



Dwellings promoting sustainable lifestyles in Vartiosaari

Thesis work Δ alto University
24.02.2015, Timo Δ rjanko

School of Δ rt Δ esign and Δ rchitecture
Creative Sustainability Δ epartment of Δ rchitecture Professorship: Δ -52 Housing Δ esign

Supervisor: Professor Hannu Huttunen, Instructor: Δ rchitect Ritva Luoto

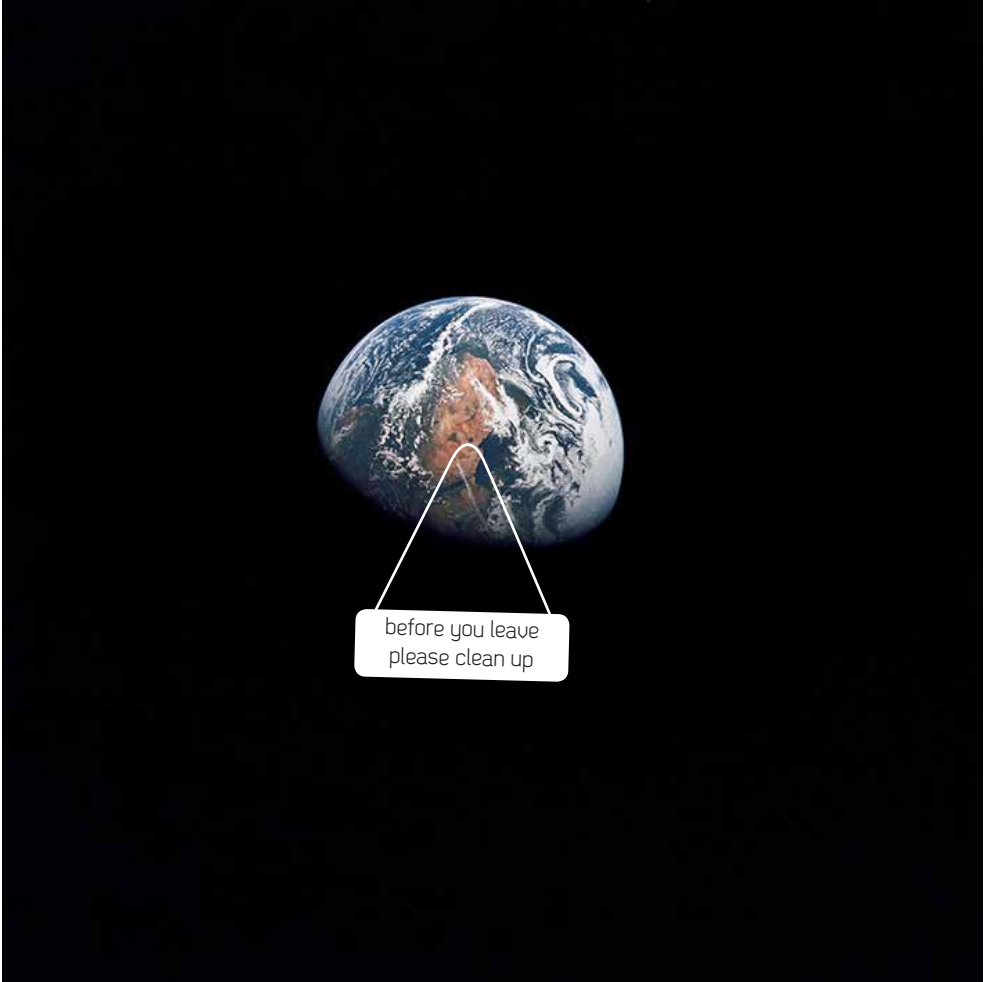
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before you leave
please clean up

- 1) [page 3] photomontage: sustainability
- 2) Uartiosaari from the air. The design area is in the down right corner of the island in the picture. The city center of Helsinki can be seen in the back. (Helsinki city planning office, KSU)
- 3) [page 6] Edith's home in the centre valley of Uartiosaari is in perfect harmony with the surrounding nature.





3

Abstract:

The topic of the thesis work is to study sustainable lifestyles in Vartiosaari island in Helsinki, Finland. The commission for the project was given by the city planning office of Helsinki. Vartiosaari, located seven kilometers east from the city center, has remained mostly natural and unbuilt despite of the city's expansion around it. In autumn 2013 the city planning committee decided that a new city district of 6 000 - 7 000 inhabitants will be build in Vartiosaari.

The thesis work is design centered and consists of housing area in the north-eastern part of the island. The purpose is to study (1) sustainable lifestyles, (2) ways to improve the nature connection in housing and (3) constructions for hillside topography. The more detailed design of a smaller part of the island is supposed to reflect and give guidelines for more comprehensive planning of the island. Further on the aim is that Vartiosaari could function as a pilot project for sustainable planning in the capital region in general.

The project studies a new typology which combines positive aspects of sustainability from urban apartments blocks and suburban single family housing. Another objective is to examine adaptation on hill side topography and minimize the negative visual and ecological effects from construction.

The total construction in the project is 14 480m² including 88 apartments. The building stock consists of apartments of 3 rooms and kitchen and 4 rooms and kitchen. Both apartments are designed in a way that it's easy to divide them in two smaller apartments if the family structure changes.

Submitted material: 8 exhibition panels, A written report

Tiivistelmä:

Diplomityön aiheena on tutkia kestäviä elämäntapoja itä-Helsingissä sijaitsevaan Vartiosaareen. Työ on tehty toimeksiantona Helsingin kaupunkisuunnitteluvirastolle. Seitsemän kilometriä Helsingin keskustasta sijaitseva Vartiosaari on säilynyt suurilta osin rakentamattomana ja luonnontilaisena näihin päiviin saakka huolimatta kaupungin laajentumisesta. Syksyllä 2013 Helsingin kaupunkisuunnittelulautakunta päätti uuden 6 000 - 7 000 asukkaan kaupunginosan rakentamisesta Vartiosaareen.

Suunnittelulähtöinen diplomityö käsittää asuinalueen saaren koilliskulmassa. Työn tarkoituksena on tutkia (1) kestäviä elämäntapoja, (2) keinoja parantaa luontoyhteyttä asumisessa ja (3) rinnerakentamista. Pienen alueen tarkka suunnittelu on tarkoitettu antamaan suuntaviivoja saaren kokonaisvaltaisemmalle suunnittelulle. Suurempana päämääränä on Vartiosaaren toimiminen kestävän suunnittelun suunnannäyttäjänä koko pääkaupunkiseudulla.

Työssä tarkastellaan uutta asuntotypologiaa, joka yhdistelee positiivisia kestävän kehityksen ominaisuuksia kerrostalo- ja omakotitaloasumisesta. Toinen keskeinen lähtökohta on tutkia rinnerakentamisen keinoja ja pyrkiä vähimmäistämään rakentamisen esteettiset ja epäekologiset vaikutukset.

Suunnitelman koostuu 88:sta asunnosta kokonaiskerrosalan ollessa 14 480m². Asuntojakauma sisältää 3h+k ja 4h+k asuntoja. Molemmat asutopohjat on suunniteltu joustaviksi siten, että ne voidaan jakaa kahdeksi pieneksi asunnoksi perherakenteen muuttuessa.

Luovutettu aineisto: 8 esittelyplanssia, diplomityöselostus

Forewords

I got the opportunity to work for the Vartiosaari project at the city planning office of Helsinki at spring 2012. This thesis work is also a commission by Helsinki city planning office. During the past three years I've been visiting the island ten times and each time I've been amazed by its unique landscape and peaceful atmosphere. It feels like time has stopped at the island. But still it's constantly changing according to the circulation of the sun and seasons of the year. I'm thankful that through my work I got the chance to experience Vartiosaari. The planning process has been extremely complex and challenging but at the same time also really extractive. My attitude for the design has been humble and respectful. In the end I feel like no matter how well I design the given area it can never compete with the beauty and quality the island has in its present state.

Acknowledgments: I would like to first thank my supervisor professor Hannu Huttunen for the guidance through the thesis project. To Architect Ritva Luoto and the project group of Vartiosaari at the city planning office of Helsinki, I thank for tutoring and commenting of my work. And last but not least my wife Sassi Arjanko for help and endless support I receive from you.

In Helsinki 23.02.2015, Timo Arjanko

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4-5) Seasonal changes are strongly present in Uartiosaari (Hesam Pakbeen (4))

Introduction

Vartiosaari is an island of 82 hectares in the Eastern archipelago of Helsinki, Finland. The first human settlements were built on the island in the late 19th century as summer residences for the upper middle class of Helsinki. The transportation to the island has been taken care of by boats and there hasn't been any bridges built. Therefore, despite being located only seven kilometers from the city center, the island and its beautiful nature has remained mostly un-built, while the city of Helsinki has constantly expanded around it. In autumn 2013 the city planning committee of Helsinki decided that a new city district of six to seven thousand inhabitants will be built in the island. The scenario includes two bridges connecting Vartiosaari to mainland.

The modern western lifestyles aren't sustainable. The design of the thesis work is based on an assumption that along with technical improvements we need to also change our behavior to reach sustainable level in our society. The concept of sustainable building is vital in the project but the main focus is to create spaces which promote sustainable lifestyles in and outside the buildings. In the project, by sustainability are mainly considered immaterial things, like wellbeing, happiness and values of the residents. These parameters are often hard to measure, but still they can contribute to the sustainability to a great extent. Learning how to create spaces and environments that enable sustainable lifestyles is one of the key areas of sustainable design that still needs to be developed. The idea is that sustainable housing comprises both the building and the residents. The fundamental initiatives on sustainable development in housing can be estimated only after the interplay of these two factors is embodied in the design.

Besides being unsustainable, our lifestyles are also more and more detached from nature. Both the share of urban citizens and the share of time spent indoors have expanded dramatically during the past decades. By highlighting the connection to nature, the project is contributing to the rise in environmental awareness of the inhabitants. The compounding principle of the thesis work is that there's a strong link between nature and human beings as well as between sustainability and wellbeing.

The written part of the thesis work starts with the theory on more general issues behind the design objectives. The second chapter is introducing the site and the preconditions for the design. In the last part the design is presented together with argumentation on the decisions made in the design phase.

Keywords:

housing, sustainability, lifestyles, nature connection, values, wellbeing, Vartiosaari

1. Theory

1.1. Futures studies

On the 19th of August 2014 humanity had consumed the annual resources provided by our planet (Global Footprint Network, 2014:1). The remaining four months and twelve days we have been taking from the reserve built up before 1970's, which was the decade when our consumption exceeded the Planet's ability to renew. The consumption is growing and the World overshoot day will come earlier and earlier next years.

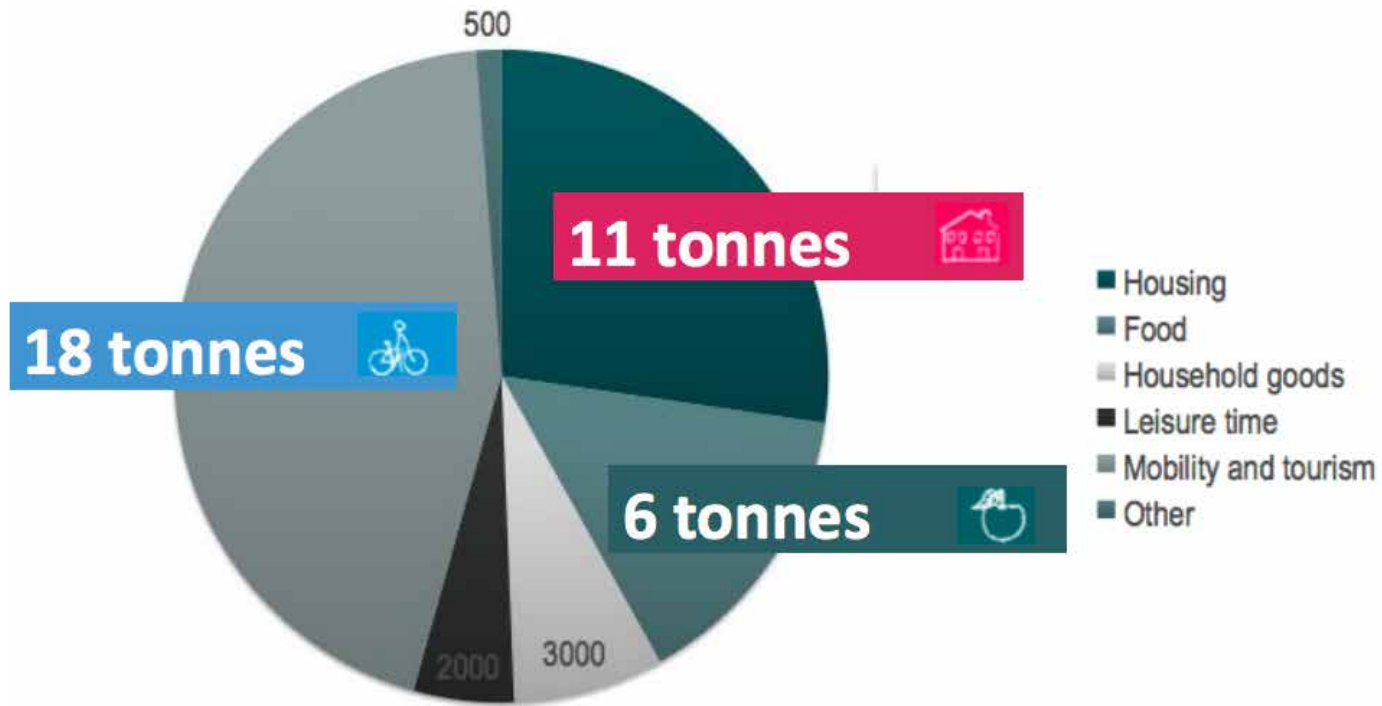
Vartiosaari, the island in Eastern Helsinki, will be built as a new neighborhood for 6 000 - 7 000 inhabitants. At the moment the city of Helsinki is preparing the proposal for the new master plan for the area. The construction of the island is estimated by earliest to be ready in late 2030's. The city of Helsinki has set its goal to reach carbon neutrality by the year 2050 (City of Helsinki, 2012:4). To reach the goal it is essential that at least all the new buildings and neighborhoods from now on will be built with high ambitions on ecological sustainability.

When planning new city districts which will be built 20 years in the future, it's important to browse and study possible scenarios for the future. Which could be the possible drivers for change and how could they possibly change our society? Before thinking ahead, it's good to look back and see how fast the change has been during the same time span backwards. 20-30 years is a long time in politics, economics and technology. Cultures and human behavior is changing more slowly, but eventually the rapid change around us will even leave it marks on our human behavior. On the other hand, some needs, like physical activity and connection to

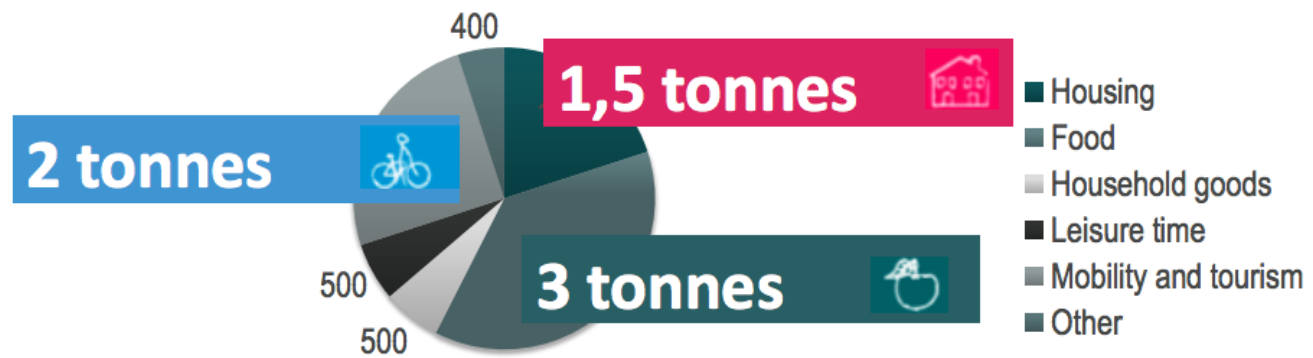
nature, and how they influence our mental wellbeing, remain the same from generation to generation.

The European social platform SPREAD Sustainable lifestyles 2050, develops two visions for sustainable future. The main driving forces for the change in the reports are global population growth, urbanization, climate change, lack of resources, technological development, aging population, increase in mental illnesses, growing consumption of material and energy and disapproving the idea of constant economical growth. Based on these assumptions and studies on lifestyles, iFuture report creates scenarios for 80 specimen persons around the Europe on how they can get their material footprint to a sustainable level of 8 000 kg per year by 2050 (SPREAD, 2012:10-13). Housing and transportation form the biggest share in material footprints. A study made on 27 households in Finland by Kaisa Kotakorpi resulted in material footprints varying from 13 to 120 tonnes/cap./a (Kotakorpi et al. 2008). Conversely the report Scenarios for Sustainable Lifestyles developed future scenarios of possible societies that support more sustainable ways of living on a more societal level. Each scenario of these two reports is a result of several factors including less transportation with focus on public transport, use of renewable energy, sharing of utilities and reduced or shared living space. The main singular factors concluded in the reports are diminishing the need for space and travel, i. e. even the mid-class citizens will have to decide between home-centric and mobile lifestyles, because they can no longer afford them both. Another is life stage transitions, where for example children moving away from home results in significantly increased material footprint in housing for the remainers, due to the stable infrastructure of the home (SPREAD, 2012:18,44).

Also professor Anneli Juntto has studied the future of housing. In her book *Asumisen muutos ja tulevaisuus* (Juntto, 2008) Juntto describes drivers for change more precisely from the perspective



6) The average material footprint in Finland in 2008 (Kotakorpi et al. 2008).



7) Michael Lettenmeier sets the sustainable level of material footprint in year 2050 on 8 000 kg[cap.a. (Lettenmeier et al. 2012)

of housing in Finland. The listed main factors are pretty much the same as the ones in SPREAD reports. Juntto writes, for example, that according to the estimations by Tilastokeskus, the amount of people aged over 85 years in Finland will grow from 100 000 in 2007 to 350 000 by 2040. At the same time there are already inevitable signs of declining social sector and public healthcare in Finland. As a conclusion Juntto, like the SPREAD reports, highlights the importance of housing units' ability to adapt to changes in family demographics. In futures housing, inbetween the pressure of ecological aspects and economical realities, as an example, it is important whether the other half of the house can be rented after the children have moved out to settle on their own. The extra income from the leaseholder can be vital for the aging couple in financing their increasing private healthcare costs and yet they can still house the home they created when their children were small. Especially nowadays when the loneliness and depression of the elderly is increasing and generally the family ties aren't as strong as they used to be, it's important that elderly can stay at home as long as possible to stay active and happy.

Aija Staffans writes in her article *Ilmastomuutos ratkaistaan kaupungeissa* (Staffans 2008), that the problem of climate change will be solved in the cities, because it is estimated that two thirds of the World's population will live in cities by 2021.

One part of the solution could be the change from materialism to consuming services which promote positive experiences and wellbeing. "In western cities at least, there's a discernible trend whereby the acquisition of possessions is replaced by the acquisition of experiences", she adds. Also the vision that we must completely abandon the fundamental idea of economic growth to reach ecological as well as social balance, has become more popular during the last decades. The so called de-growth movement states that economical growth, which has this far been based

on inputs from nonrenewable resources, will sooner or later lead us in severe problems.

The vast development of information and communication technology (ICT) has clearly been the biggest singular factor in changing our lives during the past twenty years and it seems like the development is speeding up. For example according to Google, their self-driving cars have already driven more than 500,000 miles in beta tests on the streets and roads of California (Birdsall 2014). At the moment the most optimistic estimation by the company is that first self-driving cars will be available for public in 2020. At the moment there are still many problems to be solved, but if self driven cars will be reality in the future, it will totally reshape our cities. For instance the present norms for parking based on private car ownership can be totally outdated in no more than 20 years. When a car can drive itself, it can drop us in front of our homes and find a parking place a bit further or head for another customer to give a ride. If we want to get prepared for this kind of development in the future, we should at least plan the parking halls and garages so that they can be easily adjusted for some other purpose when the self-driving cars will take over.

1.2. Distinctive neighborhood

Helsinki is growing fast. The new master plan to come is based on estimations that the population of Helsinki will grow from present 600 000 to 860 000 by 2050 (KSV, 2014). At the same time the population of Helsinki region is expected to grow from 1,34 million inhabitants to 1,76 million (Uusimaa Regional Council, 2014). For the sustainable development in the region, it is highly important that these new inhabitants will find their homes from the areas well covered by the public transport network (Otso Kivekäs, Mikko Särelä, Osmo Soininvaara, Mari Holopainen, 2012).

The new master plan is based on a vision that in 2050 Helsinki has a network of several regional centers, which will be concentrations for services and working places, each with their own personal areal identity. These satellite centers are connected with rail traffic - underground, communal trains and fast tram lines. The densified city structure based on public transport creates a sustainable setting for living. Daily services are within a walking distance and more occasional services are easily accessible by public transport. Pedestrian and cycling traffic as well as connection to the sea and green areas are also part of the main focus areas. Network of fast biking lines will expand throughout the city, and both physical and mental walking environment will be improved. Helsinki's extensive closeness to sea and its recreational values will be better utilized, and even wide continuous green areas will be preserved inside the city structure.

Juntto writes that sustainability has become a new argument in cities' competition on new taxpayers, next to other factors like innovative companies, diverse line of businesses, education, accessibility and quality of life (Juntto, 2008:26-27). A good reputation and

image is important for cities, and in the future it is estimated that the specially alluring, the so called creative class, will become a vital part in cities' growth and development. The idea behind the prediction is that in the future companies will increasingly gravitate to regions with strong human resources. The exquisite essence of Vartiosaari Island and the general presumption that life on an island is not only physically but also mentally distinguished from the mainland, creates great potential for creating a new unique neighborhood with strong character and sense of community. How could Vartiosaari express the modern perception of the term islander? The potential of Vartiosaari in becoming highly self-sufficient in free time activities is huge. Nearly half of the personal material footprint in Finland consists of mobility (Kotakorpi et al. 2008) and according to Finnish Transport Agency, half of the private traffic in Finland consists of free time traffic (The Finnish Transport Agency, 2012). The recreational values of the island and the sea should be utilized in a sustainable way. Like Vartiosaari, Finland in general has a long and popular tradition of summer cottages and especially nowadays people in the capital region tend to have long a distance to their summer places. Perhaps in the future Vartiosaari could offer new concepts for local and shared summer cottages, and by that way reduce the material footprint of the islanders.

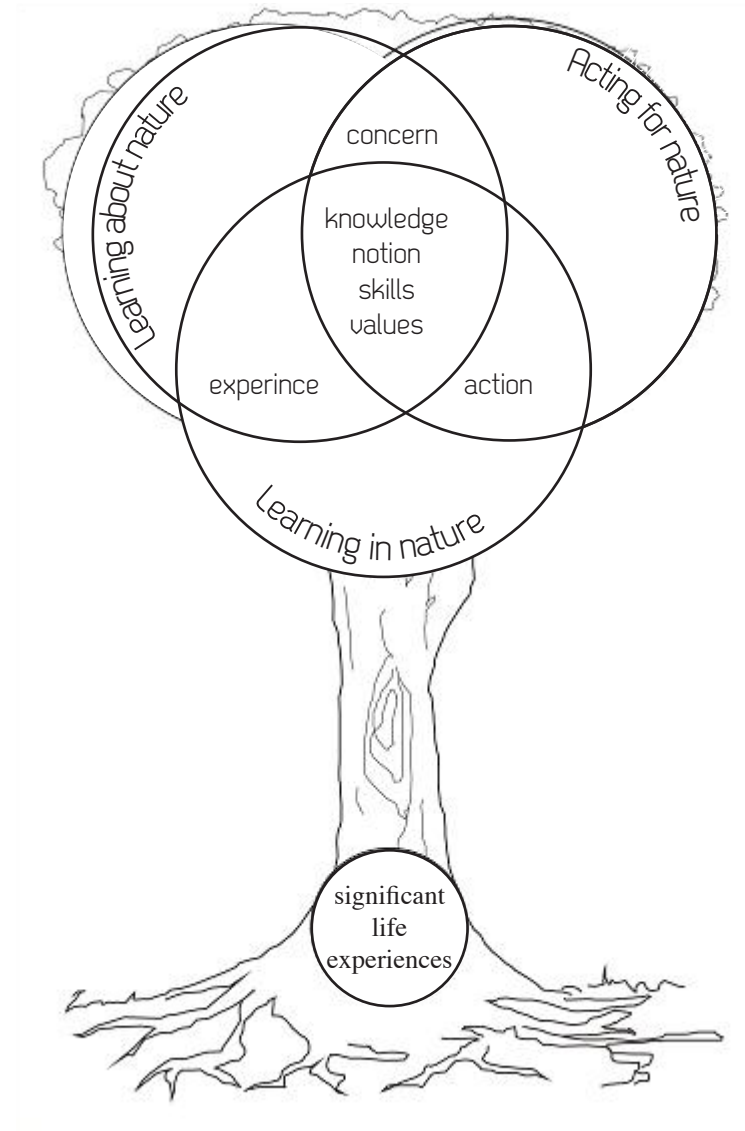
Juntto continues that besides economics, just socio-cultural development is an important driving force for change in housing. In general, the scope of housing will expand including both individualism and collectiveness. Juntto describes that the difference between these two lifestyles is that the pleasure derived from individualistic and consumer based identity is more temporary, than the pleasure derived from collective life styles.

Juntto and reports by SPREAD are both emphasizing the sig-

nificance of social ties in the future. Either the development will happen spontaneously, or then for example the declining of the social and public health sector will make us more dependent on our social networks. Mark Granovetter writes that encounters in public spaces like courtyards, staircases and neighborhood shops are vital in formation of so called weak social ties (Granovetter, Mark). It is particularly these weak social ties, that are improving the safety and coziness of our neighborhoods.

1.3. Sustainable lifestyles

The rapid changes in society are influencing the housing. The focus in self expression is changing. Thanks to the development of ICT and social media, the status competition is changing from ‘what we own’ to ‘what we do’. Timo Hämäläinen writes in his article (Timo Hämäläinen, 2006), that consumption is generally no longer a way to improve your social status, after society has reached a certain level of wealth. According to Abraham Maslow (1943), after we have satisfied our basic needs in materialism, we tend to meet needs from higher levels like creativity, spontaneity and problem solving. A sustainable consumerism is focusing on consuming services and collecting experiences, instead of consuming material. Housing has also become important in expressing lifestyles and social status, as well as in creating a personal identity (Ilmonen, Mervi 2007:10). Antti Ahlava writes that the change in consumerism and marketing has lead to a situation, where the focus in housing lies more in immaterial concepts and mental images related to housing, rather than in a house as a physical product itself (Ahlava, Antti 2007). So far it still seems like the theoretical concepts and visions on housing have changed more than the practice of living itself. In reality the consumers still end up in more or less similar apartments and the image of new innovations is being used only in marketing (Mäen-



8) Joy A. Palmers tree modell of environmental education.

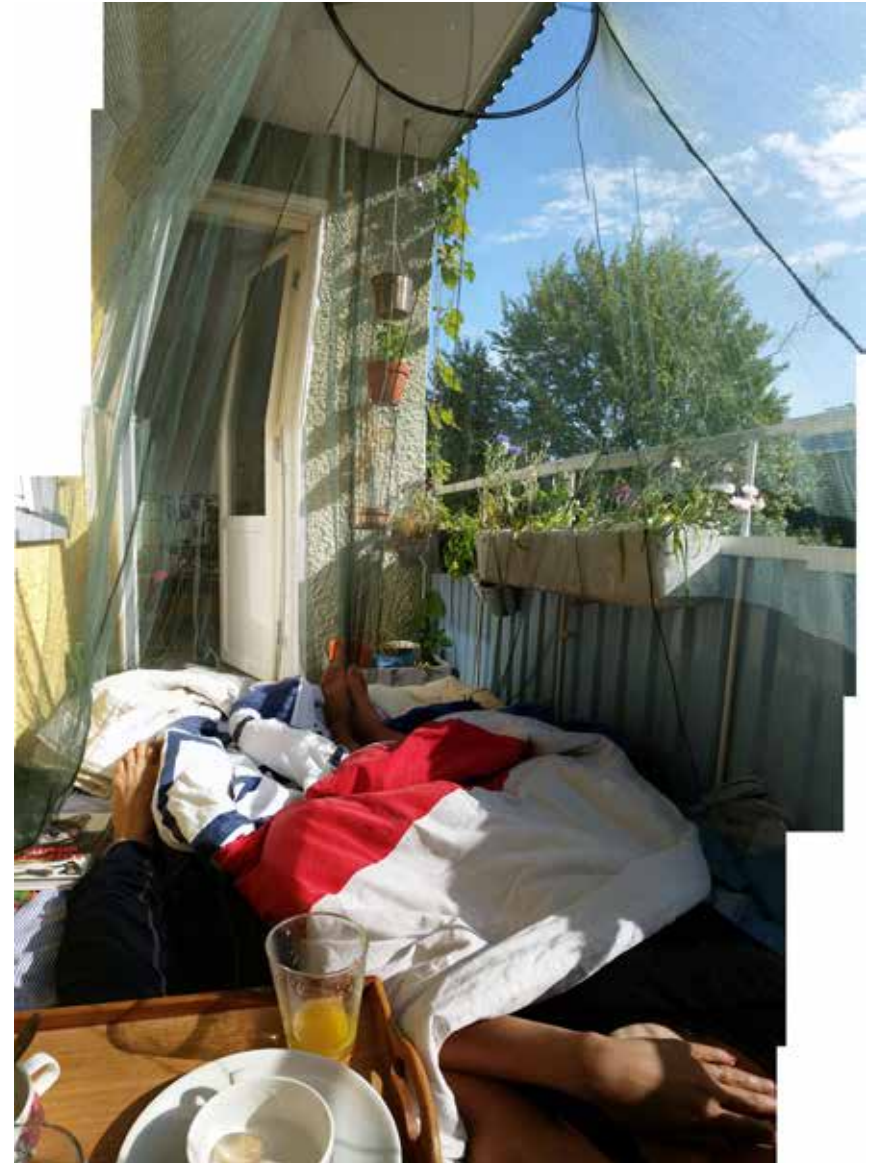
pää, Pasi 2008). In any case, the fact that new ways of living are important in marketing, proves that there exists a demand for them. The challenge is only to put these new ideas in practice.

Sustainable architecture can be divided into two different sections, sustainable buildings and sustainable lifestyles inside and outside the physical buildings. Technology has made some leaps towards sustainability in buildings, but quite few are done to lead people's lifestyles to a more sustainable direction. There is still a lot of potential in improving our behavior. Actually technical improvements should more often be considered as engineers' achievements, while architects should concentrate more on designing spaces that promote sustainable behavior. In SPREAD report iFuture the 80 persons interviewed were generally not against the change itself, as long as it was comprehensive and equal. The freedom of choice and self-actualization play an essential role in change towards more sustainable lifestyles. It only helps if sustainable architecture is more preferable and better even in aspects not straightly related to sustainability.

1.4. Nature connection

How can we then motivate people to change their behavior towards more sustainable lifestyles? Richard Louv writes in his book *Last Child in the Woods* (Louv, Richard 2005), that children who are distanced from nature in their childhood, are also devaluing the importance of environment and sustainability later in their lives.

“The children and nature movement is fueled by this fundamental idea: the child in nature is an endangered species, and the health of children and the health of the Earth are inseparable.” —Richard Louv



9) Sleeping on the balcony improved the author's nature connection during the summer 2014.

Joy A. Palmer emphasizes in his famous tree model that in order to be effective, children's environmental education should happen simultaneously on three levels: learning about nature and environment, learning in the nature, and acting for the environment (Palmer, Joy 1998). Strong nature connection doesn't only motivate us to act environmentally friendly, but it is also a vital part of our mental and physical wellbeing. Recent development has not only decreased the amount of physical activity but also detached the connection to nature in our daily lives. Traditionally we got our daily dose of nature from making our living in the fields, farms or forests and the work was varied by the nature's seasonal changes. Nowadays our work and daily routines are more and more detached from the nature and remain the same no matter if it's winter or summer. Even in Finland where the seasonal changes are strong and nature is well present even in biggest cities, the layout and the way we live in our apartments remains stable. It's true that winter is setting the preconditions for our dwellings, but couldn't we still have non-heated extra square meters for summers. At the moment especially in apartments we live in, have the thick insulated walls designed for winter conditions a year round. The same change can be seen also in our free time. We often tend to do same hobby around the year, indoors in addition. Juster, F. Thomas writes in his study that children are spending half as much time outside as they did 20 years ago, and much more time doing "inside" activities (Juster, F. Thomas et al. 2004). World Health Organization states that depression and other mental illnesses are on the rise globally and especially in the Western countries (WHO, 2003). The rise of mental illnesses has emerged at the same time with fast urbanization. Richard Louv discovers that lack of nature connection in our childhood links directly to the rises in obesity, attention disorders, and depression. To ease this negative trend, Jules N. Pretty listed in his article (Pretty, Jules, 2004), that the engagement with nature, which delivers mental health benefits, can happen on three different levels:

"The first is viewing nature, as through a window, or in a book, on television or in a painting. The second is being in the presence of usually nearby nature, which is incidental to some other activity, such as walking or cycling to work, or reading on a garden seat or talking to friends in a park. The third is active participation and involvement with nature, such as gardening or farming, trekking or running. There is now strong evidence that all these levels deliver mental health benefits." Jules N Pretty.

The study on how urban environment promotes children's health and physical activity showed, that a certain level of density, together with amount of green areas are the key factors in activating children physically (Marketta Kyttä, Anna Broberg ja Maarit Kahila, 2009:19-22). The level of urbanity has positive effects on child friendliness in the environment at certain point, whereas too much density results in fear and danger. The optimum level of density was enabling social play and incidental exercise, like walking or cycling to school and hobbies.

Different housing typologies promote different lifestyles. There's the urban downtown living on the other end of the scale, and rural single family house living on the other. The Finnish Environmental Agency has compiled national goals for regional development (Valtakunnalliset alueidenkäyttötavoitteet 2009:16), which aim for densifying the urban structure in the name of sustainability. On the other hand Jukka Heinonen and Seppo Junnila are stating in their research (2011:13-14), that often consumer habits in urban lifestyles result in higher total carbon footprint compared to rural living. Even the research by City planning department of Helsinki on developing typologies of apartment housing stated, that the future housing supply in Helsinki will remain apartment dominant (Ilmonen, Mervi 2007). Already at the moment 85% of the citizens live in apartments. The city of Helsinki aims to diversify the apart-

ment housing so that it will become a considerable option also for those who can afford single family housing. In my diploma work I started thinking if we could somehow gather the good aspects from different lifestyles and housing typologies and put them together in Vartiosaari? At the moment the problem is, for example that aspects like own garden, which is generally desired and enables sustainability in many ways, also results in sparsely populated areas which can't sustain proper public transportation.

Garden city / Single family house areas

cheaper apartments (bigger-)
own privacy and peace
own garden,
nature connection
no wall neighbors, able to go round the house
safe gradually growing environment for kids
own garden - block playground - neighborhood...
views/ windows to several directions

big houses (m² per capita, exterior envelope)
commuting, weak public transport
extravagant land use
inefficient use of infrastructure
homogenous environment / no mix use
owning instead of sharing (transportation, services etc.)
high exterior envelope area
lack of services

Down town / Block of flats

short distances, walkability
good public transport
smaller apartments
efficient use of infra and land
mix of housing, work, services, leisure...
sharing instead of owning (transportation, cinemas, restaurants...)
small exterior envelope area
accès to services

expensive apartments
lack of privacy
small private outdoor areas (balconies)
noise and air pollution
lack of playgrounds for kids
lack of nature connection
views/ windows to few directions
'consuming lifestyles', status competition

A list of positive and negative aspects of suburban single family housing areas and urban apartment blocks.

1.5. Design references

1,2) Urbana villor in Malmö, Sweden by Pontus Åqvist is a good example of a new typology combining single family house and block of flats. Instead of a traditional staircase the building has a lift which leads straight to apartments. The safety requirements are taken care by the stairs located outside in front of the balconies. The wide balconies on both sides of the building are bringing the aspects of living closer to the typology of single family house, but still the use of land remains effective.

3) The architecture of student housing on Friggagatan in Gothenburg (White arkitekter) is strongly characterized by loft staircases which are economical way to organize the logistics in multi storey buildings. Besides the lofts are offering great views to the surrounding city as well as promoting social encounters of the tenants.

4) The french architect studio Lacatton & Vassal is famous for its design for housing with different layers of interior and exterior. The habitable part of the **Latapie House** changes from living room and bedrooms at winter to the largest, embodying the whole PVC panel covered garden in the summer. The budget of the construction was kept low with use of cheap materials.

5) The Tila housing block is a finnish example of housing with loft corridors. The project by Talli architects consists of 39 loft apartments with a room hight of 5 meters. The flats are occupiable at the moment of purchase, but the installation of kitchen furnitures, partition floors and intermediate floor is left for residents.

6) Hammarby sjöstad in Stockholm is a neighborhood of 25 000 inhabitants with high ambition on environmental sustainability and focus on improved nature connection. The environmental program of the area incorporates energy supply, rain- and wastewater treatment and waste management. The district also aims to provide a healthy environment for residents by offering diverse opportunities for recreational activities like exercise, sport and walk on waterfront promenade.

7) The 8tallet housing block in Örestad, Copenhagen by Bjarke Ingels Group (BIG) is an innovative example of combining different typologies. Even the uppermost apartments of the ten story high building have their own entrances which can be reached by biking along the long slope starting from the street level.



1)



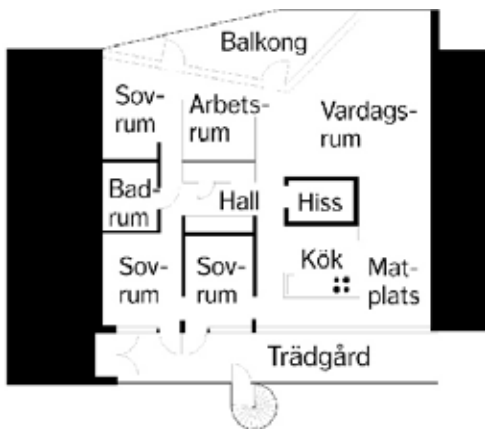
3)



5)



6)



2)



4)



7)

8) Donnybrook quarter in London by Peter Barber Architects is an example of so-called slack space where the house type can acquire more space by constructing living spaces into the open spaces in between. The quarter is also based on a mix use idea containing commercial spaces on the street level added with two story housing on top.

9) Quinta da Malagueira in Évora, Portugal is a social housing project designed by Alvaro Siza. The atrium type attached houses consists of L-shaped floor plan on 8m x 12m plot. The municipal infrastructure for the area is lifted on aqueducts. The aqueduct system is justified on economical aspects, but it is also easy to maintain and creates architectural character for the area.

10) In Fælledhaven housing block located also in Ørestad, Copenhagen (Domus Architects) the function of a loft entry is expanded from corridor to semi-public terraces and gardens. In this way the architecture creates the basis for social networks and sense of community to emerge. Usually the apartment buildings are lacking this kind of gradual transition between public and private space. However the semi-private and semi-public spaces are for example providing gradually growing playgrounds for kids. As kids gets older it's really important they can step by step assimilate to new environments starting from private (home) in early childhood all the way to the public space in the age of puberty.

11) Cinque Terre in in the west coast of Italy is an interesting example of housing on a landscape with extremely demanding topography. The group of five villages and the surrounding hills are listed as Unesco world heritage. Narrow but tall houses are accessed from the narrow alleys parallel to the slopes of the hill. Only tenants can access the villages by cars.

12) The Mountain located in Ørestad, Copenhagen was a project by Bjarke Ingels and Julien De Smedt at PLOT architects (BIG+JDS). This unique typology consists of attached houses placed on top of the sloping parking garage. The solution enables own garden for each apartment on an area with high density.

13) By reaching above the sea the **Merenkulkijanranta housing block** in Helsinki by Architects NRT is taking the connectivity to nature in totally new levels. The maritime location is fully utilized by providing the sea view from each apartment. Emergency exits from parts of the apartments are solved by loft corridors or outlets with ladders down from the balconies.



8)



11)



9)



12)



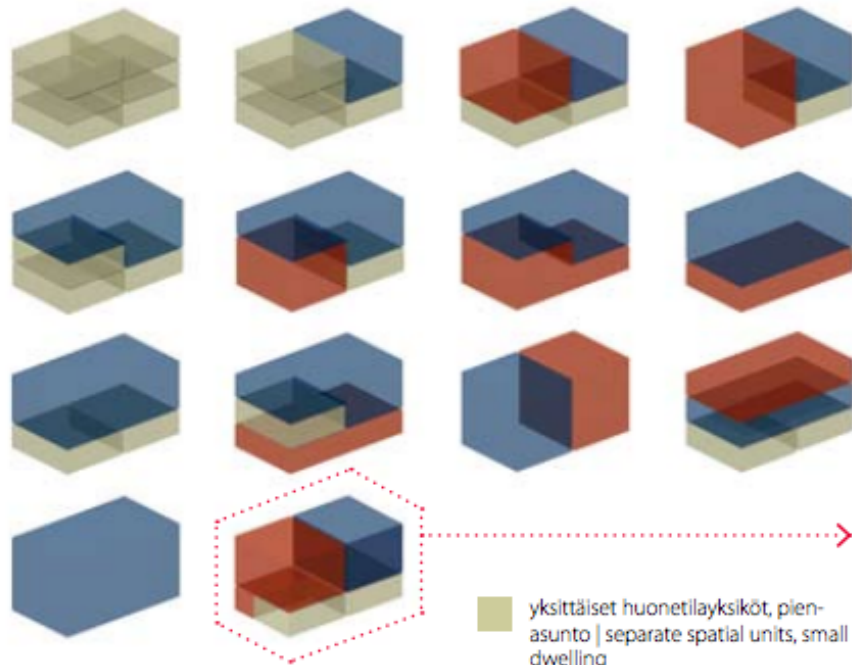
10)



13)

14) Vanhakaupungin Kellokas condominium (Karin Krokfors, Architects) is an example of typological flexibility, allowing dwellings to grow and decrease in size. The spacial units of the building has individual share certificates and therefore they can be combined into larger dwellings or divided into separate small dwellings or work spaces. The key factor is a stairwell solution that can work either as an internal stair for a dwelling or as a shared stairwell. Also the spaces requiring plumbing and water have been set apart.

In her article (Time for flexible housing) architect Karin Krokfors is highlighting flexibility as a new key concept in housing. Krokfors says that that family structures and peoples lifestyles are getting more diverse. Also the division between work and free time is fading. As a solution she introduces a term typological flexibility which refers to temporary flexibility in dwellings floor area. The idea that modes of habitation are predictable is outdated and should be replaced with new typologies which can adapt to social change.



- yksittäiset huonetilayksiköt, pien-asunto | separate spatial units, small dwelling
- useasta huonetilayksiköstä koostuva asunto | a dwelling consisting of several spatial units
- porras | stair or stairwell
- märkätilat, keittiö | wet spaces, kitchen
- viemäri- ja aukkovaraukset | drainage and openings reservations

As Oy Vanhakaupungin Kellokas, Helsinki,
 Arkkitehtitoimisto Karin Krokfors, 2009 »



vapaana tilana | as raw space

sovellus tilan organisoinnista | application for organizing the space

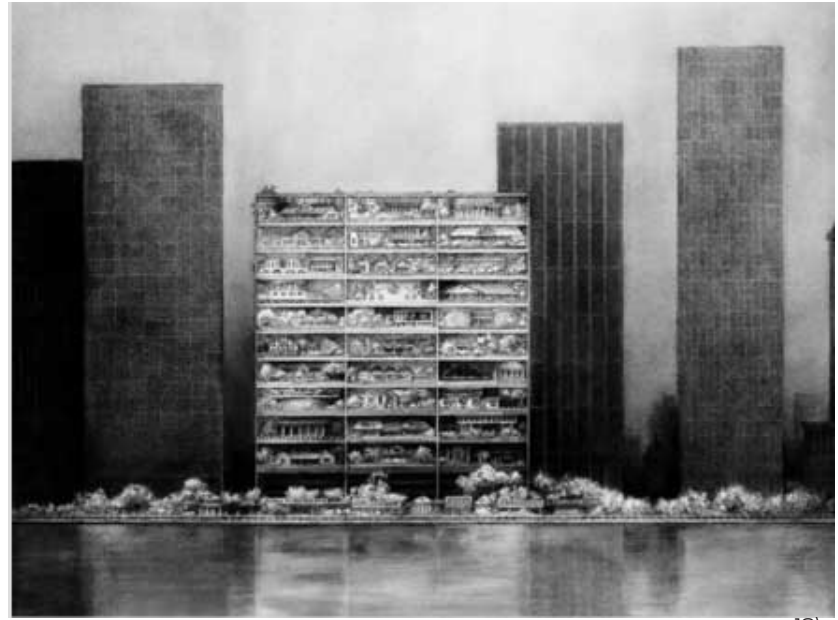
- a** pienasunto | small unit
- b** työtila | work space
- c** työtilan laajennus autotalliin | extension of work space into garage

15) Next 21. Osaka, Japan is an experimental housing project from 1994 by Yositika Utida in Shu-Koh-Sha Architectural and Urban Design Studio. The project consists of 18 housing units and it was conceived by Osaka Gas Corporation. The separate housing units were planned by 13 different architects. The project aims in creating more comfortable urban life without increasing energy consumption. Another interesting design objectives for the project were to incorporate natural greenery and wildlife habitat in high-rise structure and minimizing the building's compound burden on the environment. The material footprint of the housing is diminished by treating the everyday waste and drainage onsite within the building.

16) The highrise of Homes is a housing proposal by design organization SITE founded in 1970. The 15-20 stories high building is intended for hybrid use of mixed income housing, shopping and parking. The supporting frame of steel and concrete creates a platform for individual single family houses. The philosophical idea behind the concept is a critique towards homogenized and anonymous mass constructions where individuals have no chances for self expression in housing. The multilevel structure combines both high urban density and individual village-like communities.



15)



16)

17-20) The western part of Viikinmäki is a new housing area under construction next to Vantaanjoki river in Helsinki. The full construction of the area started in 2010. The topography of the area is much similar to Vartiosaari with great height differences. On a website promoting new areas of Helsinki Viikinmäki is said to become a unique hillside city of 3700 inhabitants. The identity of the area is based on proximity to nature and long views to the sea and valley of Vantaanjoki river (City of Helsinki - Uuutta Helsinkiä -website: <http://en.uuttahelsinki.fi/viikinmaki-mountainous-hill-city-vantaa-river>). The architecture in the Viikinmäki area contains successful examples on adaptation to the demanding landscape on a level of singular buildings but fails in comprehensive areal planning and subtle implementation in the construction phase. For example the altitude of the main road climbing up the hill has remained too low and therefore the houses along the road are build two to three meters below the existing height of the hill. Also the dense and low typology of attached single family houses doesn't preserve any nature between the build structure.



2001

17)



19)



2013

18)

viewpoint 



20)

10) Vartiosaari island and the design area seen from Ramsinniemi. The pedestrian bridge planned by the city of Helsinki from Ramsinniemi to Vartiosaari would start from the place where the picture is taken. Later on the bridge could be transformed so that trams could drive across it all the way to Uuosaari in eastern Helsinki.

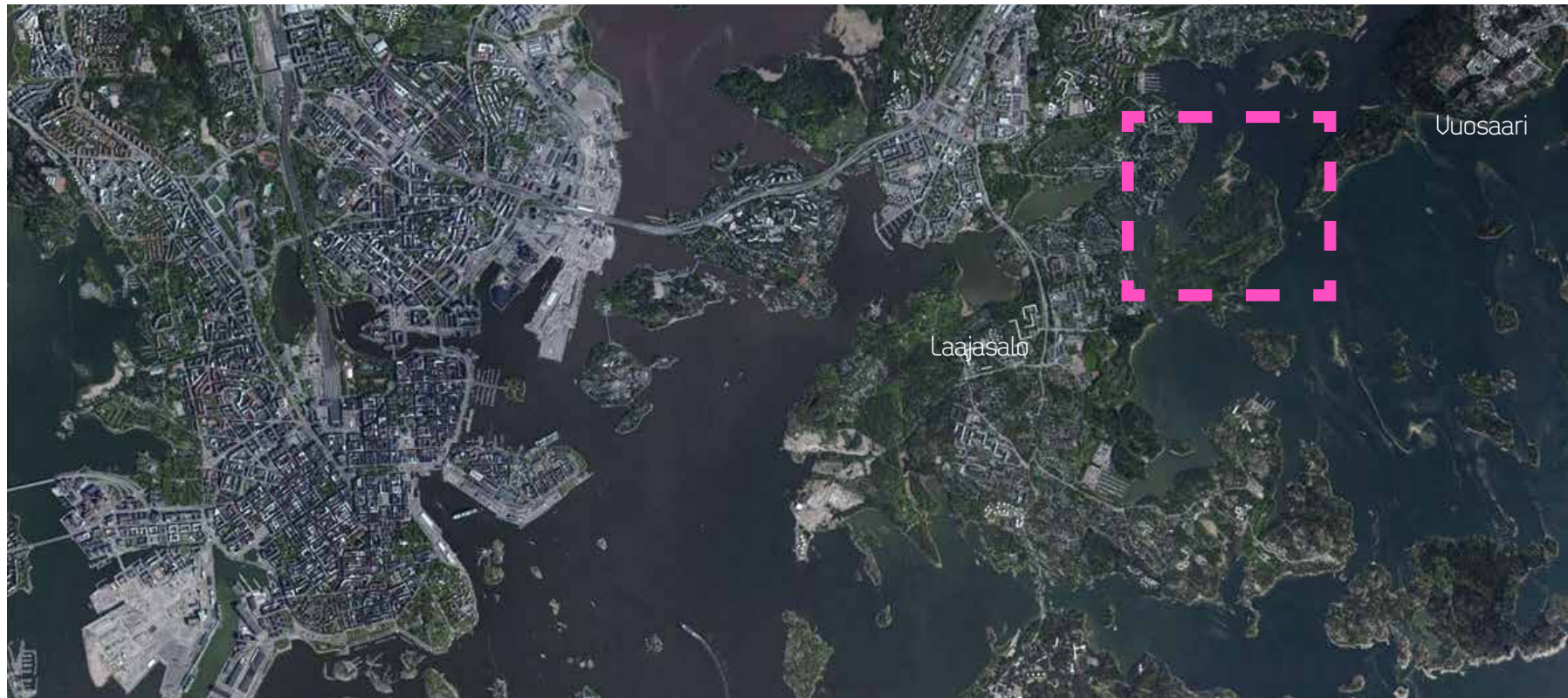




2. The site

2.1. Location

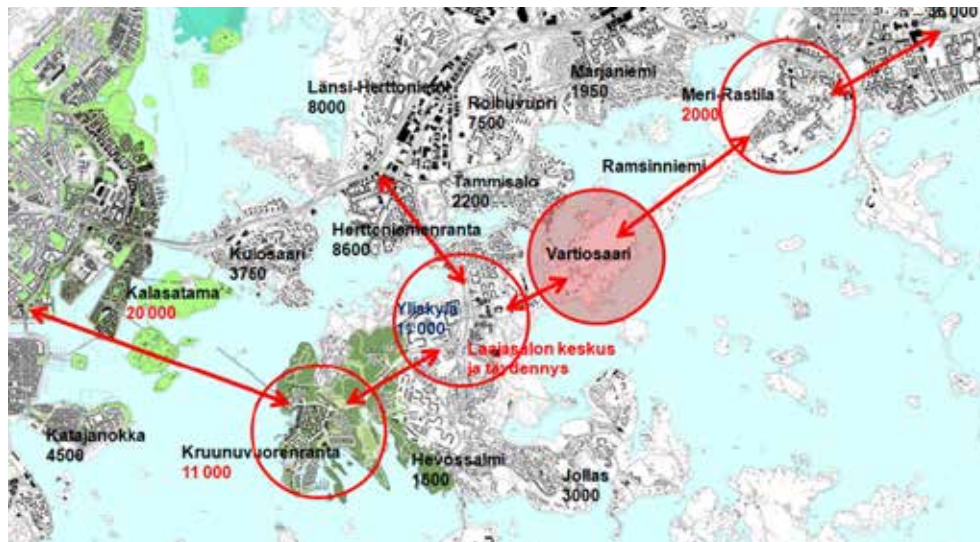
Vartiosaari island is located in the Finnish coast of Baltic sea 7 kilometers east from Helsinki city center between Laajasalo and Vuosaari city districts. The 82 hectare big island has remained mostly unbuilt and natural despite of the city's expansion around it. At the moment there's only around 20 people living around the year on the island. Vartiosaari is part of the nationally remarkable build culture environments in Finland because of its history as one of the popular islands with villa settlements of steam boat traffic in late 19th and early 20th century. In november 2013 the city planning office of Helsinki decided to start the regional plan project for housing 5 000 - 7 000 inhabitants in the island.



1) Location of Vartiosaari in eastern Helsinki, between districts of Laajasalo and Vuosaari

2.2. Design principles of Vartiosaari

The city planning department of Helsinki had three different options for land use in Vartiosaari. One was supposed to develop the island only from the recreational point of view with no housing presented to be built. The second option studied was based on single family house living providing homes for 3 000 new inhabitants. The most dense option which was also selected to be presented to the city planning committee consists of wide range of housing from single family house units to ten story high apartment buildings. The main principles for the development of the area are that it will be developed as a unique, diverse and dense maritime city district which has not only housing but also free time activities serving the citizens also from the wider area. The island will also be connected both to Laajasalo and Vuosaari by bridges and by that way be part of the chain of maritime neighborhoods in the Helsinki archipelago. In a longer time scale one of the goals in building Vartiosaari is that tramline and cycle path can continue all the way to Vuosaari. The principle for developing the landscape in the area is that the shores and the silhouette of the island will be designed in way which forms an enriching layer to the landscape of Vartiokylänlahti and tries to preserve the green scenery towards the eastern archipelago. The scale of construction will vary from 300 000 to 350 000 square meters. The new housing areas will be concentrated in the middle parts of the island. The old villas are mainly located along the coastline of the island. Therefore only small scale infill construction will be presented close to coast.



12) Vartiosaari as a part of the chain of maritime neighborhoods in the archipelago. (KSU)



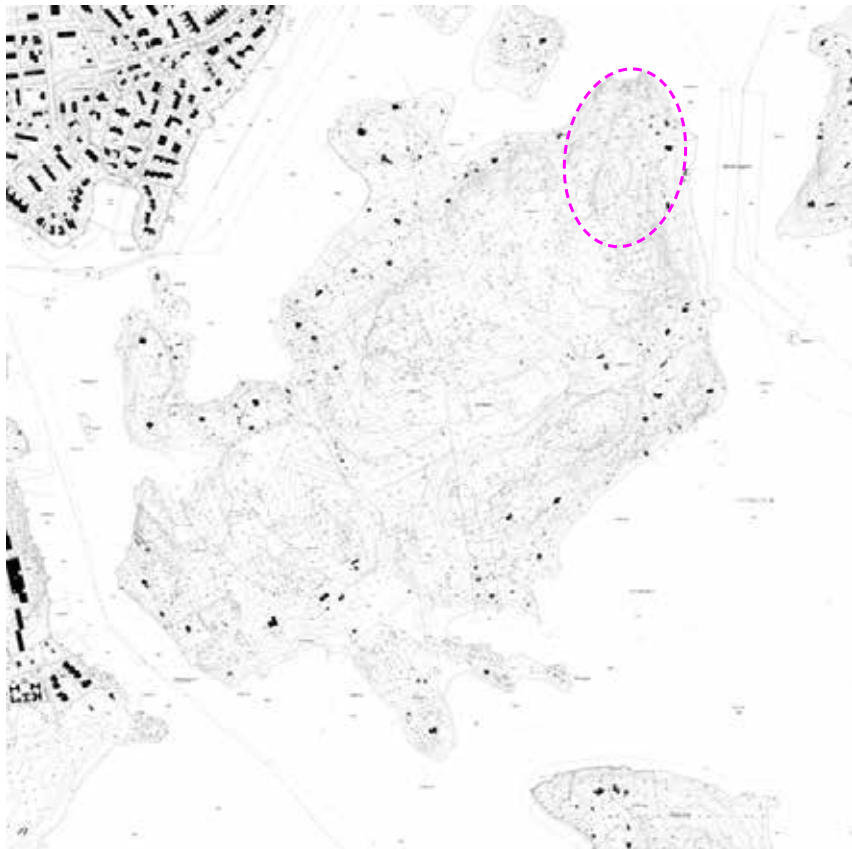
13) Housing structure and bridges studied for the dense land use. (KSU)

2.3. Design area

Vartiosaari is surrounded by the Vartiokylänlahti bay in the north and Kallahdonselkä and the eastern archipelago in the south. The island's geography has high variation with highest points reaching 32 meters above the sea level.

The forest types are varying in the island from dry pine forests up in the hills to the flourishing groves down in the valleys and shores. There's also a nature protection area with only deposit of a plant *Petasites spurius* in Finland. The valley in the center of the island has been used for small scale agriculture since 18th century. The design area of the diploma work is in the north east corner of the island on a narrow ridge lowering down towards the sea in the north. New buildings are placed so that waterfronts below the altitude of 16 meters are preserved for nature and existing villas. The southern border of the design area is constrained to the new bridge leading to Ramsinniemi and further to Vuosaari.

14) The location of the design area in north-eastern part of Vartiosaari.



2.4. Topography and views

The topography of Vartiosaari is varying a lot with highest points reaching up to 30-32 meters. Longest views to the eastern archipelago and Vartiokylänlahti are opening from the rocks in the eastern and north eastern parts of the island. The rocky hill called Viikinkikallio (viking rock) is offering perhaps the most famous view from Vartiosaari to surrounding archipelago.

The landscape of the island has been shaped by changing sea levels and ice age. Some marks of the changes can still be seen in islands geography.



15) A view from the disgn area towards Vartiokylänlahti and metro bridge in the north.

2.5. Climate

The dominant wind direction is south-west and west. The sea is balancing temperatures locally by cooling in spring and warming in autumn.



16) The eastern archipelago seen from the Viikinkikallio. (Teemu Saloriutta)

2.6. Green areas

Vartiosaari is part of the cultural park of eastern Helsinki which is one of the six green fingers of Helsinki. In 2012 the city planning office of Helsinki made the development plan for the green areas of Vartiokylänlahti (KSV 2012). These six green fingers are creating the base for the network of green areas in the city. The city aims to develop these green areas and their aesthetic and functional recreational values. The cultural park of eastern Helsinki is special because of its maritime character and historically important villa settlements. Despite other green fingers in Helsinki it's not only consisting of unbuilt natural areas. The park includes also vast areas where housing and nature are intertwined.



17) The culture park of eastern Helsinki. (KSU)

2.7. History

There's around 50 villas from late 19th and early 20th century located by the shores of the island. Besides the villas there's around one hundred other buildings which are mainly secondary buildings, like sauna's and storages for the villas. The villa settlements were built in Vartiosaari as summertime residents for upper-class during the era of vivid steamboat traffic in Helsinki's eastern archipelago. During the years when the steam boat traffic was most frequent it was even possible to commute to work in the city. According to the investigation for Vartiosaari's history and culture (Salonen, Kati and Schalin, Mona 2013) one of the most remarkable and valuable villas in Vartiosaari, villa Tirrebo is located in the design area. The building is designed by architect Theodor Höijer and it's part of the oldest layer in islands villa settlements,

In the turn of the twentieth century also gardening was important part of the villa culture. At the moment most of the gardens have become forested and therefore aren't as present in the scenery as they used to be. The investigation for Vartiosaari's history and culture found out that the garden culture has been remarkably active in the island. Some gardens have completely vanished during the years, but still there can be seen many signs like terraced landscapes and remained plants as proof from the age of active gardening.

Vartiosaari has a colorful history also as a summer place for governmental companies, cooperatives and associations. Already in early 20th century Vartiosaari became a popular place for children's summer camps, organized by different institutions. The summer residence of Alko, the governmental own alcohol company, in Villa Sunnanvik and food cooperative Elanto's Villa Nytorp are perhaps the most famous examples in the islands history of social activities.

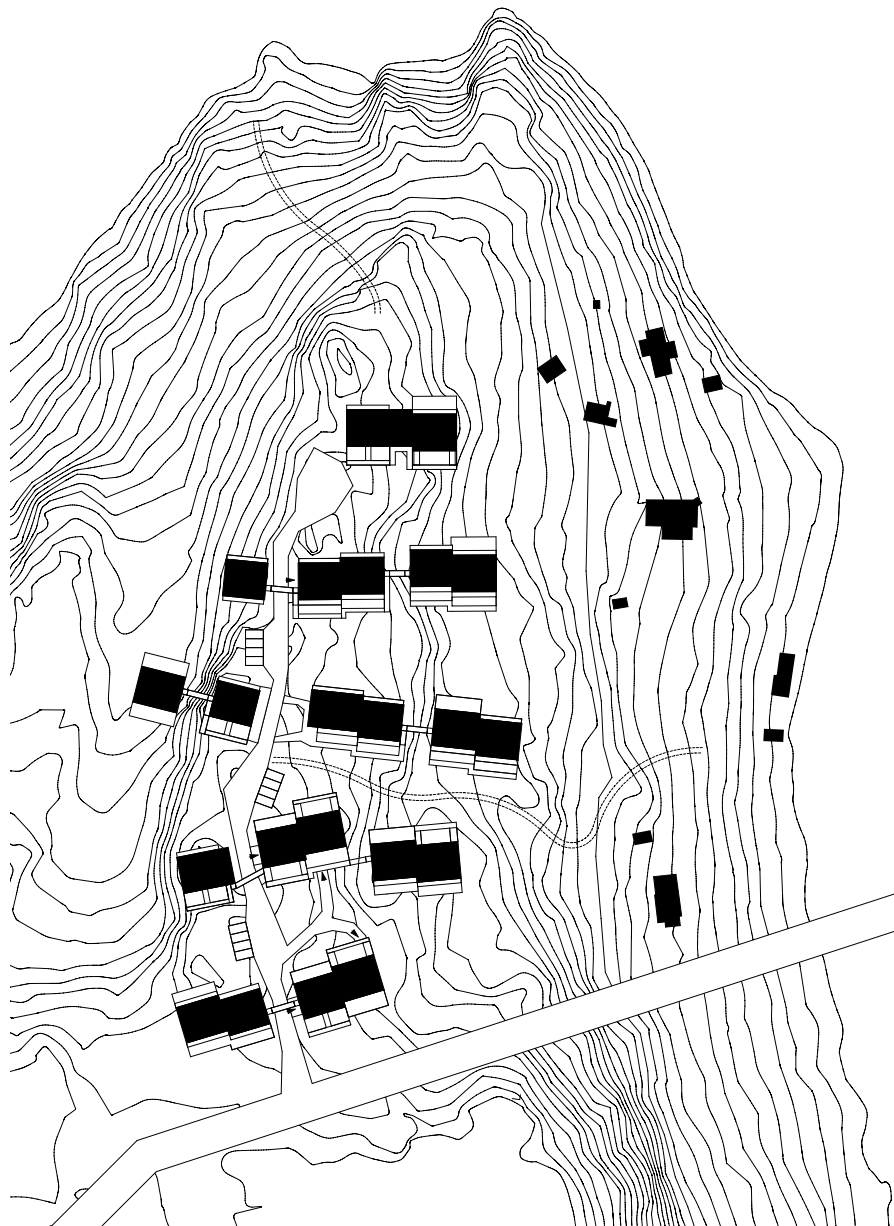


18) Villa Sunnanvik is located in the design area (Mona Schalin)

In city's decision making Vartiosaari has been bouncing here and there since Helsinki bought big share of land in Vartiosaari from Kansallis-osake-pankki at 1980. At the moment city owns 90% of the land in Vartiosaari ((Tolonen, 2008) Vihervai-asuinalue? Vartiosaaren kehittämissuunnitelma, Tolonen Hanna 2008). In master plans of Helsinki from 1972 and 1992 Vartiosaari was marked as green area, but the present master plan from 2002 left the role of the island undefined and to be further investigated in more detailed planning. In autumn 2013 the city planning committee decided for housing area to be built in Vartiosaari.

19) Isolation and remoteness is sometimes challenging in practical matter but still a vital part of the atmosphere in the island.





1. Design

The design task and the area was given by the city planning office of Helsinki in spring 2014. The topography of the site is extremely challenging. There's high difference from the sea level up to 30 meters on an area of approximately 4,6 hectares. The area of construction on a ridge in the middle of the peninsula is 1,5 hectares. One of the main reasons that the city planning department chose the most dense alternative for further development for the island is that with six to seven thousand inhabitants the proper public transport system can be provided for the neighborhood. But high amount of inhabitants and willingness to preserve the shorelines for nature and old villa settlements led to a situation where the share of small scale housing decreased. That's why one of the starting points given by the city planning office was that typologies for small scale or single family housing should be studied on the area of the thesis work. Also the location in the most far reached corner of the island and the extreme topography of the site advocates for small scale construction. Anyhow the goal for the density of small scale housing was set high on approximately 12 000 m².

The requirements for combining high density and single family house -like housing led me to study different typologies to start with. I was also interested to find out how different typologies promote sustainable lifestyles. The outcome of the design is a fusion typology between single family house and block of flats bringing together the sustainable aspects of these two typologies.

The area is mainly covered of mixed type forest with some parts of the ridge tops being bare rock. The measurements made in the area showed that the tree line is not following the shape of the terrain. Because the highest parts of the ridge are more dry the trees are up



a view from the balcony towards loft corridors connecting the buildings

apartments 88
parking places 88
total floor area 14 480 m²
design area 15 000 m²
floor area ratio: 0,97

to 10 meters shorter compared to ones growing on the lower parts of the hill. This information is important for the design in two ways. First of all it's important that the construction doesn't dramatically in the slopes of the ridge to ensure stable growing conditions for the existing flora. Secondly the heights of the buildings can be adjusted to high circumstances of the landscape.

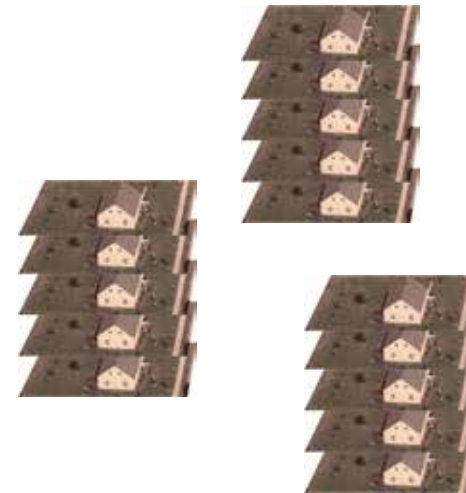
The eastern slope of the ridge is so steep that it's impossible to build a road which would fit smoothly to the landscape. On the western side there's a gently towards north sloping valley which could be reached by road, but from where it's once again impossible to reach the upper parts of the ridge. Therefore the design is based on an idea of singular road following the highest part of the ridge.

Another feature pursued in design was small physical footprint of the buildings. One benefit from the small footprint is that it maximizes the amount of nature preserved between the built structure at least on a theoretical level. Building shapes with point loads are also offering flexibility on a site with challenging topography. Accessibility on dense hillside constructions is often solved with long building volumes following the contour lines of the landscape. The negative side of the solution is that it cuts the natural flow of storm waters on the slopes. Therefore the building clusters are placed in rows parallel to the slope allowing the nature to reach out between the structure. High buildings with small footprint can also reach high density without disturbing the water balance of the area so much.

The buildings are constructed from wooden elements. Despite of being ecological material the qualities like lighter weight and faster assembling times in wooden elements are advocating them as right structural solution for the demanding design on a site with great height differences.



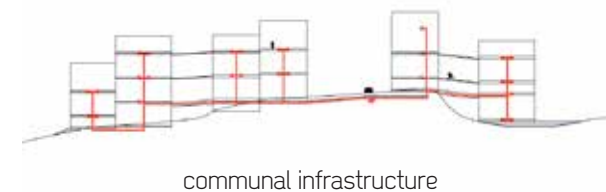
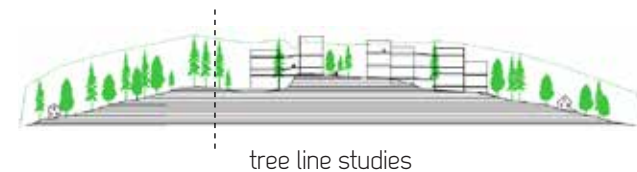
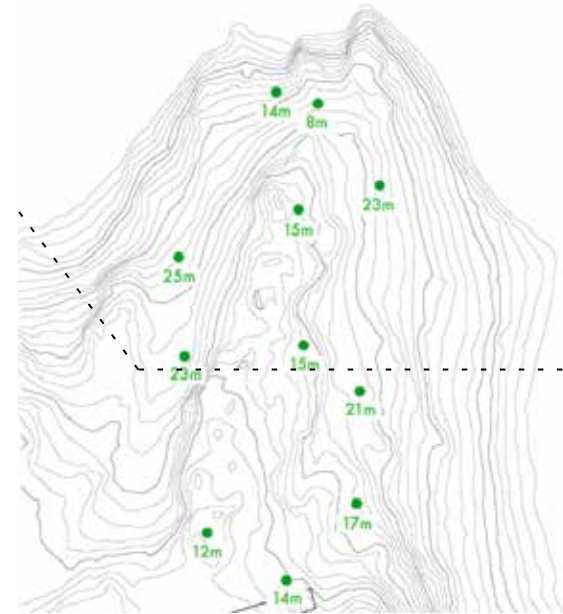
Suburban single family housing is globally popular but at the same time really unsustainable for example in land use and ways of transportation.



One of the main principles for the thesis work was to study different typologies and combine their sustainable aspects.

The typology of vertical volumes of singular houses which are connected with loft corridors enables great flexibility for design already on a general level. Early sketching and placing of buildings is based on an idea that the distance between two buildings is determined by the steepness of the slope. The height difference of neighboring buildings should be the floor height (3.2m) plus or minus the height which can be balanced with the vertical angle of loft corridors connecting the buildings. When the angle of the slope is small buildings can be attached to each other. In the steepest parts of the slope, which would be hard to build anyway, the gap is left between the buildings and the formed height difference is leveled with loft corridors between the buildings. Staircases with elevators are placed in building volumes with lowest location to ensure accessibility for disabled persons to every apartment. This solution enables also the efficiency up to 8² apartments in each floor per one lift. In rows where the lift is furthest from the street one extra staircase is placed by the street. The small amount of lifts as well as the placing of the lifts and staircases can be justified by economical reasons but it's also nudging the physical activity of the tenants by favoring the stairs before lift.

The communal infrastructure can be led from buildings closest the street to furthest ones inside the bridges formed by loft corridors in order to avoid the need for opening the ground between the buildings. When being built in this way it will also be easier to maintain the communal infrastructure in the future. Loft corridors are not only economical non heated space, but also improving the nature connection by bringing the nature right behind the apartment doors. The implementation of the design should be done so sensitively that it would be possible to reach the treetops from the loft corridors. Undeniably the vast areas of the present beauty of

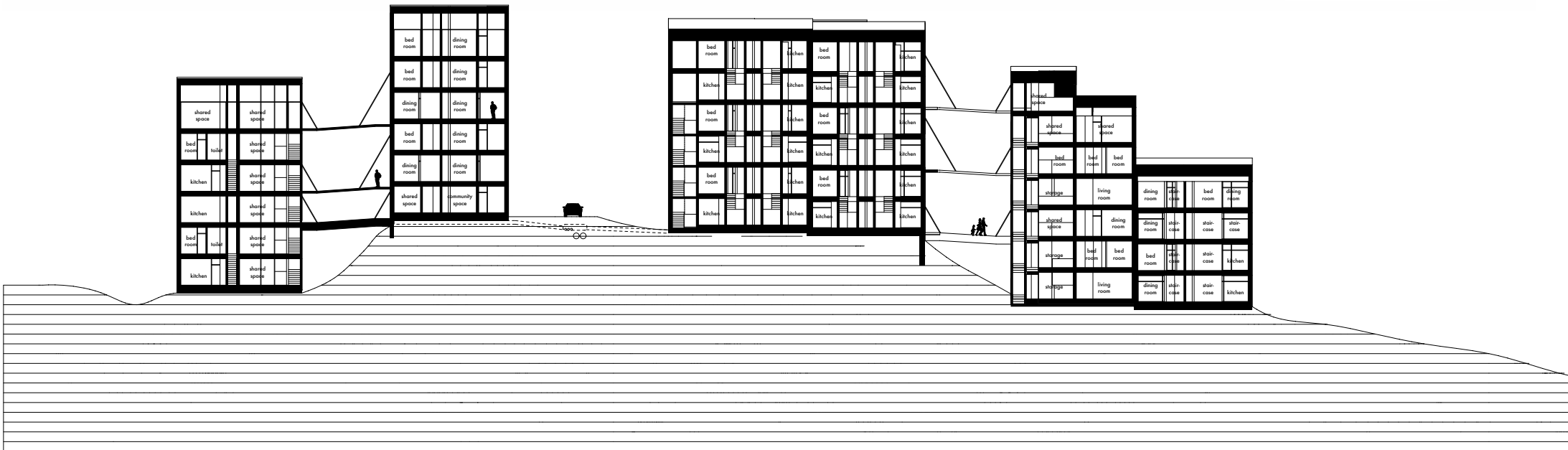




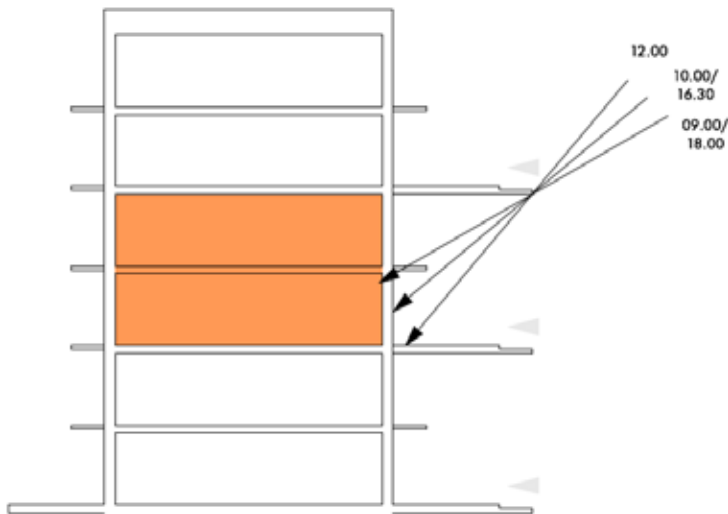
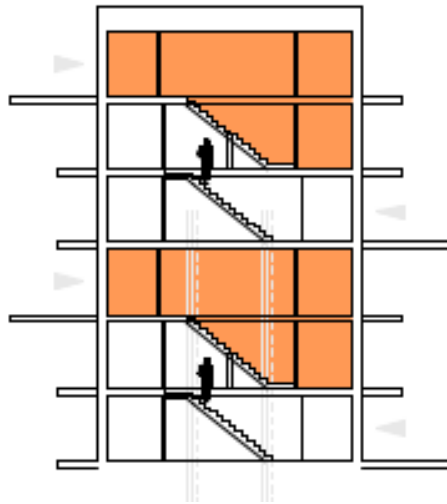
Plan from the street level, 1:1500



facade north 1:500



areal section 1:500



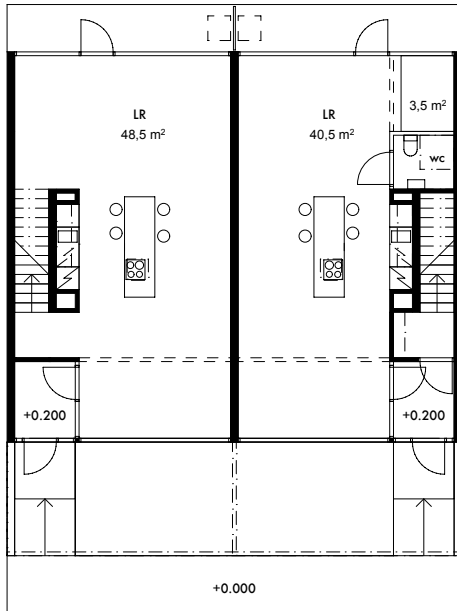
apartment division and day ligh studies

the island will be lost in the construction of the area. The design is based on the idea that at least the areas between the new buildings deserves to be treated with extreme care.

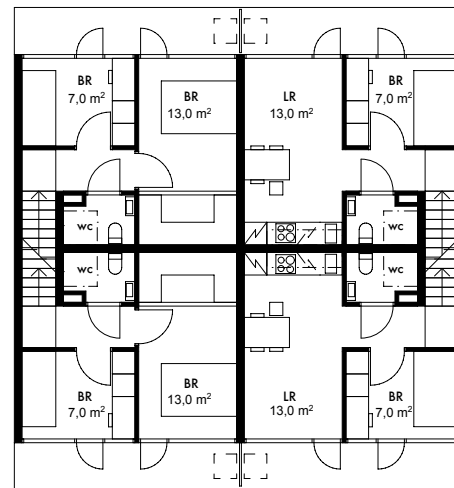
There's two alternative floor plans in the buildings, 3 rooms with kitchen and 4 rooms with kitchen. One of the main principles for the design was that each apartment could be effortlessly divided in two parts with 1-2 rooms and a kitchen. The solution where every house consists of two floors makes the division possible just by re-organizing few walls in the internal staircase of the house. The installations for new kitchens and the extra toilet in the smaller (3 rooms + kitchen) apartment are made ready beforehand in the construction phase. This arrangement enables parents to sell or rent another half of the house when their children have moved out on their own. This kind of flexibility in housing gives economical leeway for tenants at the same time when it's reduces the material footprint of housing per person. Flexibility can also be advantage already in construction phase by giving the constructor possibility to adjust the supply between studio apartments and family apartments. The apartment on the right side in the floor plan is presented as divided version and apartment on right as family apartment.

Another advantage in two story solution is that it allows bigger balconies in every apartment. Deep balconies in every second floor of the building expands the meaning of a balcony but still each apartment is provided with proper daylight conditions in the entrance floor. Four meters by six meters wide front yards on a side of the loft corridor are bringing the typology closer to a single family house instead of a traditional block of flats. Each apartment has 3-4 balconies facing on two different direction. The smaller balconies in every apartment have traditional private character whereas the biggest balcony next to loft corridors is meant for different actions like gardening and social encounters with neighbors passing by.

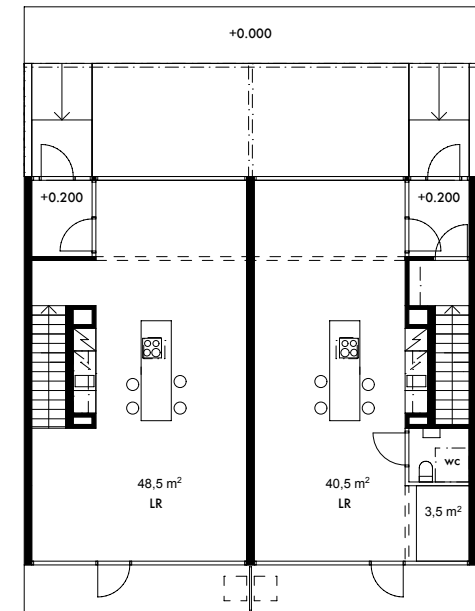
3 rooms + kitchen:
 whole apartment 83m², divided 48m² + 30m²



1. floor, 1:400

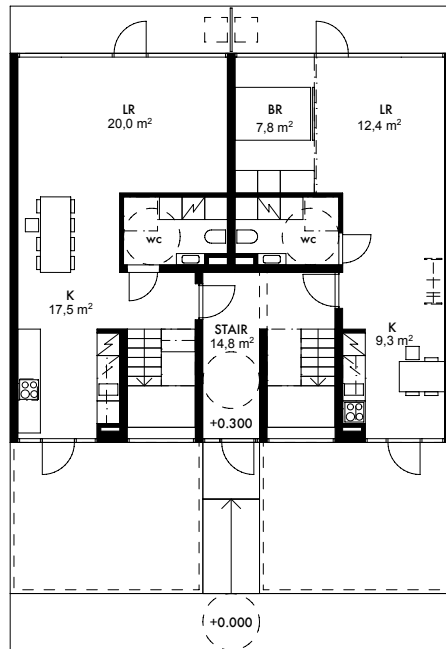


2. floor, 1:400

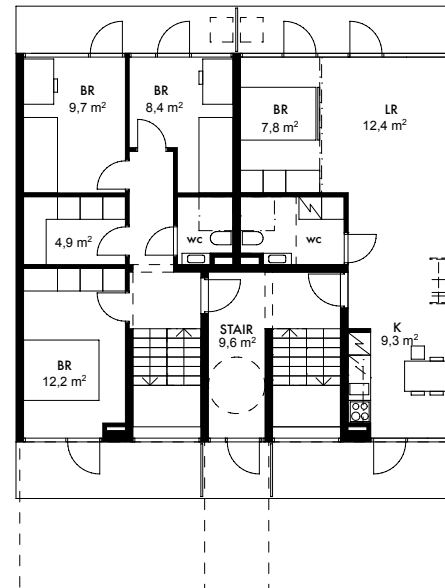


3. floor, 1:400

4 rooms + kitchen:
whole apartment 98m², divided 43m² + 43m²



1. floor, 1:400



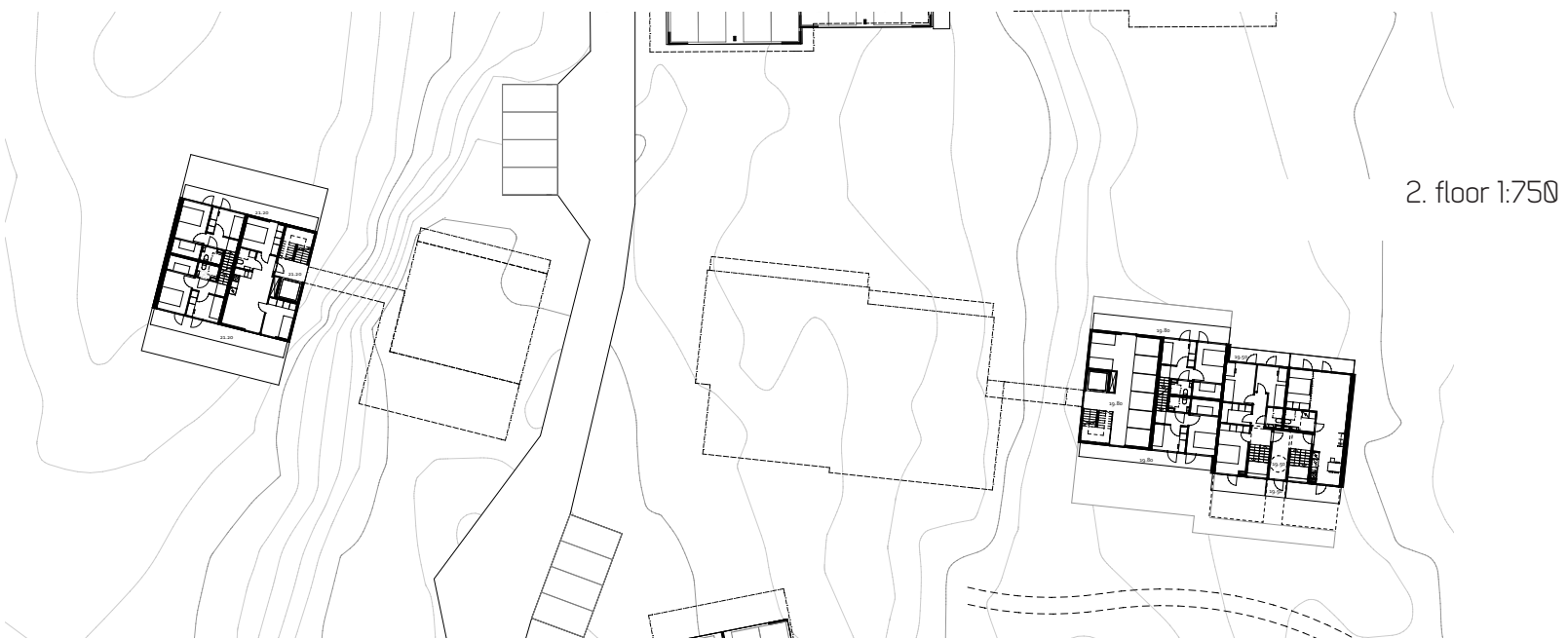
2. floor, 1:400



a view from the living room of the 4 rooms + kitchen apartment



1. floor 1:750



2. floor 1:750



3. floor 1:750



4. floor 1:750

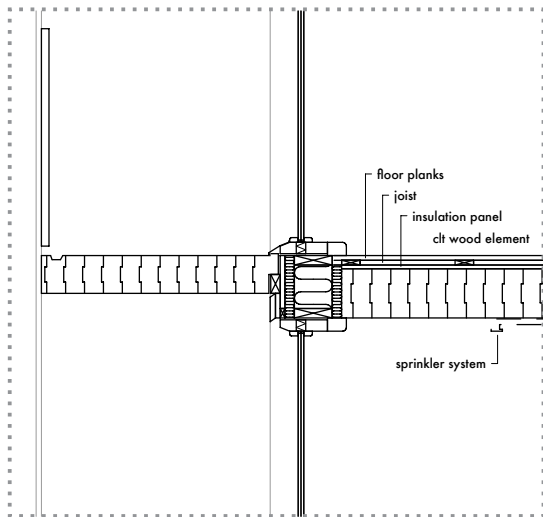
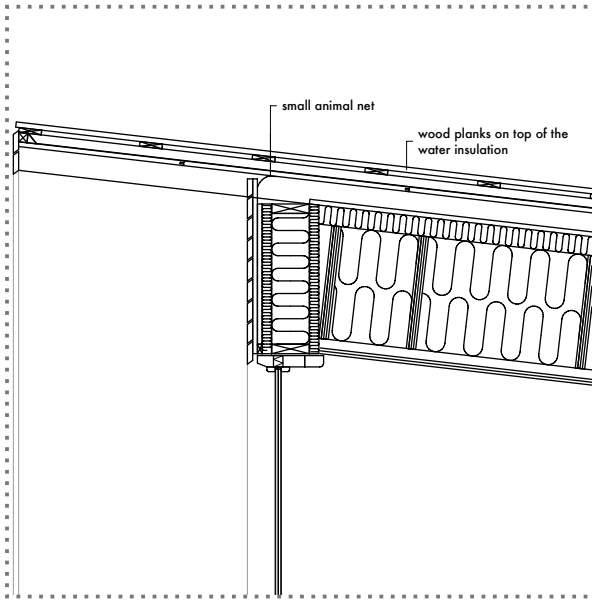


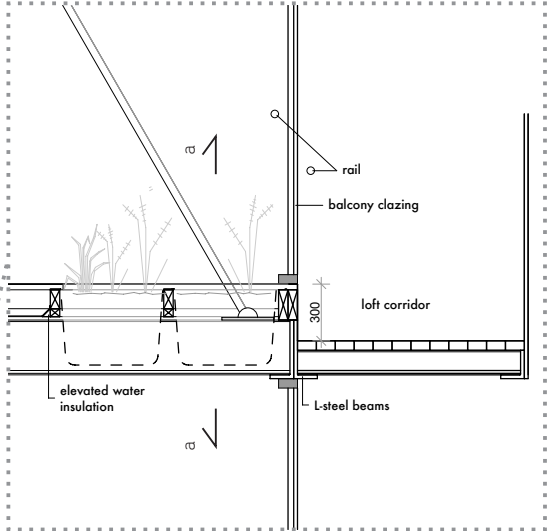
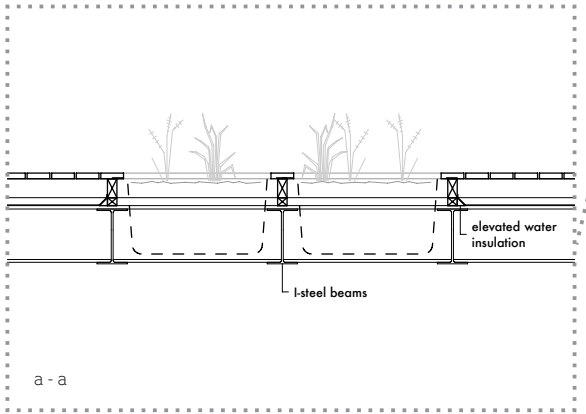
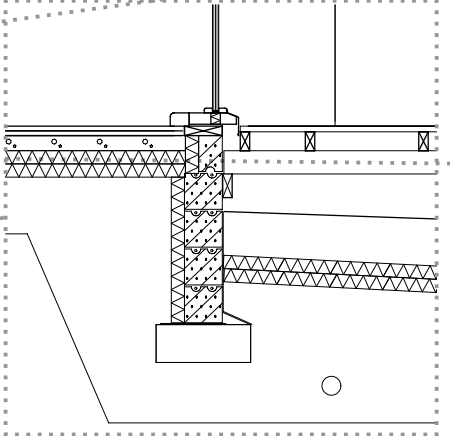
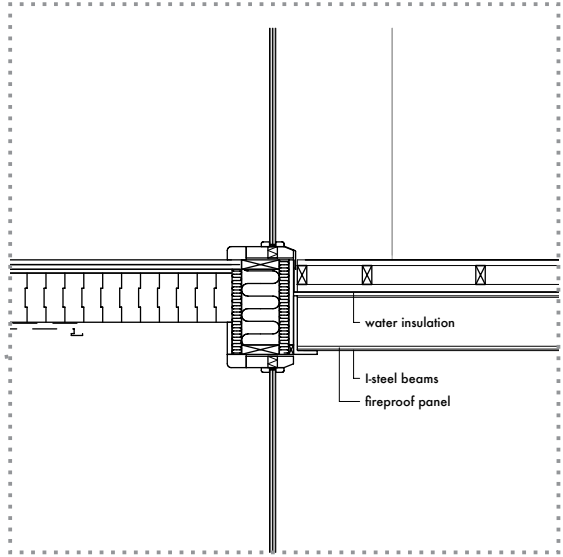
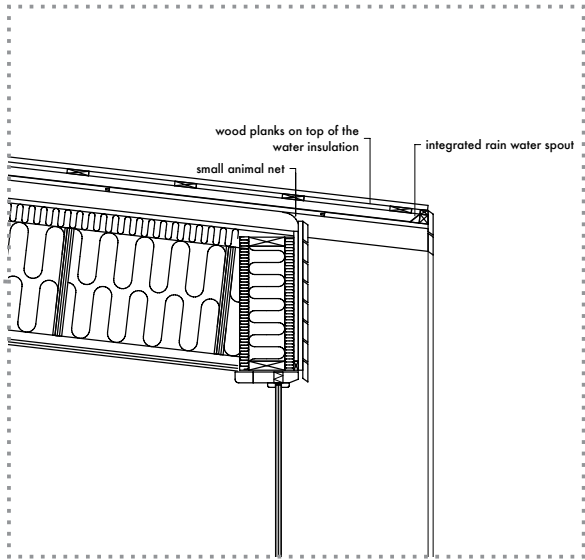


7. floor 1:750



8. floor 1:750





detail drawings 1:40

For children it's also very important that the housing area is providing suitable environment for play in each phase of their development. In apartment buildings own garden is often the missing link between the home and neighborhood playgrounds when it comes to gradually growing living environments for kids.

At the same time when large front yards are creating the platform for social encounters to emerge in the neighborhood they are also improving the privacy inside the apartments by creating distance to the loft corridors. In addition there's also 30 centimeters vertical height difference between the corridors and the apartments. The thickness of the large balcony is 50 centimeters which makes it possible to place planting pools between the supporting beams in the structure. When glazed the large balcony functions like a big greenhouse, which expands the growing season from both ends and supports the idea that more time should be spent outside even during the cold and rainy seasons. At summertime the garden can be even furnished to function as an extra room and in that way bring seasonal changes in to concepts of living. Being able to have own garden even in multistory houses helps to strengthen tenants nature connection. Teaching kids in practice on how food is growing is a vital part in teaching them environmental values and responsibility. In order to fully mimic the natural cycle of nutrients there's shared composts placed next to every stair landing.

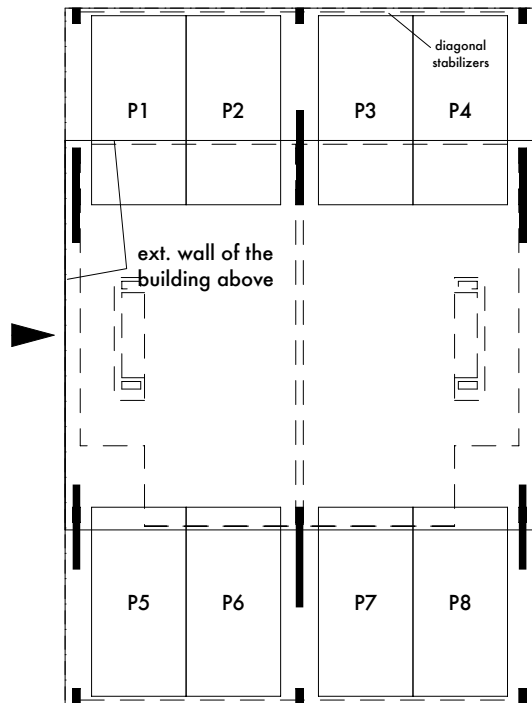
In the shared courtyards on the ground between the buildings the idea is to build as few artificial elements as possible and let the existing nature to function as a playground for the children. This practice is once again supposed to restore the lost nature connection in peoples every day lives as well as to diversify the housing stock. Housing areas with standardized playgrounds can easily be found elsewhere. The site is also a central part of the culture park of eastern Helsinki which makes it even more important to preserve the nature also between the buildings as much as possible.



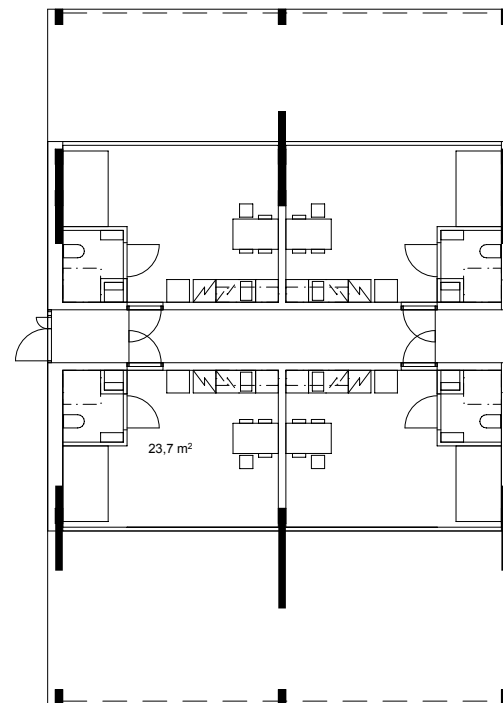
a view from the front yard

The first alternative for parking was to organize it centralized in one big parking garage. Anyhow the uncertainty on how parking and public driving will evolve in the future led to a solution where parking places are decentralized in same building volumes with the housing in order to improve the flexibility of the space. The idea is that when placed in the same volume, the parking spaces can be more easily changed into offices for remote working or apartments if the need for private parking will decrease in the future. The loft corridors works as emergency exits. Secondary escape routes goes via integrated ladders from balconies.

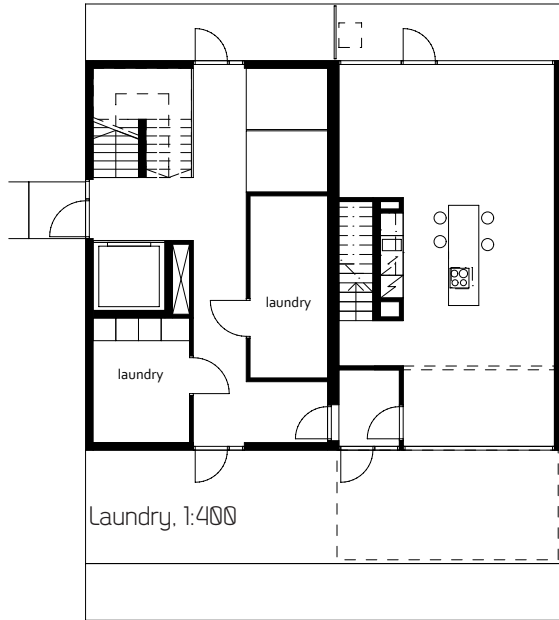
The storages and shared spaces as well as facilities for property maintenance are focused next to elevators and staircases in every floor. Some of the buildings have shared saunas on the top floor and communal spaces on the first floor next to the street. One of the existing seaside saunas on the site will be used by residents and by that way reduce the need for free time transportation in the area.



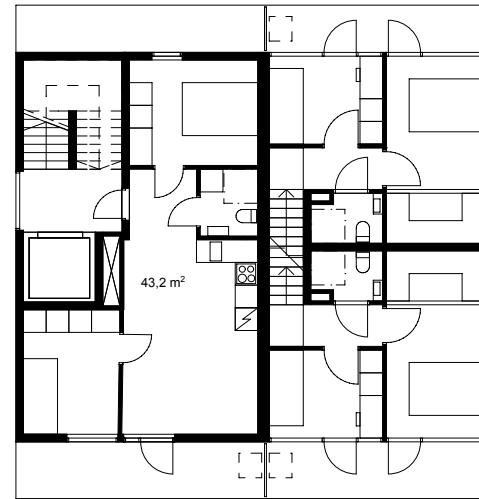
Parking. 1:400



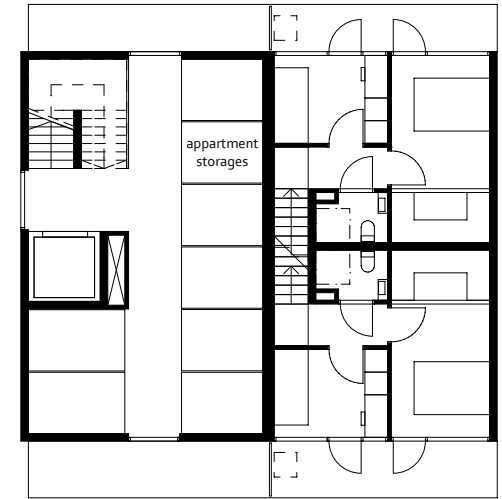
Parking turned in to apartments. 1:400



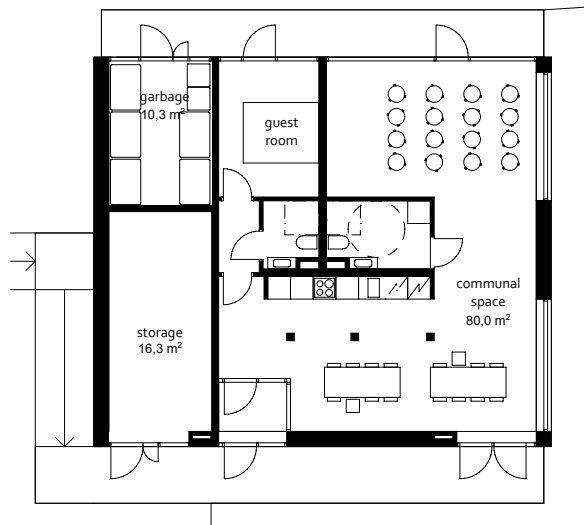
Laundry, 1:400



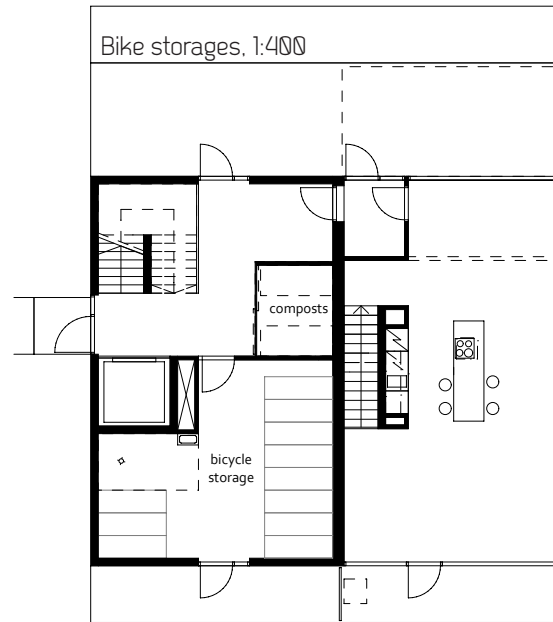
Apartment or working 1:400



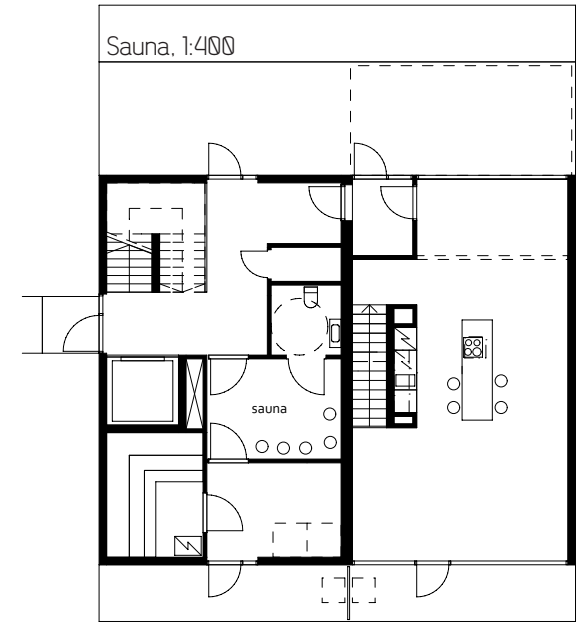
Apartment storages, 1:400



Shared space, 1:400



Bike storages, 1:400



Sauna, 1:400



a view from the central street of the area



() A view from Uartiokylänlahti towards Uartiosaari in south and studies on how building volumes fits in their environment. The design area is on the left in the picture. The preliminary volumes of the 6-10 storey high houses next to the design area can be seen on the right.



facade south 1:1000



facade east 1:1000



facade north 1:1000



facade west 1:1000

Conclusions

The thesis work is a design based approach to study and develop hill-side dwellings that promotes sustainable lifestyles. The main focus is in design solutions which enables residents behavior and values to develop in more sustainable and healthy direction. The new typology developed in the project makes it possible to have housing areas which are dense enough to support proper public transportation system and at the same time consisting of houses with own private outdoor spaces. The maximized amount of balconies and front yards are providing economical extra square meters for different housing activities. In the interiors the space is effectively utilized and the apartments are able to be divided in two. Therefore it is possible to adjust the floor area of the apartments according to the amount of persons living in the family unit.

The nature connection in housing is highlighted in order to motivate residents to change their habits towards more sustainable lifestyles. The existing wild nature is preserved between the built structure to a great extend. The typology of narrow and tall building volumes linked with pedestrian bridges and loft corridors are creating the architecture which is subsidiary to the varying topography of the area. The views from the apartments and loft corridors as well as the intensive presence of the surrounding nature creates the strong harmony between the nature and human settlements. The importance of environmental education in upbringing responsible new generations is taken into accounting in design by providing the opportunity for own garden in every apartment. In this way children can learn at home in practice how flows of energy and nutritional cycles are working in nature. The small garden on the balcony just like bigger cycles in the society can be self-sustained closed loops with no inputs from outside. The diverse living environment that is gradually expanding from home to private front yards and

further to forests between the buildings is creating the preconditions for new generations to grow healthy and responsible citizens.

The decisions made during the process of the thesis work are leaving great responsibility for later stages in design and building process. In order to become realized as presented in the illustrations the ambition and respect towards the atmosphere and nature in Vartiosaari should be carried on in every phase of the building process from master planning to construction of singular buildings.



A view from the tree top towards Uartiokylänlahti and Uuosaari metro bridge in the north.

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