

Norra Kymlinge from doughnut to urban fabric



The Kymlinge story, from doughnut to urban fabric

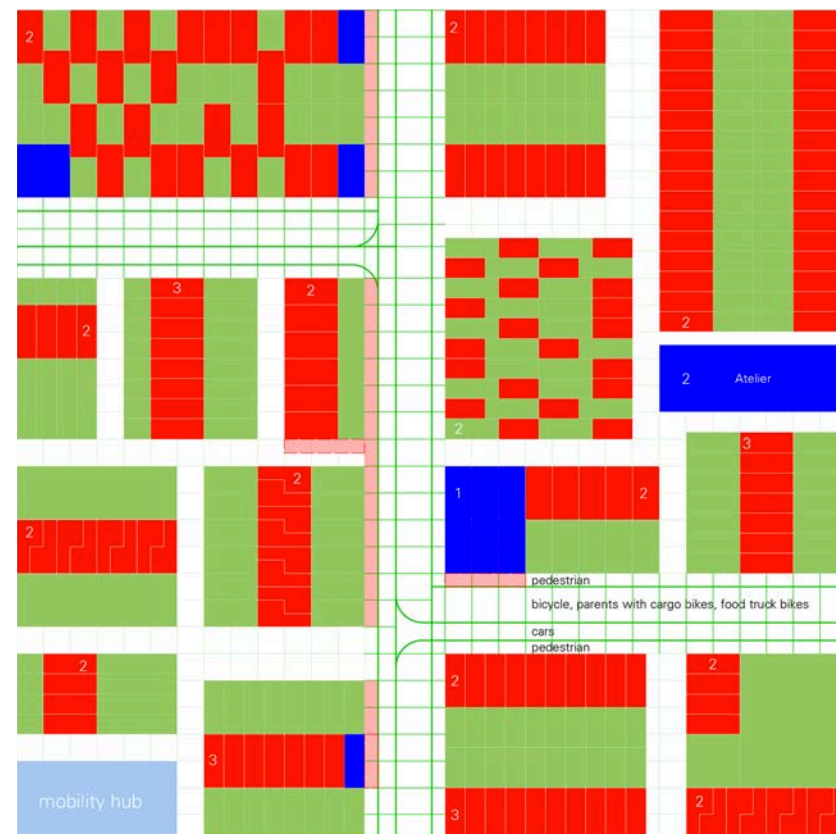
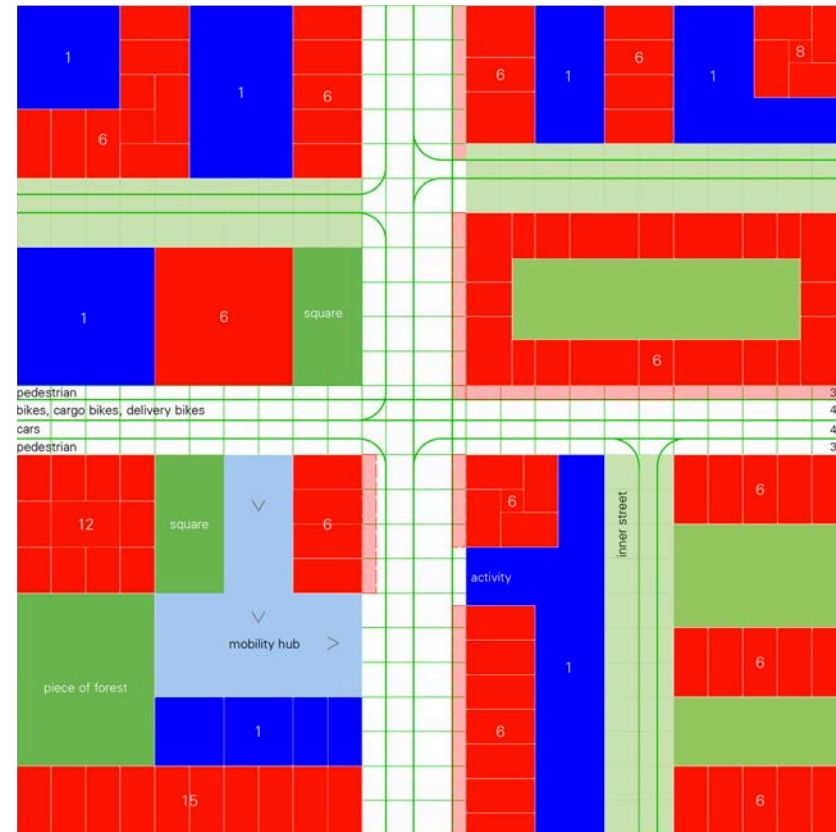
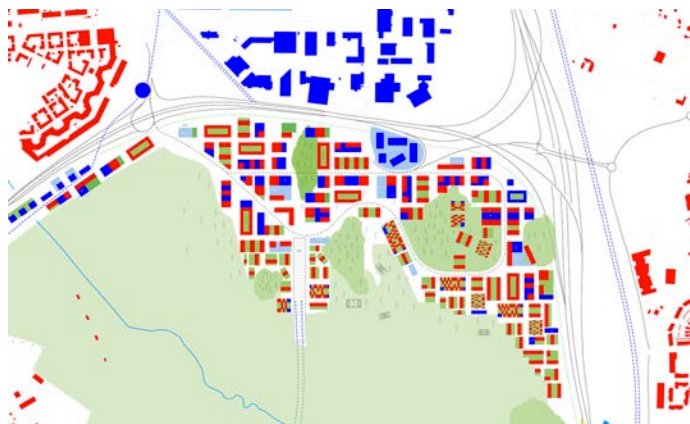
Designing a city with quality of life within planetary boundaries that fits into the doughnuts requires new methods to think about and work on the city, understanding the implications at many levels of a new urbanization.

Building Norra Kymlinge could help connecting different urban pieces together, both by creating physical connections through infrastructure and empty spaces and by offering certain attractions that may bring the different neighborhoods together.

The new city needs to offer a certain urbanity without trying to reproduce the traditional city center like development. We believe this could be achieved by working with the campus model, in essence a suburban model that aims for a higher level of landscape, program and interaction.

The city of Norra Kymlinge is turned into a vibrant urban fabric that combines housing, offices (productive spaces, home offices, open plan) and nature and that can spread to the immediate surroundings, especially Kista. It is a walkable environment where cars are temporary guests and streets become parks, a place with a large concentration of common services, an environment that reunifies with nature and a flexible and resilient structure. Two prototypes with strong living qualities fit into an urban infrastructure for the site :

- High Campus is a dense urban fabric with a highly programmed common ground ;
- Ground Campus is a low urban fabric with strong relationship to the ground.



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Norra Kymlinge tomorrow

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1. A method

« There is also the subject of form. Form and process are indivisible aspects of a single phenomenon. There is no such thing as an abstract form... If one wishes to describe an atom, molecule, crystal or compound, one can describe it only in formal terms. If one wishes to describe a cell, tissue, organ, organism, or ecosystem one can only do so in formal terms. All form is meaningful. The degree to which meaning can be perceived is a function of the ability of the observer to perceive the meaning which is intrinsic »
Ian Mc Harg

Conceptual framework

We cannot start to explain our design thinking without mentioning the conceptual framework of the project.

The goals for Norra Kymlinge, as stated in the brief are highly ambitious : « planning a district that meets the requirements defined to achieve a strong level of sustainability, a district where we can enjoy quality of life within planetary boundaries ».

So are the means proposed to reach the goals, a trans-disciplinary dialogue through prototyping.

The doughnut

This project starts with a theoretical model of sustainability, the doughnut (Kate Raworth). It describes sustainability as a place that offers quality of life within planetary boundaries, with the doughnut defining a space inside of which all of humanity can thrive.

The doughnut model suggests that there is not only one sustainable model for the future city but actually many. It tells us that in order to reach sustainability we need only to respect only two boundaries, the social foundations, above which every individual shall stand, and the planetary boundaries, under which we all must remain.

As a spacial concept the doughnut is very interesting. But how do we apply this theoretical model to Norra Kymlinge ? In its current state this model will be difficult to apply to a city district because it is a plenary notion. In order for Norra Kymlinge to « fit into the doughnut » we need to understand what the city doughnut looks like. For the planetary doughnut to exist, it might mean that in a developed country like Sweden, we need to increase the social foundation of the doughnut and lower its environmental ceiling, giving us a thinner place to thrive but still plenty of creative paths.

The process of prototyping, as followed in this proposal,

should help us move towards a finer notion of the doughnut.

The prototype

A prototype is by definition something to perfect. It is this notion that guides our thinking. The prototypes defined in our proposal will need to be adjusted, transformed and perfected in many ways but they give a first image of what a city in Norra Kymlinge may look like.

Speed methodology

The timeframe of the exercise was of importance in this context and needed to be taken into account. In order to develop ambitious physical concepts for a sustainable city that fits into the doughnut, all within three days of workshop, precise methods needed to be defined and followed, based on iteration.

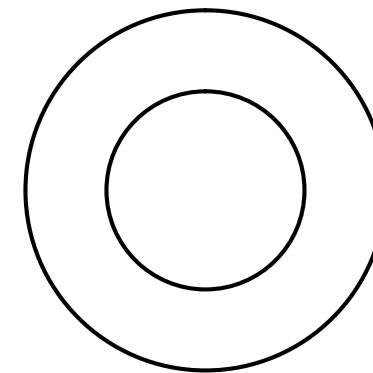
We chose to work in parallel with the site and the specification, trying to define a coherent program for the new city, that draws both from the main site qualities and constraints and the general objectives of a sustainable city. The program was then combined into a general urban infrastructure implemented on the site and two prototypes of urban fabrics. It is the combination of these two elements, the urban site infrastructure and the prototypes, that will create a city.

Testing

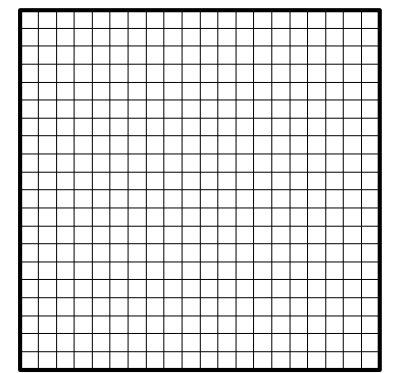
Implemented on a square of 200 x 200m (4 ha) the prototypes allow us to test and measure several parameters such as critical mass, programmatic mix, form relationships, etc.. Far from theoretical they are highly contextual as they relate to the specific site qualities. The prototypes should be looked at as a potential urban fabrics for a new city in Norra Kymlinge

Urban fabrics

An urban fabric, as opposed to a structure, is an inhabited environment. It includes built forms and landscapes, public space and uses ... An urban fabric constitutes a coherent and continuous whole rather than a juxtaposition of individual objects or logics. It can therefore evolve in a sustainable way and according to specific rules. The starting points for the urban fabrics proposed here are a clear structure, based on our conviction that this allows for higher individual diversity and complexity in the city, thereby assuring resilience in time.



Doughnut



Prototype

2. Norra Kymlinge, here and nowhere else

Why build here ?

Stockholm is suffering from a severe housing shortage, making any available site a potential site of interest for construction. Looking at Norra Kymlinge, a forest located between Igelbäcken and the two highways E4 and E18, one question comes to mind : why should we build here ? There is of course the station that SL would be prepared to open up if 10-20 000 people lived and worked in Norra Kymlinge in the future. This would put future inhabitants and users of the site within 15 minutes from the city center of Stockholm and is an important factor.

More reasons

But we believe that the station alone is not enough as a justification for urbanizing an existing forest and that there need to be plenty of reasons in order to make this decision. Scientifically speaking, building a city for 10-20 000 people on 55 ha of land will automatically eliminate the ecosystem of the forest. The new city should be green, sustainable and even enhance ecosystem services, but will never remain a forest. Therefore, the choice of the site of Norra Kymlinge is an important one and needs to be clearly justified.

We believe that there are two other reasons, in addition to the station, all of which, together, may be justification enough for building here.

Life qualities for everyone

First of all, this site has the potential to offer strong life qualities in the immediate surroundings. The proximity to nature, that will be accessible to everyone, if a high asset of the site that could encourage its inhabitants and users to more sustainable lifestyles, both for their own health and for our ecosystem.

Connecting the pieces

The second reason, and the most important one to us, is that building Norra Kymlinge could actually help connecting different urban pieces together, both by creating physical connections through infrastructure and empty spaces and by offering certain attractions that may bring the different neighborhoods together. The northern region of Stockholm is made up of different urban fragments that coexist, often without much interaction. If we look at Rinkeby, Kista and Helenelund for example, which will all be connected with Tvärbanan, there are few current interactions except Kista

Building Norra Kymlinge could actually help connecting different urban pieces together, both by creating physical connections through infrastructure and empty spaces and by offering certain attractions that may bring the different neighborhoods together

Galleria. Building Norra Kymlinge can and should change that. A big part of what Norra Kymlinge can do for the world is what it can do for the surrounding neighborhoods. A sustainable city is one that has a snowball effect on a larger environment

Objectives

Linking different fragments together while offering strong life qualities that encourage a sustainable lifestyle for all, those are the main objectives that guide our proposal. Here the immediate context is of high importance. When we look at Norra Kymlinge it is clear that we are between two very strong contexts : Kista science city and the nature reserve of Igelbäcken.

The nature reserve of Igelbäcken

The nature reserve – consisting of Igelbäcken Valley and Stora Ursvik Recreation Forest, and bordered by Kymlinge Forest to the north – creates the impression of a densely green, forested natural area nestled within highly man-made urbanized structures including roads, housing, and business areas. With Järva Green Wedge to the west, Kista Enterprise Zone to the north, and roads surrounding all but the southern edge of the nature reserve, the site is highly constricted for development by a variety of man-made and existing environmental conditions. The water course within the flatter landscape of Igelbäcken valley provides a natural conduit for positive water flow from rain events. Retaining ecologically functional ecosystems is reliant on keeping large areas (approximately 10ha) of undisturbed forested links or green space clumped together; minimizing impact to the existing water body while safely increasing

positive water flow and restoring the natural water cycle; and building with nature instead of against it, in particular, trying to work as much as possible with the topography and landforms existing currently on-site.

Kista

Kista is mainly known for Kista science city that hosts headquarters for large IT companies and Kistamässan. 30 000 people work in Kista, most of them arriving in the morning through commute by car, train (Helenelund station) or subway (Kista station). The office part of Kista has a campus like urban structure with large buildings, an abundance of public spaces and very few cars. But it is lacking the vitality that many urban campuses have today, certainly because the public spaces are not very appealing and the city only functions half of the day (one will not find more than a couple of people in the street after office hours).

But Kista also hosts one of the main public places of the northern region of Stockholm, Kista Galleria. With 62 000 m² of retail floor and 18 000 000 visitors in 2012 (almost 50 000 per day) it draws people from all neighborhoods around, not only those who work in Kista. The galleria is still full of people at 9 pm on a weeknight long after workers have left the city, it is clearly an important destination in the area.

A larger context

Ursvik and Järvastaden, directly adjacent to the nature reserve of Igelbäcken are among the largest expansion projects in Stockholm. Stora Ursvik will be a dense new neighborhood, relying on the expansion of Tvärbanan, and will connect both with Rinkeby to the west and the future city of Norra Kymlinge to the north.

To the east, the relatively new neighborhood of Silverdal in Helenelund, with strong relationship to nature but quite isolated, would also benefit from clear links with Norra Kymlinge.

View of Norra Kymlinge between Igelbäcken and Kista.

3. A programme : 17 + 1 points

The following points detail our transcription of the specification into a programme. The different themes are translated into spatial concepts and strategies for the prototype.

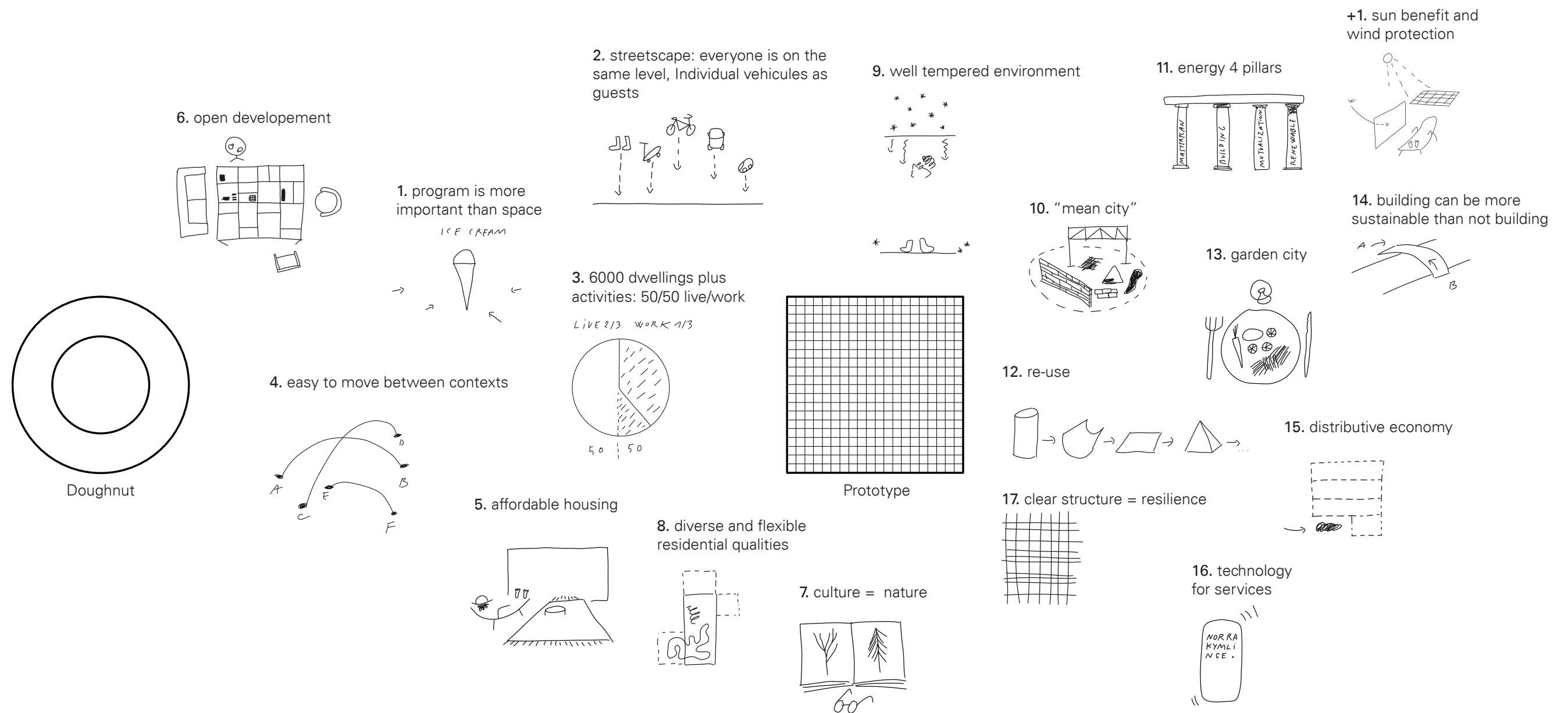
- 1. Spaces and places**
Multifunctional, secure, inclusive and flexible spaces that work for everyone.
> To guarantee that the city remains open for everyone, programme and services are more important than space. The public space needs to be flexible enough in its form to be able to accommodate different kinds of activities, especially mobile ones. In the future city, it will be less about a fix public square than about the capacity to activate all kinds of spaces.
- 2. Movement**
Secure, safe, available and affordable modes of transport, integrated network.
> The city of Norra Kymlinge needs to redefine the streetscape, moving from a hierarchical system towards a more democratic one where everyone is on the same level. In Norra Kymlinge the street will become the public space.
- 3. Density**
A basis for a sufficient range of urban activities, including a population base that would be adequate to justify opening the underground station (10-20 000 people).
> Norra Kymlinge should be full with people at each hour of the day. Our objective is 50/50 in terms of living and working. To reach this goal we propose to build 6,000 dwellings where people can live and work and add 50% of additional floor area for different activities.
- 4. The whole city**
Bring the city together, linking it with surrounding districts
The number of induced displacements is estimated to 60-70,000 inbound / outbound per day. Such a flow requires a rational and objective rethinking of the “mobilities” and implies the need to promote alternatives to the individual car and to link up with surrounding districts, and in particular with Kista, which offers a large range of modes of transport. The goal is to reduce as much as possible an additional burden on the already saturated road network. For example, we propose a shuttle service that will

- connect Norra Kymlinge station with the future Ärvinge station.
- A place for everyone, housing for all, functional mix.
> To guarantee housing for all it needs to be affordable and there should be a good balance between rental apartments and condos. To lower prices new options must be explored, such as possibilities to buy unfinished units to DIY or rent apartments and certain amenities within it (kitchen...). Participatory projects must also be encouraged.
- 6. Processes**
A framework of active openness by producing ideas and proposals together with those who will be affected by the area.
> The working method through prototyping will allow an open development (see p.21).
- 7. Culture and history**
Utilize existing culture and history.
> Nature is the main exiting cultural value in Norra Kymlinge. Nature must be enhanced and access to nature for everyone must be assured, through direct contact or views.
- 8. People, stages in life and lifestyles**
Facilitating social activities, make different lifestyles sustainable
> To assure different lifestyles housing needs to be built flexible and reversible. Working on new sizes of housing units (within deeper buildings) and plans free of structure can offer new possibilities for living : participatory processes, co-living, intergenerational... Another important factor in offering different lifestyles is the combination of collective and individual lifestyles.
- 9. Well being**
Indoor and outdoor environments that remain good and healthy
> The development of technology and targeted services offer new possibilities within your home up to a point that there’s no vital need to go outside since the whole city can be delivered to your doorstep. Therefore, spaces within the city need to be made attractive so that people make use of them. This includes spaces adapted to the climate of Norra Kymlinge with certain road sides covered to get

- protection from snow, rain, and wind.
- 10. Safety and security**
Location, design and construction must prevent ill-health and accidents
> Design will partly assure a safe city. But we need to bear in mind that producing a new city from scratch that tries to solve issues like safety and security, can result in the production of a quite sterile environment. The friendly city that we aim for can often result in an exclusive city that produces exclusion and segregation through its design. The concept of the “mean city” acts as a counterweight to assure openness. By providing space for activities that are less planned and less neat, diversity can be maintained.
- 11. Energy**
The district must provide a net surplus of energy each year (including energy in construction)
> When it comes to energy, we should make use of what is there and reduce our consumption through : optimization of the masterplan and the urban structure, building optimization, mutualization (district heating and cooling), and use of renewable energies.
- 12. Materials and resources**
Biologically renewable resources, with retained recycling value of nonrenewable resources.
> Make use and reuse of what is there (through local building workshops for example) and reduce the consumption.
- 13. Ecosystem services**
Increase in terms of structure, function, benefit and value.
> Ecosystem services within the new city could be increased with a garden approach.
- 14. Land use**
Resource-efficient, adapted to local conditions use (including changing needs)
> Norra Kymlinge as a city should prove that building can be more sustainable than not building.
- 15. Economy**
Embedded in society and the biosphere, regenerative and distributive in its design
> Norra Kymlinge should offer a distributive economy within

- its fabric. A business model needs to be implemented that offers oportunities for businesses and activities of various kinds and economies, including common interest associations.
- 16. Technology**
An instrument that uses the needs of people as a starting point and it will contribute to satisfying those needs
> A Kymlinge app could be developed to offer access to services for its inhabitants.
- 17. Resilience**
A resilient and flexible urban structure.
> Cities that have proven to be resilient are those with clear structure that allows for a higher individual diversity and complexity. This should be taken into account when developing the structure for Norra Kymlinge.
- We have added one point to the specification : climate adapted design.
- +1. Climate adapted design : sun benefit (7 - 55°) and wind protection**
The area presents interesting potential for solar panels installations : solar thermal collectors for heating demands, photovoltaic panels for electricity demands. Solar energy systems can be efficiently implemented on rooftops and south-facing facades (they require in addition seasonal storage to cover heating demands throughout the year)
The main wind directions for Stockholm region are West and South-West (South in summer season, West ad North West in winter season when the temperature drops below 0 and winds effects have to be countered to maintain outdoor comfort). Winds remain at moderate speeds throughout the year. Wind protection for pedestrians is the main challenge.
- For the workshop and the prototype we have chosen to work on the whole specification but with a main focus on the points that we know are harder to achieve :
- 1. Spaces and places**
5. Functions for everyone
8. People, stages in life and lifestyles
15. Economy
16. Technology
17. Resilience

4. Assumptions for a future city



Programme

We have chosen to start prototyping with the following hypothesis :

- 6,000 housing units (medium size of 75 m² > 94 m² BTA) for a total of 450 000 m² (Bruksarea) of housing spaces
- + 50% of surfaces for productive spaces, services and activities (225 000 m² Bruksarea)

This would give us a total surface of 675 000 m² (Bruksarea) in Norra Kymlinge and a Floor Area Ratio of 1,22. It should allow a maximum of 20,000 people to use the site. To compare, Hammarby Sjöstad has a medium FAR of 1,43. The prototypes designed in this proposal are adaptable (for densification or dedensification) and should help to define the right density. However we believe that this

density needs to be quite strong, for several reasons :

- access to public transportation ;
- access to nature ;
- access to jobs.

A study by Sundbyberg (<http://www.sundbyberg.se/download/18.54e99b02146e4cc68147cf60/1404136960252/130417>) shows that developments around Norra Kymlinge are quite dense, for example Västra Urskvik (to which we will connect) has a FAR of 1,75.

Mobility as a service

Mobility as a service describes a shift from personal owned vehicles to mobility solutions that are consumed as services. It combines transportation services from public and private transportation providers, and relies on a unified digital gateway that creates and manages the trip. That implies that mobility will certainly be:

> Shared : it goes with the idea that ownership – especially car ownership – will decrease. Then, there is not the same need for hierarchy in the street network.

> Greener : we don't assume that vehicles will all be electric or with biogas fuel, but it will certainly be greener and using the most adapted energy regarding to the inner resources of the area.

Street network

With mobility as a service individual cars will no longer be prior in the street profile and the street can evolve into a "linear park system". This means that open spaces in Norra Kymlinge will mainly consist of the nature reserve and the streets which will be treated as spaces rather than infrastructure.

With new materials emerging we can assume that the whole street can be porous while still smooth and allow for a certain amount of natural infiltration.

5. Hypothesis : the campus model

Norra Kymlinge is located in a quite suburban environment that offers clear living qualities, both in residential neighborhoods and in working places like Kista, but the « urban » qualities are lacking due to highly mono-functional programming and few active public places (Kista Galleria being the main one within a one kilometer radius).

Within this context, Norra Kymlinge needs to offer a certain urbanity without trying to reproduce the traditional city center like development.

We believe this could be achieved by working with the campus model, in essence a suburban model that aims for a higher level of landscape, program and interaction.

Setting aside the programmatic specificity of the campus and focusing on its organizational and spatial qualities a campus model offers :

- a walkable environment where cars are temporary guests ;
- a place with a large concentration of common services (people who live on a campus often rely more heavily on external services such as restaurants, cafes, laundry services, concierges....) giving it urban quality ;
- an environment that reunifies with nature, with a parkscape rather than a streetscape ;
- a structure with a high degree of flexibility.

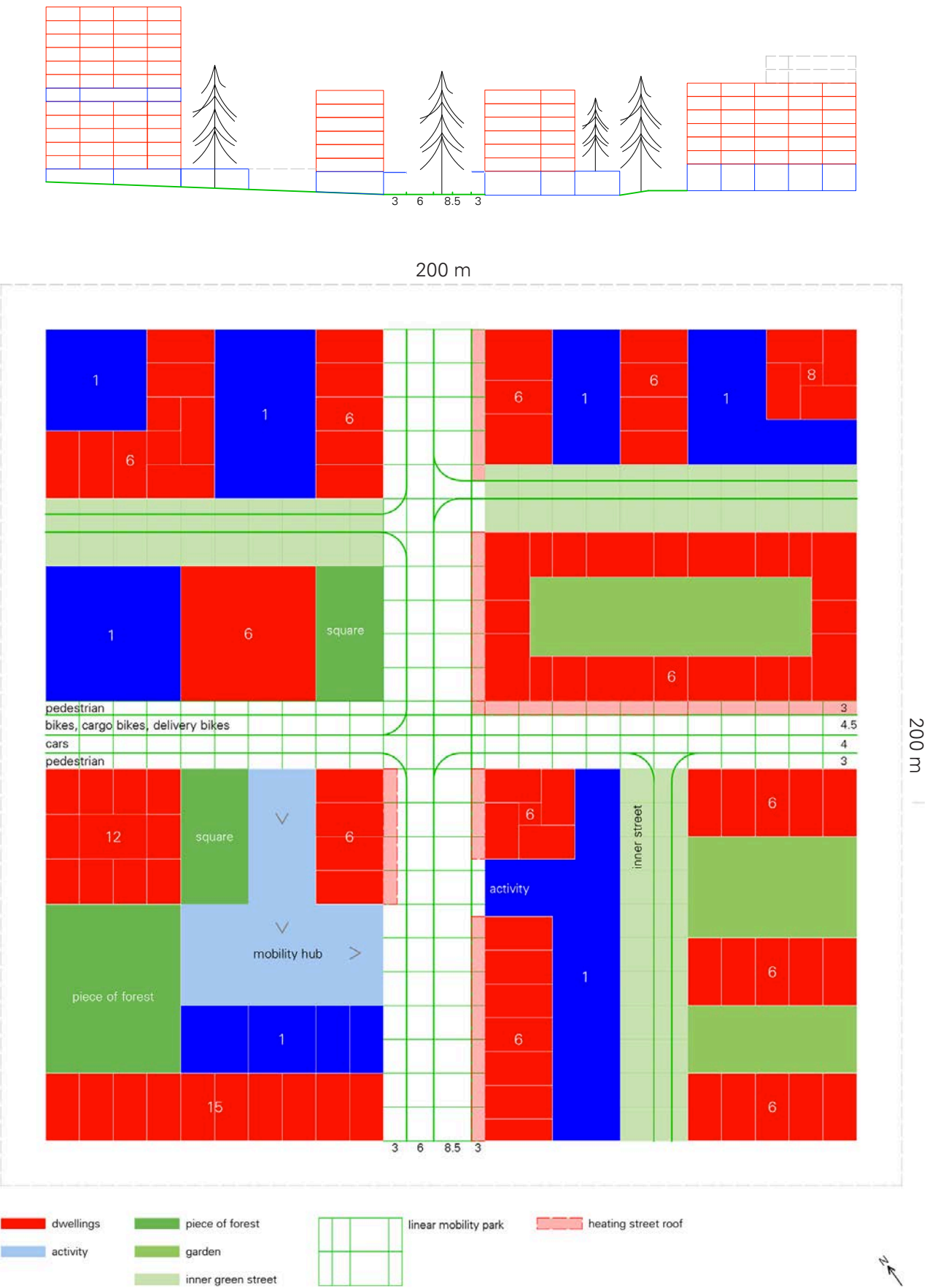
To reach this goal we need to work on several scales simultaneously :

- two prototypes for the campus that form two urban fabrics complementing each other and offering strong living qualities ;
- an urban infrastructure that applies the principles of the campus within the

site and its connections to the surrounding ;

- a metropolitan infrastructure, capable of turning Norra Kymlinge into a destination place for northern Stockholm.

6. Prototype n°1 « High Campus »



“High Campus” is a dense urban fabric with a highly programmed common ground. Building heights vary between 6 to up to 15 stories depending on place of implementation.

The ground floor is entirely free of housing units and offers diverse activities. A business model should be developed in parallel with the plan to offer economic possibilities to a wide range of actors. We can imagine a 70/30 scenario where 70% of the ground floor surfaces are allocated to profitable businesses and activities and 30% is reserved for activities that generate less income but offers urban qualities : a collective pub, a recycle store....

Buildings are relatively deep and conceived with fully flexible floorplans that can be adapted by its occupants.

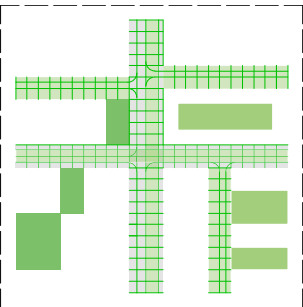
The prototype shows a scenario of 808 housing units and about 23,000 m² of activities and services but the plan should allow for any unit to be either housing or productive activities, making the fabric completely flexible and building structures reversible in terms of program.

“High Campus” is adapted for implementation on the northern part of Norra Kymlinge with strong connections to Kista, the new developments of Ursvik and the main infrastructures surrounding the site.

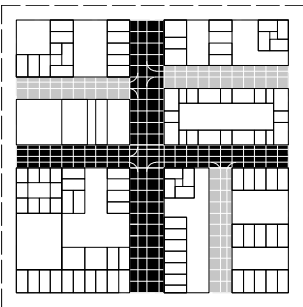
Program
TOTAL within the prototype : 80,464 m² (useful floorspace)
> 56,585 m² dwellings (808 housing units)
> 23,879 m² activities/services

8,4 prototypes are needed to reach the initial programmatic hypothesis (675,000 m²).

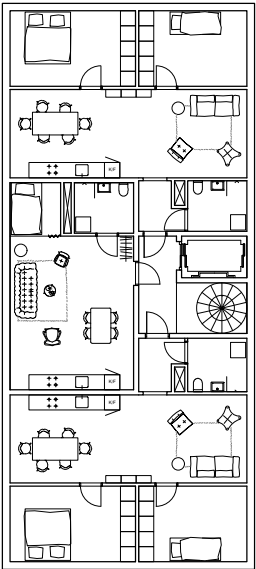
- Principal qualities
1. multi-oriented units with maximum views
 2. deep buildings : more surface to use and change
 3. flexible floorplans sold or rented unfinished
 4. a collective urban ground floor accessible for everyone (70/30 rule)
 5. street at main public space
 6. no dedicated parking space, mobility hubs every 400m



Connected nature



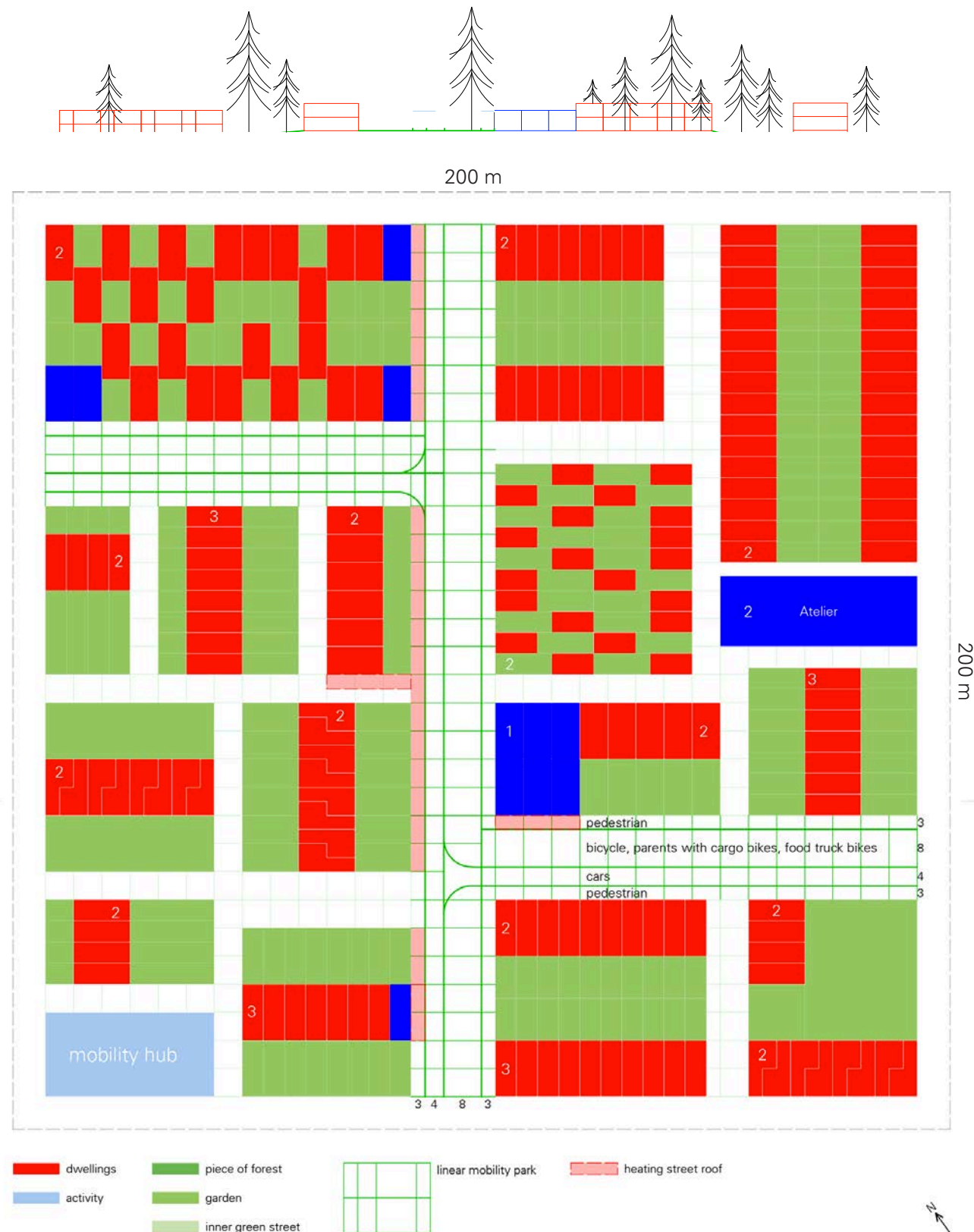
Public space



Typical apartment 7.5X15 m / 3 bedrooms 90 m²



7. Prototype n°2 : « Ground Campus »



“Ground Campus” is a low urban fabric with strong relationship to the ground. Most buildings are two stories high dense individual units with private access and gardens, and there are some semicollective units of three stories.

The flexible structure allows for building in time with possibilities to have lots open for private construction.

The prototype shows a scenario of 211 housing units and a few productive spaces for small scale activities but the plan should allow for any unit to be either housing or productive activities, making the fabric completely flexible and building structures reversible in terms of program.

Common services such as a “collective workshop” and “mobility hubs” are embedded in the fabric.

“Ground Campus” is adapted for implementation along the border of the nature reserve and Igelbäcken.

Program

TOTAL within the prototype : 20,116 m²

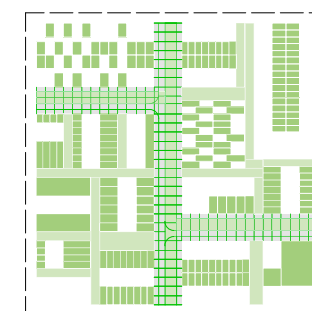
> 17,366 m² dwellings (211 housing units : 179 houses, 32 apartments)

> 2,750 m² activities/services

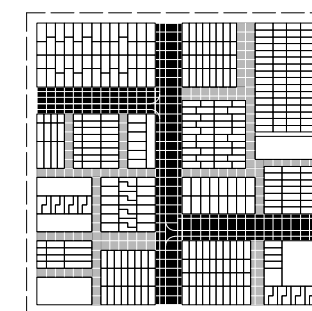
33,5 prototypes are needed to reach the initial programmatic hypothesis (675,000 m²).

Principal qualities

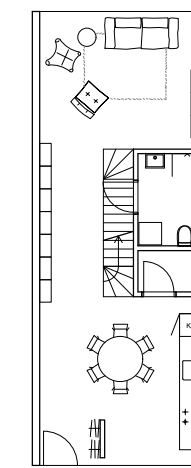
1. individual qualities
2. sun
3. strong relationship to the ground
4. productive gardens
5. lots open for construction > build your own house with the Kymlinge app
5. ateliers to work, small scale production
6. no dedicated parking space, mobility hubs every 400m
7. mobile services in the street (retail, culture...)



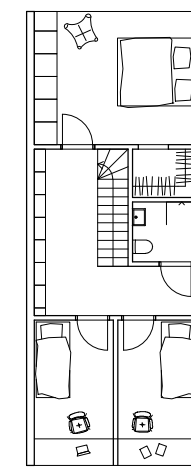
Connected nature



Public space



groundfloor



first floor

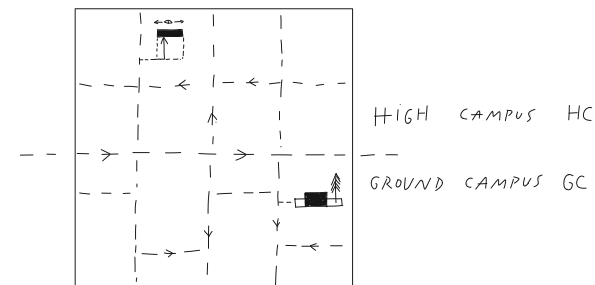
Typical townhouse 6X12 m / 3 bedrooms 115 m²



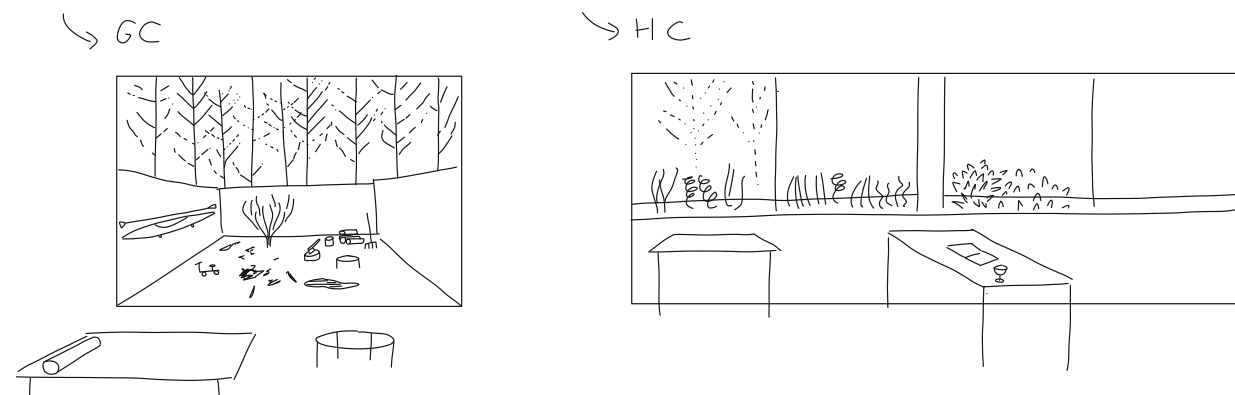
8. Framework for the prototypes : from housing to urban fabric and vice versa

We believe that four main objectives need to be pursued within the prototypes to achieve housing for all :

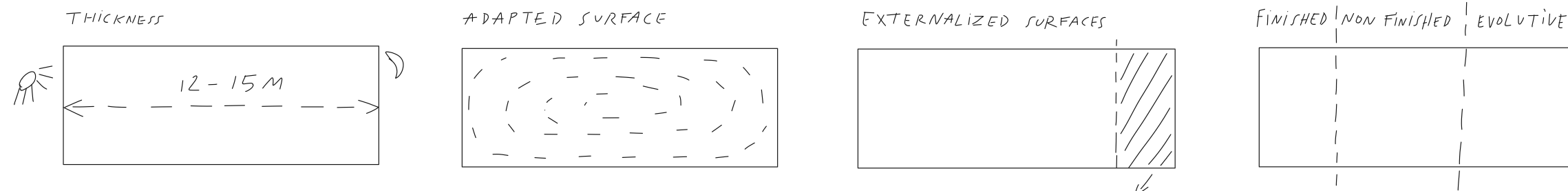
1. life quality
2. affordability
3. evolutiivty
4. urbanity



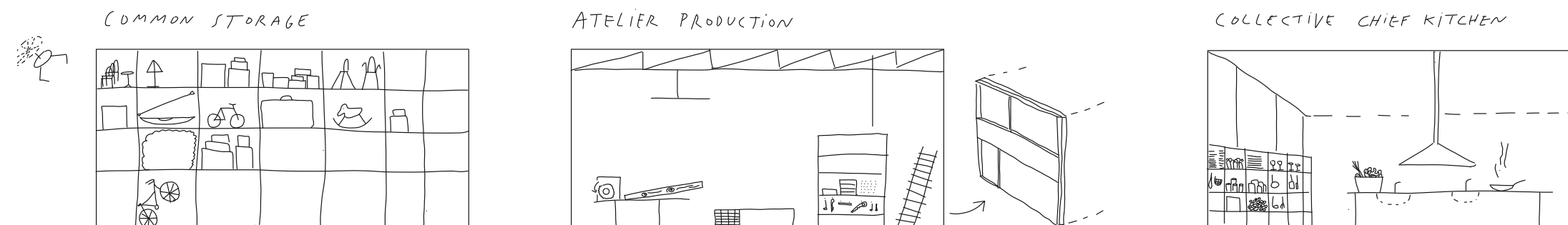
Life quality



Affordability and evolutivity

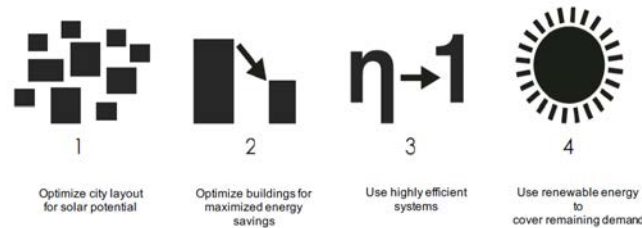


Urbanity : sharing economy



9. Framework for the prototypes : climate responsive design

The prototype design is following a four step approach to optimize city layout, building construction and operation and integrates local renewable energy potentials to minimize energy use and associated carbon dioxide emissions.



Solar access and shading

Solar exposure plays a critical role for designing comfortable indoor and outdoor spaces as well as for the use of renewable energy sources to supplement the city's energy supply.

To maximize solar access, multi-oriented buildings are planned. The variation in height is another parameter, alongside with the planning of 2- and 3-storeys buildings for the ground campus. Large streets contribute to reducing overshadowing of facades from neighboring buildings, particularly in winter. Lots orientation is recommended to be 36° to North.

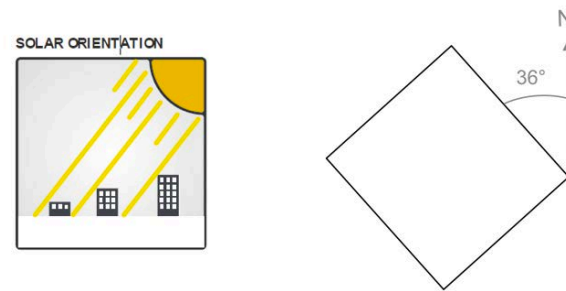
Exterior shading is recommended to avoid overheating during summertime. It's the most efficient solution to control solar gains.

Surfaces with high radiation such as roofs can be equipped with photovoltaic or solar thermal systems to harvest renewable energy. Passive solar heat gains in buildings contribute to reducing energy demands.

Daylight access

Satisfactory daylight levels in buildings is another key aspect of the city layout optimization. Daylight access relies on an appropriate combination of building depth, orientation and window ratio. It is also influenced by shading effects of surrounding buildings and vegetation. To that respect, mixed low and high rise buildings are planned, alongside with large streets and open areas, and few courtyards.

The urban morphology of the city campus is designed to provide well daylit indoor spaces. This contributes not only to energy savings through reduced use of artificial lighting, but also to improved occupants health and satisfaction.



Optimum solar orientation

Prevailing wind and wind access

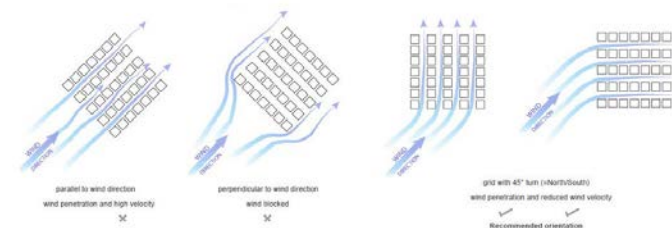
Wind exposure is the second main climatic parameter influencing the city layout. If wind can be beneficial in urban environments to vent and cool down exterior surfaces of walls, roofs and streets in summer days, cold winds are uncomfortable in winter days. Furthermore, high wind speeds can also reduce outdoor comfort in both summer and winter seasons.

The most indicated approach to avoid high wind speeds while providing a minimal air flow is to ensure that wind enters the city with a certain angle. This strategy allows the air to flow smoothly into the major streets while maintaining a sufficient fresh air supply in the minor streets.

Cloud cover being mostly overcast during winter, and direct radiation being extremely low between November and February, wind protection is extremely important.

Wind protective features can take many forms: they can be incorporated into the landscape, vegetation or separate structures, and they can have multiple functions such as shading from the sun in summer while protecting from wind in winter.

When planning vegetation, prefer evergreen trees and hedges (low line wind on pedestrian level) to improve winter comfort. Breaks in frontage are also interesting since they can provide shelter from wind.

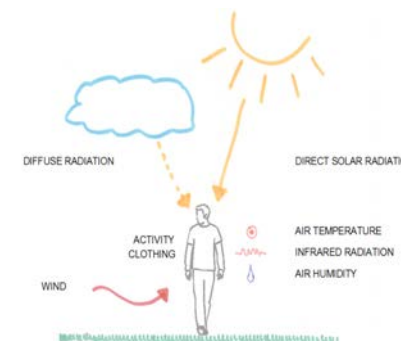


36° grid recommended wind orientation

Outdoor comfort – Principles

Thermal outdoor comfort is influenced by eight parameters: direct solar radiation, diffuse radiation, air temperature, air humidity, infrared radiation, wind, clothing, activity.

A number of indices have been developed to assess thermal outdoor comfort. Among them is the Universal Thermal Climate Index (UTCI), which is a 340-node model simulating phenomena of the human heat transfer. This index includes all 8 environmental parameters effect and assesses the thermo-physiological stress experienced, taking into account the interaction of environmental temperature, humidity, wind speed and long- and short-wave radiant heat fluxes



Main factors influencing outdoor comfort

Outdoor comfort – Winter strategies

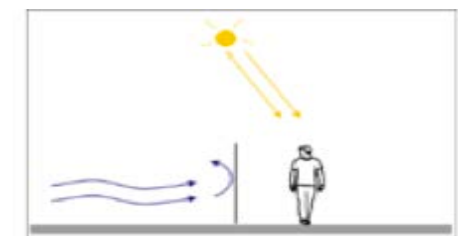
From the results of the UTCI index in Stockholm's area, the main challenge lies in winter season, when the cold stress ranges from moderate to strong. To make the most of opportunities to stay outdoor during winter days, the best approach is to provide sunny and wind-protected environment.

Combining maximized access to sun and blocking of wind, strategies could be to use snow mound for playing as wind barrier, to plant deciduous trees in some areas to allow sun in winter, to plant evergreen trees in others to block cold winds, to design south-facing parks protected on the wind exposed side by trees or neighbor buildings, etc. These strategies would help creating public spaces that are inviting year-round.

Comfort islands where people can recover from the cold should also be planned. It could be existing spaces like pavilions or shuttle stops to create stopping points that can be used by all (not just to wait for the bus). The community

center planned as the exit of the station contributes also to the creation of comfort islands.

Certain pedestrian streets could also be maintained free of ice during winter by a system of ground heating by geothermal energy using boreholes circulating ground water underneath the streets. This would help people getting around outside more comfortably and conveniently during winter times.

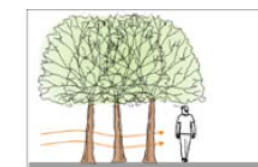


Sunny, no wind

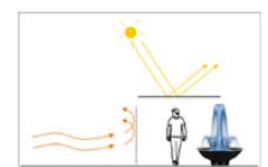
Outdoor comfort – Summer strategies

In terms of summer outdoor comfort, shading should be provided through vegetation or shading screens for instance. Water playgrounds or water spaces can also benefit summer comfort via adiabatic cooling and could even been transformed into skating spaces in winter.

Comfort islands should also be created, that would serve as gathering spaces in summer. It could take the form of Individual pavilions that protect from the sun and rain or temporary spaces that change function depending on the season.



Shaded, wind

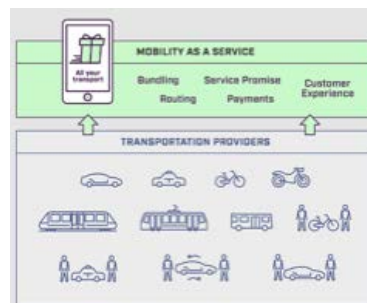


Shaded, no wind adiabatic cooling

10. Framework for the prototypes : new mobility

« Mobility as a service »

The sustainability of the city of tomorrow lies in its ability to adapt and to be resilient to future changes and developments. Within the prototype, the vision of “mobility as a framework” will have several direct impacts on the streetscape and general structure.



Individual vehicles as guests, no dedicated parking

The individual car may circulate in the neighbourhood, following the dedicated road grid, but it is not prior in the street profile. Shared spaces, where the car remains a “guest,” are recommended. :

- the internal grid is accessible for “drop on - drop off” and for deliveries.
- there is no dedicated parking space.

The objective is to have zero parking spots directly on site, but to maintain parking on the outskirts of the neighbourhood, following the principle of the eco-district of Freiburg in Germany. This lot finds its place in the part of the site included in the loop of the interchange (land hardly recoverable) which is directly served by the main vehicle axis (extension of Torshamnsgatan).

For all users wishing to keep their individual vehicle, it is possible with a subscription in this common parking lot (principle very widespread in eco-neighbourhoods).

For the other users: direct access is provided by the opening of the metro station which links efficiently to Stockholm in 15 minutes, and the offer of efficient mobility services, which relies in particular on a fleet of shared vehicles (see after).



Internal street in the eco-neighbourhood Vauban - Fribourg (Germany)

Hubs of “mobility services”

Provision of a fleet of shared vehicles which accompanies the “un-motorisation” of households, and which makes it possible to adapt to the needs according to the users (different types of vehicles, different types of subscriptions, etc.).

Opening of “mobility hubs” every 400m (a short walkable distance) within the district where the stations are linked to the fleet of shared vehicles, but also services related to bicycles, urban logistics, etc.



Autonomous vehicle (French example “VICA”)

Internal Shuttle

Creation of an internal shuttle which serves the whole district (200m radius). This shuttle may be an autonomous vehicle if subsequent studies prove its relevance (experimental field for example)

Street profiles

Street profiles in the prototypes have taken into account the following principles :

1. A minimum of 4m wide

This ensures that the whole site is serviced for emergency vehicles, but also allows vehicles to temporarily stop (drop-off or delivery) without hindering traffic (possibility of Doubling) but without having to dedicate a specific place for this use.

2. Shared spaces where the car is a “guest”

The spaces for active modes are generously dimensioned to allow different types, shapes and speeds of bicycles to circulate: minimum of 3m for the bikes for each direction, and generalization of the 2x2 lanes

3. Generous standards of comfort for pedestrians

Sidewalks of 3m50 minimum, generally allowing 3 people to travel comfortably

4. An “all-in-one” design

This facilitates the movement of people with reduced mobility, but also allows more flexibility for the evolution of modes insofar as the allocation of a way to a mode can be distinguished by a simple colour or coating treatment (for example: the possibility of a specific route for robotic deliveries in the future)

5. Vehicle speed management via non-rectilinear paths

The principle of sharing roads does not necessarily set limit speeds, so to avoid conflicts of use (at off-peak hours for example), the profile provides some visual obstacles such as trees, which induces non-linear paths and prevents peaks of speeds

6. Roads designed to allow smooth traffic in winter

Sheltered spaces to pace the movements, and setting up of a sustainable system to prevent freezing and snowing structuring roads (geothermal principle for example)



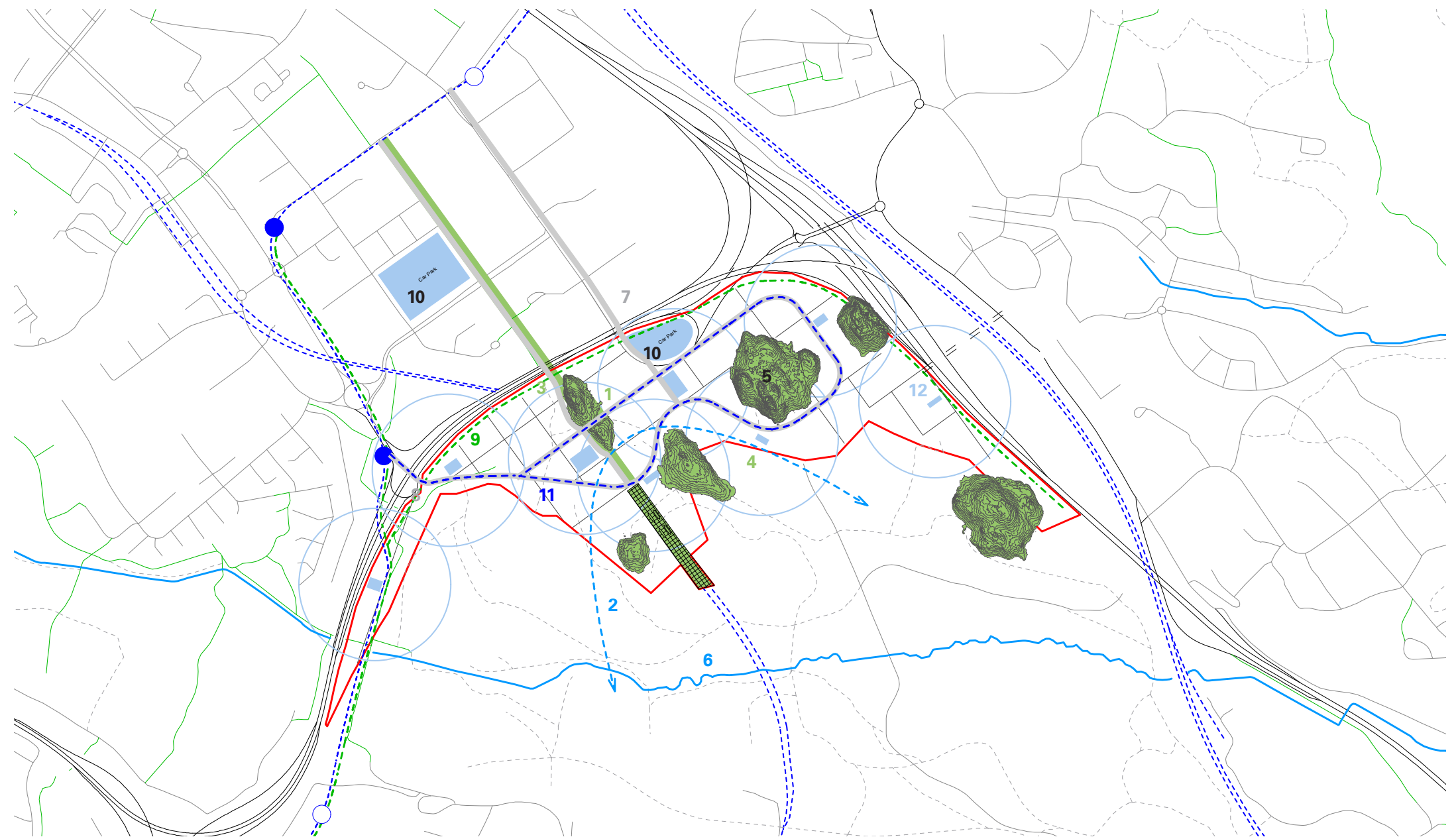
Examples of the prospective study « Mobili2040 » - Tractebel

11. An urban infrastructure

An ecological infrastructure

Norra Kymlinge's Ecological Infrastructure Framework is based on reinforcing the following principles:

- > Unlike property lines, ecological infrastructure has no border. Thus functional ecosystems require interconnected natural areas and linked networks to remain viable.
- > There is a bold gesture of a linear green platform reserved for nature, testing ecological concepts, and providing a destination zone for human interaction (1)
- > The Blue Axis of Kymlinge results by viewing water as integrated infrastructure. Drawing on cues from the site's drainage slopes, we integrate the dynamic natural flows along a multi-functional curvilinear link. It is at once a functional corridor integrating infrastructural functions underground; a dedicated channel for catching, treating and conveying stormwater; and a recreational mobility arc, where the shared nature of transportation is made highly visible (2)
- > We connect to and limit the impact of development on the Järva Green Wedge and establish wildlife eco-corridors as bridges over the highway. Where bridges are not possible, passageways bore through the highway and are renaturalised to allow ecosystems to adapt over time (3)
- > While the northern edge of the site opens up views and access from Norra Kymlinge into Kista, the undulating topography of the southern edge is sensitively managed by utilizing the philosophy of 'Building with Nature'. Slopes carefully tieback to grade while a minimum no-build buffer zone is established along the edge to limit the impact of development on the existing natural ecosystems (4)
- > The hilly nature of the site is characteristic of the genius loci of Norra Kymlinge, and likely vital to the existence of specific micro-ecosystems. Major vantage points are retained as natural as possible, where building is limited, and instead low-impact paths and trails allow for access while reducing human intrusion into conserved natural areas > see next page (5)
- > Lastly, by working with instead of against existing patterns, Igelbäcken valley's natural water cycle is replenished and water quality is restored, creating a safe and reinvigorated stream (6)



A transportation infrastructure

The aim is to reach a hierarchized grid of roads connected to the existing and future infrastructure. It is based on the following principles:

- > Vehicle access : extension of the existing western link Torshamnsgatan from Kista to the future neighbourhood as the main "vehicle" access. This main north-south route distributes the flows to the east and west (7)
- > Soft modes access : extension of the existing cycle route to cross the E18: creation of a structuring road "active modes" linking Kista to the future "Magnet" (1)
- > Public transport access : Connection to the future

"Arvinge" tram station via the existing crossing. This link to the tramway allows an efficient connection to the neighbouring municipalities of Helenelund to the NE and Ursvik to the SO. It is also the most direct link to the metro station Kista (8)

> Regional cycle track : Connection to the east to a regional cycle route, allowing an efficient alternative to the individual car to Ursvik in the southwest and to Kista and the other towns further north connecting to the existing bike path with many ramifications (9)

To go along with less personal vehicles ownership, city

must provide efficient services, we thought about the three following services (concepts that have to be more developed) :

- a hierarchical framework to give its importance and its space to each mode and each user
- parking at the entrance of the site and a fleet of shared vehicles: instead of only providing a space to park, we provide a subscription to this service (10)
- an internal shuttle that serves the whole district and links efficiently Kymlinge with Kista (11)
- hubs of mobility at a regular distance where users find several services of mobility and logistic (12)

12. Hills and grid systems

The site of Norra Kymlinge is a hilly area with height differences of up to 20 meters within the site (from 20m a.s.l to 40 m a.s.l) There are six main hills within the site area.

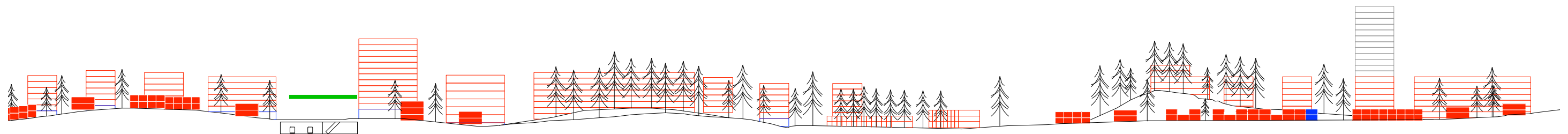
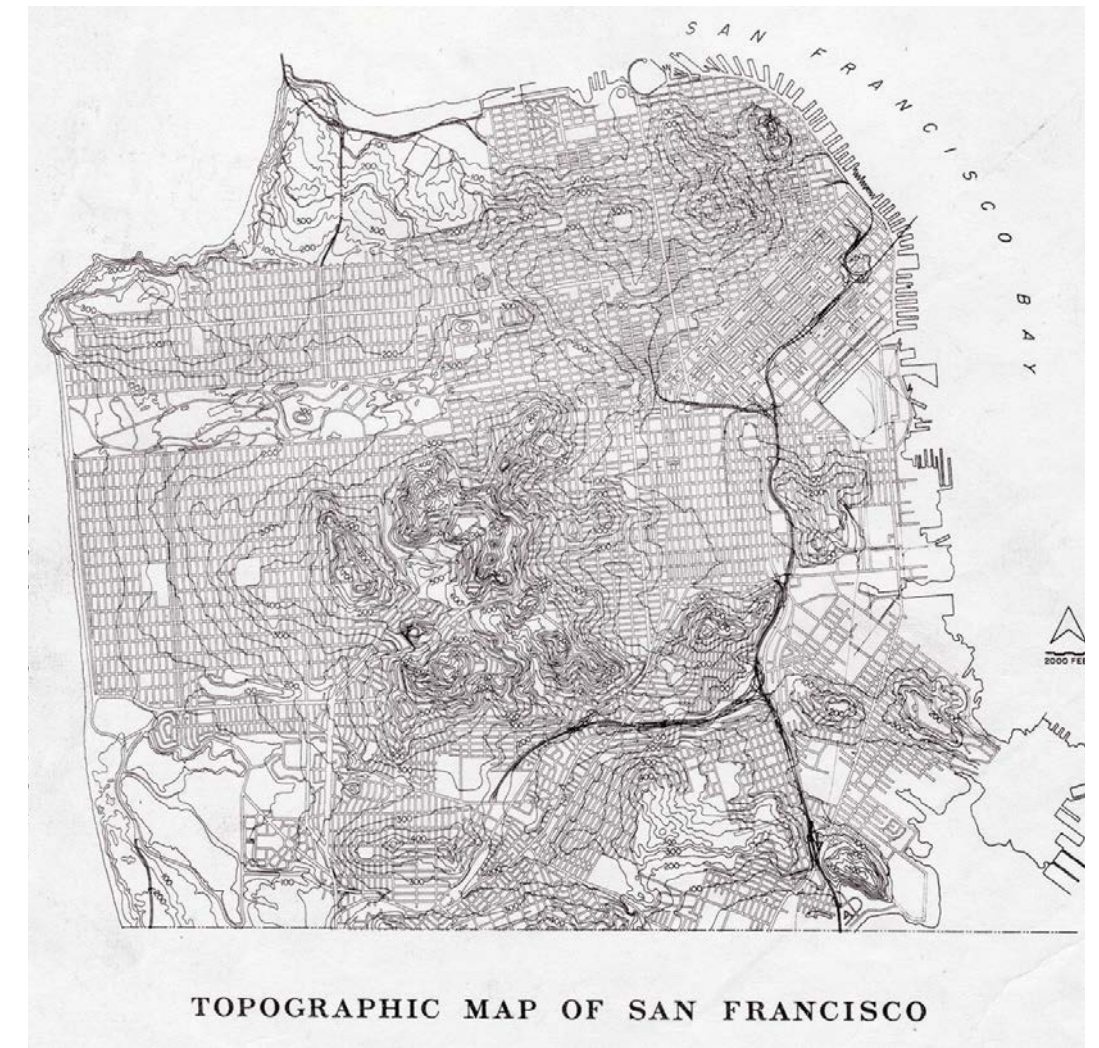
In some parts of the hills the topography becomes a constraint for development because of the steepness of the slopes but in general it represents a strong quality, both for the diversity that it offers within the public spaces of the prototypes and for the multiples views it generates for the dwellings.

To address the topography we propose a pragmatic and sensitive approach : neither to level the whole site and erase the topography nor to « stage » the topography by building everything around the slopes, but rather a coproduction between the grid system of the fabric and the topography, where each one enhances the other.

Three situations coexist :

- troughout the soft slopes of the site the topography adds diversity within the built fabric ;
- around the few hillsides where the slopes are very steep we step back
- on steeper areas that could be built land contours are followed and the built structure changes.

As Allan Jacobs argues in his book *Great Streets* :
 « The determination of early san Fransisco surveyors and engineers to disregard topography in the layout of their city is well know,. But at some points it became impossible to continue the grid, the topography was too steep, and either development ceased, to be continued only years later when pre platted public streets could be replatted to follow land contours or the designers were not so heard-headed in the first instance and let land forms determine street and block layout. In either case, the changes in land form are reflected in the street patterns »



13. The station, a natural magnet



2. Children's learning garden, Missouri

The station of Norra Kymlinge should be much more than a transition point for the future inhabitants of the city : its strategic position, at the border between the new city and the valley of Igelbäcken, one of the main recreation areas and green links of northern Stockholm, offers opportunities to turn the station into a new metropolitan attractor. Like a magnet, it could attract people from surrounding neighborhoods making it an important gathering place.

The only existing subway stations in north-east Stockholm with immediate access to nature are Ängbyplan and Akeshov (the nature reserve of the Judar Forest). Looking at large metropolitan places around central and northern Stockholm many are shopping and recreation centers in indoor environments.

The potential of Norra Kymlinge station is to offer direct access to Igelbäcken valley and a concentration of recreational activities related to nature.



1. Sport fields Saint-Paul, Paris, NP2F

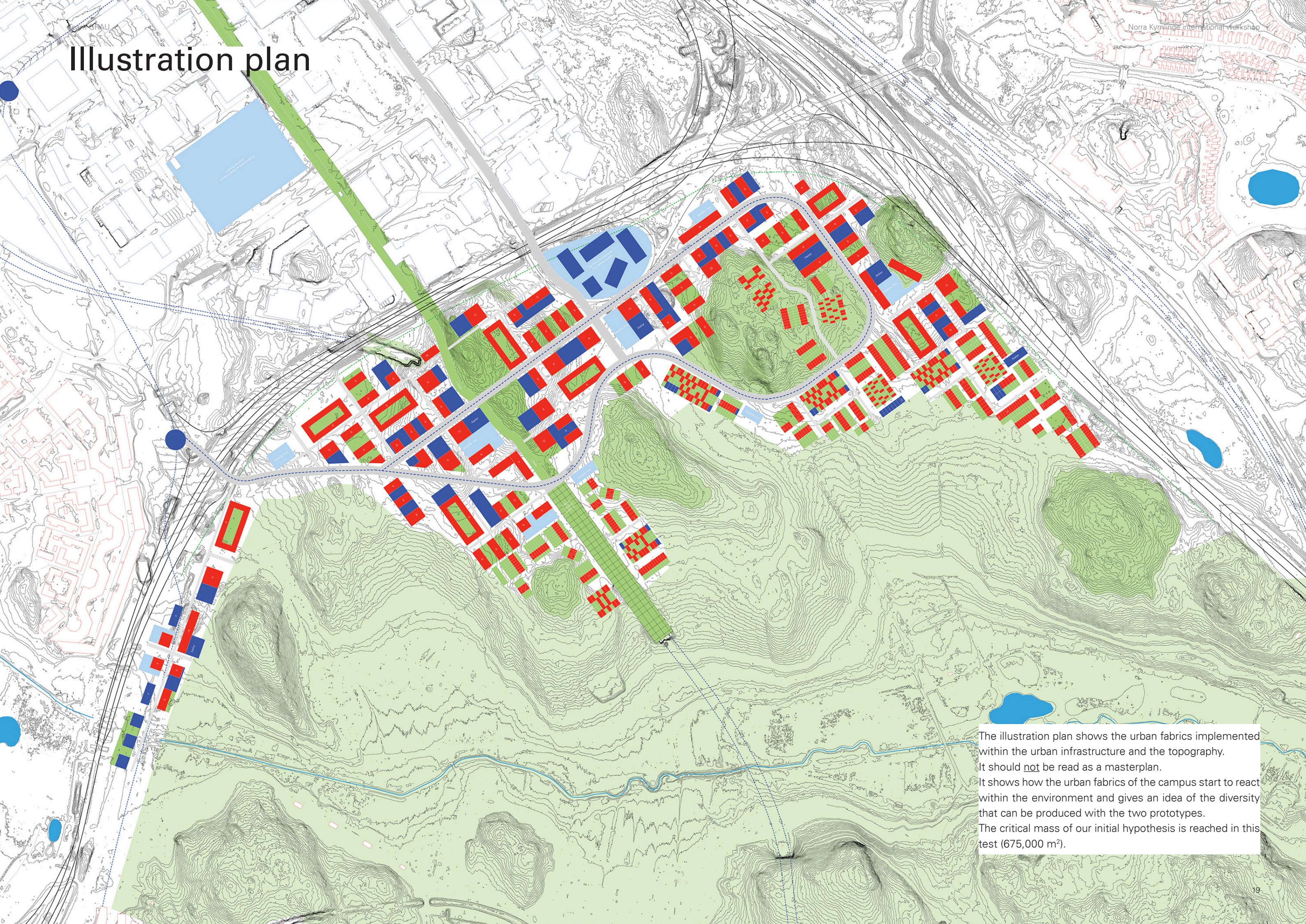
When exiting the station on site one enters a natural well tempered environment, protected from wind, rain and snow. It is a covered platform of about one hectare (300 x 30 m) that offers a high concentration of outdoor activities centered on wellbeing (sport and growth) :

- productive greenhouses are scattered around, open for the schools of the surrounding neighborhoods, they become a pedagogical element and something that Kymlinge gives to the rest of Stockholm (1)
- different sports fields and playgrounds are arranged on the platform (basket, soccer, handball, hopscotch...) allowing for children and adults to play in a safe and protected outdoor environment (2)
- a surface for a local food market is reserved that could also house local events such as flea markets.

The platform is the starting point for the campus link that extends north towards Kista.



Illustration plan



The illustration plan shows the urban fabrics implemented within the urban infrastructure and the topography. It should not be read as a masterplan. It shows how the urban fabrics of the campus start to react within the environment and gives an idea of the diversity that can be produced with the two prototypes. The critical mass of our initial hypothesis is reached in this test (675,000 m²).



How can we get there : reflections on process

This is just a start

The design proposal presented here does not constitute a fixed and final strategy and the illustration plan shown on the previous page should not be read as a masterplan for Norra Kymlinge. It is merely the beginning of a process, with just enough information and precision to be able to extract the knowledge needed to get to phase 2.

Testing the prototypes

The prototypes can already be tested in many aspects. However, it is important to consider them together during the testing since they offer complementary qualities as answers to the objectives. To give an example, one of our responses to point 8 in the specification, « People, stages in life and lifestyles », is to propose two very different kind of housing typologies in the two prototypes.

Many aspects still need to be solved within the prototypes but there are beginning of answers for all the points within the specification and therefore the specification could serve as a good reading grid of the prototypes.

We have defined a strategy for how we relate to topography on the site but at this stage this can not be tested precisely on the plan and there need to be additional studies carried out regarding the topography, slopes, leveling etc in order to make decisions regarding this point.

Prototypes and doughnuts

Three things are important to consider when moving forward :

A. For each of the prototypes we have worked with the whole specification (17 + 1 points) to transcribe as many objectives as possible into the physical fabric of the prototype.

B. It is quite clear that the prototypes could fit in the planetary doughnut since they meet the social foundations and could fit within the planetary boundaries but the «Kymlinge doughnut » has yet to be defined. The elements proposed in the prototypes could help to guide the process of designing the « Kymlinge doughnut ».

C. The doughnut, as a common language of sustainability, has been important during this phase of the process. However we believe that for the next step, testing the prototypes and gaining knowledge, we should move away from the doughnut and back into the site and its possibilities. The tool for defining a new city in Norra Kymlinge that offers life qualities within planetary

boundaries is the prototype. Only when the prototype is considered “complete” will we be able to define the Kymlinge Doughnut in precise terms.

A city is not a machine

While the physical structure can have a strong impact on sustainability including the social one, we need to be careful with the parameters that we use to test the prototype. A city is not a machine and many aspects can lose their strength if they are tested through purely quantitative or physical parameters.

An aspect that we have insisted on is the idea of the « mean city » as a counterweight to the « friendly city ». This aspect, touched upon in point 10 of the specification, « Safety and security », can not be measured per se in the prototype. We believe that one element that can contribute to this aspect is the introduction of a certain amount of productive activities within the city fabric, such as suggested in the prototypes through the programmatic mix and the atelier offered.

However, many other things can and should be done to offer unexpectedness within the city :

- the first one would be to offer spaces to common interest associations who could occupy the site prior to construction. The Darwin initiative in Bordeaux is an interesting example of what can happen when we let citizens and associations take control of their environment. Darwin (<http://darwin.camp>) is a local initiative to occupy old military barracks on a former wasteland on the banks of the Garonne. It started as a temporary occupation during the urban renewal of the site but has grown into becoming the main driver within the area, an alternative place dedicated to responsible economic development, social entrepreneurship, ecological transition and citizen activism with more than 1000 visitors a day. This kind of initial occupation of a site creates place making and a richness to a city that no new development can produce. It is of course easier to do when there are existing structures on site but we believe this kind of process needs to be explored in Norra Kymlinge. It would also be possible to work on this kind of development in the warehouse-like buildings of Kista that borders the site to the north.

- another possibility is to start working immediately around the station. We have proposed to turn the station into a

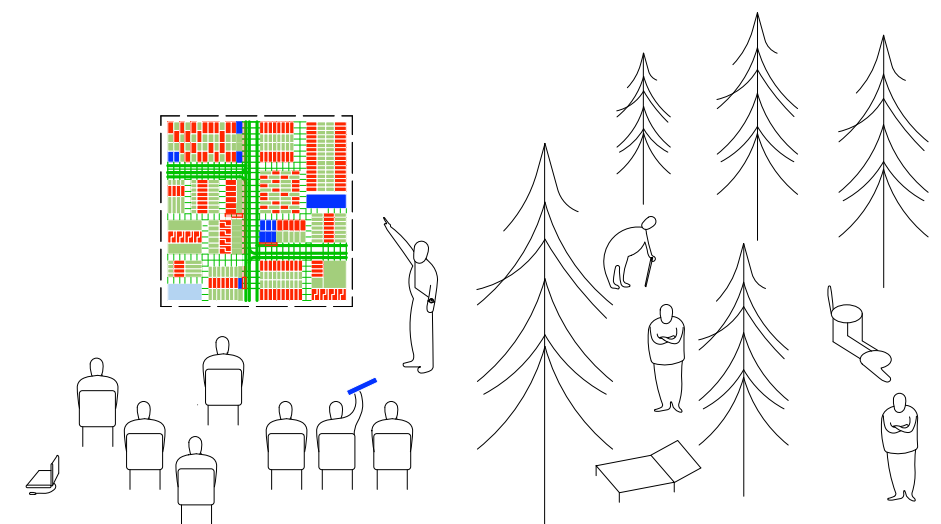
new metropolitan attractor within the northern region of Stockholm, a place where everyone feels welcome. Starting to work with schools in the surrounding neighborhoods, by offering them plots grow for example, could trigger an interest for the site and attract parents and other people in return.

Two-way evolution

In order to go deeper into the prototypes we imagine that the work could evolve in two parallel directions : on-site process and technology investigation.

> On-site process would engage different local stakeholders (inhabitants, associations, businesses) in building knowledge on the local forces that could act on the project.

> Technology investigation could explore how technology and « big data » could help shape the prototype, notably in terms of services offered and embedded economy. This process could engage researchers from different institutions in Sweden (Stockholm resilience center, KHT...) and local start-ups. Kista science city could play its role here too.



The thought process

Following a method

Our thought process was directly influenced by the method designed for the task, that was followed during the whole workshop. We saw the method as a part of the prototyping process and decided to “stick to it” to see the outcome.

Prior to the workshop the whole team had gotten familiar with the site and the surroundings. The prototypes emerged slowly during the workshop through the knowledge drawn from the working method :

- day one, discussion on the programme ;
- day two, discussion on site and its main qualities and constraints and beginning of test design on prototypes ;
- day three, definition and design of the urban infrastructure and the prototypes.

To start the prototypes we used several references of urban fabrics that we had brought with us. These were all represented on the same size and scale as the prototypes (4 ha) and consisted of fabrics from the surroundings and other cities. It was a working tool that helped us to rapidly evaluate and discuss different strategies regarding the urban fabric and the critical mass of the project.

The presence of Oscar Wallin from One reality was also an important « tool » for the process as it helped to gain knowledge of the site and stimulated the production of physical form.

Different areas of expertise

The sustainability strategy cannot be considered separately but relies on an iterative process to provide a final design meeting the goals of livable, resilient, healthy and sustainable district. The planning approach spans across different disciplines and those present within our team (urban planning - GRAU, architecture - EO, landscape and water management - Dreisittl, mobility - Tractebel, energy and climate - Transsolar) were all explored in detail within the project. Everyone tried to build as much knowledge and input from their own area as possible while seeing the « bigger picture ». Thus, the urban infrastructure and the prototypes are infused with this knowledge and we believe that this played an important part in the way they were developed.

Social sustainability

One of our main focuses throughout the workshop and after has been on the elements of the programme that dealt with social sustainability. We know that this is the most difficult to achieve within the city and especially when building from scratch so it was an important point of discussion for us. The physical structure of the prototype and the urban infrastructure are thought entirely as a support for a diverse social structure. Design of public space, building structures and depths, block size are all elements that have been thought to offer maximum flexibility and openness to diversity. It is not a subject in itself but a general approach to city planning.

Time spent on site

Being on site, both in Kista and in Stockholm, was a key element in our thought process. Spending time on the site, and especially in Kista, helped us to gain an understanding of the spatial context but also of its living qualities. The campus fabric, the importance of the station as a metropolitan attractor, climate adapted design... were all ideas that emerged during our reflections from time spent on site, including in the evening.

Our initial « intuition », that building Norra Kymlinge could help reconnect several fragmented pieces of the area, was confirmed by the time spent on the site and we strongly believe that Norra Kymlinge, together with Kista, has a solid potential for creating new relationships and interactions in northern Stockholm.

Our team



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GRAU (Good Reasons to Afford Urbanism) is a creative office working in the fields of architecture and urban planning. The firm proposes operational design strategies for clients who aim to create qualitative urban environments. In 2016 GRAU received the Young Planners Award from the french Ministry of Housing and Sustainable Habitat. The office has an extensive experience in urban planning, both at local and territorial scale, and has developed a strong expertise on issues related to housing, through urban renewal projects, densification of existing neighborhoods and masterplanning of new districts.

We believe that a clear urban structure is essential to providing people with opportunities to achieve individual creativity and that context always matters (no city can be generic).

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ELDING OSCARSON is the joint operation between Johan Oscarson and Jonas Elding. Our collaboration is young, but combines substantial experience from employments in Sweden and Japan, covering both local and international architecture, from large projects to small ones – museums, offices, private houses, interiors, furniture, and product design.

We want to continue to challenge an eclectic array of architecture and design tasks, to see how our joint effort can contribute to new solutions, ways to live, and spaces to enjoy. We feel successful when we surprise ourselves; when our projects are highly relevant to the user, the site, or other parameters that make every project unique, real, and story-telling.

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Transsolar is an international climate engineering firm determined to create exceptional, highly comfortable indoor and outdoor spaces with a positive environmental impact. We believe that the very measures taken to create remarkable architecture can simultaneously enhance human experience and minimize resource use. To us, sustainability is not separate from design, but an indispensable component that enhances the experience of the built environment.

We are vision facilitators, idea generators, and design integrators. Our engineers are not just experts in basic physical principles; their creativity enables the collaboration necessary to develop deeply integrated comfort and energy concepts.

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For more than 35 years we at Ramboll Studio Dreiseitl have been combining cutting-edge skills in landscape architecture, urban design, urban hydrology, civil engineering and ecology to create special and unique public spaces. We are grounded visionaries who do not just conceptualise solutions; we take them from visioning through to implementation. Technology becomes transparent; landscape and water are fully integrated to create highly desirable liveable public spaces. Our well-trying approach puts collaboration, hands-on public participation and cross-agency coordination as the first step in arriving at innovative solutions that generate civic pride. Our passion and philosophy is founded on our European heritage, honed and delivered by our multi-cultural teams in Germany, Singapore, China, the Nordic countries and the Middle East.

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With more than 4,500 high skilled employees in over than 30 countries, mostly European countries in particular in France, Belgium and Germany, Tractebel Engineering is able to source in-house multidisciplinary teams that are able to complete successfully the most complex projects. Infrastructure today is not just about technical solutions, it is about smart solutions: solving problems in a sustainable, eco-nomical and ecological way that our clients may not have seen for themselves. Bringing the full range of infrastructure and energy competences needed to make Cities of Tomorrow, Tractebel Engineering is uniquely positioned to add value; from the earliest stages of policy-making to the realisation of a complete masterplan. From vision to reality, urban planners and architects, developers and public authorities can rely on us as serious partners, every step of the way.

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