Architectural Habitat in the Natural World

Integrating green connections in the urban landscape

Masters Thesies in the Master's Programme Design for Sustainable Development

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Abstract - Architectural habitat in the natural world

In this thesis I examine how architects can use architectural design to create the prerequisites for a mutually beneficial co-evolution of nature and human culture. I do this by integrating ecological connections in a city development plan. My question formulation therefor is:

How can you as an architect work with integrating ecological connections in a city plan?

The idea is based on a sustainable development approach called regenerative development. With regenerative design it aims to remake the system of human culture to become a positive influence, with a mutual beneficial relationship to nature. Allowing ecological connections throughout cities, helps connecting different ecosystems and populations in that region. The interactions of these can take place and further both the evolution as well as the rescilience of the ecoregion, in which the city is located.

This is a research for design thesis. Literature and references have been a guide to find a direction of what to investigate. Chrisna du Plessis, Dominique Hes, Janis Birkeland, Stephen R. Kellert, Pamela Mang and Bill Reed, are important sources.

The result is a new housing area in the Swedish city Visby. When developing the plan I integrated green connections in the city structure with the goal to allow “wild nature” to reach towards existing green areas in the town. However, the intention is not to create a spectacular “show off green neighbourhood”, but rather to introduce “green” ideas, such as this one, in a modest and quite ordinary way. That is important since a sutainable society is reached by introducing these sustainable solutions as the conventional instead of through a few “islands” of “green neighbourhoods”. It needs to be squiggled into the ordinary way of how we do things.

An important part is the significance of the word **integration**. It applies both to the need of ecosystems as well as the need of us as human beeings, such as a sense of belonging and connection. This is done by breaking borders, connecting the new housing area as a part of the existing town, with the intention to create a stronger sense of continuity of the city. Instead of *adding* a new area it should be *merged* into the city.

The ecosystem services that are brought into the city by working with greenery in the urban landscape are great potentials of this idea. A challenge is that this kind of project demands a more free approach towards development in cities, since delimitations of plans and ownership of land, prohibits this kind of large scale perspective of city development. That is connected to another potential subject, our worldview.

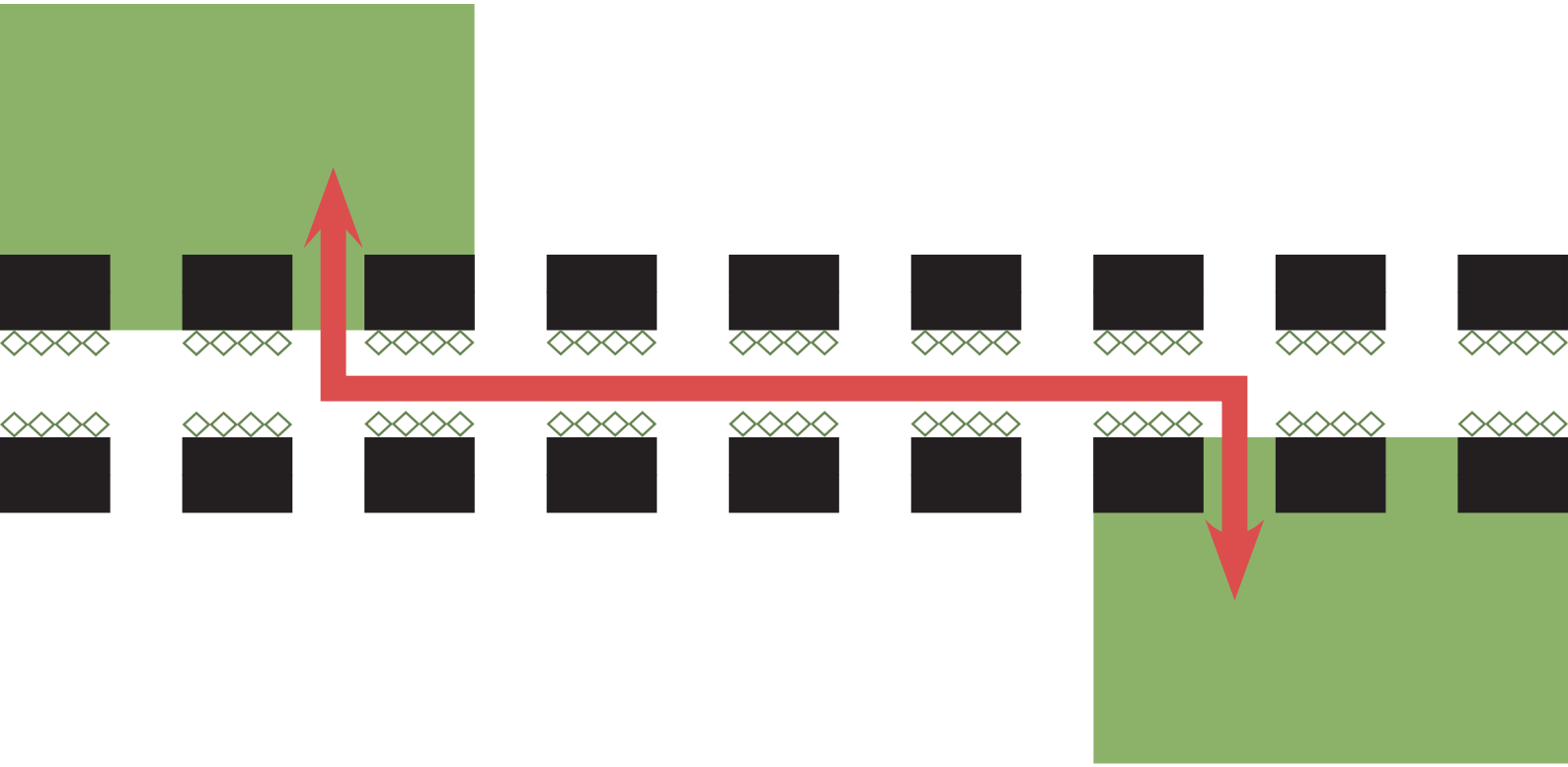
1. Introduction

This beautiful alley is Fiskargränd in Visby, Gotland. It is characterized both by the roses, the houses, the material and the street togethere. They all interact, creating the sensation of this room.
Photo: thefad.pl (i)

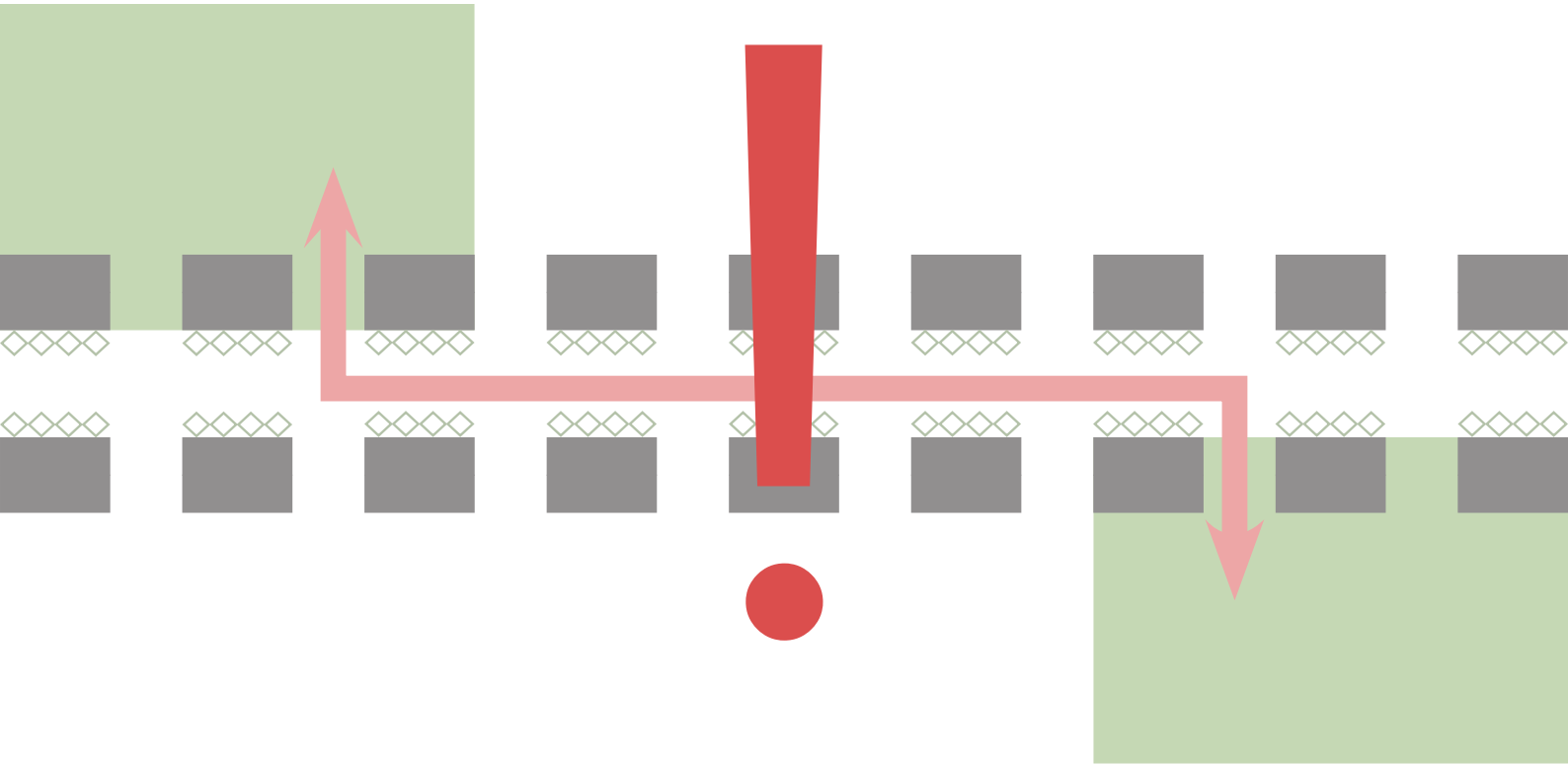
Also, the roses in the alley of Fiskargränd constitute a nutrient source for pollinators.
Photo: Petri Kratochvil (ii)

With that realization, the alley also work as a connector, leading the pollinators from one end to another.

Photo: thefad.pl (i) adjusted by Annie Lovén



The alley could therefor potentially work as a connector of larger green areas.
Illustration: Annie Lovén



This is the idea of the thesis:

How can you as an architect work with integrating ecological connections in a city plan?

Illustration: Annie Lovén

This master thesis is a city plan project with a focus on integrating ecological connections in a future housing area in the Swedish city Visby.

However it is not about creating an eco-district or eco-village, but rather about how to integrate ecological connections in, what could be called a conventional plan. That is important, since additions of these kind of eco-villages are not actually making a real change in conventional planning or exisitng structures, but just ad isolated islands of sustainable districts. Instead these sustainable solutions need to be merged into the conventional to make a real change. My project is therefore seemingly modest, because I want to investigate how suststainable solutions, such as the ecological connections, can become a natural part of the urban landscape, just as houses and streets are imperative parts of that landscape. That is also why we, architects that work with the space need to work with this, how to integrate ecological connections as a natural part of the urban landscape that supports and interacts with the spacial qualities in the cities.

The basic idea of making a change of the overall system is based on an approach to sustainability called regenerative design. It is about remaking the human activity on this earth to become a positive part of the natural systems. Doing so the other organisms can coexist and the ecological base will be able to expand, and so will the access to the ecosystem services on which human prosperity depend. Therefore, designing for nature is actually to design for us.

This is not about a building or a plan in itself. It is rather about how to design the prerequisites for reconnecting human culture as a positive part of the ecological systems. It is a seemingly large task to handle, but vital for finding more thoroughgoing and integrated sustainable solutions. As an architect this can be about working with materials and systems in buildings and city plans, designed to be part of the ecological cycles. It is also about creating the prerequisites for living and acting in a sustainable way.

Another part, which is the focus of this thesis, is to connect the city physically with surrounding ecosystems. That is to connect those systems through qualitative green infrastructure with existing green areas in the cities, such as parks, gardens and courtyards. By studying different ways of introducing these connections in the different spaces in the city, I also investigate how this green infrastructure can interact with and create stronger architectural qualities in the cities. Some sub-question are:

- What can the green in the cities be?
- What are the qualities that the green can bring into the cities?

The architectural quality of a city space or a building, I would say, is also an important part of sustainability. Buildings and spaces with high qualities will be taken care of. That is the resources put into that project will sustain. To merge in these green solutions successfully is therefore a true architectural task. That is since it is about integrating those solutions in relation to the spirit of that place, so it not becomes a separating function or a barrier, but rather an enhancing part of the continuity of the city.

Regenerative development as a reaction on conventional sustainability

The emergence of regenerative development can be seen as a response to the dominant solution of sustainability, which focuses on lowering the negative impacts of human activity, in majority through optimization and technological development.[1] The problem with that reasoning is that it is basically only slowing down these negative impacts. They are not actually changing the system that has caused them. Would it not be better to urge for a way of living, a way of developing human culture so it has a positive impact instead of a negative one?[2] Only focusing on lowering our negative impact also has another problem. With increasing population, that optimization is consumed. Therefore it would be better, and more interesting to find a way where human culture has a positive impact on nature, being part of helping its process of evolving and getting stronger.

The reason for the conventional approach to sustainability can be traced back in history. Basically it is rooted in the idea of human culture as something totally different, and even disconnected from nature. That is why we have developed human activity as such. In architecture one reoccurring question that mirrors this mindset is: *“Why do we need nature in the cities when we have a lot of it on other places?”* If you rephrase it, as Hedlund did in Fauna and Flora[3] to: *“If we don’t need nature in the cities, how large can the cities be allowed to be?”*; you realize that the approach of seeing human and nature as disconnected is a limitation in itself. As one perspective, that is why we need to think differently and reshape the system of human prosperity to collaborate with nature.

About the process and me

All through my life I have felt a small distress about the way the world has been presented and depictured. The world, my school education have always been about learning one thing at a time often in an isolated manner, but I felt that I wanted to see the whole world and how it is all connected. Until not long ago I could not put into words what I was searching for, that I was urging for a an approach that allows the world to be complex, as it is.

Before my years at the department of architecture here at Chalmers, I have studied one year of social science with focus on relations and development, and two years of engineering, one in bio energy and one in chemical techniques and physics. In the year of studying bio energy I discovered the power and the delicacy of ecosystems. With my years in architecture I have been reflecting over why this power is not incorporated in our designs. Wouldn't it be amazing to work with ecosystems in our built structures, to strengthen them and expand their potential to encompass the functions of the city systems? That is to develop the ecosystem services, which in cities clean, provide us with water or absorbs the floods due to heavy rains or just nourish our well being. This reflection in combination of the search for a relation based approach and a "true sustainability" in the early studies of this thesis, is what landed me at the subject for this thesis.

I have instinctively felt that finding true sustainability is not about minimizing energy demands alone, but about something more. So in the years of my architectural studies and the early research of this thesis I found my question: how can I as an architect design the frames for human culture, the human place, as part of nature and its processes. Therefore I chose to look at greenery in cities, since the base of ecosystems are the interactions of organisms with other organisms and habitats.

I initiated this thesis process by research on different approaches to sustainability. This was partly about finding my own question, since this quest, this topic is based on a personal urge for something whole, something that allows for a more complex view of the world.

Method and delimitaions

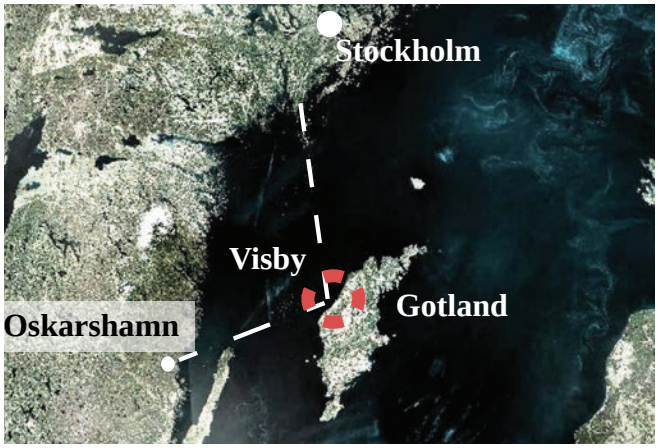
This is a research for design thesis. By studying literature by among others Chrisna du Plessis and Dominique Hes with their research on regenerative design; Janis Birkeland that has developed an idea of how to strive for an expansion of the ecological base within human structures; Stephen R. Kellert that investigates the topic of biophilic design: as well as Pamela Mang and Bill Reed who are prominent performers of regenerative design, I developed my question. In the process I narrowed it down to work with greenery, based on the idea of Janis Birkelands strive for a net-positive development of the ecological base by including design for nature within human habitats.

For the research an implementation on a site, located at the periphery of Visby on Gotland, was done. It is an area that is about to become a large new urban district of the Swedish city Visby. Its strong natural character as well as its proximity to Visby and a cherished nature reserve made it an interesting site for this project. With the development of the new housing areas I tried to merge in the natural system into the city.

Limitaions

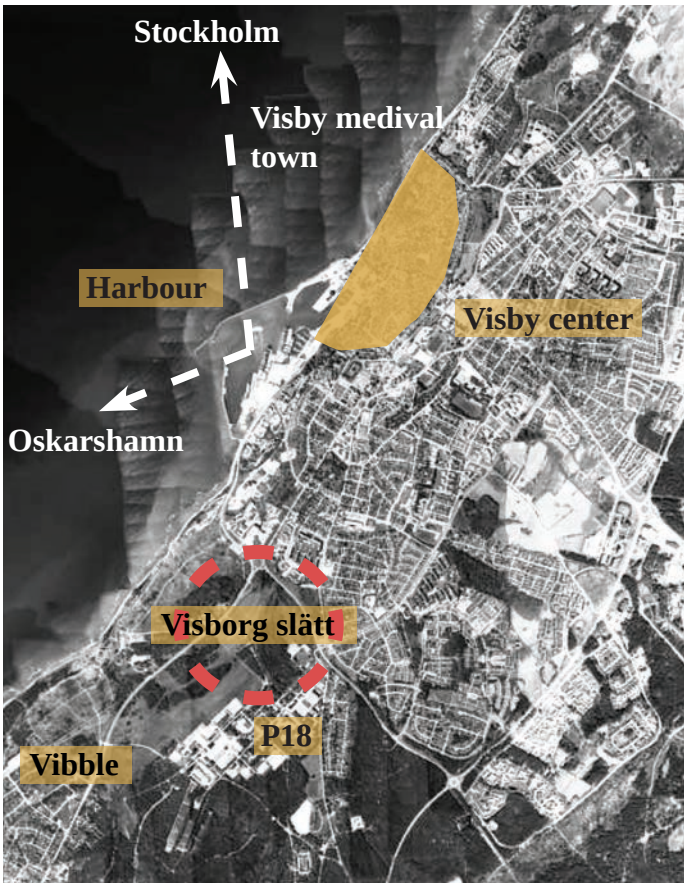
This thesis do not go into a deeper investigation of the argumentation for why these methods or concepts are the way to go. Also this is not a thesis that goes into an argumentation of the to be or not to be of human activities as a cause of the severe changes in our environment, such as climate change and its consequences. I declare at this point that I emanate that this is the case. Also, I declare at this point, that my starting-point is that those consequences are also a threat to human prosperity; all resources such as food, medicine, information, energy, raw material, and clean water, air, soil, are pre-requisites for that prosperity, and are provided from nature through what we call ecosystems services. So the health of nature, the web of ecosystems and the biological diversity, is, with this realization, a question about the health of human prosperity.

2. Presentation of Gotland and Visborg Slätt



Aerophotos: Eniro (iii) adjusted by Annie Lovén

The site, Visborg Slätt, is located on Gotland, a Swedish island located in the baltic sea. It is situated on the south periferi of Visby, between the city border and Vibble.



The distance to the medival town and center of Visby is about 2km and the harbour where the ferries to the mainland berth is about 1 km away.

Gotland has a cultural heritage that attracts many tourists every year. Its largest city Visby, has a medieval city center surrounded by a limestone wall. It is highly protected as a cultural historical heritage and just small adjustment, such as painting a window frame or putting up a sign, need approvement from the citiy's housing department.

The history of the city stretches through the time of the vikings when it was a trading site, through its glory days in the 1300th-1400th century during when it became conquered by Denmark and further through times of war and plunder. In the 1800th century it had an upswing which affected the development of the city. In the end of the 1900th century it emerges as one of the first tourist destinations in Sweden. In 1995 it became listed in the UNESCO world heritage list.[4]

All over the island you can find many farmhouses, single family houses or large *grannlag* (Swedish word), that are farms positioned close to eachother, either in a cluster or alongside a road to facilitate collaboration during harvest or larger work tasks. Traces and examples of traditional handicrafts are found all over Gotland and many of the loved and cherished historical buildings have typical Gotlandic features, that you easily recognize.

City of Visby from Almedalen Visby.
Photo (iv): Georg Gyllenfjell

This beautiful farm called Gaustäde is located in Bunge socken on the north part of the island.
Photo (v): Annie Lovén for Region Gotland

Visborg Slätt - a new major housing area of Visby

The site of Visborg Slätt is part of a large area that is planned to become four new housing areas of Visby. The local city office intends the area to provide a mix of housing types, both villas, apartments and row houses. Sustainable solutions and living are goals for the area. Amongst others shall structures for pedestrians, cyclists and public transport be prioritized. They also highlight that continuing green pathways should connect the area. The existing landscape shall be highlighted. A maximum of three stories plus one withdrawn story on top is suggested. One reoccuring reference for the project is Lomma in Skåne. A modest scale, with buildings close to the street framing the city space, details and materials as well as highlighting natural elements, such as prominent groups of trees or vegetation are important values for the future housing area.[5]

Lomma in south of Sweden is a reoccuring reference for the future new housing area in Visborg Slätt.

Photo (vi): Väsk (user at wikimedia.org)

Stakeholders

Stakeholders would be the municipality of Gotland, which owns all land with exception for the Färjeleden, which is owned by Trafikverket, The Swedish Transport Administration. Also, the population of Gotland, since different types of ownership structures as well as house typologies (single family houses or apartments) affects who and how many that will move to the area.

Other potential stakeholders would be the county administrative board (Länsstyrelsen) of Gotland, and future contractors and developers.

3. The stronger ecological base the stronger human culture

- theory and background

By adding a green layer into cities the intention is to expand the ecological base. This is needed since human prosperity depend on access to ecosystem services, which are provided by that ecological base. In the work of Janis Birkeland called Positive Development, her standpoint is that we do not only need to work with restoring ecosystems that have been lost due to the human rampaging, but also make them even stronger, expanding the ecological base. This is to allow for a continual development of human wealth where there is no apocalyptic threat due to the end of resources, that is the ecosystem services. Thereof, aiming for this kind of regenerative development with a net-positive ecological base, is to aim for a stronger human culture.[6]

When it comes to urban development, one part is about integrating greenery as a layer in the cities, using vertical and horizontal structures of the city as seedbeds for that expanded ecological base. That is when we design for us we need to design for nature.[7] That is the background for my thesis.

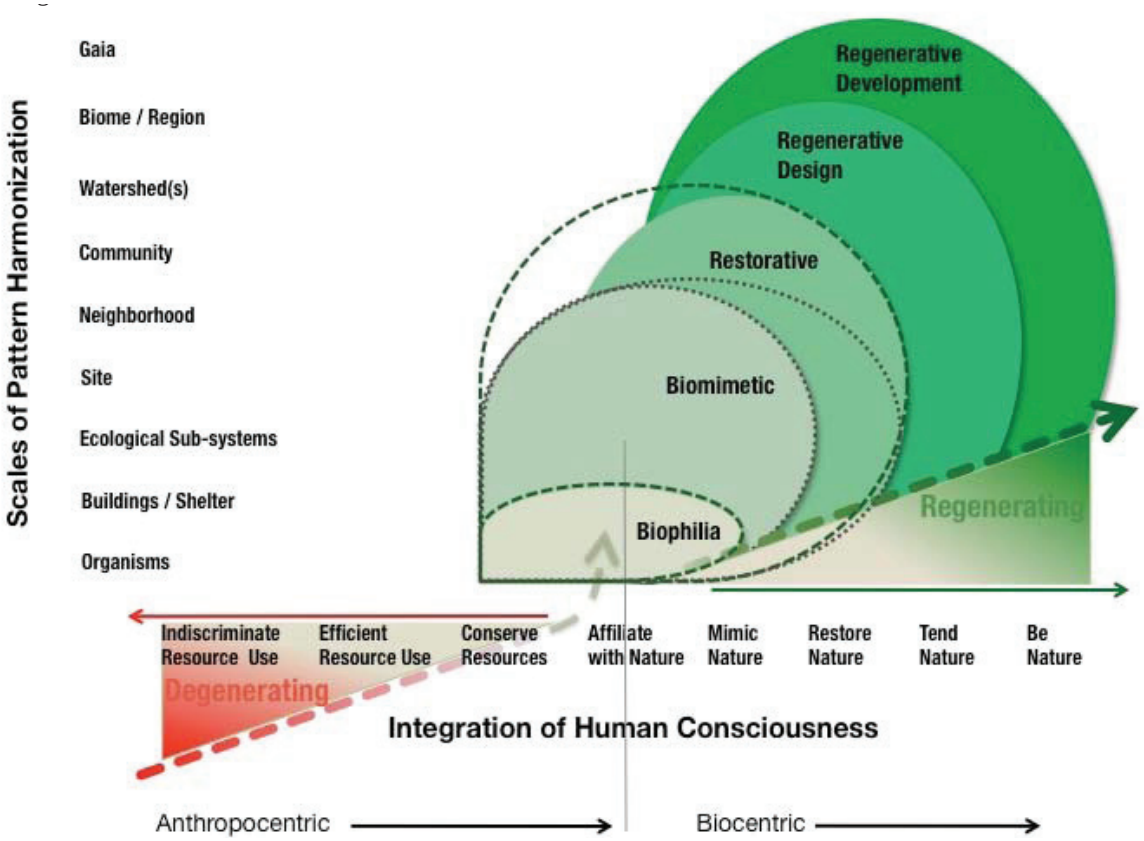


Figure 1: The diagram shows the differences of "conventional" sustainability and then the idea of regenerative development. Source: Mang and Reed 2. 2012 p .13

Regenerative design are the tools and strategies for a regenerative development. It includes strategies and approaches of restorative design, biomimicry and biophilic design. The goal is to have a regenerative effect where the processes of time generate a greater health and potential of nature.

Regenerative design for a regenerative development

In this part a short description of regenerative development and design will be presented.

Pamela Mang and Bill Reed are one of the most prominent spokesmen for and performers of regenerative design. In their article[8] Regenerative Development and Design from 2012, they define regenerative development as such:

"Regenerative development works at the intersection of understanding and intention, generating the patterned, whole-system understanding of place, and developing the strategic, systemic thinking capacities and the stakeholders engagement required to ensure the design process achieves maximum systemic leverage and support. To that end, it integrates building, human and natural development process within the context of place."

Regenerative design is then formulated as follows:

"Regenerative design then follows directly, to offer a system of technologies and strategies based on an understanding of the inner working of ecosystems. Regenerative design solutions regenerate rather than deplete underlying life support systems and resources, are grown from the uniqueness of place, and work to integrate the flows and structures of the built and natural world [9] *"across multiple levels of scale, reflecting the influence of larger scales on smaller scales and smaller on larger"."* [10]

Regenerative design is the actual creation and design that strive for regenerative development. It is based on the understanding of the relations in the cultural and natural systems. Human activities are then integrated, through the design, as positive part of those systems. The idea is to create the possibilities for the ecosystems to continue grow and evolve parallel to human prosperity; expanding the ecological capacity, of which we live.[11] That is the idea of regenerative development.

Disciplines such as permaculture, biomimicry, restorative and biophilic design are some helpful strategies, with different scopes, for working with regenerative design. As illustrated in figure 1.

For the project:

- I need to find a way to develop the plan to be part of the bioregion at place, as part of the ecosystem at place, so the plan can be part of strengthen the larger life supporting system of which that ecosysem is part of.

The relationship of nature and human culture

To integrate the ecological processes in the cities, we need to understand nature, ecosystems and our relation to nature. Studying an ecosystem is often done by observing its living organisms and the environment in which they live. The ecosystems create a complex web and together they constitute the whole biosphere. The biological diversity of populations, species and types of ecosystems is a key to the health and prosperity of the whole biosphere. The worldview of how we perform science, also colors the science of ecology and the biosphere is divided into different categories such as ecosystems, biomes, eco-regions etc. This should not be interpreted as the biosphere being a sum of those fragments. The biosphere, the ecosystems are very much a web. They are interconnected either through moving organisms, the flow of nutrients or through the movement of chemical compounds in the atmosphere such as CO2. Therefore we need to keep in mind how a project lands in this web and how it can become a positive part of it.

Human culture depends on the health of this web as we manifest our development through the use of resources and services provided by those systems. Diminishing that system is therefore to diminish our continuing development.

Below is a shorter description of ecosystems, biological diversity and how humans and human culture is interconnected to those webs.

Ecosystems are based on the interactions of organisms and habitats

Ecosystems are withheld and developed by the interactions of organisms with each other and their environmental surroundings. From the individual species perspective it needs an appropriate habitat. A habitat constitutes of abiotic and biotic elements. The abiotic are among others climate (winds, temperature, precipitation etc.), geological structure, water and nutrients. The biotic are other organisms, both plants, animals and microorganisms, on which the individual species depends on.[12] The borders of ecosystems are not obvious to the eye which might the habitat would be. A forest or a grove is obviously very different in character than an open meadow or a lake.

The borders of ecosystems are obscure

Where the limits of an ecosystem are, are actually rather fugitive. One very simple example is migrating birds. Here in Sweden the birds assemble to breed in the summer-half year. During the winter-half year they spend abroad, possibly in some country in Africa taking part in the natural processes at place.[13] In this perspective the two countries are obviously ecologically connected through the bird and are both part of the migrating bird's habitat, which depend on the health of the ecosystems in the two countries. Another example could be the rather well-recognized CO2. Released into the air through combustion or respiration at one place connects it to other ecosystem through the absorption of it into the atmosphere. CO2 absorbs infrared light from the sun, increasing the temperature for the ecosystems all over the world, causing weather change and therefore changes the abiotic features of habitats. It is also an important part of the photosynthesis, where plants absorb it to create carbohydrates, in consequence also balancing the CO2 released into the air. The removal of vegetation through exploitation or pollutions therefore adds to the accumulation of CO2 in the atmosphere.[14] The oceans also absorbs the CO2 which lowers the ph. When reaching levels above 350ppm in the atmosphere, this acidification start affecting the coral reeves dissolving their formation, affecting all organisms dependent on them.[15]

What is important to understand when studying the science of the ecological systems of our world is that all these terms and fragmentation of the biosphere into biomes, fauna regions, eco-regions, biotopes, ecosystems, habitats etcetera, is not to say that these regions are independent of each other. It is rather just a way to facilitate the understanding of the world for us.[16]

As the examples of the fuguitive character of the borders of the ecosysytems shows, you cannot either disclaim your responsibility just because your project is geographically delimited. It is most certaintly connected to a larger system. How the project lands in and affect that system is therefore an important understanding to obtain.

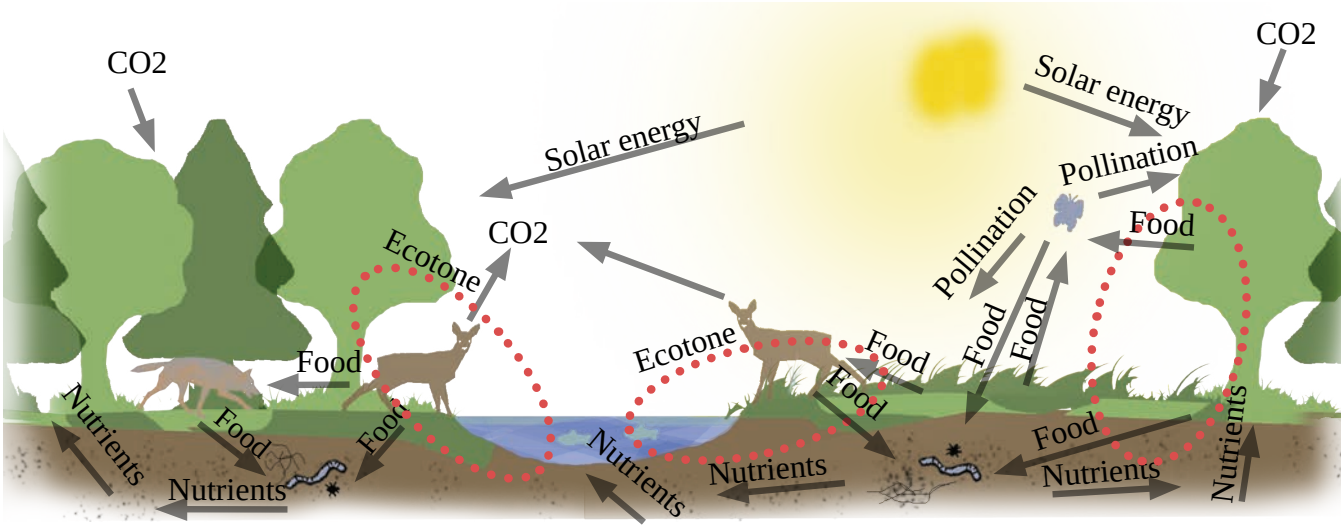


Figure 4: Ecosystem are based on the interactions of organisms with eachother and the surrounding habitat through a flow of nutrients.
Illustration: Annie Lovén

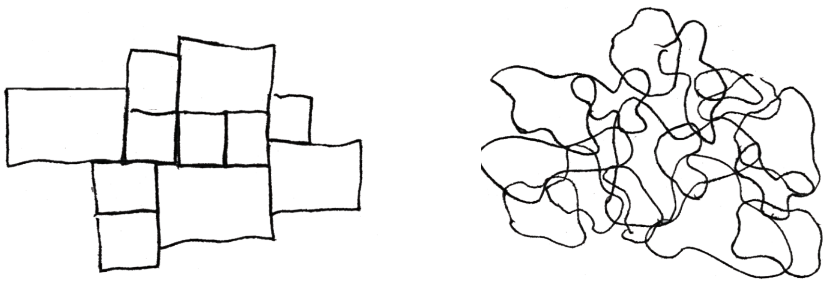


Figure 5: To the left, the way we like to depict the world, but the world is more complex with no clear dilimitations, as the picture to the right intends to illustrate. The division of the biosphere in to ecosystems, eco-regions etcetera is only for our understanding. The biosphere is rather a complex web of relations through connected habitats, biotic or abiotic.

Biological diversity the foundation of ecosystems

The ecosystems are founded on an active biological diversity where every organism interacts with the habitat and other organisms, directly or indirectly. These interactions are the driving processes that build up and develop the ecological assets for further evolution. They strengthen the ecosystems, both their physically body and their resilience. This is done through evolvement of species and populations. The diversity therefore provides the variety needed for that development. The increasing biological diversity is both about a diversity of ecosystems, plants, animals, microorganisms and fungi.[17]

The plants absorb solar energy in its tissues, which is then consumed through the nutrient chains by animals, microorganisms and fungi. Energy is taken into the system, adding energy to the biosphere as a whole.[18] The biological diversity of plants ensures this process by adaption of different species to different environments and the CO2-cycle is withheld balancing the abiotic conditions for other organisms.

The biological diversity also works as a buffer in occasion of destructive happenings, such as volcanic activity, fire or climate changes. These disturbances are part of the evolutional process.[19] A variety of populations in a bioregion can be critical, where one population has developed a bit different then another and might be more adapted to handle “just that type of disturbance”. This can be significant for the survival of that species and thereof its part in withholding and rebuilding the ecosystem at place, after the disaster. In the same situation, the variety in species are just as necessary, since in the case of extinction of one species, another species with a similar role in the ecosystem could take its place, preserving the ecosystem and its processes. Therefore a variety of populations both in numbers and sizes is just as important as a variety in species.[20]

For the project:

- Learn how the site work as an ecosystem and how it relates ecologically to surrounding nature.

I need to do a analysis of my site with the intention learning in what way this place work from an ecological perspective. It is not about learning each and every species at place, but to understand how it works as an ecosystem in relation to nature and the city. So I can develop a plan that witholds and preferable strengthens it. To connect to the surrounding nature I also need to indentify poosible wedges, or fingers of greenery that reaches the city and connect to those, develop that connection into the city.

Human culture manifested through the use of ecosystem services

The human being is in a way a very evolution-contingent species. Our way of developing is pervaded by our innovativeness. Just as the evolutional process pushes forward an improved system, we have used our innovation to develop and urge for a better living conditions for us. pushing forward a distinct evolution of human welfare.

The word culture comes from the word cultura which means processing, education, and cultivation.[21] Searching the word on the internet and reading about the rather diverse use and encompassment of it on Wikipedia makes you reflect on the complexity of human culture. One of the uses is in relation to the art-forms such as literature, music and architecture. In an anthropologic context it can intend a specific group of people. In some contexts it is almost synonyms to the word civilization.[22] I will not try to define what human culture is, it is not my point, but I want to lift it here as a reflection in the light of the natural systems. The human culture is just as complex as the ecosystems, the biomes the biospheres. The evolution of it does not really have a defined goal, but kind of is both about the achievement and the progression to get there, just as natural evolutions maintains and evolve.

However our innovativeness in combination with our social advancement has reshaped our evolution process in relation to the life supporting web called nature. Our manifestation of human culture is very much connected to this life supporting system, through use of the ecosystem services.[23] We breath, eat, we use raw material for energy and production of merchandise goods. We build, we depict our world through art, we produce sensations such as music and theatre. There is no doubt that we rely on this life supporting system's abundance and its supporting ability for doing all those things that is the manifestation of human culture.[24]

The problem now, is that we have realized that that manifestation has detracted that life supporting system beyond the limit of its capability to support the human culture. By that destructive way of development we deprive our selves the continuing development of human culture as whole. I do not want to give up culture but to have culture we need to have the means for it. So instead of continuing the way we develop it, as we have done the past 100-150 years, we should strive for a new way of developing which furthers nature to develop to the better. Therefore to allow for ecological processes in our development is to allow for a sustainable progression of human culture.

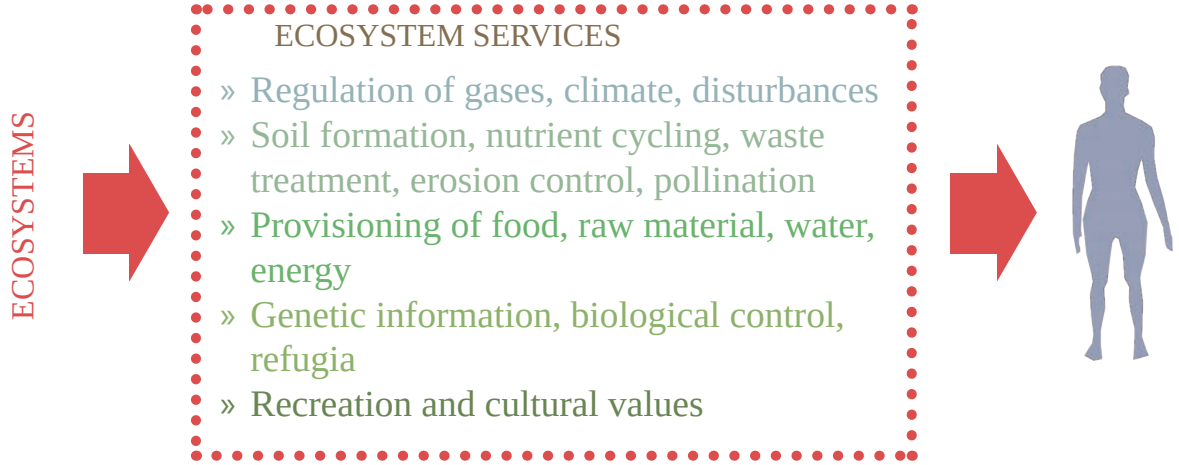


Figure 2: Ecosystem services provide human culture with many service that are imperative for our survival as well as our prosperity.
Illustration: Annie Lovén Source: Millenium Ecosystem Assessment, p. 19

Expanding the ecological base in the urban landscape

From an ecological perspective the existing city development that are at place today have several direct and indirect negative impacts. Building new buildings cannot compensate for those negative impacts. Instead it should be about developing those existing structures to become part of the strive for sustainable development. That is to do more than just reducing their energy use. If their physical structures also becomes seedbeds for plants and vegetation, they can become part of regenerating a stronger and more abundant ecological base, supporting the whole web of ecosystems.[25]

From an anthropogenic perspective we are dependent on the ecosystems through the use of ecosystem services. They are imperative for life and human culture in several ways by providing information, energy, water, air, food, materials, cleaning (or reintegration of substances into the system) and healing. At the present time human culture has detracted that life supporting system beyond the limit of its capability to support the whole society of life (both humans and other organisms) in a sustainable way; we are encumbering future generations prospect of life.[26] So what we need is to rebuild and make that system stronger, as Janis Birkeland[27] puts it we need a:

"Positive development that expand the ecological base (means of survival) and public estate (access to means of survival) beyond indigenous conditions."

With indigenous conditions, she relates to state before present urban development. The imprecise formulation is intended since there is no solution in demolishing urban structures and restoring ecosystems to a specific time or state. The solution is instead to integrate the preconditions for ecosystems into the existing urban structures.[28]

For the project:

- By using the vertical and horizontal structures in the city I will create this ecological connections.

Doing so, the city will enjoy of several ecosystem services. Some of which are not obvious to the eye. Among others, they will help clean both air and water. But also, with increasing vegetation, the soil quality will get better, and a good soil can hold more water. This is good since Gotland, intermittently suffers from water scarcity in the summers. Also from a world view perspective, the increasing green body will absorb more and more CO2 for each year.

Green infrastructure as one element of regenerative development

In architecture green infrastructure could be one part of regenerative development. While it focuses on expanding the ecological base, other approaches such as Cradle to Cradle and passive house-strategies are examples that could constitute as other strategies of regenerative design. **Cradle to cradle** handles reuse and cycles as a cornerstone of all human artifacts and services produced, of course only with the help of renewable energy. This material and energy aspect could be implemented when designing and producing the actual physical structures of buildings.[29] **Passive house-strategies** have a focus on reducing the external energy input for heating the building by thick insulation layers and using solar radiation as well excess heat released from both electrical domestic appliances and human bodies. However, passive house-strategies do not demand that the material used for building the house are recyclable.[30]

So while Cradle to Cradle focuses material, reuse and renewable energy and passive houses on reducing energy usage of housing, green infrastructure focuses on expanding the source of the biological processes and the material that is used for building and running those houses. The point I want to make is that even if this thesis is delimited and narrowed down to greenery in cities, it is only one part of achieving a regenerative development.

Biophilic design - nature as an inspiration

The philosophy of biophilic design, is based on the human need for experiencing and connecting to nature. It highlights how research have shown that contact with nature has a positive impact on human health and also increases productivety and the work capacity.[31]

All people benefit from contact with nature. Research show how it has a positive impact on stress and has shown to shorten the healing process after a surgery. Actually frequent affiliation with nature has such good benefits of the personal well being so it actually has positive cost-related impacts from a social economical perspective. Considering the evolutional process one can also comment on that the time we spend indoors, rather screened of from the natural environment has increased to about 90% of our time. Historically, during the evolution of mankind we have instead spent most of our time out in nature. So it can be said that "this thing" of being indoors is rather new and not what we have been adapted to. [32] In reflection our need of contact with nature and its positive impacts on us is therefore not so strange.

Therefore to work with biophilic design is to work with the built environment in such way that it relates to nature and its processes in different ways. In the book Biophilic Design Stephen R. Kellert[33] provides an approach to biophilic design through six main elements which in their turn is divided into70 attributes, see figure 3.

Attributes of nature for biophilic design

These biophilic elements are then categorized into two different dimensions: the organic or naturalistic dimension *and* the place based or vernacular dimension. The first mentioned is connected to the experience of nature and he defines it "... as shapes and forms in the built environment that directly, indirectly or symbolically reflect the inherent affinity for nature". With directly he intends the direct contact with natural things and phenomenon such as sun light, animals, natural habitats etc. . With indirectly, it is about human efforts to bringing elements of nature closer by e.g. potting. The symbolic is pictures, images, metaphors etc.[34]

The place based or vernacular dimension is related to the experience of a specific place. It is about relating to both social culture as well as the ecology at place. It is about catching the spirit of the place where people can identify and relate to both the buildings and surrounding nature.[35]

Environmental features	Natural Shapes and forms
Color	Botanical motifs
Water	Tree and columnar supports
Air	Animals (mainly vertebrate) motifs
Sunlight	Shells and spirals
Plants	Egg, oval and tubular forms
Animals	Arches, vaults, domes
Natural materials	Shapes resisting straight lines and right angles
Views and vistas	Simulation and natural features
Facade Greening	Biomorphy
Geology and landscape	Geomorphy
Habitats and ecosystems	Biomimicry
Fire	

Natural patterns and processess	Light and space
Sensory variability	Natural light
Information richness	Filtered and diffused light
Age, change and the patina of time	Light and shadow
Growth and efflorescence	Reflected light
Central focus point	Light pools
Patterned wholes	Warm light
Bounded spaces	Light as shape and form
Transitional spaces	Spaciousness
Linked series and chains	Spatial variety
Integration of parts to wholes	Space as shape and form
Complementary contrasts	Inside-outisde spaces
Dynamic balance and tension	
Fractals	
Hierarchically organized ratios and scales	

Place-based relationships	Evolved human-nature relationships
Geographical connection to place	Prospect and refuge
Historic connection to place	Order and complexity
Ecological connection to place	Curiosity enticement
Cultural connection to place	Change and metamorphosis
Indigenous materials	Security and protection
Landscape orientation	Mastery and control
Landscape feature that define building form	Affection and attachment
Landscape ecology	Attraction and beauty
Integration of culture and ecology	Exploration and discovery
Spirit of place	Information and cognition
Avoiding placelessness	Fear and awe
	Reverence and spirituality

Table 1: The biophilic elments with a total of 70 attributes
Source: Kellert. p. 17

Kellert goes through all the 6 elements and their 70 attributes and describes shortly how or what they could represent. However he also declare that the description or interpretations of the attributes are work in progress. Reading them you also see how one attribute in one element relates to another in a different element. Additionally you realise that no attribute can stand alone when it comes to architectural design. One example is related to an attribute belonging to the last element, *Evolved Human-Nature Relationships*, which goes into to the emotional connection or sensations of nature from a human perspective.[36]

The attribute that I find so intriguing relates to the insight of no attributes can stand on its own. It is the one called Order and complexity. Here Kellert describes the importance of balance of order and complexity, where too much of the first can lead to boredom, monotony, and too much of the second can lead to an incomprehensive chaos. Balancing an inspiring variety with a clear structure could create stimulating experience and still give the sense of harmony.[37] I believe this is highly relevant to bring with you when you work with biophilic design; working with a balance of the attributes that applies for a design in relation to its context (to create order and comprehension at that specific place) and strive for an enriching complexity derived from a well and carefully composed merging of different biophilic attributes. To relate to the context of the design, I would say, is crucial for achieving a sense of uniqueness of that architectural design. That relation is what places that design at just that location and not elsewhere; otherwise the design could be placed just anywhere, making it into an un-designed object. That is the complexity that inspires me. It is about how the attributes can be merged together to achieve this inspiring variety based on its local context, or in what Kellert puts in under the penultimate element, place-based relationships.[38] It is not about the singular attribute itself, but about the relations of the attributes and how they together create a wholeness.

For the project:

- By integrating greenery I will reflect on what qualties they ad.

- Also, the qualities of the natural landscape at place as well as its character should be a guide for the development of my plan.

A persistent worldview prevents us from reaching true sustainability

The idea of optimization as a pathway to sustainability is rooted in our worldview that depicts the world from a quantitative and mechanistic perspective. That worldview has a tendency to rely on the belief of an infinite universe of technical solutions to the problems of the human kind. Hes and du Plessis[39] explain how this perspective can be traced back to Galileo and Copernicus and the way they performed their discoveries through observation, reflection and conclusions. It laid the groundwork for the scientific approach of studying phenomenon in an isolated manner and that the world and the universe is a sum of those phenomenon. However, a superstition in those innovations, through those secluding methods, blinds us from seeing the whole picture, where the relations are the key to understanding and finding a solution.

This perception is part of the reason behind the conception of the human kind as disconnected from nature where we, through our inventions, can domineer nature to benefit human prosperity. However, this worldview and mode of procedure has lead us to this situation of today's environmental crises. Still, we prevail in finding the solutions in the same manner that created that reaction.[40]

In research this worldview lingers and the studies are done in a similar isolated manner. Since the scientific procedure is characterized by this reductionist way of measuring, evaluation and implementation, diverging approaches risk being regarded as unscientific. When looking for innovations and new knowledge of sustainability, the recognized mode of procedure for scientific research therefore obstructs innovations of new scientific procedures.[41]

When it comes to working with green buildings we tend to look at the individual building, minimizing its impact by lowering energy use, toxins etcetera. The building gets greener by accomplishing certain goals answering to a checklist, according to whatever environmental mark you have chosen to work with. Therefore potential synergies with the surroundings are missed and we end up with singular buildings or complexes, that have a lot of sustainable solutions, but do not work with improving surrounding systems as a whole. What if we could widen our perspectives so projects could be seen as possibilities to improve the larger existing systems of human culture? In that case we need to widen our perspectives to include more than just quantifiable and measureable values.[42]

Another consequence, is that instead of looking at the potential of relation based benefits of a project, we tend to base our ideas on opposing interests. In sustainable development, the stakeholders are often pictured as the ecological, social and economical spheres, traditionally illustrated through a Venn-diagram. The designs are modeled to balance their interests, emanating from a starting point that they are opposing each other. So when working with sustainability in this way it is about compromising.[43] However, the economy is based on resources that are provided by the ecosystems as well as the capacity of people. The economy brings out wealth (though not equally to all). In that reasoning it would make more sense to work with the three spheres as interdependent on each other to be able to increase the potential of all three of them.[44]

Another worldview compose the foundation for regenerative development

The foundation for regenerative development is based on, a social-ecological worldview. Here the relations, the interconnectedness of organisms and ecosystems constitute the wholeness of life. It is a dynamic world, where change and self-organisation are vital for withholding that system.[45] Without a new worldview the work for a regenerative development, where the goal is a more healthy and prosperous world, will not be achieved.[46] Therefore we need a significant change in the way we design the frames for human prosperity and a redefinition of the purport of the architectural field: for a regenerative development we need regenerative design.[47]

Theoretical conclusions

As conclusions, or rather, learnings from the theory:

1. I need to find a way to develop the plan to be part of the bioregion and the ecosystems at place. That is so the plan can be part of strengthening the larger life supporting system of which those ecosystems are part of. That is the goal from the idea of regenerative development.

2. To do do so I need to learn how the site work as an ecosystem and how it relates ecologically to the surrounding nature.That is to do an analysis of my site with the intention of learning in what way it works from an ecological perspective. It is not about learning each and every species at place, but to understand how it works as system in relation to nature and the city. That is so I can develop a plan that witholds and preferable strengthens that system. To connect to the surrounding nature I therefor need to indentify possible wedges, or fingers of greenery that reaches the city today, I need to connect to those and develop and integrate them into my plan so they can connect further into the city.

3.By using the vertical and horizontal structures in the city I will create these ecological connections. Doing so, the city will enjoy several ecosystem services. Some of which are not obvious to the eye. Among others, they will help clean both air and water. But also, with increasing vegetation, the soil quality will get better, and a good soil can hold more water. This is good since Gotland, intermittently suffers from water scarcity in the summers. Also from a world view perspective, the increasing green body will absorb more and more CO2 for each year.

5. By integrating greenery I will reflect on what qualties they ad. Also the qualities of the natural landscape at place as well as its character should be a guide for the development of my plan.

4. Site and context analysis

In this part I will analyze the site based on the two first conclusions from the theory. Additionally I will also analyze the cultural historical context, as well as the connection to the existing city.

Photos, left to right and down (vii): Annie Lovén; thefad.pl; Eniro; Annie Lovén; Annie Lovén; Żeglarz (viii)

Natural character of site

A natural value inventory shows that the site inhabits serveral specifially important areas from an ecological perspective, that support different types of organisms. These areas are connected through insects and animals that use them in different ways. One area can constitute as housing, another as a source of nutrient. The numbers such as 1:9 etcetera, are list numbers for different appointed spots in the area that were found interesting from a natural value perspective in the inventory.

Photo (ix): Region Gotland 3b

Class 1 - Very high natural value

Class 2 - High natural value

Class 3 - Natural value

Observed redlisted species

The site is characterized by a mix of meadows, boskets and areas of woodland. Several pathways and smaller, scarcly used cartways, cross through the meadows and small woods, creating a more sandy character at those places.While the grassland is a bit dry the woodlands are more lush and moist. You see many insects of various kinds and traces of larger animals.

The area inhabits several redlisted species. The observation or location of these organisms are dependent on the surrounding areas. Such as a redlisted threatend fungi in the red field marked 4:7, that depend on the neighbouring wood in the yellow field marked 4:2. Also the small spot marked 1:6, is a sandy swale that inhabits several pollinating insects that depend on flowers, bushes and trees in the surrounding meadows and woodlands. These woodlands produce fruits and constitute dwellings that support other birds, insects and mammals. The point is that the mix in character is a part of the ecosystem at place.[48] I need to keep this in mind and allow for a continuning mix of different habitats as well as preserving apointed places for high natural values.

When adding a city area, the disruption of the nature at site is inevitable. However, the lost green should be replaced in such way that the relations and functions of the ecosystem is preserved. That is to use the native species and mimic the habitat structures. One example could be to use green roofs and specifically choose native species of herbs, flowers and grass on them.

Pathways creates a more sandy character reaching through both meadows and the small woods.
Photo (x): Annie Lovén

For the project:

- Mimic the mix of existing habitats for the greenery in the new housing area.

- The green that is removed due to the development should be replaced, based on the species at place.

- The connections of these habitats should be witheld.

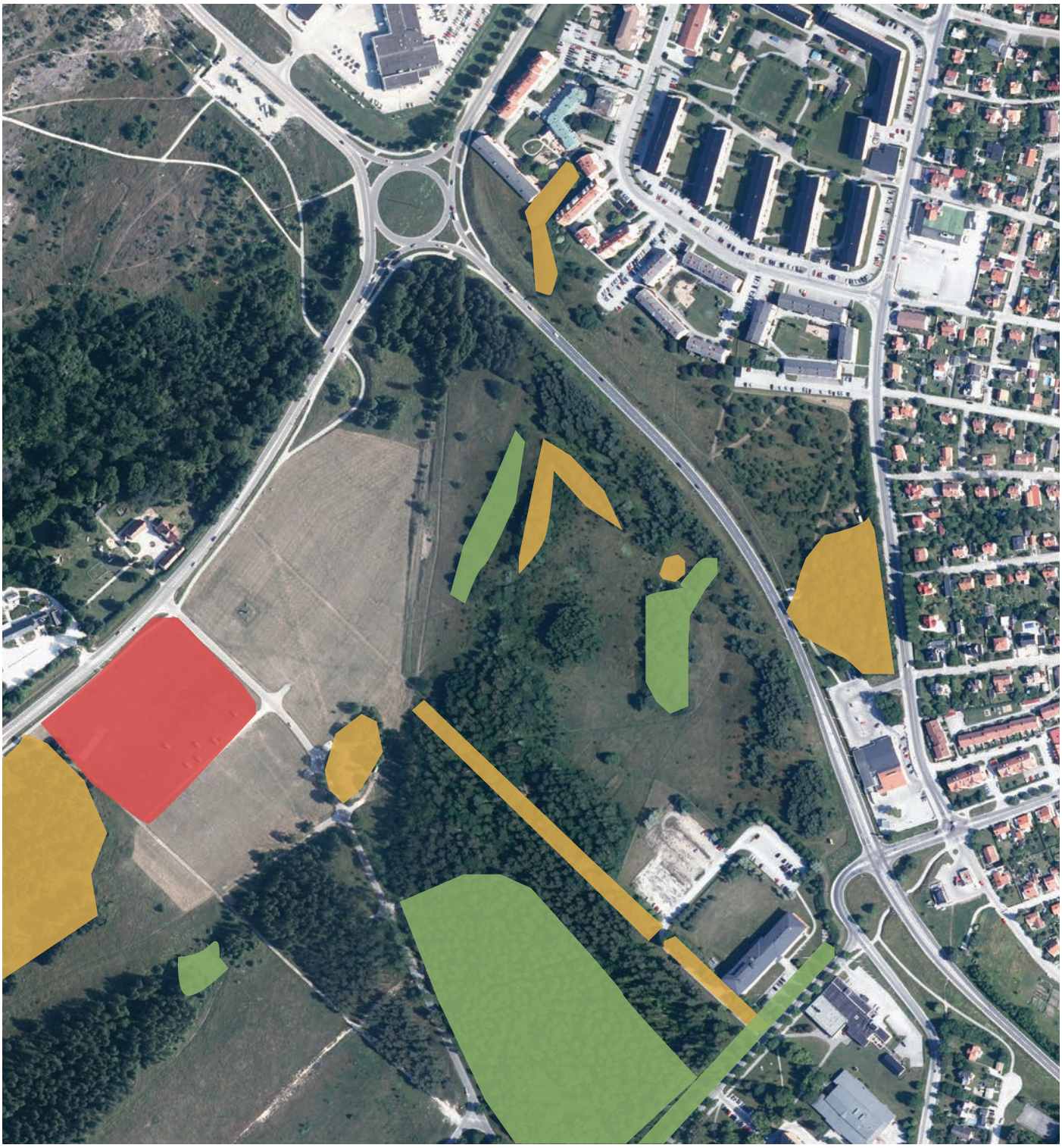
Bushes and woodlands. *Photo (xi): Annie Lovén*

Meadows with Oscasrsstenen and Kungsladugård in the background. *Photo (xii): Annie Lovén*

The woods are more lush. *Photo (xiii): Annie Lovén*

The sandy swale is an importan habitat for insects. *Photo (xiv): Region Gotland 3*

The area supports a variety of insects and animals. Väddklint, the flower you see at three of the pictures is an important nutrient source for pollinators.
Photos (xv-xviii): Annie Lovén



Aerophoto (xix): Region Gotland, adjusted by Annie based on the source: Region Gotland 3b

The natural inventory togethere with identfied qualitative landscape elements lands me on the structure above for the greenery. Especially important is to keep the incoming wild from the southwest.

Aerophoto (xix): Region Gotland adjusted by Annie Lovén

The site’s cultural historical heritage

This is the collonade used in the screen version of Pippi Longstocking in the end of the 1960’s
Photo (xx): Annie Lovén

Kungsladugården and Oscarsstenen are some of the cultural historical traces at the site.
Photo (xxi): Annie Lovén

The old railway crosses through the landscape and is today used by pedestrians and cyclists.
Photo (xxii): Annie Lovén

Villa Villekulla, in the screen version of Pippi Longstocking.
Photo (xxiii): vasternorrlands.blogs.se

The site in Visborg Slätt has several cultural historical traces.

Aerophoto (xxiv): Eniro adjusted by Annie Lovén

In the area you find Kungsladugård an old farm with ancestry back to the beginnings of the 1500 century, when Gotland still was part of Denmark. The surrounding meadows and natural areas were part of its grounds. The farm has been changed during its long existence and the builing in itself have lost much of it original character. Anyway it is identified as an important cultural-historical heritage, due to its significance throughout the history of the island.[49]

Oscarsstenen is a stele that was rased in the middle of 1900 century in the memory of Oscar I commiting three formation banners to Gotland.[50]

Some modern cultural historical traces are the old collonade and the garden that were used in the screen version of Pippi Longstocking made in the end of the 1960's. The house were later remove and rebuilt in a funfair just a few kilometer south of the area. While the colonade is more obvious, the traces of the cottage that were in the garden are not. However looking closely you can possibly anticipate its former existence.

Another trace that still characterize the landscape is the old railway, the diagonal pathway crossing the site. It is today used by both bicyclist and walkers. The visisble traces of the railway are scattered over the island and in the site you find one of them. The railway was constructed in the second half of the 19th century and abolished in the 1950's due to economical reasons and competition of the cars[51].

For the project:

- The old railway can be used as an highlighted connection through the new housing area.

- Other cultural historical traces, such as the colonade and the garden of Pippi Longstocking should be highlighted and integrated in the new plan.

Surroundings, infrastructure and potential connections

Aerophoto (xix): Region Gotland adjusted by Annie Lovén

Surroundings

In the neighbourhood around Visborg slätt one will find some buisnesses, both commercial and industrial. The old regemente area of P18 houses several administrative authorities, such as Sida - which works with aid and international development - and the municipality office. In connection to the area you will also find some smaller restaurants, some child welfare and the appreciated nature reserve Hällarna.

1. Hällarna - a nature reserve and important recreation area.
2. Kungsladugård barns - used as a restaurant and experience center
3. Kungsladugård main building - used as a childrens day care center
4. Oscarsstenen - a stele from the 1900th century
5. Original location of the wooden house used in the screen version of Pippi Longstocking in the end of the 1960's
6. Collonade, used in the same screen version of Pippi Longstocking.
7. Gym
8. Grocery store
9. Fast-food restaurant
10. Sida
11. Bowling and sports center
12. Commercial and industy

The nature reserve of Hällarna is an appreciated nature reserve used as recreation.
Photo (xxv): Annie Lovén

You will also find some smaller buisnesses in the neighbourhood. In the picture above you see the barns of Kungsladugård that houses a restaurant.
Photo (xxvi): Annie Lovén

Aerophoto (xix): Region Gotland adjusted by Annie Lovén

Infrastructure

The area is right on the periferi of the city. It is rather disconnected from the city by Färjeleden, the road along the northeast border of the site. It is charcterized by an embankment and fencing on the north perimeter of the road and no crossings. Toftavägen leading to the south of the island is also hard to cross, but has a combined walking and biking pathway which takes you all the way to Tofta, about 20km south of Visby.

Worth to notice is that the rondella with one road leading to the harbor is an important road for all travelers coming from the ferries. Most car-borne travelers enters the island through this way, so this is in a way the gate to Gotland.

Housing areas are mainly found in to the north east of the site, such as Visborgsstaden and Värnhem.

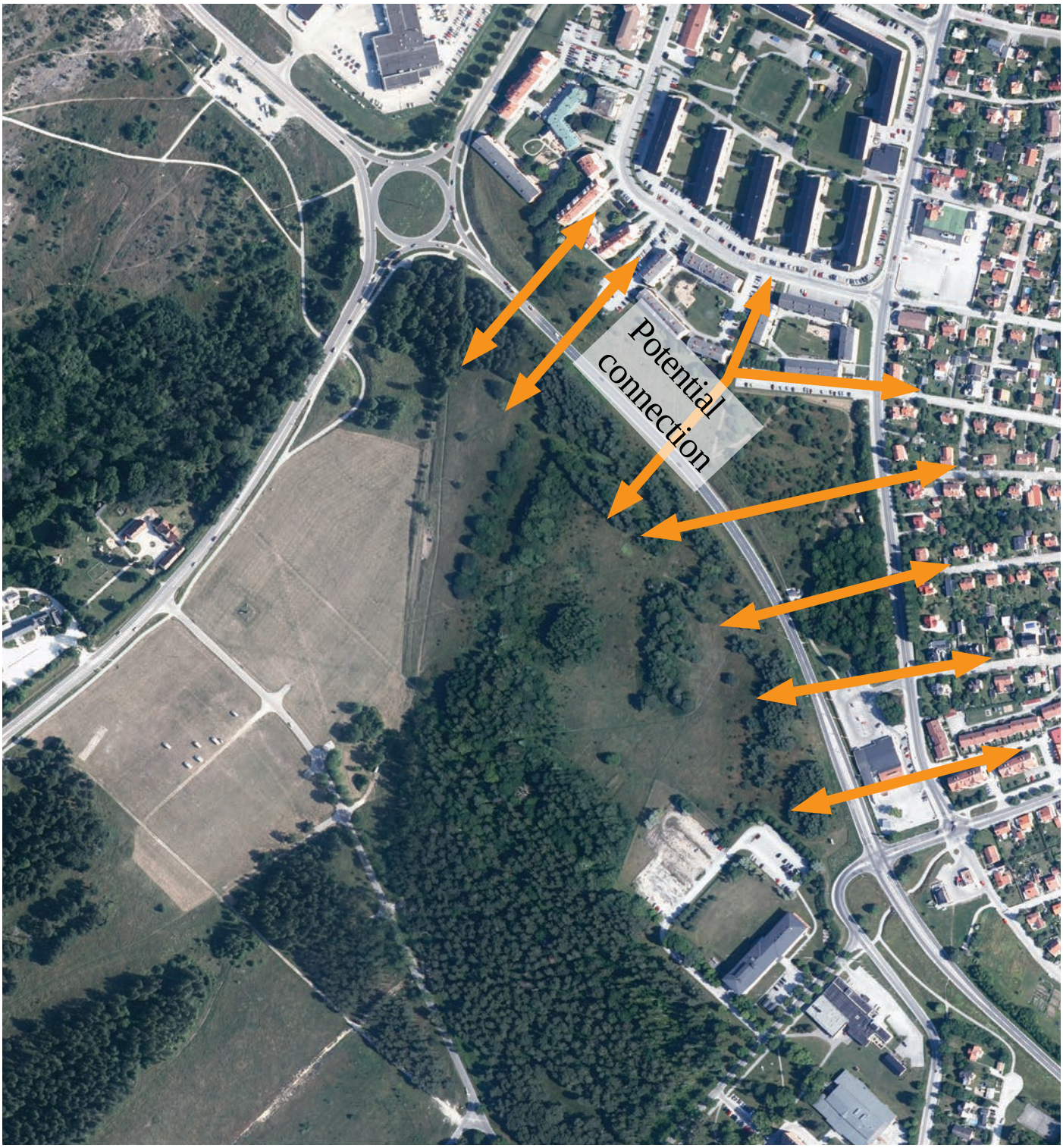
Färjeleden and its embakment along the north side.
Photo (xxvii): Annie Lovén

Some housing in Visborgstaden.
Photo (xxviii): Annie Lovén

Visborgsstaden

Section i-i' of färjeleden and the embankment to the north of the road. Scale ~1:800

0 40 m

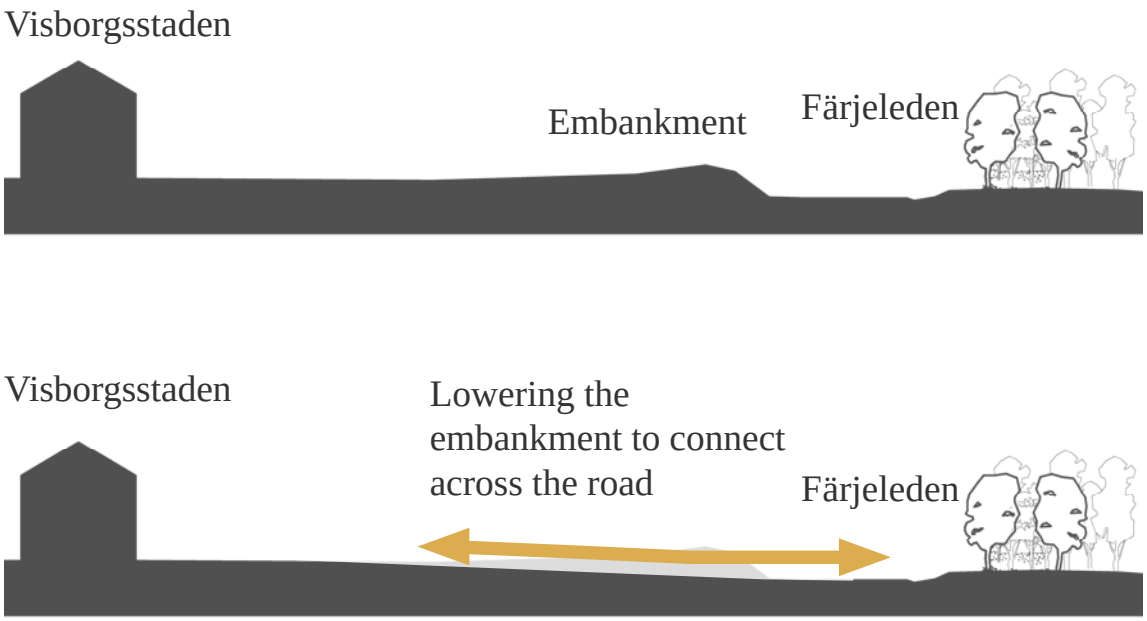


Aerophoto (xix): Region Gotland adjusted by Annie Lovén

Potential connections

There are plenty of infrastructure around the site making it possible to connect the new housing area directly to the exisiting city structure. As for one example the open housing structures in “Visborgsstaden” to the north could allow for potential direct connection of the new housing area to these parts of the city. Attaching the new area across Färjeleden demands management of the embankment and a reprogramming of the road into a street. Doing so would allow the road to work as a connector both across it as well as along it.

The open city structure of Visborgstaden allows for several potential connections.
Photo (xxix): Annie Lovén



Section i-i’ of färjeleden and the embankment to the north of the road, scale ~1:800

To connect over Färjeleden, the embankment need to be lowered.

City structure and building typologies in Visby

The medieval town of Visby is characterized by a dense structure with a continuity of places and transparency. The infrastructure is a organic type of gridstructure.
Aerophoto (xxx): Eniro

Large parts of Visby are covered with a gridstructure of villas. This building typology provide large areas of greenery, but is low in density which in a long term perspective leads to sprawl.
Aerophoto (xxxi): Eniro

Picture over Visby. Even if the medieval town of Visby is dense and a “hard surfaced city” it has reccuring green elements that accentuates the experience of the place.
Photo (xxxii): Helena Simonsson 1, accessed through Flickr.com

Apartment buildings are also common, however often in connection to parking lots and common green spaces. These parking lots and also, in some cases, the greenery diffuses the street space, disrupting a potential continuity of spaces.
Aerophoto (xxxiii): Eniro

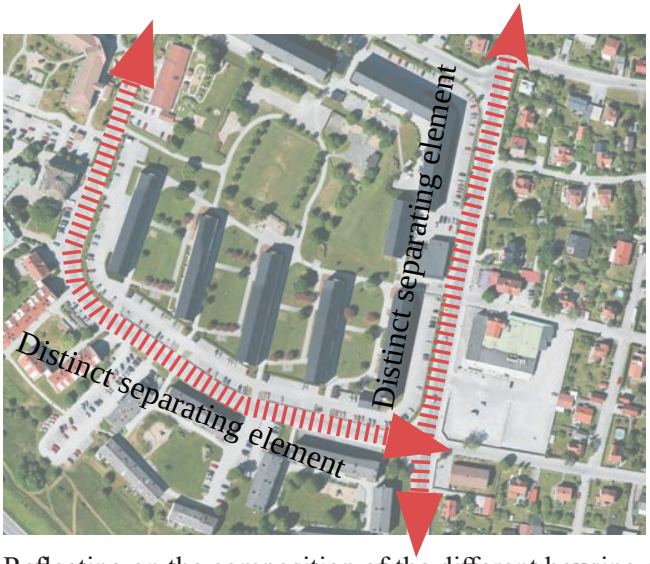
The picture shows some apartment buildings from 1950's in Visborgsstaden, north of the site. Compared to the medival town, the interaction of the houses and streets are low creating a diffuse sense of space.
Photo (xxxiv): Annie Lovén

Large areas of Visby is covered by single-family houses. These areas are of a typical gridstructure, but are not so dense compared to the medival town. This typology provide much greenery, but the low density could in a longterm perspective lead to sprawl and car dependency.

The medieval town of Visby has a typical medival structure, with narrow allys, small blocks, where the different functions of streets, houses and greenery interact. Walking around one will get the impression of it as a stone-city, but actually it is in majority a wooden town. However, many of the houses were plastered, especially in the middle of the 1900 century during a peak of the limestone industry.[52] The infrastructure is an organic type of gridstructure with a continuity of spaces, where the houses, streets and occasionally green areas interact, creating well defined room.

You also find some areas with row houses, mainly from the 60's and 70's. These areas are characterized by trafic separated infrastructure with large areas of parking lots. Often the greenery is in the small gardens and in the courtyards between the houses.

The apartment buildings in Visby are mainly from the 1950's to the present time. Most of them are lamella houses and as most four stories high, with exception of the ones built in the last ten years.[53, 54]



Reflecting on the composition of the different housing areas in the city, one can notice how roads and sometimes greenery clearly marks the border of different areas with different housing typologies. That could potentially fragment the city. The examples above are both from Visby. To the left shows Visborgsstaden north of the site. The picture to the right shows the north east corner of Södervärn, Stäven (the apartment buildings) and Furulund, the villas in the upper right corner.

Aerophotos(xxxiii and xxv) : Eniro adjusted by Annie Lovén

Reflection on separated city districts

What is interesting to see when studying the city structure outside the medieval town is how roads and greenery can have a clear separating effect on the city. As the pictures to the left show, green areas and roads therefore kind of frames the sensation of moving between different areas when going from one area to another.

As comaprision the medieval town do not have such strong separating elements in its city structure, even if it has a variety of single family houses and apartment buildings within the mediveal city walls. Similar to other old towns it is charcterized by a continuity of spaces, with no highways or roads cutting through. These areas are often popular and where you find a mix of housing, buisness and happenings. Continuity of the city spaces, breaking barriers could therefor be seen as a key for the social aspect of the city.

With this realization I identify Färjeleden as this kind of separating element. Therefore it becomes important how I relate to it, to choose to integrate it in the new plan instead of allowing it to speparate and only work on the sides of it.

For the project:

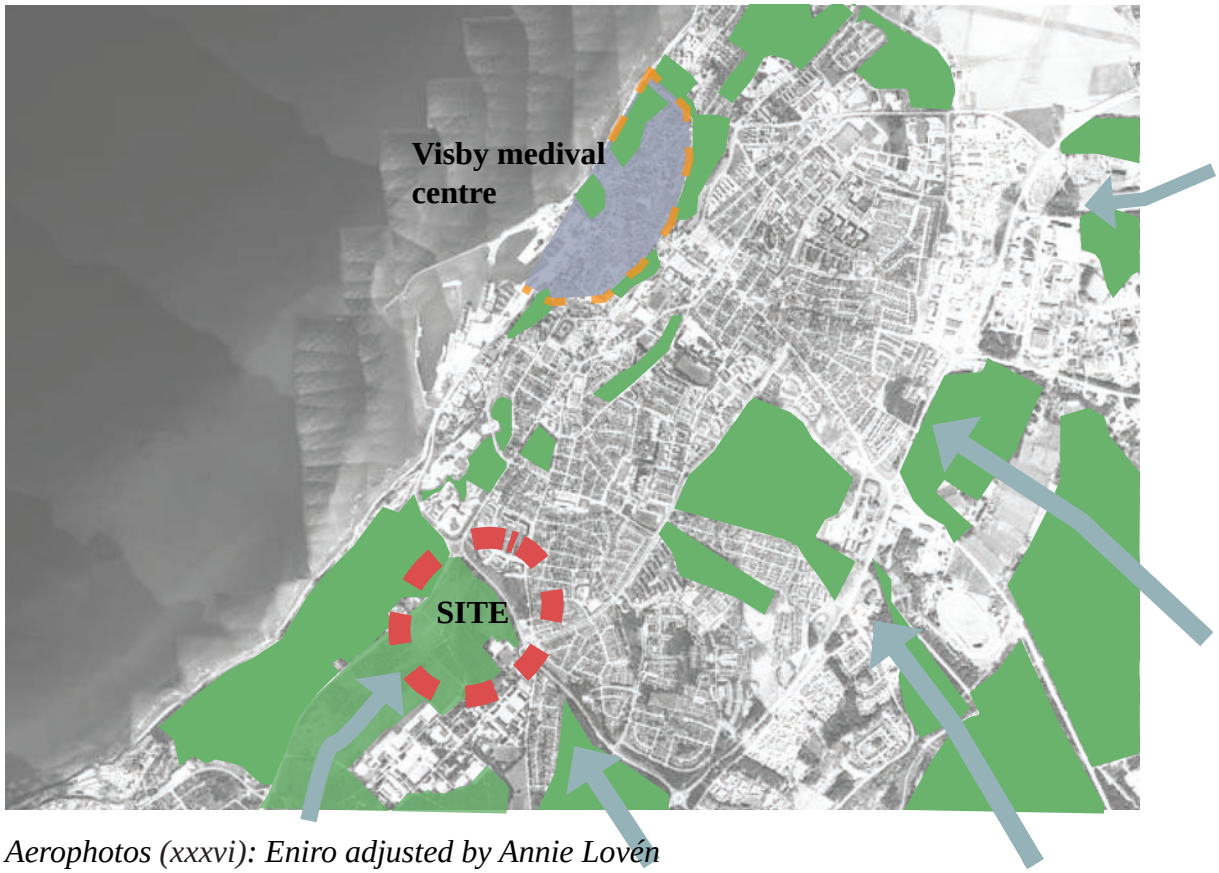
- Break the barrier of Färjeleden

- Merge the new area into the the city by attach to exisiting structures. Continuity and connections are the objectives.

A key objective in the project is continuity. By attaching the new housing area directly to existing structures, I will be able to remake the road *Färjeleden* to a connecting city space instead of a breaking barrier.

Aerophoto (xix): Region Gotland adjusted by Annie Lovén

Green areas in Visby and potential connection to the site



Aerophotos (xxxvi): Eniro adjusted by Annie Lovén

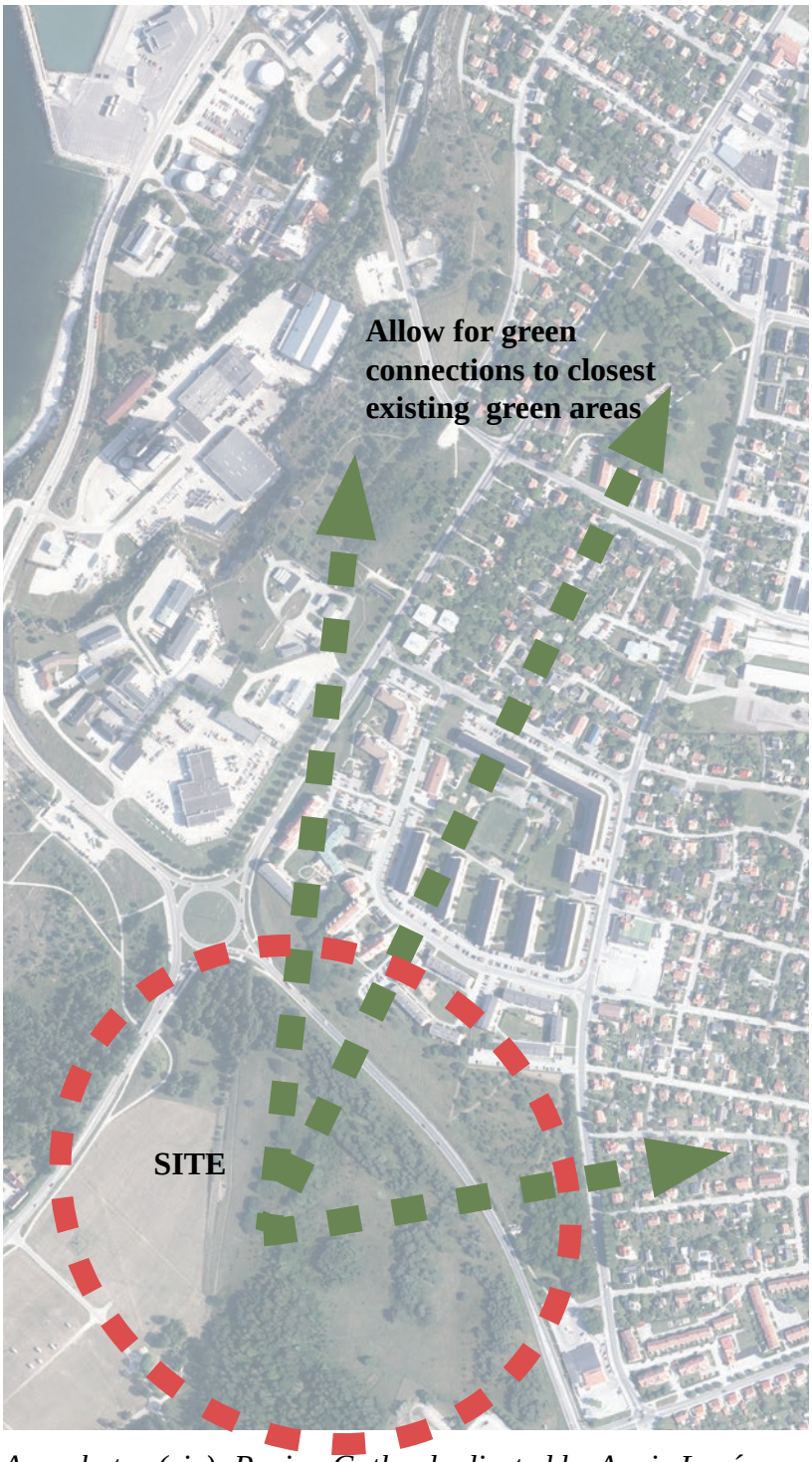
Visby is rather green due to its large quantity of villas. Some larger green area are scatterd around in the town, as the illustration above shows. Some are arranged parks, some are left to its own processes. Around the medival wall you will find some of these green areas which are called Gravarna, or “The Tombs/Graves”. They are appointed as important part of the heritage value of Visby.

From the surrounding ecosystems there are some wedges, or fingers of *incoming wild nature*. These fingers should be withheld and actually work as ecological gateways into the city, opening upp for actually connecting the city with eco-region at place. Therefor these wedges should be preserved, and with the ecological connections I intend to create, be allowed to intersect through the city.

The closest exisiting green areas in the city, are two areas to the north of the site. Therefore the housing area should consider that as an important direction for the ecological connections, that should reach through the site into the city. Also allowing some connection to the villa area to the east is important, since their gardens could work as a green connection to the larger green areas in the east. Then the the incoming fingers of wild nature would intersect.

For the project:

- The devlopment should open up for wedges of green connections from the area into existing green areas in the city.



Aerophotos (xix): Region Gotland adjusted by Annie Lovén

Conclusions and main objectives

With the wild nature entering the city through the site opens up for connecting it with the exisiting green areas inside the city. This demands that the incoming wild fingers need to be preserved and alowing the greenery to wander through the city. Therefor the new housing area should allow for these connections to reach into these existing green areas. Also, to preserve the ecosystems and their function, the green in the are should mimic the existing mix of habitats and use native species.

The site has several cultural histroical traces of which some, like Oscarsstenen and the railway, characterize the landscape. They should be highlighted and integrated into the new area.

Today Färjeleden works as a separating element of the site from a city-continuity perspective. Therefore it should be integrated as a a street in the new area, allowing it to connect along as well as across its direction.

Main objectives for the project:

- Break the barrier of Färjeleden

- Merge the new area into the the city by attaching it to exisiting structures. Continuity and connections are the objectives.

- The old railway is used as an highlighted connection through the new housing area.

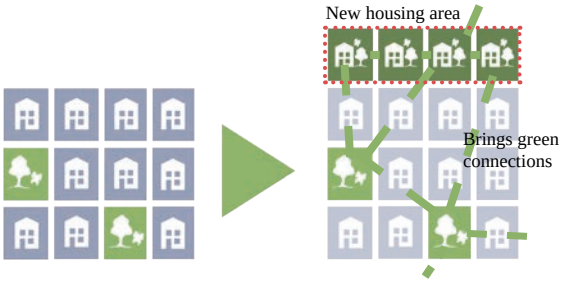
- Other cultural historical traces, such as the colonade and the garden of Pippi Longstocking are highlighted and integrated in the new plan.

- Mimic the mix of existing habitats for the greenery in the new housing area.

- The green that is removed due to the development should be replaced, based on the species at place.

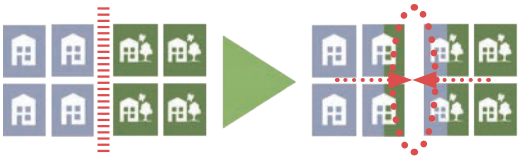
- The connections of these habitats should be witheld.

- The devlopment should open up for wedges of green connections from the area into existing green areas in the city.



NEW HOUSING WITH INTEGRATED AND CONNECTED GREENERY

In this project I focus on greenery and how we can physically connect our human habitat to the surrounding ecosystems by integrate greenery and green connections in cities.

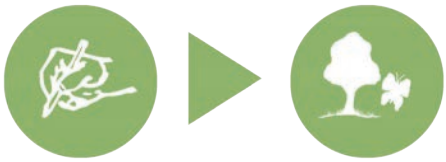


INTEGRATTION AND CONTINUITY OF CITY SPACE

The new housing area should be integrated into the city, attached directly to exisiting structures so both the and new houses, streets and greenery spacially interact, creating the sense of continuity, safety and belonging.

DESIGN HUMAN CULTURE AS GOOD TO NATURE

The basic theory behind the idea is that instead of continue designing human culture as negative to nature and minimizing that negative impact, let us remake the system to become good to nature.



DESIGN FOR NATURE, WHEN WE DESIGN FOR US

One part is to design the human habitat to also allow for other species to live and evolve. However, designing for nature is to also design for us. That is because the ecosystem provide us with the ecosystem service, upon which our health as well as economical development depend.

5. Finding the green in the cities

- references and examples

In this part I will investigate number 3 and 4 from the theoretical part. What can the green be in the city and what qualities can they add?

Finding the green in the city

Gardens and courtyards constitute an important part of the greenery in cities. Also they are of different characters, some with higher diversity than others.
Photo (xxxvii): Annie Lovén

Left over greens along a road could be used as green connections by adding ecological diversty.
Photo (xxxviii): Annie Lovén

Parks are also important green areas from an ecological perspective. They often constitute important recreational and social elements in cities.
Photo (iv): Georg Gyllenfjell

The vertical and horizontal structures in the city can be used to ad greenery in many ways. Traditionally the greenery in cities are found in gardens, courtyards, parks and on the reoccurring “left over greens”. These are all elements that can be strategically used as a qualitative ecological spots and connections in the city. With high qualitative I intend a variety of native species that mimic the mix existing naturally in the surrounding ecosystem. Possibly one could favor species that are endangered, supporting both biological diversity and the resicilience of the ecoregion.

Depending on available space and uses of that space in the city can be guiding for where the green connections are, on the rooftop, on the facades or maybe as a park street along a road?

What are the vertical green? - green facades

Photo (xxxix): Yoni Monel

Before and after of the green wall in Paris designed by Patric Blanc. Below is a close up of the wall that inhabits 7600 plants.[55]

Photo (xli): Yoni Monel

Photo (xl): Yoni Monel

The example of the green walls is from a district in Paris. As the close up shows, it has a large diversity of different plants.

Reflection

As a green facades, it definitely changes the character of a building, however its effect on the sensation of the city space. The green wall adds richness in colour an detail. Also positioned on the gable of the building it highlights the meeting of the two streets, remaking it from a crossing to a place. I can also reflect upon the green trees further in on the street to the left. By revitalizing the presence of nature as an element in this rather bare human habitat it emphasize the sensation of the street as a room as continuing, where the green wall, so to speak, has “stricken the key note” of that space.

Ivy climbing the ruin of St: Clemens in Visby.
Photo (xlii): Helena Simonsson 2

Ivy climbing facades in Dublin.
Photo (xliii): "Antonf"

These two pictures shows a specific plant that is rather common to see in Visby: the Hedera or commonly called Ivy. It is the state flower of Gotland. The character of the plant, climbing vertically upon structures makes it a thriving plant on facades.

In the case above, it creates rather dominant sensation, almost competing with the rather well composed facade that you anticipate behind the plant.

To the left, the building, or ruin is consumed by the ivy. In this case the fact of the building being in ruins can possibly make you agree with this consumption by the ivy. That can tell us one thing about the experience of our environment. Time, aging, change is part of that experience. Natural elements due to natural processes is hence part of that time related sensation

The horizontal/vertical green - room defining

Colonades, such as this one on Nya Allén in Gothenburg, are good examples of horizontal green with vertical dimension that can be used to create smaller rooms in a large space. Also the design of the trees and plants, provide the space with comfortable natural diffused light.
Photo (xliv): Annie Lovén

The greenery on the edge of this courtyard in the district of Majorna in Gothenburg, defines the border between semiprivate and semipublic space without real fencing. It adds richness and detail to both sides in the same time as it clearly signals two different rooms for the visitor.
Photo (xlv): Annie Lovén

As the roses reaches true the room striving upwards

Photo (i): thefad.pl

The photos show examples from Gothenburg and Visby. With horizontal/vertical I intend greenery that is used frequently in rows or in a smaller group. They can have varied vertical characters, where some are high, some low. Trees have a clear

Reflection
Using greenery for bounding spaces, as in the garden, is a more welcoming way of distinguish more private and more public spaces in a non-defensive way. The border of the different levels of the private and public space can still be very clear.

The colonades as space defining in the transitional spaces do not only mark out where you belong as passanger, but also provides a more protected feeling as well as a more enjoyable movement through space. Especially as a pedestrian or a cyclist in road with a dense traffic. It also ads diversity in colors, and you can vary the way of using the greenery to highlight different types of spaces in the city.

The horizontal green - roofs and landscape elements

Roofs have a great potential of inhabit green. The picture shows the ruin St:Nicolai in Visby.
Photo (xlvi): Arkland

Parks are important green areas in the cities. The picture shows Slottsskogen in Gothenburg.
Photo (xlvii): Bengt Larsson

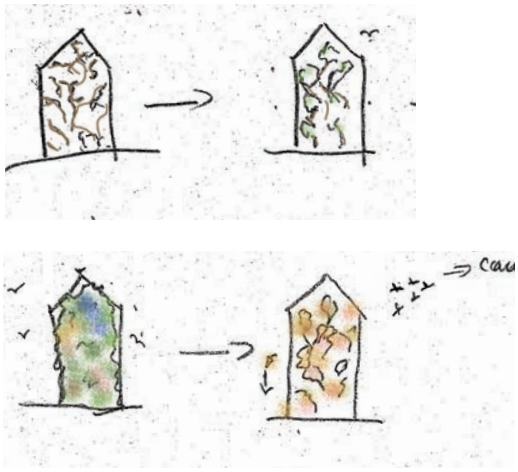
Roads could also work as green streets with outstreched parks along the movements of the cities.

Photo (xxlvii): Life Of Pix

The photos are alsor here from Gothenburg and Visby. With vertical green I intend landscape elementsm such as parks, roofs and park streets. They can include both vertical and horzontal elements, but the horizontal distribution is dominant.

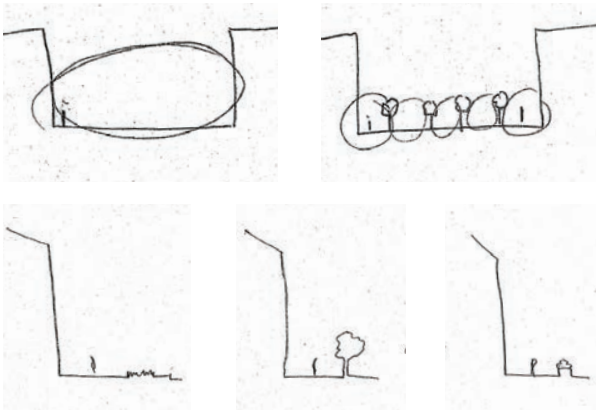
Reflection
The larger landscape elements are important recreational havens in the society. They offer affiliation with natural elements and can constitute an important place where you can outweigh all hours spent inside, as mentioned in the part about biophilic design and need for contact with nature. Also there is a potential of developing the idea of transitional spaces into park streets, so you, on your way to work could get some of that need affiliation with nature. What if your daily movement through the city could be a walk through these green havens?

The biophilic attributes of the green



Greenery marks natural processes such as seasons. As the illustration shows, the nordic seasons will change the appearence of the green facade, emphasizing time and change.

Illustration: Annie Lovén



The green can be used to break down the scale and bound spaces. It can be used as a marker, using low vegetation, or as more space defining through the use of vertical green elements.

Illustration: Annie Lovén

Some connected biophilic attributes to the different versions of green. As source I have mainly used the first chapter of Kellerts book Biophilic design. I have chosen some attributes that I found especially interesting and I use several of them in my project.

Environmental features

- Plants
- Facade greening
- Animals (since the greenery will attract both insects and possibly birds perspective).
- Habitat and ecosystems, with a diversity of plants in the greenery will attract a variation of insects, including pollinators, that might use the greenery as housing or nutrient source. With a consistence web of this kind of qualitative green, will connect the area as one kind of habitat type in the ecosystem.

Natural patterns and processess

- *Information richness* - Using a variety of species will add both static and dynamic variations in the details of the space. Colors, varying heights with moving insects that uses the vegetations are some examples. Also, as in the example of Paris, A green facade can be used to highlight a meeting point, or a crossing. It could signal a change of direction or just attract attention.

- *Age, change and patina* - with the nordic seasons the greenery will change appearnce during the year. The colors the “lushness” and sense of “bubbling life would be different. These signals, of the trees changing color, loosing their leafs or the blossoms in the spring are all part of accentuating the rythm, time and change. Also age of an area can be understood by the size of green,

Also it can be part of highlighting the directions of transitional spaces.

Illustration: Annie Lovén

Natural light is diffused through the leafs of vegetation in the summer providing an almost completly dense shadow. In the winter the shadow is more scattered, allowing more of the light to pass through.

Illustration: Annie Lovén

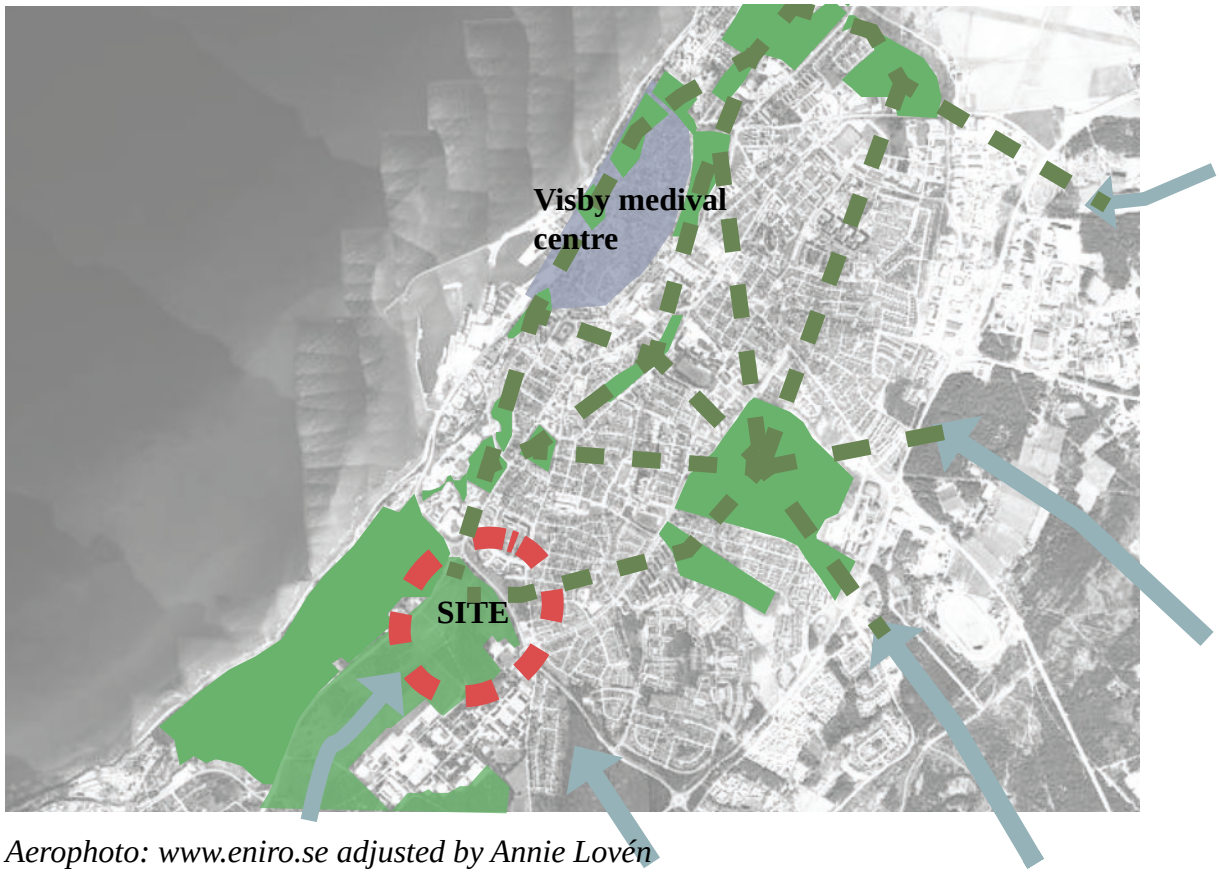
as in the newly built areas with their scrawny trees clearly indicates the youth of the area.

- Patterned wholes. This attribute could be connected to our prominence of dividing and depicturing our world into fragments of knowledge and understanding, as discussed in the section about the worldview. This appoints the importance of ordering the variety in a structured way, so it creates a sense of a pattern or a wholeness. This could be to use green elements in a consequent manner, using few and similar approaches.

6. The project

Now comes the project, developed by merging the findings from previous analyzes and inestigation of what greenery can be.

Finding the basic structure for the new housing area



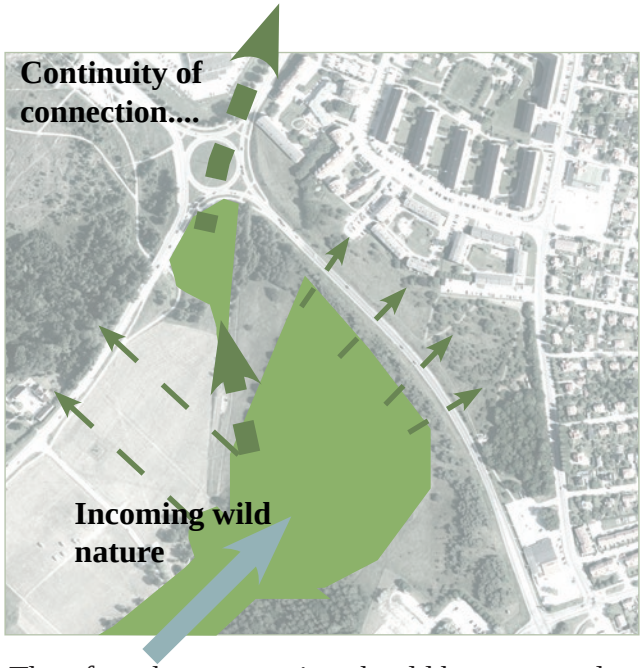
Aerophoto: www.eniro.se adjusted by Annie Lovén

To connect to the surrounding ecosystems “the incoming wild” is identified as an important target to maintain.

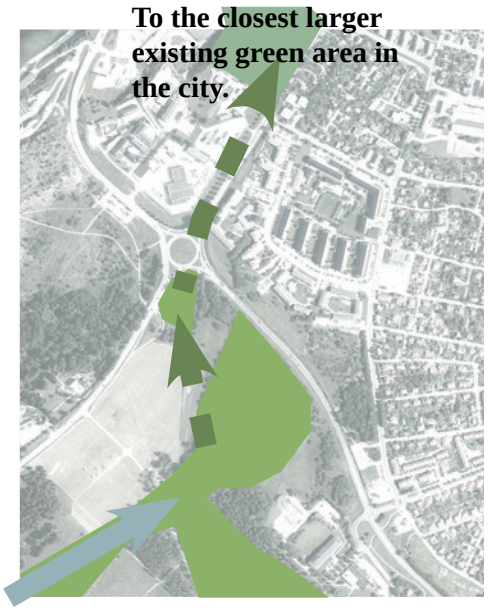
Green areas

Green infrastructure

Incoming wild nature

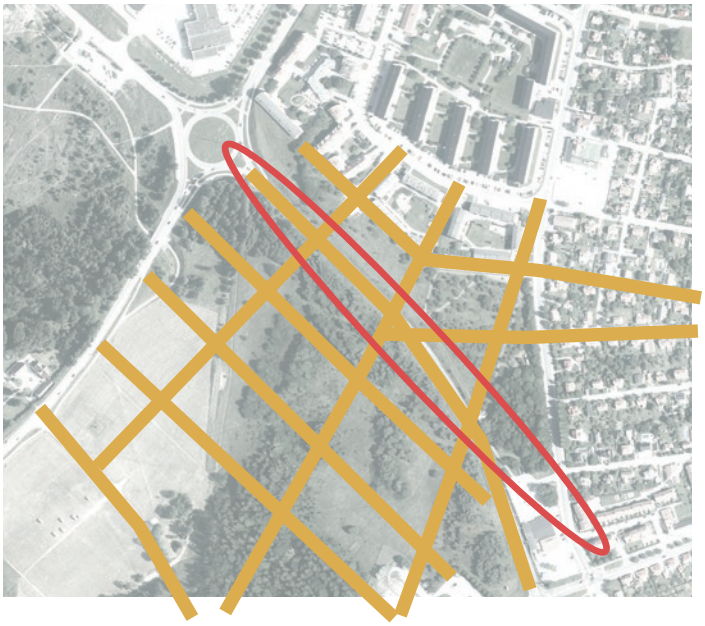


Therefore that connection should be preserved, but also, since the idea is to connect with through the city, it should also be enhanced by conitinuing connections into existing green areas in the city, big and small.

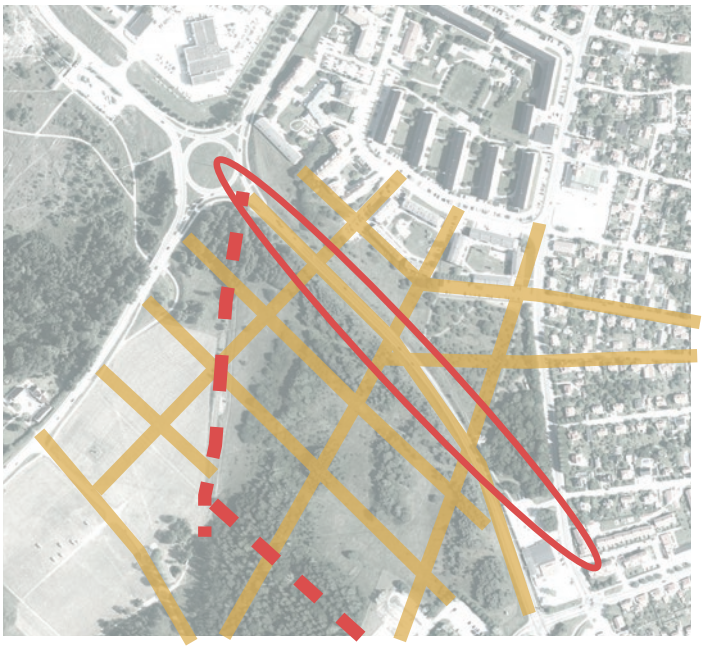


So I open up for connecting to the closest exisiting green area in the city.

To connect the new area directly to the exisiting city, I attach its infrastructure directly to the identified potential connections that I found in the analysis.



I create grid structure. Färjeleden is an importan target for the new housing area, to be developed so it connects across as well as along its direction.



Historical traces are then integrated. The railway crosses the structure diagonally and meets the end of the colonade.

Aerophotos: Region Gotland
adjusted by Annie Lovén

Merging the layers, with greenery, historical traces and infrastructure.

Aerophotos: Region Gotland adjusted by Annie Lovén

Gives the following basic structure for the area.

Section X-X' of villa area, wild park and apartment blocks, 1 :600

0 30 m

Program

» Mix of single family houses, row houses and apartment buildings.

» Majority of apartment buildings.

» Base the structure with the goal to withhold the natural functions in the area.

The program is not very specific but based on the intentions of the municipality. They have based theirintentions on the need of the population on Gotland. A mix of housing typologies is needed both apartments, single family houses and row-houses.[56] There is an major need of apartments in Visby. The housing shortage is actually a threat to the potential growth of the society in Gotland, since people with competence have problem to settle on the island.[57]

One could also question how a specific numbers for housing in an area is elaborated. Working with nature as an imperative element of an area, that is about to be exploited, that programme should rather be developed according to what the area can afford, if the natural functions are to be preserved. In my process I have worked more based on what I interpret that the area can sustain when it comes to human habitat. Mainly the areas which hold more open land are the one that I have allowed to be exploited. That is since the vegetation on the meadows are more easily to reintroduced on the structures, such as on the roofs.However, I have worked from the intention to develop a housing area with a mix of single family houses, row houses and apartment building. The last typology has been prioritzed due to the more extensive lack of apartments in Visby.

Park street - ecological connection to closest existing green area

Wild bosket connects to park street

The railway - cyclists and pedestrians pathway

Kungsladugård - a fond in end of street

Oscarsstenen - is preserved in an open courtyard.

By framing Färjeleden with housing, and allowing movement across as well as along makes it into a through connector.

The larger green area becomes a Tild park. That is only some pathways and benches is introduced to allow for walks through the area. Otherwise the barutiful landscape is kept intact.

The colonade becomes a small road.

Pippi Longstocking garden becomes a playground

Overall plan 1 :4000

0 200 m

Green roofs are used for connecting through the more densely built structure...
Photo (xlvi): Arkland

...togethere with green facades.
Photo (xl): Yoni Monel

The result is a plan with a mix of housing typologies. The larger green area is made into a Wild Park, with pathways that connect the different parts of the new housing area.

The greenery connects through more dense city structure through use of green roofs, courtyards, green facades and plants, such as trees along a street.

Programme plan 1 :2000

0 100 m

Student housing

The square stretches over the new road of färjeleden

Row houses

Apartments

Togethere with the houses and the boskets the railway also highlights the green connections...

Main street connects the north and south part with a long sight line.

..beeing “pushed” over to the other side.

The new pathways in this park, connects the different parts of the new housing area, but also invites people to enjoy and appreciate the beautiful landscape.

Smaller streets have shorter sight lines.

Apartments

A

A’

Single family houses

Pre-school

Passing along the colonade, a short section of wild nature crosses the small road.

Playground

m a distance, down the colonade, the gable of this specific building cathces your eye, signaling the continuity of the housing area.

View 1 - An entrance to the wild park, greenery meets patio.

The larger green areas such as the woodlands provide habitat for several different species

Variety, details, attract attention, change and aging processes

Gabions provides cavities for spiders and other creatures

The occasional and simple bench offers rest and a place to just sit and enjoy the recreational forces of nature.

The low greenery closest to the houses should mimic the mix of species in the meadows, to support surrounding insects with nutrients.

View 1 - An entrance to the wild park, greenery meets patio.

The close access to nature in the wild park provide a sense of connection to nature, living in a greater context. With the seasons, time and change become part of the daily life. Change in colors, details and vegetation are part of the signals of life, aging and evolution. The larger green areas also supports several different species and provide more sensitive ones with large refuge.

Beds with flowers and trees stretches along the road of Färjeleden. The species should be of species that blossoms and support pollinators.

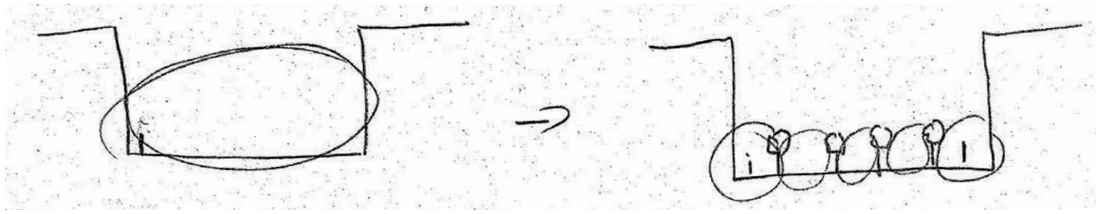
Parking will be of permable paving with grass or herbs. It also works infilitration of storm water.

Plan of square and patios, 1 :500

0 25 m

Green gables lead out greenery towards the street. With high diversity of plant species supports a variety of animals, especially pollinators that will find their way across the road to other green areas.

Green roofs with species that are found in the arid meadows in the area.



Bounding spaces, scale

Section B-B’ of square and patios, 1:300

0 15 m

Variety, details, attract attention, change and aging processes

The north square stretches over Färjeleden, connecting over the street. The traditionally hard surface square has some greenery that allows for insects to wonder across the square. The greenery adds several different qualities into the city.

View ii - From the north square along the new street of Färjeleden.
The north square and the developed street of Färjeleden work as a connector both of the city and for the ecosystem at place.

Färjeleden as it looks today.
Photo: Annie Lovén

A variety of species make the green elements work as ecological connectors in the city district.

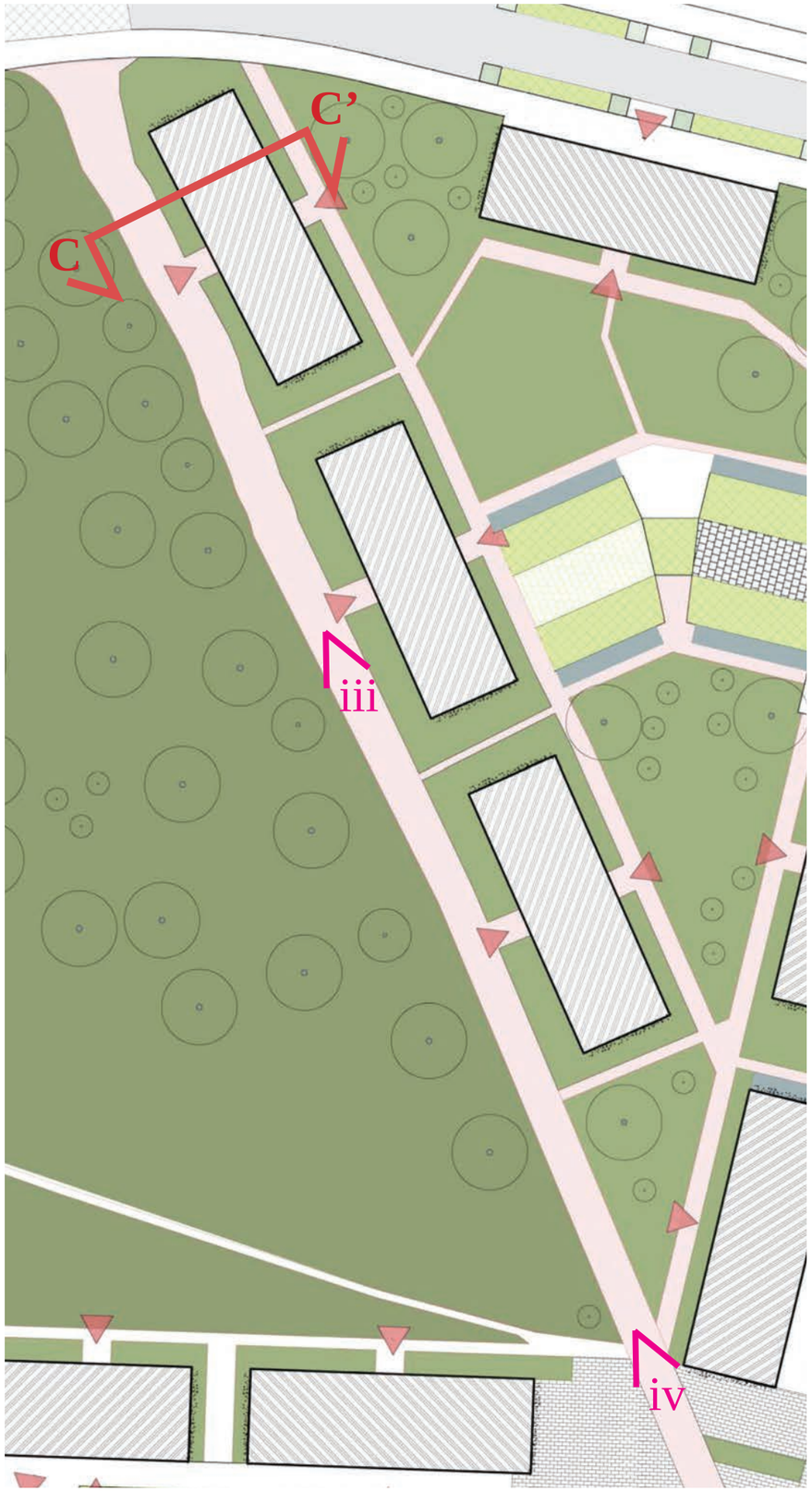
Variety, details, attract attention, change and aging processes

Prescence of nature peaking out between the houses

Patterns, sense of belonging, transitional spaces

View ii - From the north square along the new street of Färjeleden.

The streets and squares are more typical human habitats but have a continuing presecense of nature through green elements such as plants, green gable and roofs. With a high diversity of native species of plants they will be part of the ecosystem at place and can work as green connectors for insects and birds in the district.



Variety in space and character of landscape - woods

Section C-C’ of the railway 1:200

0 10 m

The railway is integrated as the main pathway for bicycle and pedestrians into the area. Togethere the green trees next to the pathway and the houses frames, encloses the space of the pathway, highlighting its direction into the area. It creates a sense of refuge, protection as well as aclear defined space.

Zooming in to the railway, following a walk through a section and two perspectives, different qualities of enclosed and more open spaces are highlighted. These are created by using the natural variety of the landscape at place framing the space with houses togethere with either woods or meadows. The contrast moving between more nature-characterized spaces and more human characterized, creates a dynamic and varied experiences of the whole housing area where nature is an important part.

Inzoom of the Railway, 1 :600

0 30 m

The photo shows the railway, that today is a trail starting in this bosket, close to the location where section C-C’ is taken in the new housing area.

Variety in space and character of landscape - open meadows

View iii - From the railway towards the south square with the arid meadow to the right.

The variety in the landscape with woodlands and meadows provides a variety in spaces and is preserved as an element in the new housing area creating a dynamic change of open and bounded spaces. Further down the pathway the space now opens up, ads the character of the wide meadow landscape with views, senses such as wind, smells etcetera.

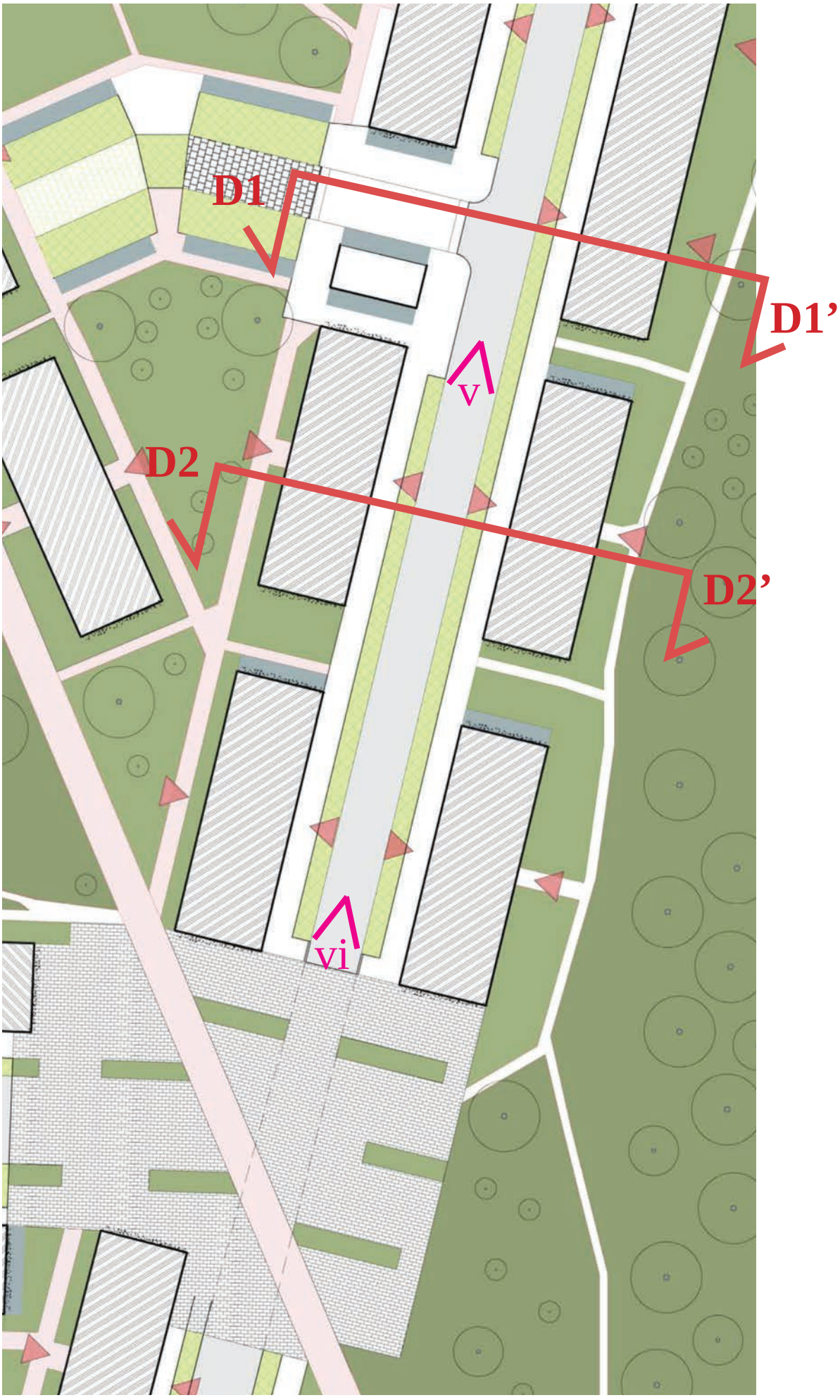
This is the arid meadow in August, aproximatley where the view iii is taken.

Variety in space and character of landscape - open square

View iv - Where the railway meets the south square.

Reaching the square, the space changes character again but is still rather open. The wild green pops over to the other side, working as a fond. The ground is now hard surfaced and the space is clearly a human habitat, with greenery in specifically appointed places. However nature, and the change of landscape character, from meadow to forest, is highly present.

Around here is where the square would be.


D1
D1’
V
D2
D2’
VI

Zooming in to the main street, I intend to show the dynamic experience of moving from a more human characterized space, naked and hard surfaced with fewer green elements; and the south square, opening up and allow the wild nature to be a part of defining the periferi of that square.

Inzoom of main street reaching the south square, 1 :600

0 30 m

Variety in space

Section D1-D1' of the main street 1:200

0 10 m

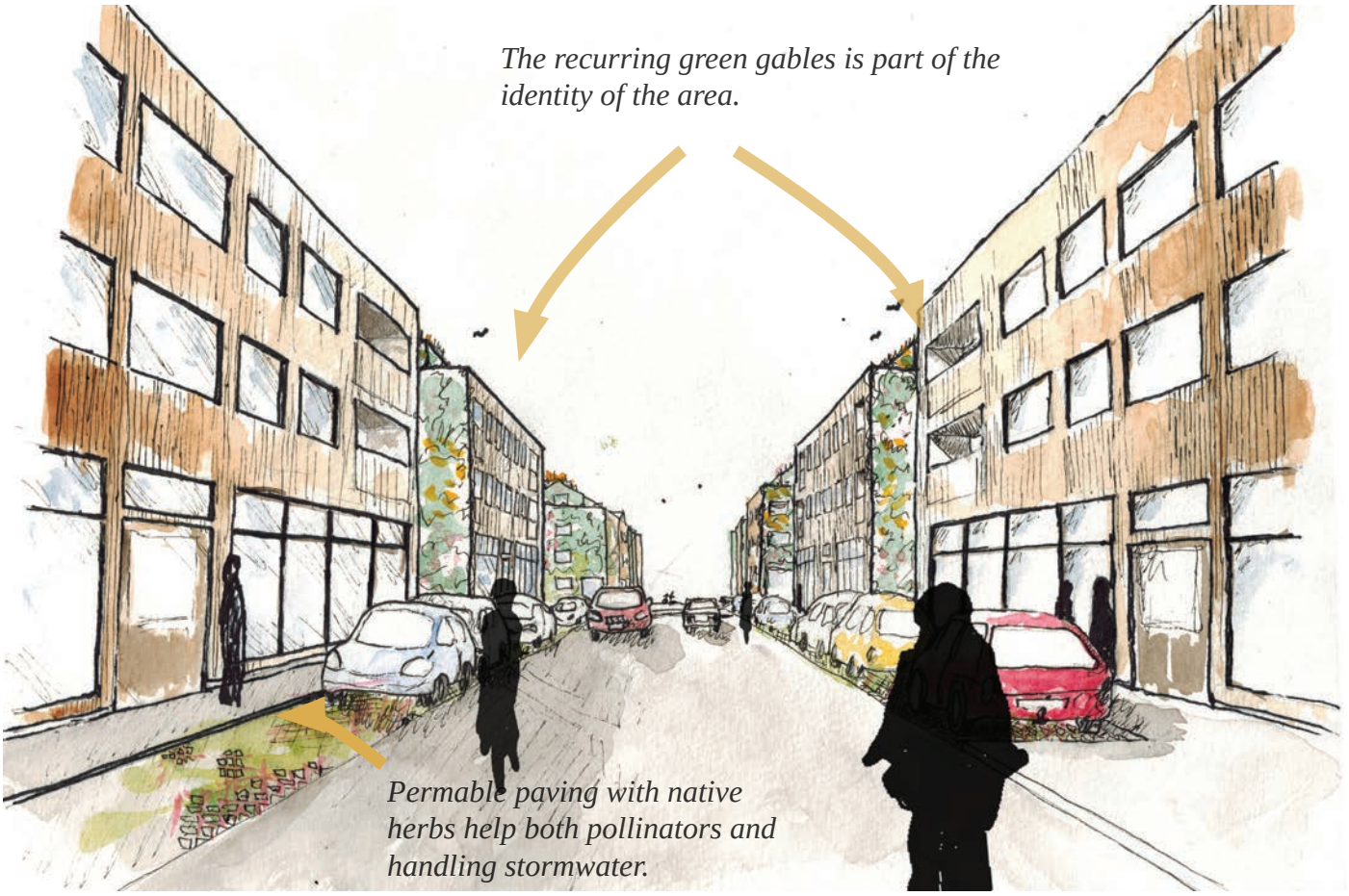
The rather bare street with the recurring green, reminding about the connection to nature at place.

The patios are elevated to give a sense of privacy for the resident, and a sense communal ownership of The Wild Park.

Section D2-D2' of the main street 1:200

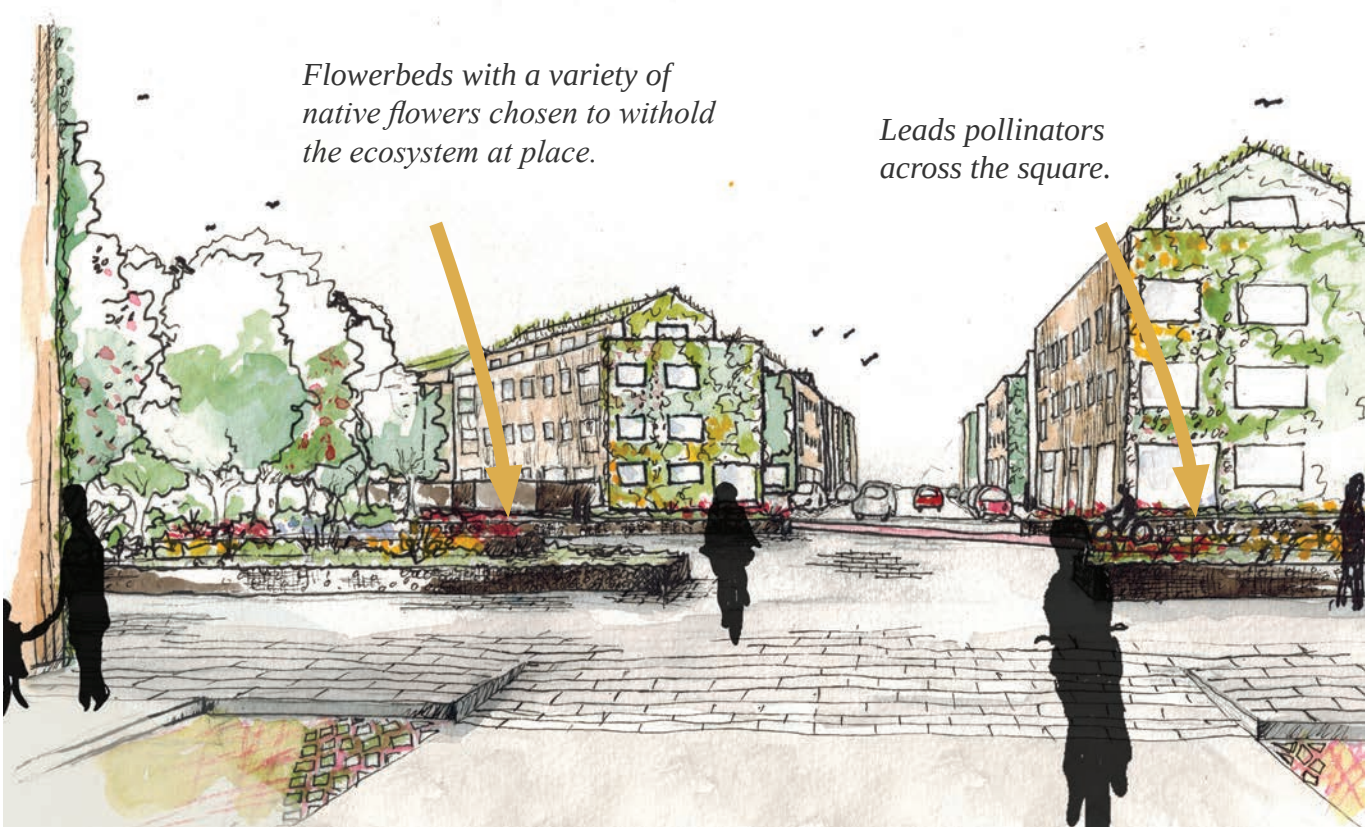
0 10 m

Moving along the main street connecting the two squares, the street space is more bare with the occasional green gable. The recurring green gables are part of the identity of the area in the same time as they work as ecological connectors, leading pollinators from one courtyard, out to the street where another gable (as in this case) or a plant leads it further. The patios towards the park are elevated to strenghten the sense of privacy on the patio, and a sense of communal ownership of the Wild Park.



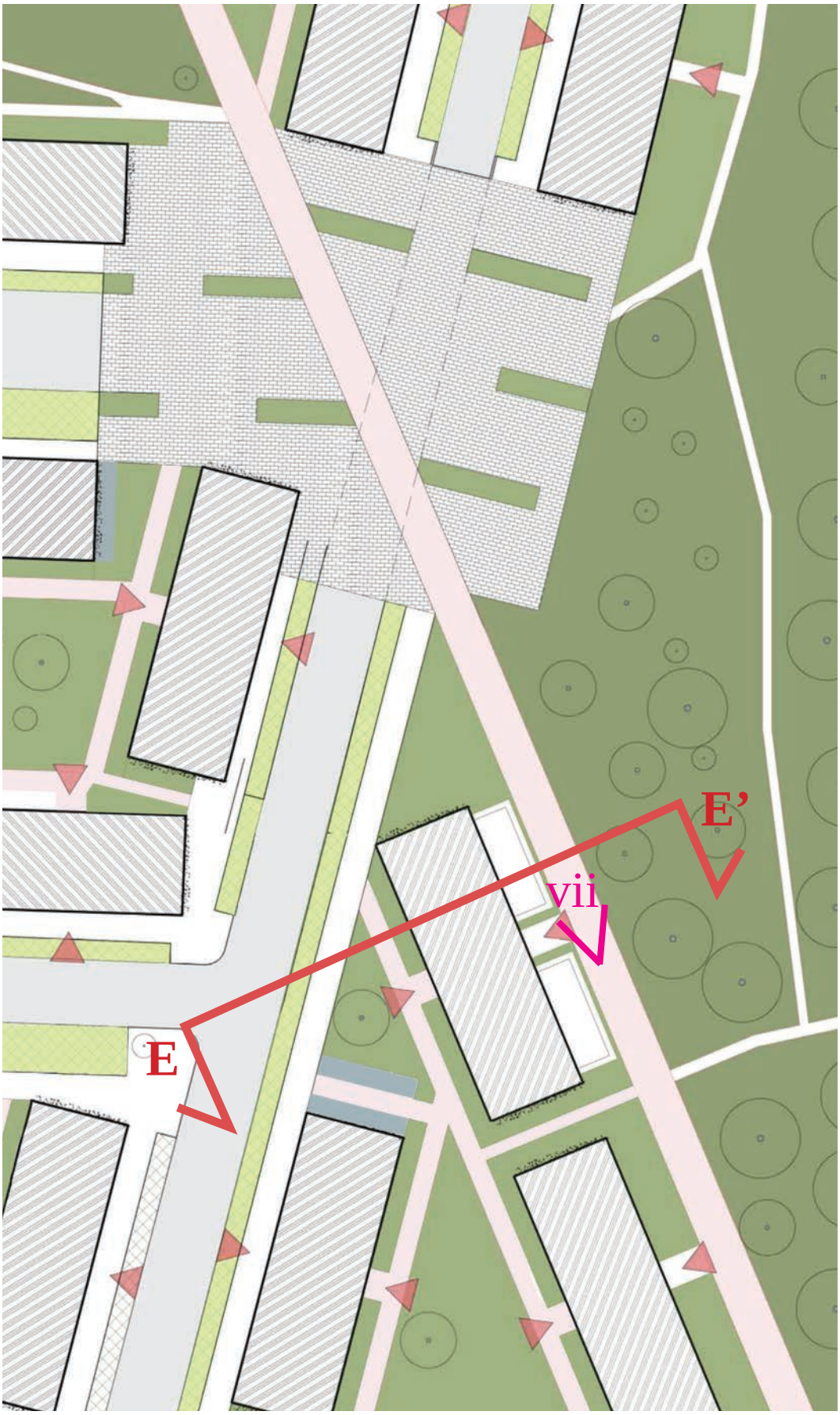
View v - From main street towards the south square

Moving between the more bare spaces, where nature’s prescence is only appearant as a reminder, as on the gables...



View vi -By the south square facing south

....into the spaces where nature meets human , as in the square, creates a dynamic experience, moving through the district.


E'
vii
E

The last zoom in, is where nature meets the more public railway and the houses. The border between the private home, the public railway that works as a cyclist and pedestrian pathway is carefully developed to allow these to meet with respect for integrity.

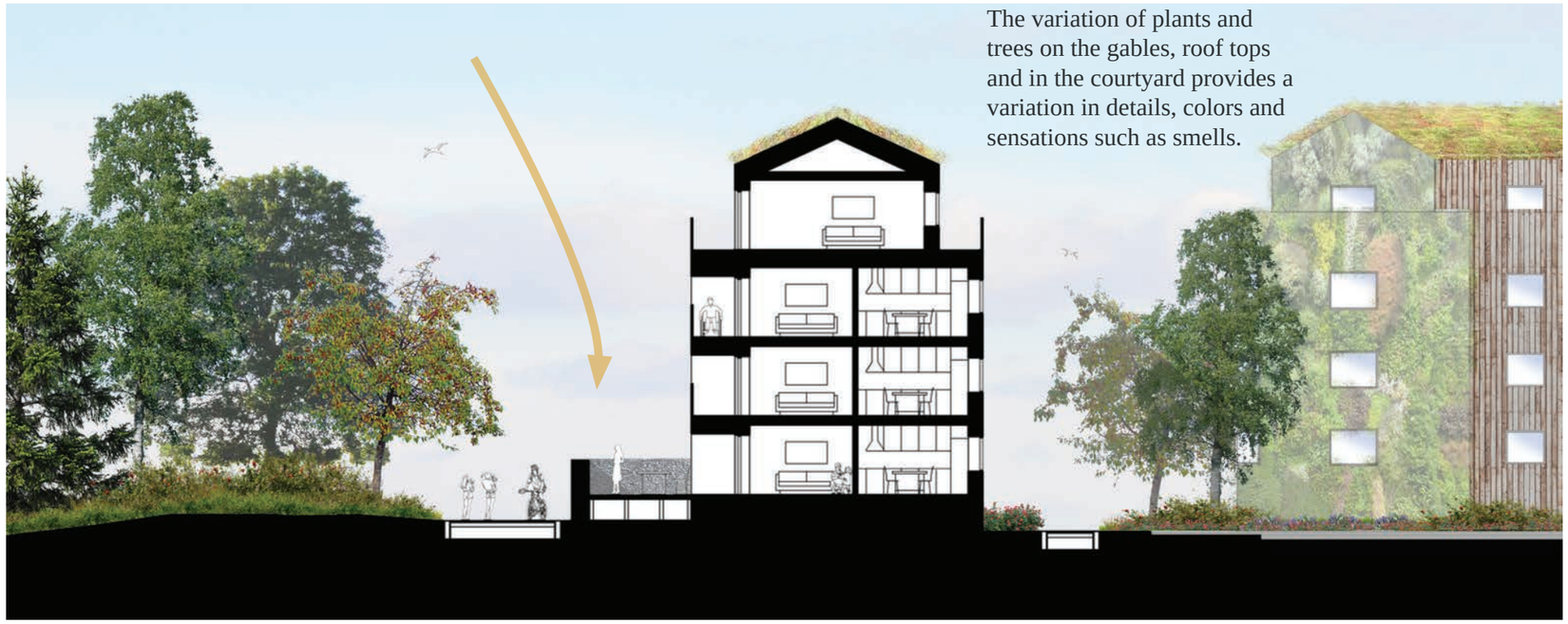
With the presence of nature, also time and change become part of the daily life. Seasons change the character of this presence and that change connects to our naturally evolved sense for time. When the leafs change color, or the snow are piling up covering the ground, that are parts of the signals of time, change and natural processes of age.

Inzoom of square and railway meeting nature, 1 :600

0 30 m

The patios are sealed of by a massive gabion-wall. It is rather high to allow for movement on the railway without getting the sense of trespassing into the privacy of the homes.

The variation of plants and trees on the gables, roof tops and in the courtyard provides a variation in details, colors and sensations such as smells.



Section E-E’ of house meeting the railway, meeting the wild park 1:200

0 20 m

View vii -Looking north along the railway

The railway has a long sight line providing a view framed by greenery. The presence of nature and the variation of species creates a richness in color and smells...

View vii - Looking north along the railway winter

...that will change over the year due to the different season. This adds another quality, the sense of time and evolvement. The signals of these changes are part of the evolutions of humans. The leafs changing colors, or the bare trees overtop the snow reminding of the exuberating life coming in spring, are all part of accentuating the rhythm of time.

7. Reflection and conclusions

Working with the idea of regenerative design for regenerative development one realizes that this idea of working with a wholeness demands a freer approach than existing regulation and structure of ownership of land allow. One example of this project considers Färjeleden. It is own and maintained by Trafikverket, the Swedish Transport Administration; and the surrounding land is owned by the municipality which result in a clash in responsibility and ambition. While Trafikverket in majority considers availability of their roads, they do not consider the larger perspective of what it does to the city as a whole. In communication with the municipality and taking part of their investigation how to develop Färjeleden when realizing the new housing area, Färjeleden truns out to be more or less untouchable, due to the ownership of Trafikverket. The possibility of remaking Färjeleden into a street, as I have, is actually not possible due to Trafikverket's focus on availability along its direction and not how it becomes an element connecting also across, connecting the city as a whole. In a sense this kind division of both responsibility and ownership mirrors the discussion about the worldview as a sum of parts, instead of dynamic and relation based worldview; causing problems when working with qualities in the city.

Reflecting on my own process I suffered a bit from the complexity of regenerative design. I got criticized for having a too general level in my theory, and that is probable connected to that complexity. During the process I realized that I had to delimitate several times, which led to a scattering of my original vision of what type of project I was to do. Originally I had the idea of developing this plan but to have a major focus on housing and to design an apartment build. But that reflection can be seen as a learning in itself about working with regenerative design. I meen that in the future, if I get to develop strategies for working with this approach, I need to make sure that that complexity is regarded as a typical character of this kind of projects and then I can make sure to assemble the necessary competence to consider it. The complexity is kind of the point of regenerative design, since it is based on this wider worldview, but it demands for me to truly realize it in intelligibly way.

Working with greenery in the cities as ecological connections is complex on its own. For this project I struggled with keeping a sufficient level. Reading the natural inventory, studying the site at place you realize the intricacy of ecosystems. In a sense this project could have gone more into detail, just designing one green wall, working composing it with the right species for the ecological connections as well as its appearance. However since that is a focused on only one connecting element in the ecological infrastructure and I wanted to develop the infrastructure, I had to delimitate myself.

Overall I am satisfied with my project, especially due to the knowledge it gave me, but I feel that the project would have needed a couple of more turns before becoming its full potential. This was caused by the need of delimitating the project over and over again. Working with regenerative design projects as an architect I would recommend working with them as group projects, readily with multidisciplinary competence, such as ecologist but also sociologist or human geographer. Also, for another thesis, make sure to delimitate the idea, and instead depicture and discuss it in how it lands in the context of regenerative design for regenerative development.

7. References and footnotes

Footnotes

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Architectural habitat in the natural world

Integrating green connections in the urban landscape

Annie Lovén,
Chalmers University 2016