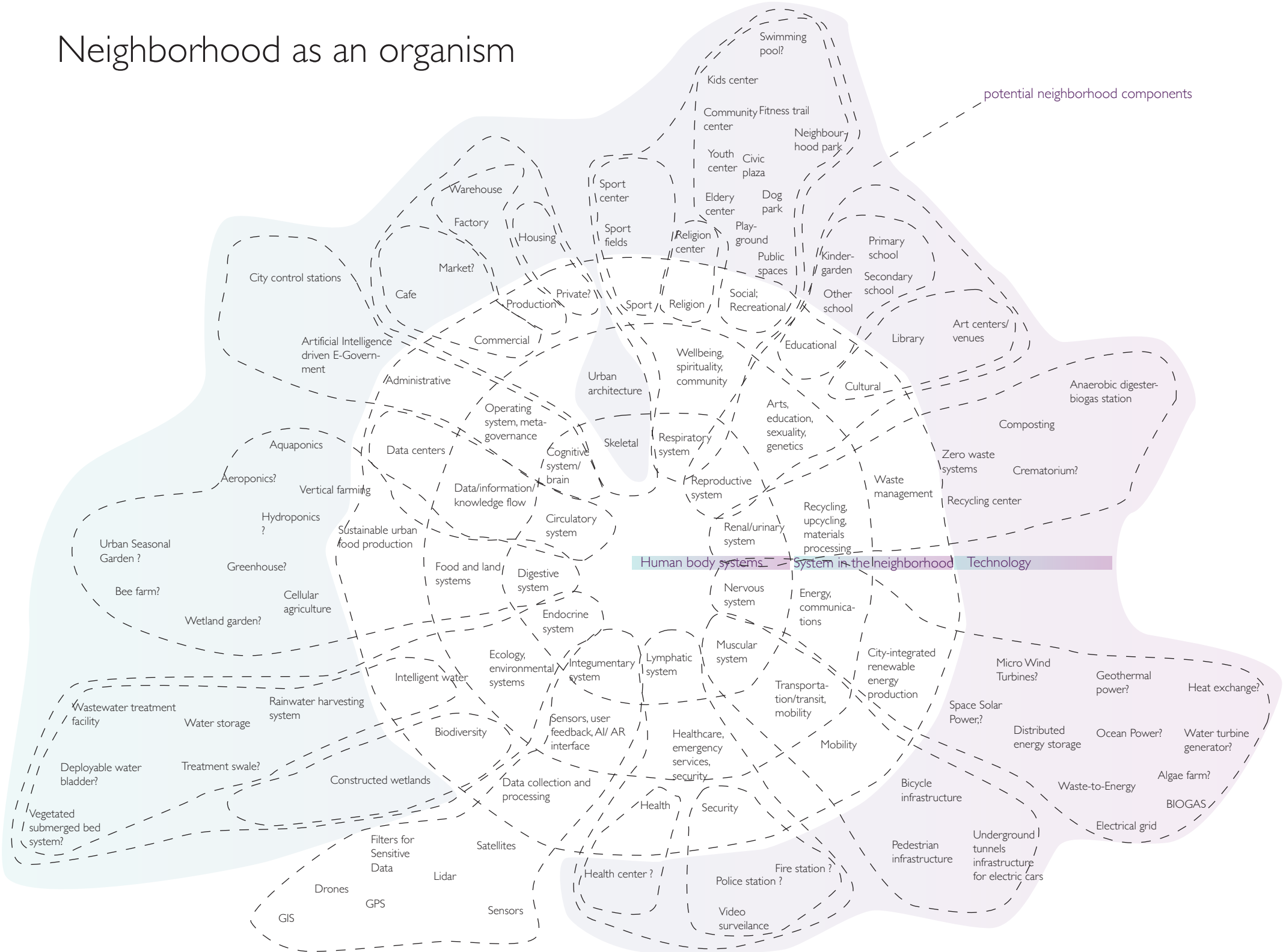
Maskinveien 13
2204 m²

Maskinveien 12
3099 m²

Maskinveien 15
1096 m²

"A post fossil-fuel culture would thus be one in which we would no longer are in the way that we have been. It would be a culture that is shaped and organized by new modalities of being and behaving. A culture that is truly after oil would be one we would find difficult to recognize. It would represent a shift as great as those imagined in the most radical political revolutions. To exist in such a culture, we would need to be unafraid of becoming other than we have been and more than we ever have been before."

Neighborhood as an organism



Research topics

I will be researching and looking for best concepts to implement in the AI driven sustainable district.

Zero-carbon city;
15 min city;
sustainable urban food production;
City-integrated renewable energy;
intelligent water;
Responsive governance;
Artificial Intelligence driven E-Government;
solutions for data privacy issue;
zero waste;
AI as a city brain;
ways of living together;
lifestyles and public spaces in autonomous district;
Urban planning decisions for reducing consumption;
Big Data use for urban planners;
Mobility(no cars over the ground);
Social sustainability;
biodiversity in the city;
planned+perceived obsolescence law:
data as a public good

Question to answer:

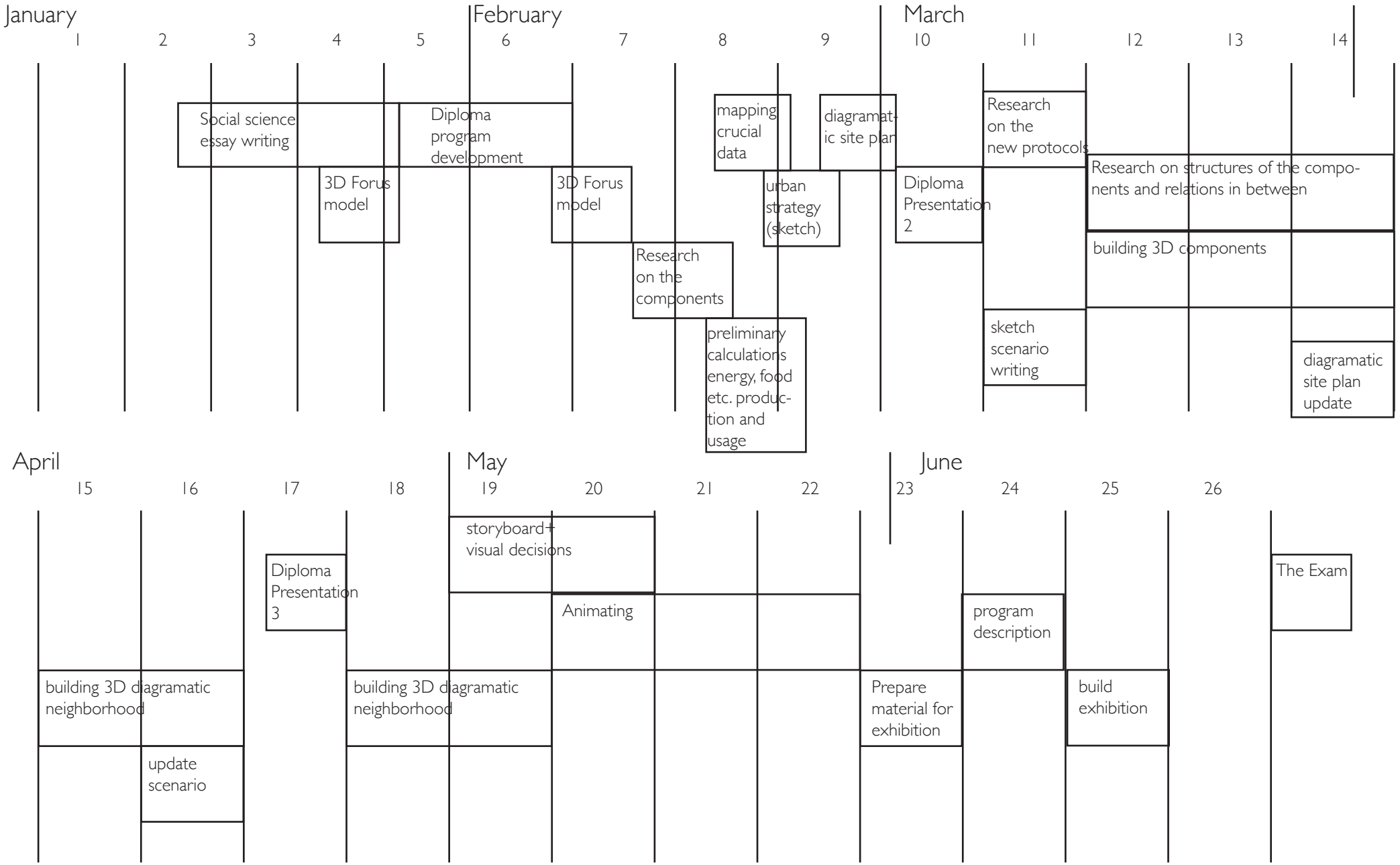
I want to answer while working on this project.

“How to combine freedom and well-being with sustainability and nature? “

“How AI city can produce unique ecological lifestyles as a consequence of urban design? “

“How will real-time data can reshape our cities and benefit people and environment?”

Timeline of the work



CV

Lina Dovydenaite (1991, Lithuania)

lina.dovydenaite@gmail.com

Education:

2020	MA in Architecture (visiting student), Oslo School of Architecture and Design
2019-	MA in Architecture, Bergen School of Architecture
2010-2015	BA in Architecture, Vilnius Academy of Art, Lithuania

Experience:

2018-2019	Architecture internship at Helen and Hard architects, Stavanger, Norway
2016	Graphic designer, The Atomic Garden Vilnius, Lithuania
2016	Product designer, Makerspace Green Garage, Vilnius, Lithuania
2015	Freelance graphic designer, Vilnius, Lithuania
2015	Graphic design internship at Framgroup, Bangkok, Thailand
2013	Co-founder and leather designer in Wildlife Analysis, Vilnius, Lithuania
2012	Illustrator, Shutterstock, Vilnius, Lithuania

Exhibitions:

2021	Design in an Age of Crisis, London Design Biennale, London, UK
2021	Perspectives 2021, Czong Institute for Contemporary Art, South Korea
2020	The Maker Art Pandemia, The New Art Fest, Lisbon, Portugal

Upcoming exhibitions:

2021	Windows into the Virtual, LoosenArt Collection Gallery, Rome, Italy
2021	Building the Resilient City, Seoul Biennalle of Architecture and Urbanism 2021

Open Form. New Wood
2019 autumn
Marco Casagrande, Eva Kun, Jacob Schroll

"Participation or how I got donated part of the parking space for the community use."

The project explores public participation in the process of creating public open space that would provide settings for the neighbourhood to get together and experience feeling of community. Architectural community activation culminating in the construction process on the chosen site, which opened channels towards public and city authorities. Build action on the Neumann parking lot, in very demanding weather conditions. The exhibitions was made on site with the goal of opening a discussion about qualities and programs for future public spaces.

Spaces of encounter
2020 spring
Jan Liesegang, Helgard Haug, Andrea Spreafico

"Democratopia. A speculative future scenario of Data Driven AI-Supported Direct Democracy."

I think beyond the given context of society, and speculate on a future alternative reality that is neither right nor wrong. Within one of the futuristic cities where data-driven democracy prevails, I speculate future public virtual space where people meet to shape how their city/city architecture is developing. Using AI architecture agent and other technologies. I am not trying to predict the future or propose a future scenario, I am just speculating WHAT IF the society where everyone is politically active where people have full influence on decision-making.

Semerster at AHO
In Transit. Contingency City
2020 autumn
Håvard Breivik, Tone Selmer-Olsen, Paul-Antoine Lucas

"The community of those who has nothing in common."

The scheme proposes a hybrid typology of a community centre, production spaces and mental well-being centre that embeds the ideas of mental health prevention within the community fabric. Helping multicultural communities build cohesion and mutual understanding. As well as being primary place during contingency, providing a welcoming community to be part of as well as enable interactions between displaced people and the local host community to come together to learn from each other through informal encounters and non-formal education.

References

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