GARDEN HOMES OF TOMORROW

A sustainable way of living in the countryside

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ABSTRACT

We are living beyond the earth's means and in Sweden, the private households stands for about three quarter of the carbon emissions. This can be divided into four categories, food, transport, dwelling and shopping, where dwelling and transport are the highest emitters. Over half of the population lives in single- or two-family houses, 63 % wants to live in a single-family home and 34 % lives in the countryside and is thus quite dependent on a private car. This is a large contradiction with the dense mixed city which is the most discussed solution of a sustainable way of living in school. And yet, a way for small municipalities in the countryside to attract new inhabitants is to build new areas of single-family houses in attractive locations.

The aim for this master thesis is to spur a discussion about how to develop sustainable housing areas in the countryside, that compensate for a more car dependent lifestyle but still meet the wish for a single- or two-family home. Several methods has been used during the process, literature studies, field studies to both older and newly built housing areas, investigations of how large our environmental impact is and different sustainable building methods such as cradle to cradle. This together with sketches in plans and sections has resulted in a proposal of a housing area that offers a flexible garden space, produces all energy renewable and locally, increase biodiversity, care for both water, air and material cycles and reduce the average personal carbon footprint located in the small town Hjo. Simply an alternative for how to live more sustainable in the countryside.

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SUMMARY

This thesis aim to initiate a discussion about an alternative way of designing housing areas in the countryside with sustainability as a point of departure. In Sweden over half of the population lives in one- or two-family houses and astonishing 34 % lives in the countryside. The general desire is to live in a detached house and more than six out of ten young adults wants to live in a villa. This is a major contrast to the sustainability discussion going on within the architectural field where the dense mixed city is the central solution.

The building sector stands for a large part of our environmental impact and there are several solutions that focus on energy efficiency but also some that focus more on circular flows. Sustainable development aim to secure future generations ability to meet their needs at the same time as we meet our own needs. This concerns three different dimensions; ecological, economical and social.

This is all necessary since we are living beyond our means and has already emitted too much carbon dioxide than the earth can handle for over 50 years. Almost all emissions are produced by the developed countries. For instance Sweden emits 17 % over a global sustainable level, but in reality that number is probably higher due to production emissions from imported goods. Of all Swedish carbon dioxide emissions three quarters comes from private households where food, transport and dwelling stands for the largest posts. Together with consumption an average person emits 8 tonne carbon dioxide per year, which is way over the recommendation of 2 tonne that we will have to reach before 2050.

Food stands for about two tonnes of our private carbon dioxide emissions and beside of carbon the food category also emits methane. The food industry is very dependent on fossil fuels and will meet major challenges with the climate change. In Sweden arable land is being exploited and there is not enough open land left to support all inhabitants with food. The demand for swedish food is also diminishing and farmers are forced to quit. As much as 40 % of all food is now being imported and one third of all food is being thrown away. Private gardens is a great potential for food production and food enough for four million people could be grown by swedish households.

Transport is one of the largest category with emissions of 2,5 tonne carbon dioxide per year and person. Fuels for cars is the biggest post and when living in the countryside the average mileage per person is often higher than average. One reason for this is lack of good public transportation.

As large as transport is dwelling which also stands for 2,5 tonne carbon dioxide per year and person. Here it is energy used for heating and household electricity that is the major emitters, but energy used for construction and maintenance is also an important issue. In the countryside most people live in detached houses. Which per square metre use less energy than apartment buildings, but instead they are often larger and a higher percentage is heated by fossil fuels.

The desire to live in a detached house is large and one major argument is the private garden. Another reason is the wish to express ourself through our dwelling, and that is more easily done in a detached house than in a modern apartment building. The home has also historically had a strong cultural value, where Swedes tend to invite friends over rather than meeting them somewhere public.

Looking at the history of the detached house they were from the beginning mostly affordable for rich people, but in the beginning of the 20th century a movement, "egnahem", was developed for making the detached house available for the working class. This type of homes focused on the possibilities to produce your own food and was very small scale. In the 1950s and 60s this idea disappeared and the gardens shifted purpose towards decoration. Since then the number of square metres has also increased gradually, peaking in the last decades.

Within the sustainability discourse today two different trends are emerging; plus energy buildings with high tech solutions or healthy buildings where focus is on materials and the entire life cycle of the building.

In this thesis Hjo will work as an example of a typical countryside municipality with 9000 inhabitants whereof 67 % lives in one or two-family houses. There is also current plans for developing a new housing area on former arable land, the old fields of the farm Knäpplan. Phase one include about 30 plots connected to a local loop street and a main street passing by. In phase two a preschool and a

possible roundabout along the main street is being planned. Some land is programmed for green area in order to handle storm water which is a major problem on the site.

People living in Hjo has a slightly bigger carbon dioxide footprint than the average Swede due to more mileage per year and person with private cars and the high number of detached houses. The main question is thus; how to compensate for the higher energy demanding lifestyle when living in the countryside.This must be done without loosing the dimensions concerning sustainability and how to incorporate circular flows.

To do this several methods has been used. Field trips to different existing housing areas, both old and newly built. Studies of housing typologies, which gave an understanding of how different kind of typologies allow for denser development. Studies of Cradle to Cradle, a design strategy that focus on circular flows. With the three key principles; waste equals food, use renewable energy and promote diversity. To use cradle to cradle in the building industry one important factor is to set up achievable goals. This project is based on the following goals;

The area shall actively increase the air quality both inside and outside and air leaving the building shall be cleaner than when it entered.

Water is to be seen as a valuable resource and taken care of locally. Water leaving the area shall be cleaner than when it arrived.

Materials that are included in the project shall be a part of either a biological or a technical cycle and also be a source of materials for coming generations. The area shall produce more energy than it uses, all from renewable resources.

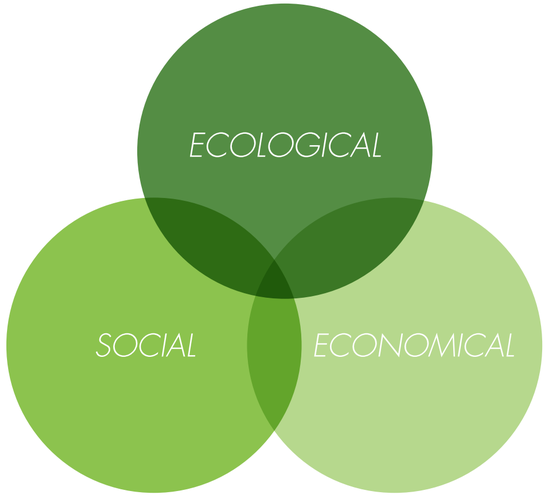
The area shall support and increase the biological diversity on the site.

The area shall attract people from different socio-economic groups and support common activities.

These goals then figured as a guide when designing the area and the result is a proposal where I challenge the regular plot. To promote smaller residences the plot is divided in two parts. One strictly regulated individual building area and a changeable common garden space. A solution which results in a more flexible area over time, where social interaction is fundamental and a more sharing lifestyle encouraged. And by decentralise the importance of the car a more people-friendly environment can take place. Materials used are chosen in order to fulfil the cradle to cradle goals and all energy is produced within the area. This lead to a decreased carbon dioxide consumption for people living within this area, although the number did not reach the level of two tonne per person. Too much depend on life style categories the built environment can not affect. Hopefully the area can contribute to a higher understanding for the importance of sustainability and act as inspiration.

INTRODUCTION

In school, the importance of sustainable development has increased with the years and focus has been on a dense mixed city where work spaces, service functions and dwellings is close to one another and therefor reduce the need for transportation. The fact that apartment buildings are more energy efficient with less outer wall per square meter is also an argument lifted in school. Since urbanisation is an obvious global trend, with calculations showing that 60 % of the world's population will be living in urban environments in 2030 it might not be very strange (Girardet, 2008). But how does the situation look in Sweden? Sweden is a relatively sparsely populated country with a large amount of the population living in the countryside. The statistics is a bit ambiguous since we on one hand has the fastest urbanisation within the entire EU, but at the same time the population of the countryside is also increasing (Gustafsson, 2012). Also, Sweden has the largest part of the population (56 %) living in middle regions, in between metropolitan and countryside, compared to the rest of the EU. The numbers does not really sum up, but one reason for Sweden urbanising so quickly is the fact that over one third of the increased population in the metropolitans is because of immigration from abroad (Magnusson, 2012). We can thus conclude that urbanisation is not done at the expense of rural areas, and the Swedish countryside, is in other words very much alive. The need for sustainable development even in smaller municipalities is therefor as important as the sustainable dense city. I grew up in small town myself, with 9000 inhabitants in the entire municipality, of which 6000 in the main town. There, the conditions for a mixed city, as we learn in school, does not quite exist. The few shops there is, has to fight for survival in competition with shopping malls and chain stores in nearby larger cities. It is not the apartment buildings that dominates the city, instead it is mostly made up of single family homes, villa areas. This is something that most often is considered unsustainable since it is usually synonymous with car dependency and lower energy efficiency (Markensten, Karlsson and Wallander, 2013). Yet, the dream of the villa is strong and more than six out of ten young adults want to live in a villa (Carlsson, 2012), and it's not unreasonable to guess that this number is significantly higher in smaller towns and rural areas. Most of my friends still living in the areas around Hjo have now bought a detached house, singles as well as families with children. And though many smaller rural towns reduce their population, or possibly only increases by a few people per year, many municipalities try to attract new residents with newly built residential areas in scenic locations, often on former arable land. At the same time we are facing major global issues with a strong increase of the population who depend on today's industrialised food production where the dwindling supply of oil is a big problem. Land will become an increasingly valuable resource both to build homes on but also to produce food for the growing population.

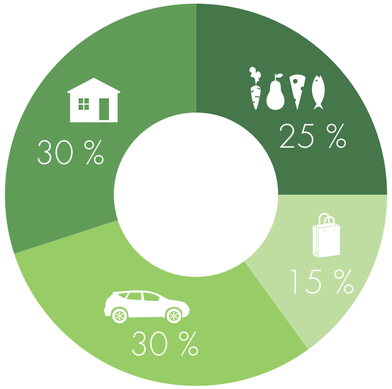


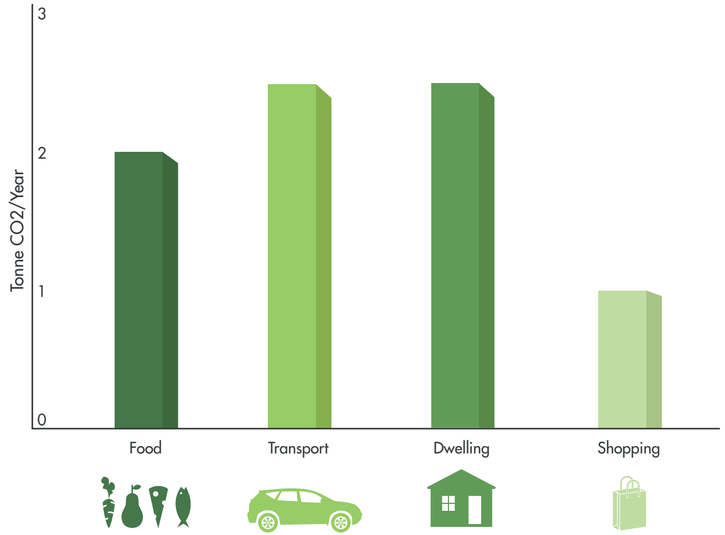
SUSTAINABLE DEVELOPMENT

When we talk about sustainable development, it is usually based on the definition used in the UN report from 1987 "Our Common Future" or the Brundtland report as it is often referred to as. The definition reads: "Sustainable development is development that meets the needs of the present without comprising the ability of future generations to meet their own needs." (Our Common Future, 1987). UN and the World Wildlife Fund developed the definition further until 1991 when following definition was presented: "Sustainability is improving the quality of human life while living within the carrying capacity of supporting surrounding eco-systems" (Boverket and Naturvårdsverket, 2000). Sustainable development is something that the world's politicians continually discuss on various climate conventions around the world. At these meetings has for instance the Kyoto Protocol been developed, a binding document where all nations who signed up has agreed to collectively lower their carbon dioxide emissions (Nelson, 2014). The concept of sustainable development includes three different dimensions, ecological, economical and social sustainability, where all three aspects are equal important and interconnected with each other.

The building industry accounts for 40 % of the world's total energy and resource consumption, 25 % of fresh water usage and one third of all greenhouse gas emissions (UNEP, s.a). The built environment stands for a large part of our climate issues. In my opinion, the major part of the sustainability discussion in the building industry is focused on energy efficiency and other money saving solutions, it is all from solar panels, better insulation, less and smaller windows to different certifications like BREEAM, LEED and GreenBuilding etc. Within the smaller housing industry the most debated solution is the concept Passive house, where the aim is to reduce the energy use of the building by making it as impenetrable as possible and then make use all of the excess heat from the inhabitants and all electric devises in order to heat the entire house (Passivhuscentrum, 2014). Though there is some people that are sceptical about the passive house solution since it is very dependent on technical solutions and often dependent on non environmental friendly materials (Bokalders, 2013), and there are a few other systems that are more focused on a circular flow, as for example Cradle to cradle and Active house.

DEPLETION OF THE EARTH'S RESOURCES

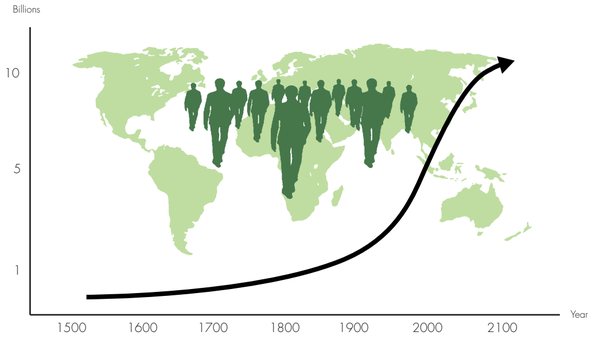




According to WWF we have emitted more carbon dioxide per year since 1956 than the earth's eco systems are able to handle in order to keep our climate stable, and it is increasing every year. We can already see the effects, more and more violent storms, floodings, drought, crop failure and extinction of species. Those who suffer most are developing countries where they are still struggling to meet residents' basic needs. Here in Sweden we are emitting 17 % too much greenhouse gases, and then the energy used in the production of imported products is not included, which means that this figure is actually much higher. So even if we, on paper, are doing quite well and is one of the leading countries within sustainable development, one can say that we are exporting climate destruction, as hazardous waste and pollution in other parts of the world. Of all our emissions, three quarters is released from the private households, where energy, transport and food stands for the highest emissions. We choose to live much bigger, drive much more than we did before and eat, mostly more meat, but also more in general. Looking on carbon dioxide alone, transport and energy is the biggest problems within the households, but since food also accounts for large emissions of methane, it also constitutes one of the major problems (WWF, 2008). According to the Environmental Protection Agency we are emitting about 8 tons of CO2 per person per year within the households and by 2050 we should have reached down to a level of up to 2 tons of CO2 per person per year (Naturvårdsverket, 2008)

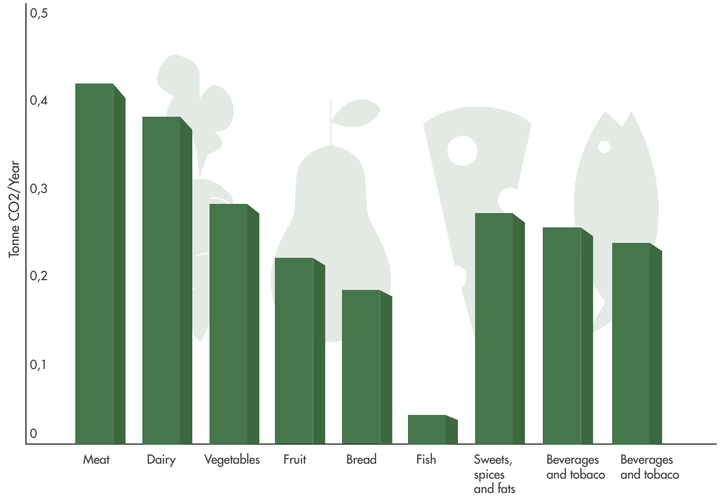
Ecological footprint

Apart from emitting too much carbon dioxide, we are living beyond our means when it comes to many natural resources. The oil is running out, large areas of the world has a shortage of fresh water and we devastates large areas of rainforest in order to produce cheap food. By figuring out how large areas of land and ocean that is required to produce what we consume and how much green space that is needed to offset our carbon emission we can calculate how large our ecological footprint is and thus how many global hectares is spent per person. As we live today, it would take over three globes. Since many developing countries have a much lower footprint than us in the Western world, the figure is held down. If everyone lived like they do in the U.S., we would need more than five globes (WWF, 2013). In the next pages the largest areas Food, Transport and Dwelling will be presented.

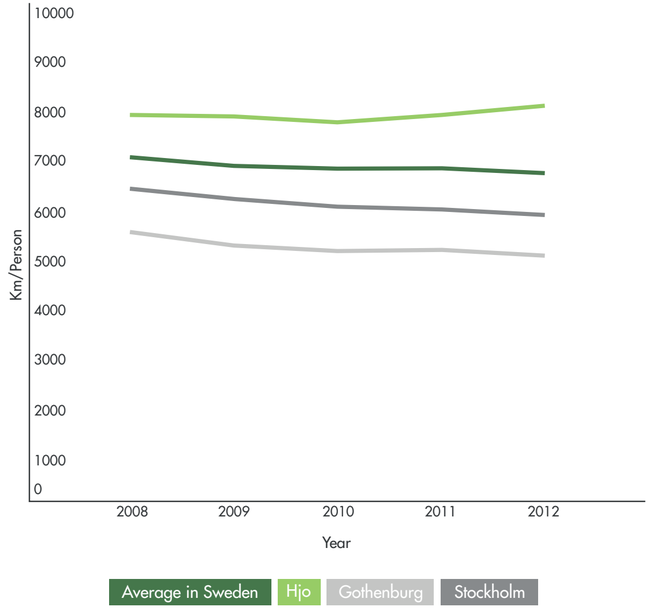


FOOD - GLOBALLY

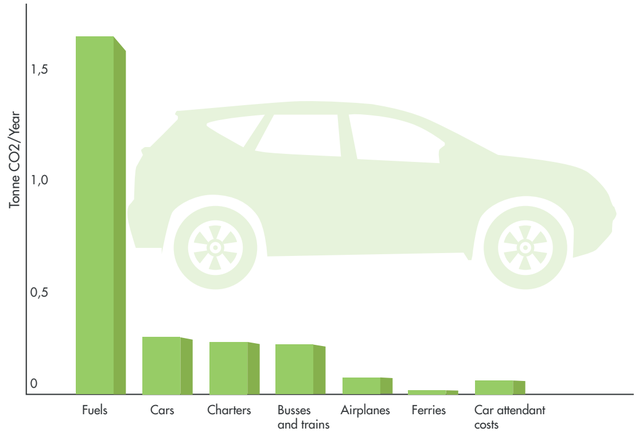
Food is now cheaper than ever and in large parts of the Western world, obesity is an increasing problem (Heinberg, 2007). Nevertheless about 840 millions of the world's population is suffering from starvation (FAO, 2013) and the population is expected to increase dramatically until 2100 and then level off at about 11 billion people (UN, 2012). The food is distributed unequally and whilst there will be more and more people to feed, agriculture will face a number of difficulties. Richard Heinberg (2007) describes four major areas of concern. First, agriculture is a major consumer of oil in the form of agricultural machinery and fertiliser manufacturing. In the U.S., agriculture alone accounts for 17 % of the energy consumption, and with a dwindling supply of oil the prices of fuel will rise shockingly, which in turn will lead to more expensive food. In addition, the production of biofuels as a substitute for oil use large areas of valuable farmland. Second, industrial agriculture have reduced the number of farmers significantly and the middle age within the profession is alarmingly high. The knowledge is in danger of dying out, at the same time as it is more important than ever with the major challenges that the oil shortage causes. Thirdly, the increasing scarcity of fresh water is also a major threat to the water consuming industrial agriculture. In the U.S. agriculture uses up 60 % of the total water consumption. The fourth and final major problem that Heinberg refers to is that climate change will not only mean a few degrees warmer average temperatures, but also much more uncertain and unpredictable weather conditions with ever more violent storms, which will lead to an uneven crop. Some years the storms will destroy entire harvests (Heinberg, 2007). As the food shortage is becoming increasingly apparent, several rich countries have begun to settle agreements, often with poorer countries, to rent or buy land in order to secure food supply to their people. This often leads to destruction of rain forests, which in turn may lead to a lower capacity to tie down carbon dioxide than we have to today, and this could accelerate climate change even further (Brown, 2009). In other words, the western world secures its food production in countries where the population growth will be much greater, so that they will not be able to grow food for their own survival.



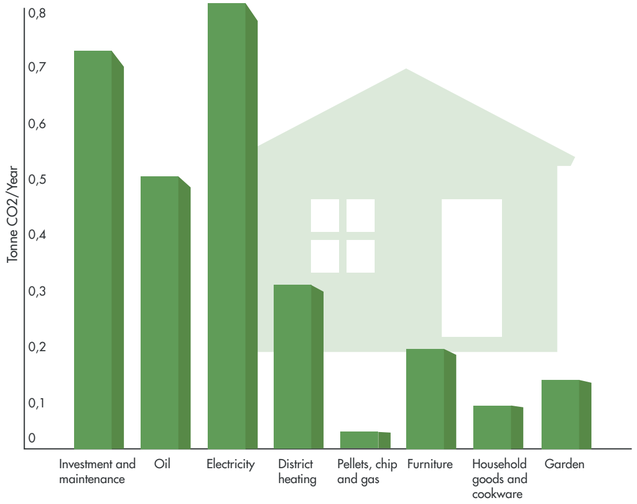
It is difficult to say how Sweden will be affected by climate change , but as in the rest of the world, we see that the numbers of farmers decreases since the farms are getting bigger but on the other hand, the total acreage of arable land is decreasing (Johansson, 2011). Between 1996-2005 3430 hectares of agricultural land was exploited, partly for roads, but mainly for building shopping malls and villa areas (Sandblom, 2010). Our arable land is gradually decreasing even though we can no longer support ourselves with food. As we live today, we need 0,41 hectares of land to provide a person with food, but we only have 0,3 hectares of arable land per person left (ibid). This means that we depend on imported food to supply one quarter of the population. Meanwhile, Scan terminates agreements with Swedish pig farmers as there is no longer sufficient demand for Swedish meat (Nygård, 2014). That we, on top of that, import nearly 40 % of our food (Regeringskansliet, 2006) and that households throw away 30 % of their bought food (Peterson, 2011) does feel pretty absurd. In addition, Sweden has about 2,6 million gardens, of which 1 780 000 belongs to permanent housing, and the remainder are spread over cottage gardens and allotments. In total these gardens cover 320 000 hectares (Björkman, 2012) which could produce food to 4 million people (Andersson, Andemo, Guamán, 2008). 500 m^2 is enough to provide four persons with vegetables for an entire year (Linde & Granefelt, 2014). That, according to Björkman (2012), gardening is the second most common leisure activity outdoors, only beaten by walking, also indicates the huge potential in our gardens. The cultivation culture has in just the past 60 years gone from being pretty rectified between professional growers and leisure growers, they cultivated the same type of crops and mostly for local consumption. But during World War II, cultivation became increasingly mechanised, while leisure gardening began to focus more in appearance and ornamental plants. Today, however, we see an increased interest in self-production of food due to the environmental debate that is becoming increasingly intense (Björkman, 2012). If we look at our Swedish gardens, almost half of the surface is covered with lawn (Rur, 2010) and there a great potential is lost. The Swedes food consumption of today accounts for about 25 % of private household carbon dioxide emissions (Naturvårdsverket, 2008).



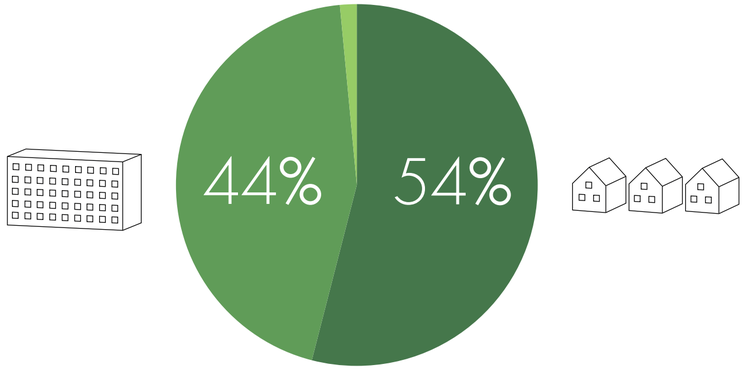
TRANSPORT



According to the Environmental board transport accounts for 30 % of the private household's carbon emissions. Mostly it is the consumption of fuels used for private cars that emits the most, but the energy used for production of cars is also something that affects the annual carbon emissions. Other topics that are relatively high are charters with their airplane travels and public transport where busses are the highest polluters (Naturvårdsverket, 2008). And even if there are statistics showing that we are slowly decreasing our travels with private cars (RUS, 2012) the amount of travels has increased with 70 % since 1970 (Trafikverket, 2013). The way and amount we travel differs depending on where we live. In the countryside public transport is most often decreasing, several bus routes are being retracted, this on behalf of increased public transport in the metropolitan regions (Andersson, 2013). This makes people living in the countryside forced to travel more with their private car. Statistics show that even if the number of kilometres per car does not differ that much from metropolitan regions to countryside regions, in fact cars within Stockholm and Gothenburg have a higher annual mileage than the average car in Sweden, the average traveled kilometer per person is significantly higher in the countryside (RUS, 2012).



The dwelling accounts for 30 % of the Swedes' carbon emissions. Here it is the household electricity that emits the most closely followed by the energy used for construction and maintenance. The third largest category is oil and that refers to oil used for heating. This category is rapidly decreasing and has only in a couple of years become half as large as it used to be. Instead the category of district heating is increasing (Naturvårdsverket, 2008). These two categories together with pellets, chips and gas accounts for higher carbon emissions than construction and maintenance, energy used for heating and electricity is therefore, by far, the largest emitters. According to a report from the authority of energy, apartment buildings has a higher energy consumption per square meter than detached single family houses (Energimyndigheten, 2013) But on the other hand the size of the entire home is often larger in a detached house (Markensten, Karlsson & Wallander, 2013) and therefore the total energy consumption per household and person can be larger when living in a detached house. Another parameter to consider is the amount of fossil fuels used for heating and electricity which most often is higher in a detached house, due to heating through oil or direct acting electricity. Detached houses is the most common housing form in Sweden with 54 % of the population living in a one- or two-family home (SCB, 2012). In metropolitan regions this number is significantly lower and most people live in apartment buildings but in other regions which mostly consist of countryside the detached house is the most common way of living (SCB, 2013). And with 34 % of the population living in the countryside (Jordbruksverket, 2013) I will look further into the detached house in the next couple of pages.



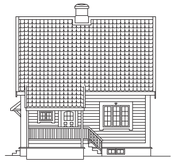
THE DWELLING - THE DREAM ABOUT THE VILLA

According to surveys, 63 % of young adults wants to live in a villa, and that number is significantly higher in regions without a metropolitan (Hedmark, 2013). And with over half of the population living in detached houses there is an obvious desire to live in a villa or a two-family house, but why is this so? On various forums, living in a villa versus living in a flat is discussed, and the strongest reason to stay in a villa seems to be the private garden and not have to worry about disturbing or be disturbed by neighbours (Familjeliv.se, 2009). Annika Almqvist (2004) tries, in her thesis, to pinpoint the dream of the own house and points to several factors. Among others, she goes back historically, noting that the dream has been different for different classes, where the working class has seen the villa as something of a life project where the family was the centre and gave a meaningful leisure time, though, and perhaps because of that, it could be financially difficult for them. While more educated did not have any financial difficulties but the question was more about acquiring a reason, like having children. Almqvist also points out that the home in many cases is a love project and a free zone, where one's house is considered easier to design in a more personal way than today's modern apartments. She also points out that Sweden has a long tradition of staying secluded with our old agricultural roots, but also that the home always has been a central meeting place, that we often invite friends and relatives to our homes rather than meeting them out in town. She also raises the question from a woman's perspective, noting that despite that the arguments for apartment buildings or co-housing is based on women's needs, many women still chose to move with their families to a villa when it became economically feasible in the context of women's big break in labor market (Almqvist, 2004). In addition to this I figure that individualism is a strong reason, where we have a great need of expressing our personalities and be able to recognise ourselves with our home, and here the detached house has very defined frames, what is mine and what is yours. It is simple to explain that I live in that brick house with the flat roof over there instead of pointing to a window on the third floor, fourth from the left. Also it has become something of a norm, the way many of us have grown up.

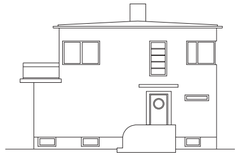
As Björk (2009) describes, the expression "villa" derives from ancient Rome and is the name of the palatial establishments outside the city where the emperor and other important people escaped Rome's dirty and unhealthy environment. In Sweden, the industrial development during the 19th century was rapid, and more and more people moved from to countryside into the cities, also here, the villas became a refuge to escape the unhealthy city where there was neither clean water or a sanitary sewer system. That this exodus from the city would be possible based on the existence of good communications, so that the male breadwinner could get into the city for work. This was something that influenced the location of villa areas until the 1960s, when a private car had become more or less a standard. In Sweden, the development of the villa can be derived from two different historical references, the mansion for the high society and the cottage for the working class. Sweden's first villa area, Djursholm, outside Stockholm, well situated with both a train and a steamer connecting to the inner city, was luxurious and as many other villa areas from the early 20th century, it was built by private investors for the upper class. Segregation was something that was considered both natural and best for all parties. The garden city was launched during the first decade of the 1900s and was inspired by previous English and German examples. This was also the beginning of planned residential areas for the working class. Enskede is one early example of the garden city, where the workers of a new abattoir would live. In the beginning garden cities mostly consisted of row-houses, but came later to mostly consist of individual houses. The intention of the garden city as a working class residential area did not turn out as planned as it became too expensive to live there, instead these areas was populated with officials. At this time emigration was a major problem and in order to prevent good working force from leaving Sweden, a house mortgage loan fund was introduced in 1904, which made possible for workers to build small villas called "egnahem" in the cities. There are several characteristic areas of "egnahem" around the country from this period (Björk, 2009). They had a large focus on horticulture and worked as a production unit, where the household grew their own vegetables in the garden, almost as the old cottage. During the 1930s, the policy changed and instead of focusing on "egnahem", apartment buildings became the new norm. The expression "egnahem" eventually disappeared and was replaced by and merged into the villa (Jonsson, 1985). As the middle class grew, the number of villa areas increased, and already in 1910, large parts was prefabricated and marketed in villa catalogues. Style wise, we can today see that the styles followed one another quite closely in the first half of the 1900s with the 1920s classicism, the functionalism of the 1930s and 1940s and the somewhat freer architecture that permeated the 1950s. In the late 50s and throughout the 60s and 70s the building of villas increased dramatically, due to governmental subsidies, and was now built collectively in small areas with a uniform and production friendly architecture (Björk, 2009). When we today speak of the million programme, that permeated the residential building market during this period, we mostly speak about the large apartment buildings in the outskirts of the cities. That there from 1950 until 1980 were built 800 000 homes in small houses of which 600 000 in single family houses, there are few who think of (Jonsson, 1985). The single family house is and has always been the countryside's and smaller conurbations most common form of housing and in the 60s and 70s they also reached the outskirts of larger cities. During the 1980s the collectively built areas decreased and instead individualism ruled with individual catalogue houses built in different areas. After the real estate crisis in the early1990s, few villas were built and it didn't increase again until the early 2000s. Now totally without subsidies and only funded by private investments. During this period the building of villas took two different paths. Collectively built areas designed by architects does have a more new-modernistic design whereas catalogue housing areas more often consists of historicised villas, and despite that new-modernistic architecture strike through during the first decade of the 2000s, catalogue house companies sold more historicising villas in 2009. Notifiable is also that the living area is increasing during this period (Björk, 2009).

1890s

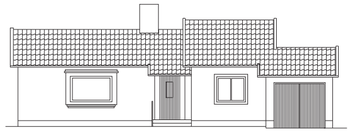
1910s



1930s



1950s



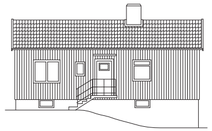
1970s

1990s

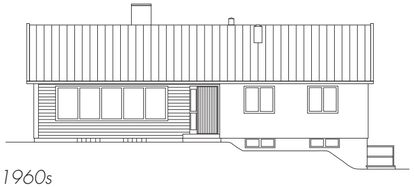
1900s

1920s

1940s

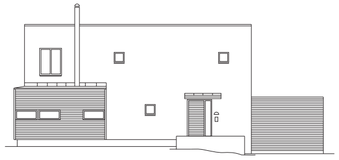


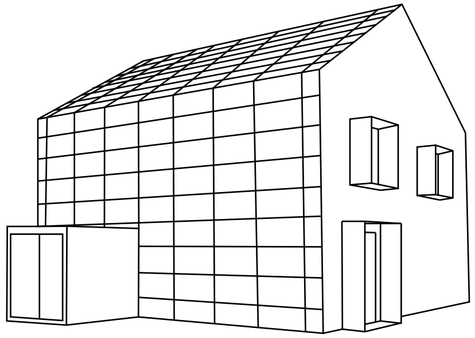
1960s



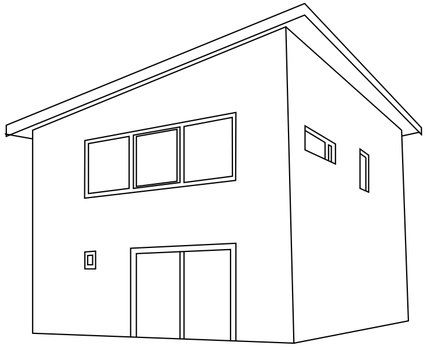
1980s

2000s





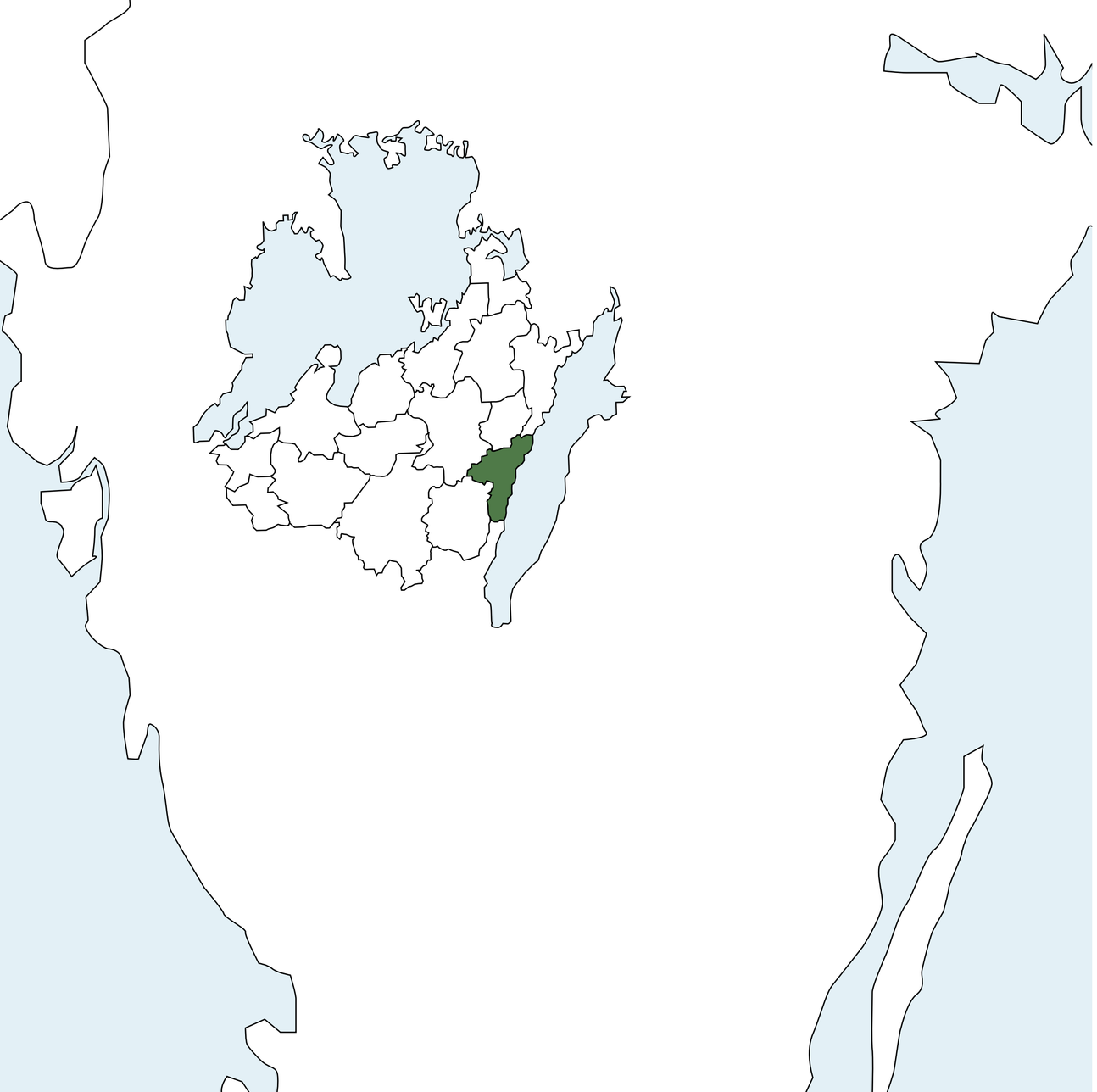
Bright living - One tonne life



Sunda huset - Healthy house

How the future will look for detached houses is of course impossible to say with certainty. But i believe there are two different main paths of development we can predict. First, the high tech solution. This is where passive houses and plus energy houses fit in, they depend on technical solutions, everything from solar cells to energy efficient equipment and electricity meters to reduce energy consumption during the buildings operational phase. And in some cases produce more energy than it consumes. One example of this is the Bright Living house that was used in the One tonne life project which was held by the housing company A-hus, electricity company Vattenfall and Volvo in order to see if a family could cut down their carbon emissions to a sustainable level of one tonne carbon dioxide per person and year (Vattenfall, 2011). The second path, what I will call Healthy homes has a larger focus on the buildings entire life cycle and value healthy materials that don't emit any hazardous chemicals or demand a lot of energy to produce. Excluding toxic materials also minimise the need for ventilation and thereby reduces the energy consumption significantly. One example of a healthy home is "Sunda Huset" built by Felicia Oreholm and she has consequently avoided chemical hazardous building materials (Kloka hem, 2013). These are the two main paths I believe we will see more of in the future and also perhaps a combination of both of them.

THE SITE



HJO - TODAY

Hjo is located in Västergötland and has about 9000 inhabitants in the entire municipality of which about 6000 lives whitin the main town and the population have in the last 10-15 years been relatively stable (Hjo kommun, 2014). 67 % of the inhabitants live in one- or two-family houses (SCB, 2014) and the average size of one household is 2,16 persons compared with the average in Sweden of 2,22 persons per household (SCB, 2014). In north the municipality of Hjo borders towards Karlsborg, in northwest towards Tibro, in west towards Skövde, which is the closest larger city, in southwest towards Tidaholm and in south towards Habo. Jönköping, which is significantly larger than Skövde is located 70 km south of Hjo. Public transport in Hjo is mostly concentrated to the bus that goes to Skövde, where you can travel further with train towards Gothenburg and Stockholm. Within the city, you move around by foot, bike or by car. Distances are like in most other small towns very short.

That I chose to work with Hjo and this site is partly due to my personal connection, but most of all, Hjo is to bee seen as a typical Swedish town on the countryside with the same opportunities and problems that many other small towns are facing.

HJO - HISTORY

Hjo is a small town located on the western shore of lake Vättern with roots back in the 12th century when the monasteries of Västergötland used Hjo as the port to get to Östergötland. However, it took until 1413 before Hjo is mentioned as a town. Hjo has a classic medieval town plan, even though no buildings remain from that era. In the 19th century Hjo was developed into a craftsman city with more artisans than both Skövde and Falköping. The buildings in Hjo has always been mostly out of wood, and apart from a fire in 1794 when the church and a few surrounding blocks was destroyed, the city seems to have escaped any other bigger fires. The town was for a long time very small with only about 350 residents, but in the second half of the 19th century the population rose drastically due to the new railroad, a new port and a water sanatorium. This population growth lead to a brand new neighbourhood north of the river in the beginning of the 20th century. It was called Nya staden - New town and is a classic grid city with magnificent villas, albeit somewhat fragmented since the area was developed during a long time. Simultaneous with the increasing number of industries a new home croft area was developed northwest of the new town. As the population increased dramatically during the first decade of the 20th century, Hjo grew a lot during the first decades. Now in areas as Söder, Vekagärdet and Orrelyckan, and at Västermalm another home croft area was developed on the initiative of Hjo Mechanical workshop. In the 1950s and 60s Hjo's geographical area did not increase very much, instead empty lots within the city was developed. In contrast, the city expanded drastically in the 70s and 80s and the surface of the town was roughly doubled during this period when the areas of Lundby, Andersfors, Hammarsjorden and Borrbäck was developed in a for this time typical way, collectively built villas (Hjo: Byggnadsnämnden 1986). The city centre is strongly influenced by the 19th century's appearance and has been preserved through the years, this resulted in 1991 that Hjo was awarded with Europa Nostra's medal of honour for the preservation of the wooden town Hjo (Ylander, 1993).

Buildings facing the square

City church facing the square

Old villas from the turn of the century, City park

Hamnbacken - one of the main roads through the city centre

The harbour area

The harbour area

Older residential area - Hantverksgatan, old city centre

Large villa from early 1900s - Floragatan, Nya staden

House in the home croft area of Västermalm - Hemvägen

Collectively built villas - Vargstigen, Lundby

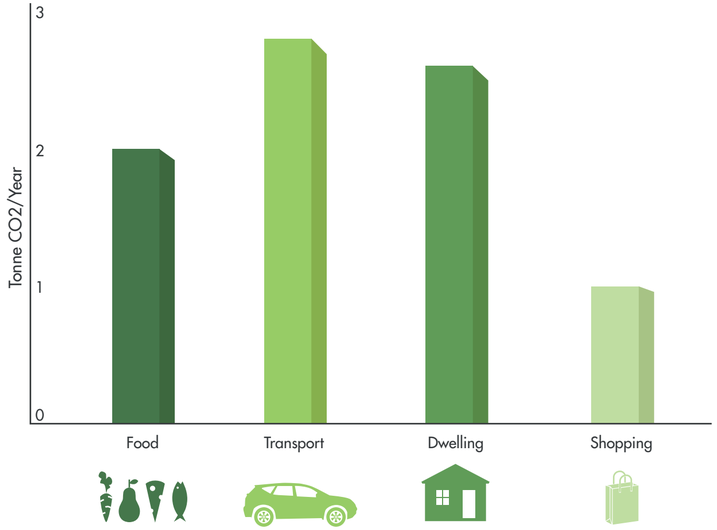
Collectively built houses - Mellanvägen, Hammarsjorden

New villas next to Knäpplan - Estrid Ericsons väg, Sigghusberg

KNÄPPLAN

The plot that is being considered for my project is former farmland that belonged to the farm of Knäpplan. When Lars, as the last farmer was called passed away, the municipality of Hjo bought the farm, cut off the residential buildings and sold them, and now the municipality plan for development on the various fields adjacent to the town. Phase one includes nearly thirty plots connected to a local loop street, a green area and a new main street, where the municipality hope for the public transport to pass by in the future. Phase two is a pre-school, a green area and a possible junction or roundabout along the main street. The green areas that are planned in the area is an important feature in order to handle the major storm water problem that exist in the area. The groundwater level is high, only about 40 centimetres down and the land slopes down towards Vättern which result in a need of storm water dikes in order to delay the water before it reaches and stress the municipal storm water system in the lower-lying existing residential areas. In the south the area is bordering to a residential areas built in the late 1970s, and in the northeast to an area that was exploited in the 1960s. Worth mentioning is that the gravel road that runs through the area today is one of the most common walking route in the city.

CARBON CONSUMPTION IN HJO



The average Swede has a carbon emission of 8 tonne per year, as shown earlier. In order to reflect the average citizen of Hjo the numbers need to be adjusted a little bit. the categories Food and Shopping will be assumed to be the same, dwelling will increase a little bit based on that Hjo has a higher percentage of detached houses than average and thereby probably a larger energy consumption. Since the number is 13 % more detached houses than average Sweden another 13 % will be added on the three posts that accounts for heating, this means that another 0,1 tonne carbon dioxide will be added on dwelling. Transport also needs to be adjusted since the average citizen of Hjo travels 20 % further by car than the average Swede. The post of fuels will therefor be increased with 20 % and increase the total transport column with 0,3 tonne carbon dioxide.

MY VISION

Based on this background the aim for my project is to come up with a proposal for further residential development in the area of Knäpplan. Where sustainable development is the point of departure and to examine if it is possible to create an area that can compensate for the more car bound and more energy demanding lifestyle you most often have when living in the countryside. Can the goal of a maximum of 2 tonne carbon emission be reached? But since carbon emissions is just one part of the world's issues of depletion of resources I also want to focus on circular flows and how the area can be as self sufficient as possible. All this in comparison with the existing plans in phase one.

METHOD

The tools for investigating this subject have mostly been studying of literature but also looking at reference projects, studies of housing typologies and calculations of carbon emissions. I have also been on some field studies, visiting different residential areas within Sweden, both historical and newly built.

Apart from this I have also been looking for trends in housing architecture following magazines and tv-shows about residential architecture. Site specific conditions, possibilities and limitations have been explored through interviews, sketches in plan and sections and model.

FIELD STUDIES

In order to learn more about planning of residential areas I have visited a few different areas. Some older and some newly built. Notifiable for all of these areas are how dense they are in comparison with the existing plans in Hjo. Also I found the different garden layout interesting, with the old home croft areas of Landala and Ånggården and their small, but private gardens to Pumpkällehagen and Valö Fyr, where there is no border between you and your neighbour.

Landala egnahem

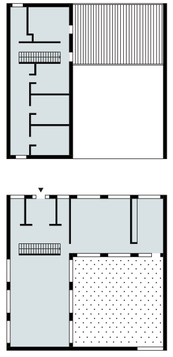
Ånggården

Pumpkällehagen

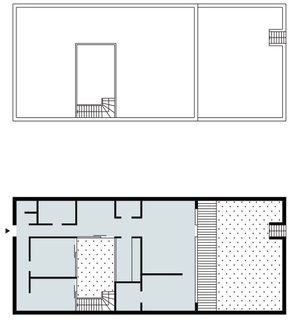
Valö fyr

In order to investigate different housing typologies, I have studied Günter Pfeifer and Per Brauneks Courtyard houses, Freestanding houses and Row houses in their serie of books A Housing Typology.

Courtyards

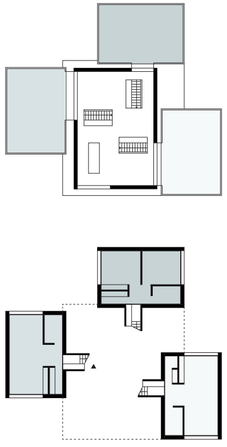


The L-shape gives possibilities for a more private garden and is easily linked to one another for a dense development. Roof terrace on one part allows for both roof gardening and solar cells.

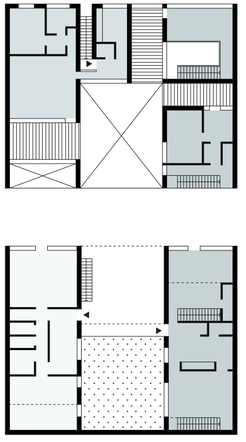


Atriums provide for a private courtyard with a different micro climate. This can compensate for a dense development. In this case with access to a roof terrace that also can compensate for a smaller garden and make use of the view.

Multifamily/Collective

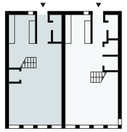


Clear private bottom floor with separated boxes for sleeping and privacy connected to a common second floor with kitchen and living room. In addition each private box house a roof terrace.



An inner courtyard links three different dwellings and allows for lighting from several directions. Here one part of the ground floor can be used as a work place or commercial business.

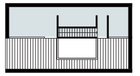
Semi-detached houses

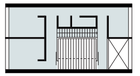


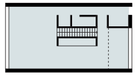
By turning the plan, both dwellings receive light from three different directions.

By having the dwellings on top of each other allow for the same conditions with light from all directions.

Rowhouse

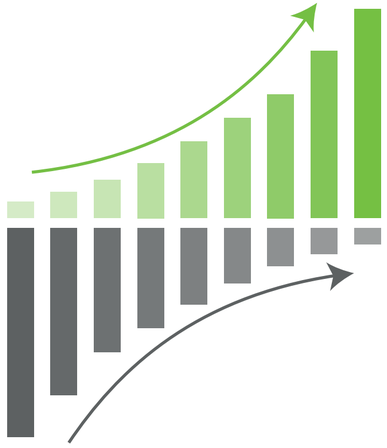






By making an atrium in a row house extra value can be added and compensate for a smaller garden space.

Here the dwellings changes sides and thereby gets the same lighting conditions. Also a third dwelling can be added on the ground floor.



CRADLE TO CRADLE

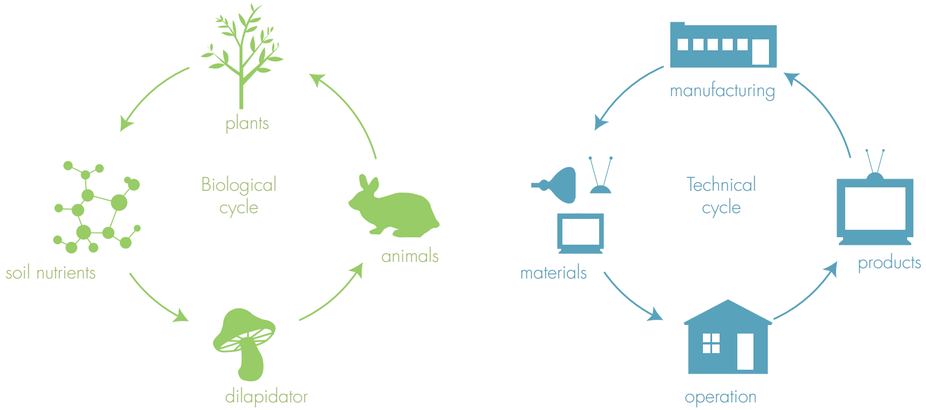
Cradle to cradle [C2C] is a design strategy that was first mentioned in the 1980s by Walter R. Stahel, a German architect who advocated a circular economy, where instead of selling products we should sell the right to use the products services, and thereby make the goods to circulate from cradle to cradle (Product-Life Institute, s.a). The concept was then further developed by chemist Michael Braungart and architect William McDonough during the 1990s and is a counter-reaction to "Cradle to grave" as they call the design paradigm that developed during industrialisation. They find that "cradle to grave" is based on that man's production cycle has become separated from nature's own cycles, that the earth's resources is unlimited and that this is why we face all these climate issues of today. Cradle to cradle is based on that we can be inspired by the cycles of nature and instead of that our production results in emissions and waste, it can actually add something positive to nature. One of the basic philosophies of C2C is to instead of minimise our negative impact on the environment, maximise our positive effects (Guldager Jørgensen, Lyngsgaard 2013).

C2C is based on three basic principals, they are as follows:

Waste = food
In nature there is no waste, instead everything can nourish something else and that is what C2C focuses on. That we instead of focusing on products's negative aspects should try to find other features for it. For example, instead of seeing CO_2 as a problem, we should see it as a resource for plants that consumes CO_2.

Use renewable energy
In nature, all biological processes are driven by solar energy and all solar radiation that hits the earth's surface in one day is equivalent to all the energy the world consumes in an entire year. We should therefore take advantage of the infinite and renewable resources such as solar and wind.

Promote diversity
Inspired by nature's diversity, C2C's third principle urge us to value diversity, whether it concerns nature's own species or human cultures.



Other key concepts of C2C are cycles, both a biologically and a technically, where everything within a biological cycle should be biodegradable in nature and products within the technical cycle should, instead of in the end becoming waste, be re-used in another, or the same product without losing quality. C2C turn away from what we today call recycling since it usually means that raw material drop in quality and eventually becomes waste, only a slower path from cradle to grave. Instead they promote up-cycling where raw materials never lose value, but instead can be reused in another product. Since most products today consists of complex mixtures, it is important, within C2C, to early work with a design that makes it easy to disassemble and separate different materials so they can be included in either the biological or the technical cycle.

GXN, the research department of the Danish architecture company 3XN, and the Danish Cradle to Cradle association Vugge til Vugge have developed a manual of how to apply C2C in the Danish building industry, which largely feels applicable to the Swedish construction process as well. It is based on "Cradle to Cradle Criteria for the Built Environment" by Douglas Mulhall and Michael Braungart, but is somewhat more comprehensive than the original. They argue that there is still no building or project that to one hundred percent can be called C2C, since the selection of C2C approved materials are limited, instead they think that today it is mostly about intentions and to plan for how the building will be upgraded in the future and eventually become 100 % positive. But the starting point of a C2C project is always the intention of a 100 % positive result. It can for example be about a project where the aim is to clean water locally or increase biodiversity. In order to get maximum impact, it is important to formulate the intention as a goal and to set measurable targets. To tell how long the project will have reached by a certain time span, which should not be too long, maximum 20 years since then the same persons will usually be able to follow the whole project and there is no risk for the project to fall into oblivion. They have developed a model for how C2C should be integrated into a project's various phases, and who will be affected by that particular phase, architects, engineers, property developer etc. The first six are already well known phases, programming, sketching, projection, tendering, construction and operation. Furthermore, an additional category which is particularly important in C2C has been added; recycling. This is perhaps the most important phase, where the cycles of the materials and products will be closed (Guldager Jørgensen, Lyngsgaard 2013).

GOALS

These are the cradle to cradle goals I have set up to work with.

Improvement of air quality

The area shall actively increase the air quality both inside and outside and air leaving the building shall be cleaner than when it came in.

Local water cycle

Water is to be seen as a valuable resource and taken care of locally. Water leaving the area shall be cleaner than when it arrived.

Material cycle

Materials that are included in the project shall be a part of either a biological or a technical cycle and also be a source of materials for coming generations.

Renewable energy

The area shall produce more energy than it uses, all from renewable resources.

Increased biodiversity

The area shall support and increase the biological diversity on the site.

Social diversity

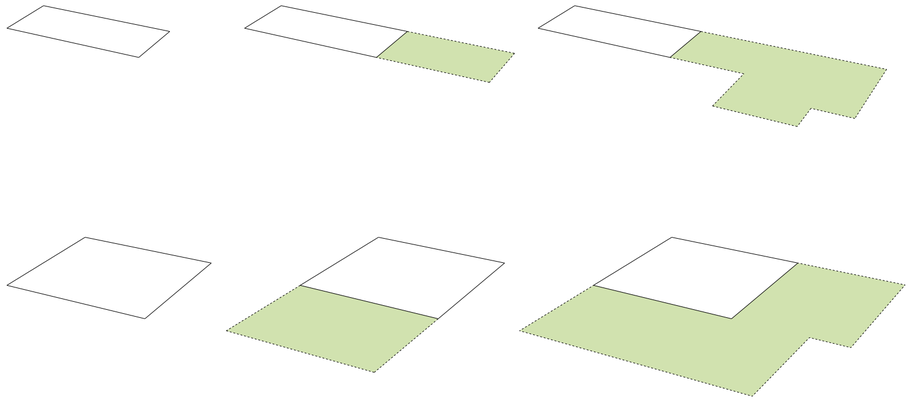
The area shall attract people from different socio economic groups and support common activities.

PROPOSAL

VIEW FROM THE STREET EAST OF THE AREA

PLOT STRATEGY

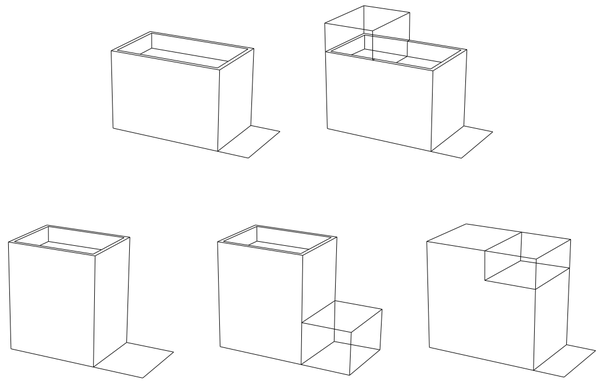
The area has two different plot sizes. One for row houses of 98 m² and one for semi-detached or detached houses of 196 m². The plot is supposed to house buildings and paved area. These plots are then surrounded by green lots that can be connected to a plot in order to provide a green area for gardening. The green lots are commonly owned. This generate a more flexible system than a regular garden and can meet different garden needs in various life situations.



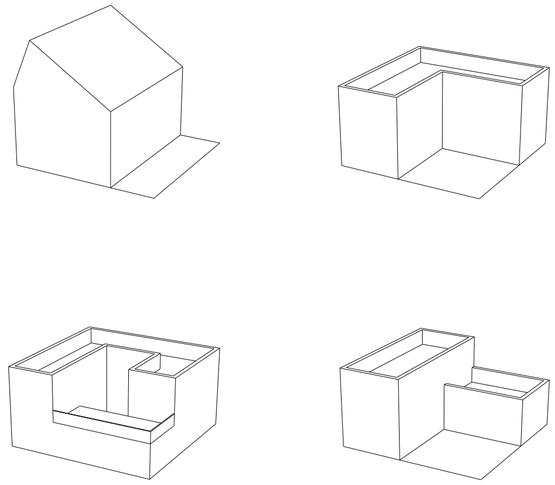
THE BUILDABLE PLOTS

The idea with keeping the buildable plots relatively small is to promote smaller dwellings. If the residents have a wish for a patio, the area for the dwelling house is limited. For the detached houses there is also an option of a future guest house (Attefallsbod). This is some examples of how the different plots can be exploited.

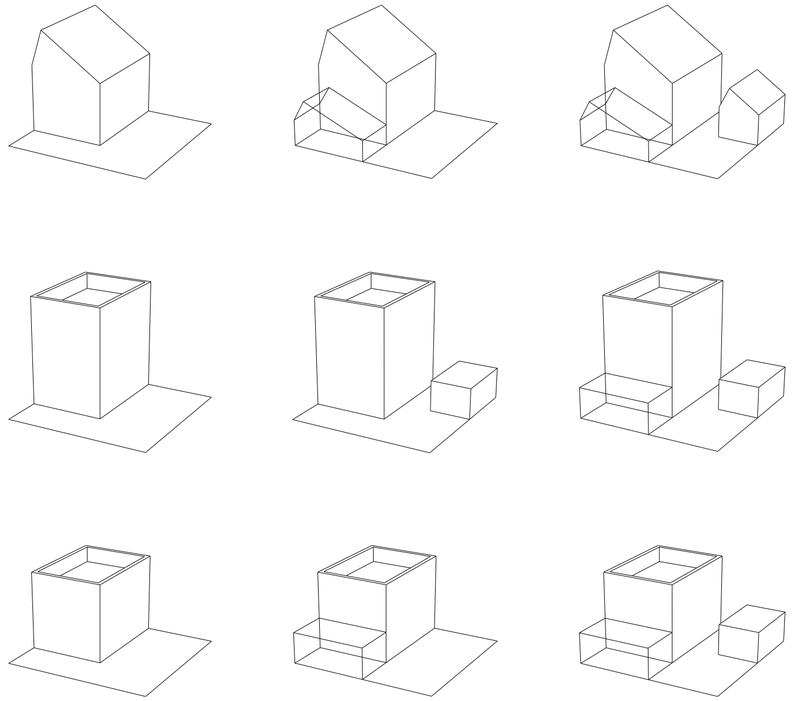
ROW HOUSES



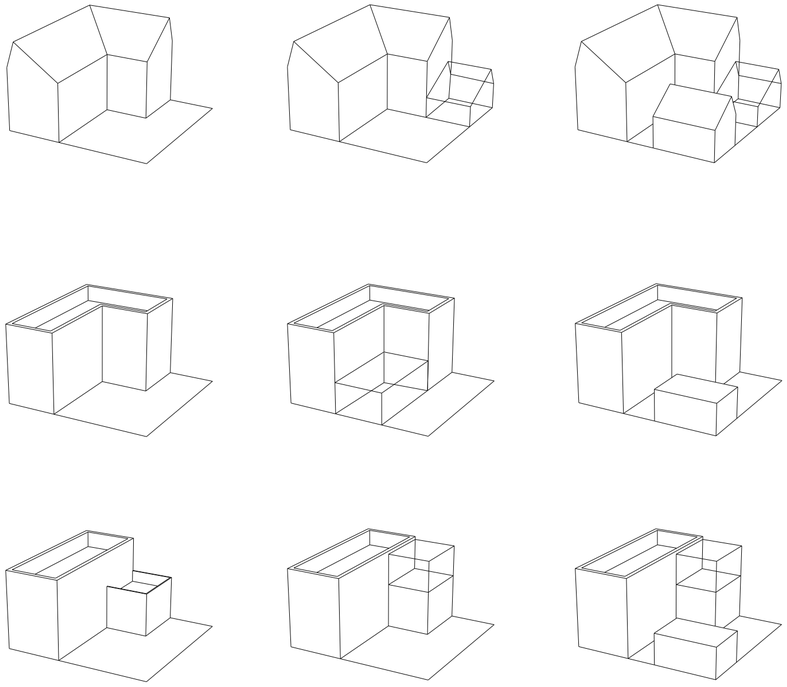
SEMIDETACHED HOUSES



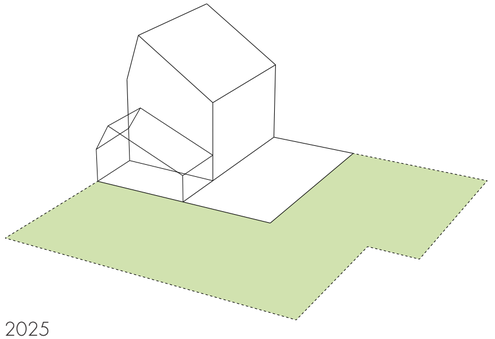
DETACHED HOUSES - RECTANGULAR



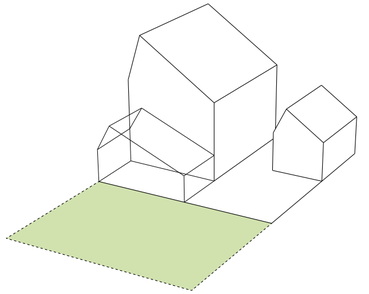
DETACHED HOUSES - L-SHAPED



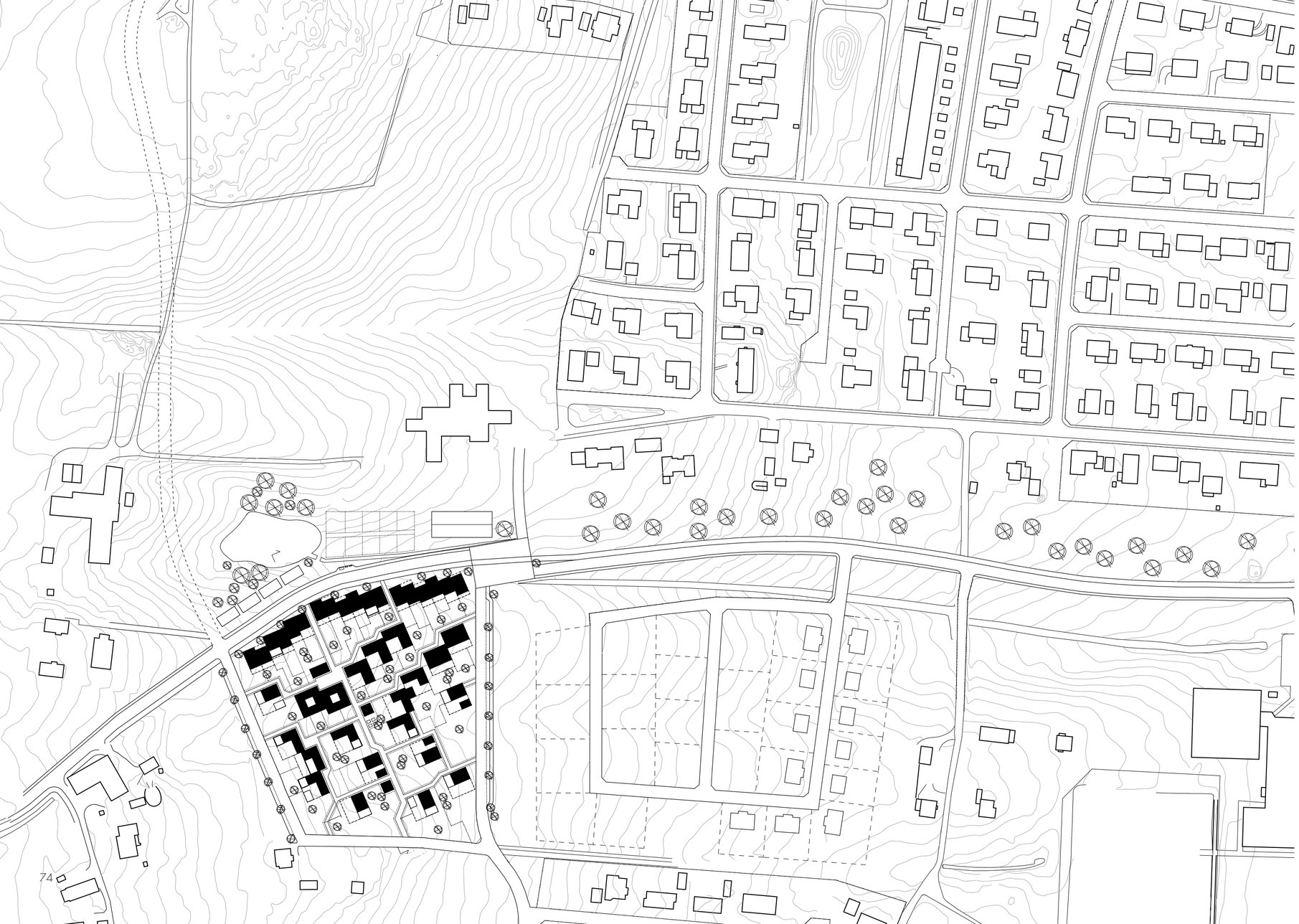
Example of a detached house and its flexible garden.



2025



2045



SITE PLAN 1:2000

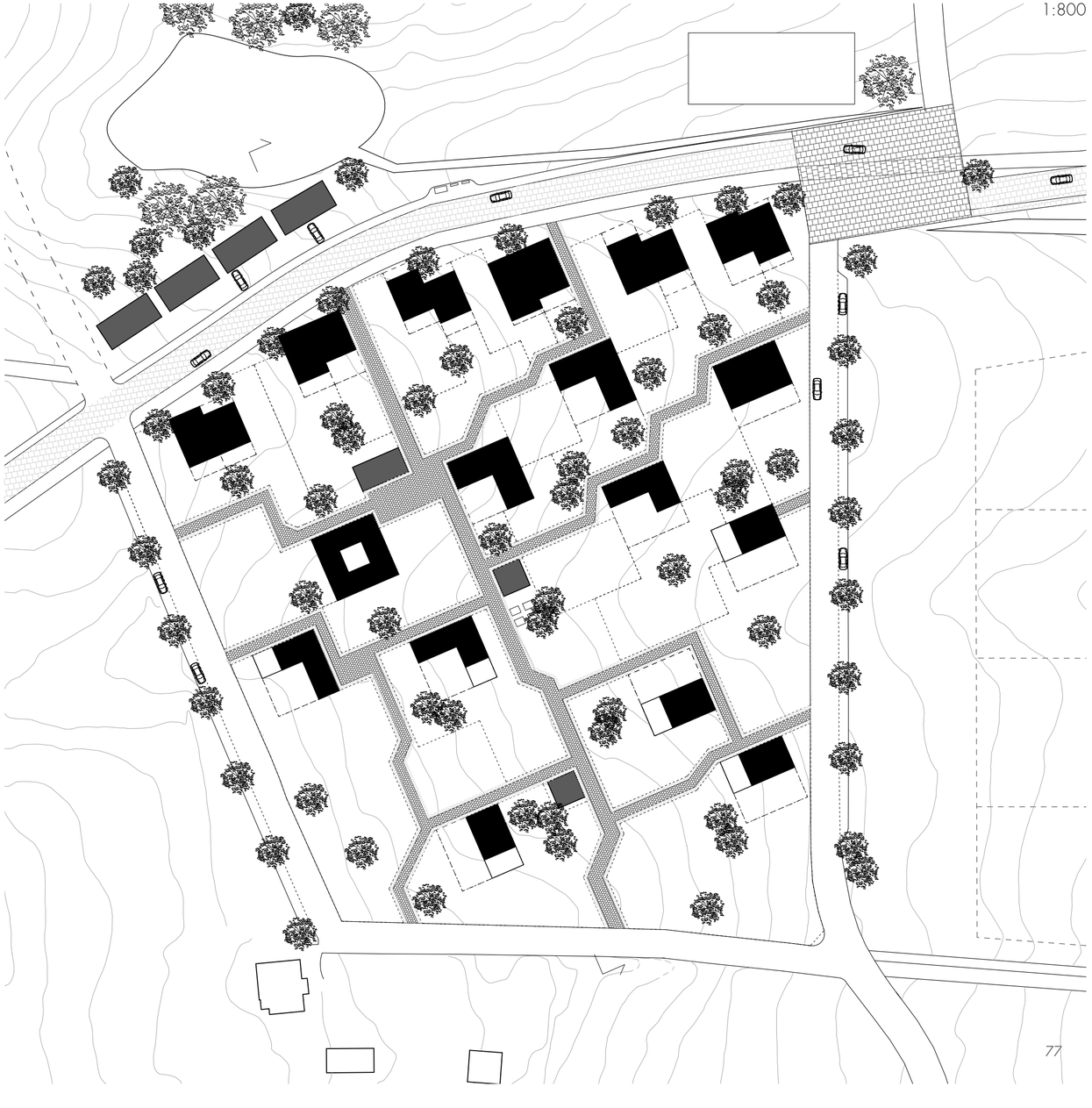
My suggestion for the area propose a more narrow main street that promotes bikes and pedestrians and instead of a roundabout in order to slow down the pace of the traffic I propose a small square where the cars must give way for pedestrians and bikes. In connection with this square is a common greenhouse, open for people passing by and with possibilities to rent some space for cultivation. It is also a possibility for the pre-school to involve in their teaching practise.

My housing area is developed with a denser part with row houses towards the main street and then gradually fading out with detached houses towards the remaining farmland. No cars are allowed inside the area except for occasional events or emergency.

Since the growth of Hjo's population is slow it will take time before the entire area is completely built. The project is therefore divided into three phases.

2025

The first phase consists of a group of twin houses, some semi detached houses and some detached houses. Now the garden lots can be large or parts can be rented out as allotment gardens to residents from other areas. There is one larger common building that can be used for parties or as a guest house and two smaller common buildings housing garden tools and other joint things such as for example larger toys and lawn-movers. Parking takes place along the streets next to the area and a car pool with electricity cars has garages towards the main street. The walking and bike paths within the area has permeable surfaces and the grass next to the paths is being reinforced to handle occasional transport. The central path is also wider to allow waste management to empty the recycling stations.



2045

In the second phase some of the twin houses gets an addition and moves one step closer to becomes row houses, also some more detached houses are being added.

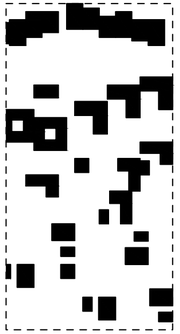
2075

Now the area is being completely built with row houses towards the main street, semi-detached houses next to them and further out towards the farmland, detached houses. The garden lots are now quite small and an area with allotment gardens is added in the green area in the other side of the main road.

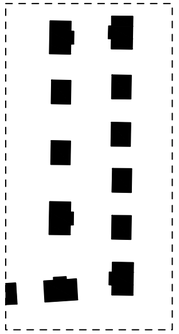
VIEW FROM THE MAIN ROAD

ONE ACRE

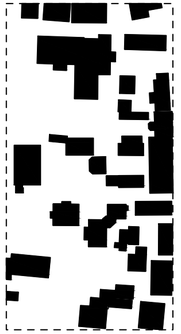
The plot ratio of one acre outcut is here compared with two other parts of the town, Knäpplan, phase one and a housing block, built in the early 20th century, near the city centre.



My area has a plot ratio of 0,44



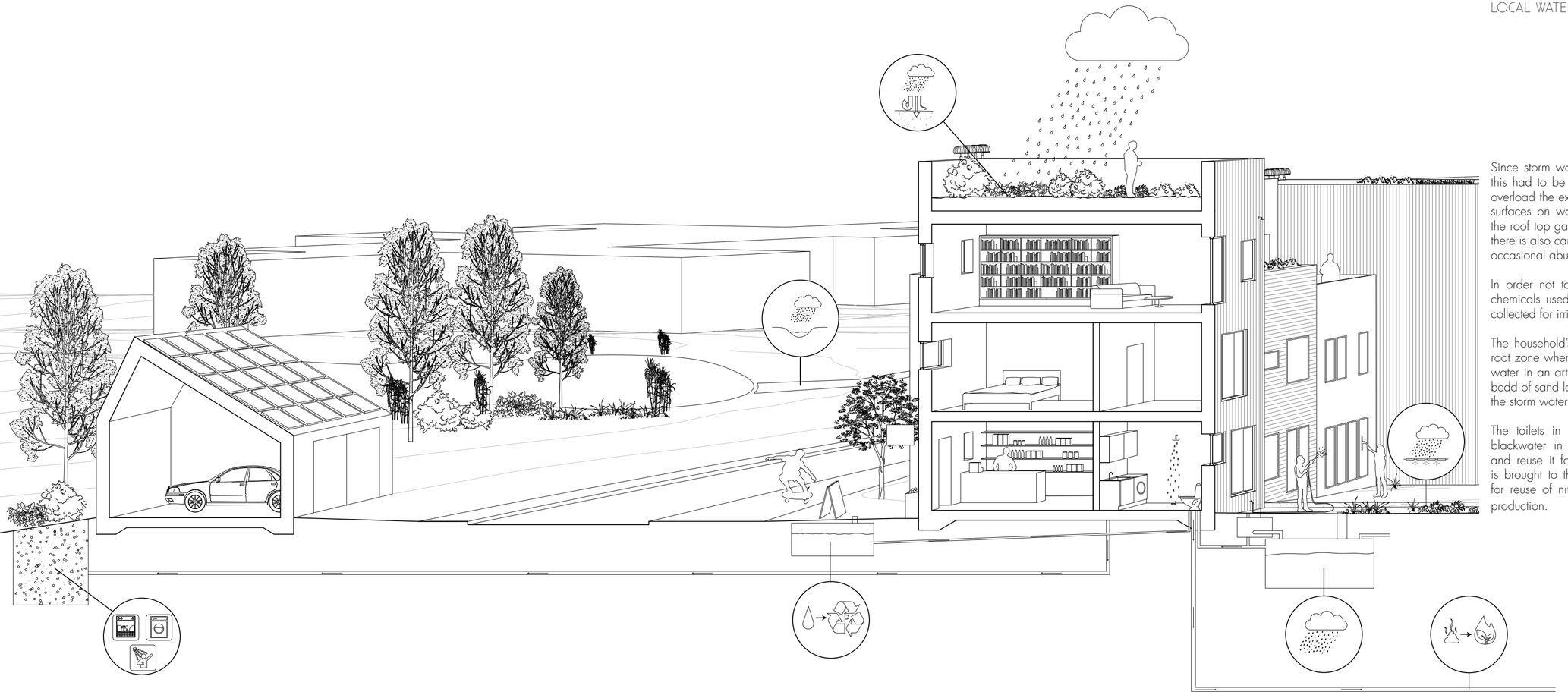
Knäpplan, phase 1 has a plot ratio of 0,17



Central housing block has a plot ratio of about 0,5

VIEW FROM WALKING PATH

SECTION PERSPECTIVE 1:300



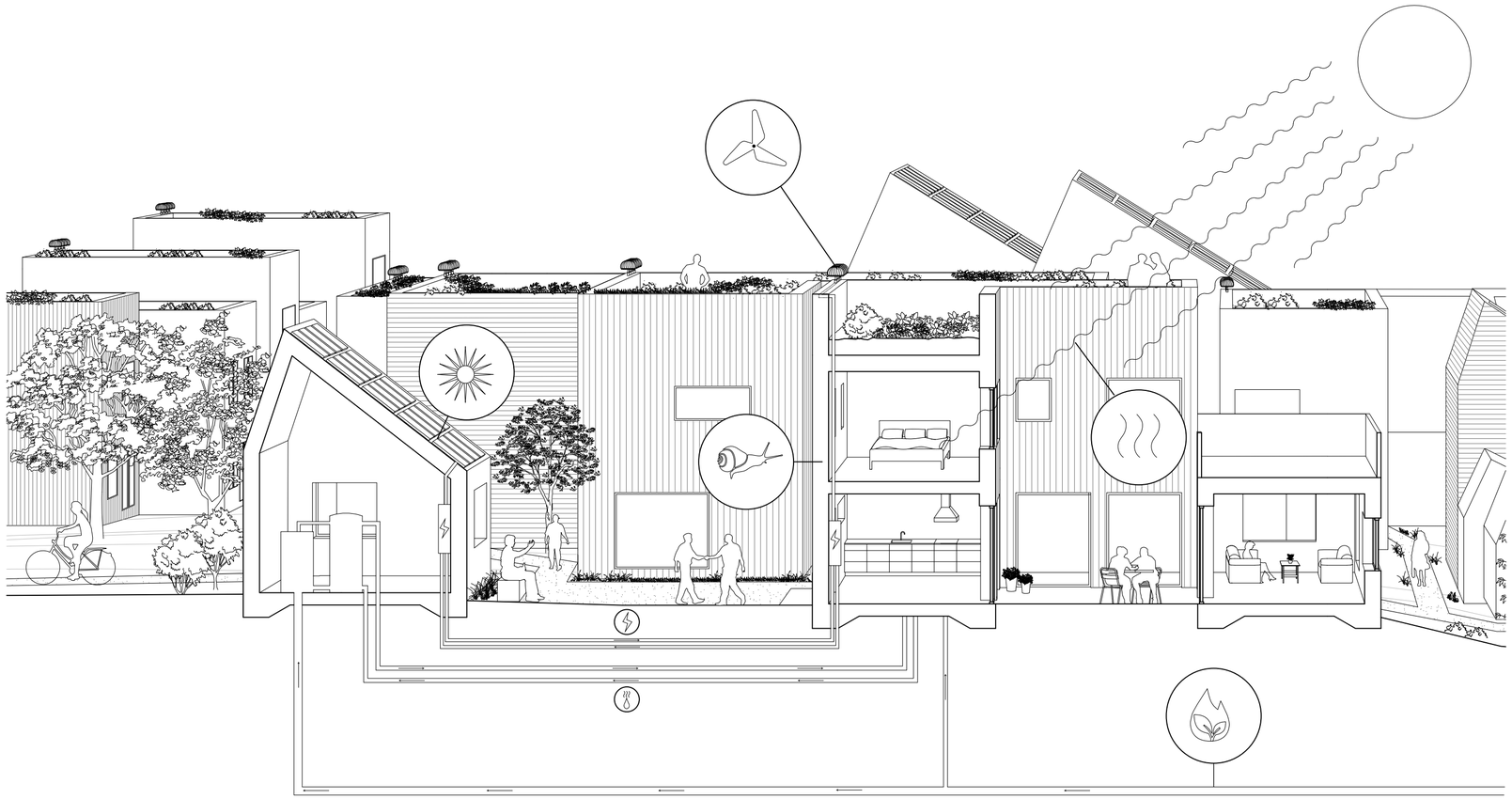
LOCAL WATER CYCLE

Since storm water is a major problem in the area this had to be considered carefully in order not to overload the existing system in the town. Permeable surfaces on walking and bike paths together with the roof top gardens help absorbing some of it and there is also canals in existing swales to take care of occasional abundance.

In order not to waste energy and reduce use of chemicals used when purifying water, rainwater is collected for irrigation and flushing toilets.

The household's grey water is purified locally in a root zone where suitable trees and plants purify the water in an artificial wetland of aquatic plants in a bedd of sand leading into a pond before going into the storm water canal.

The toilets in the area separates the urine from blackwater in order to recycle valuable nutrients and reuse it for fertilising whereas the blackwater is brought to the bio gas plant on a nearby farm for reuse of nitrogen and phosphorus and energy production.



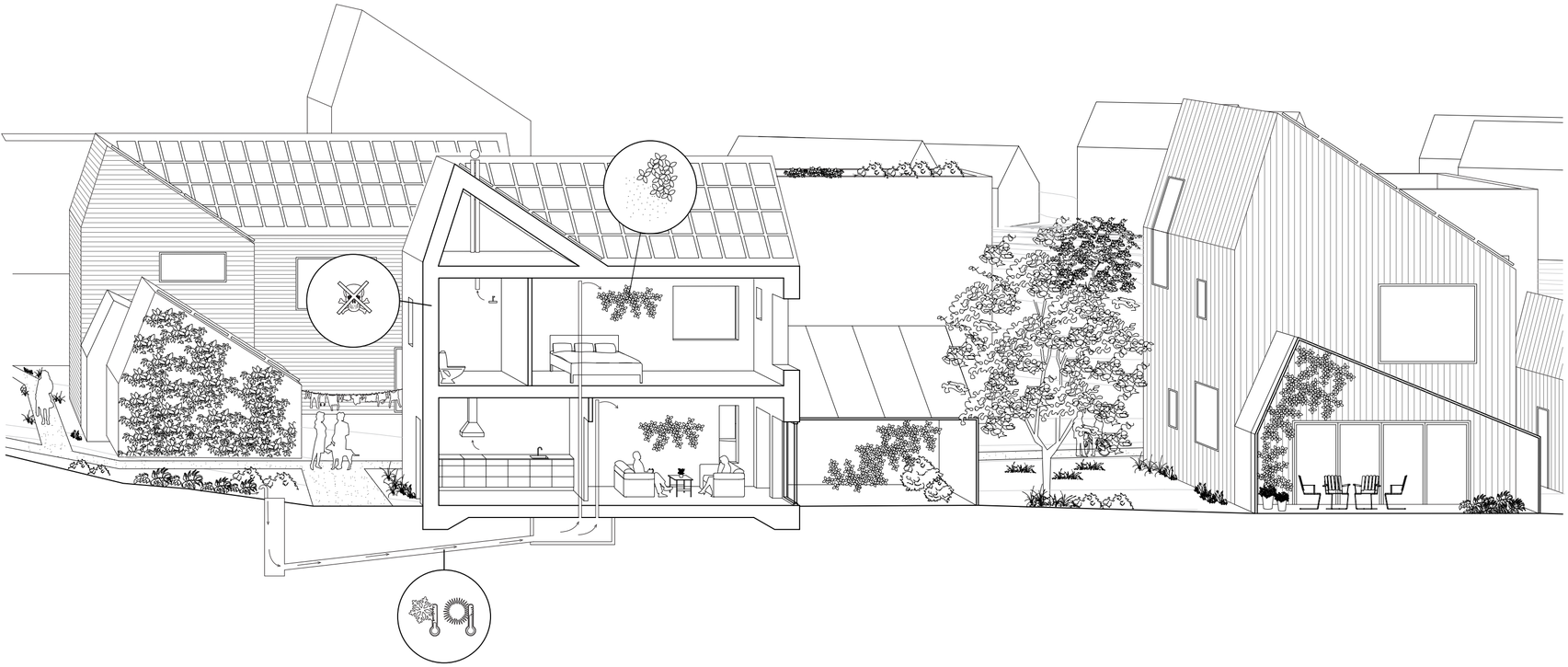
RENEWABLE ENERGY

All buildings are designed with several energy saving solutions in mind, a massive wood construction that accumulate heat during the day and cold during the night, larger windows towards south to make use of solar radiation and also the total size of the buildings. The small plot size encourage smaller houses if other surplus values as guest house or a patio is wanted.

The energy used for the household's heating and hot water consumption will be entirely provided for by a local bio gas plant on a nearby farm.

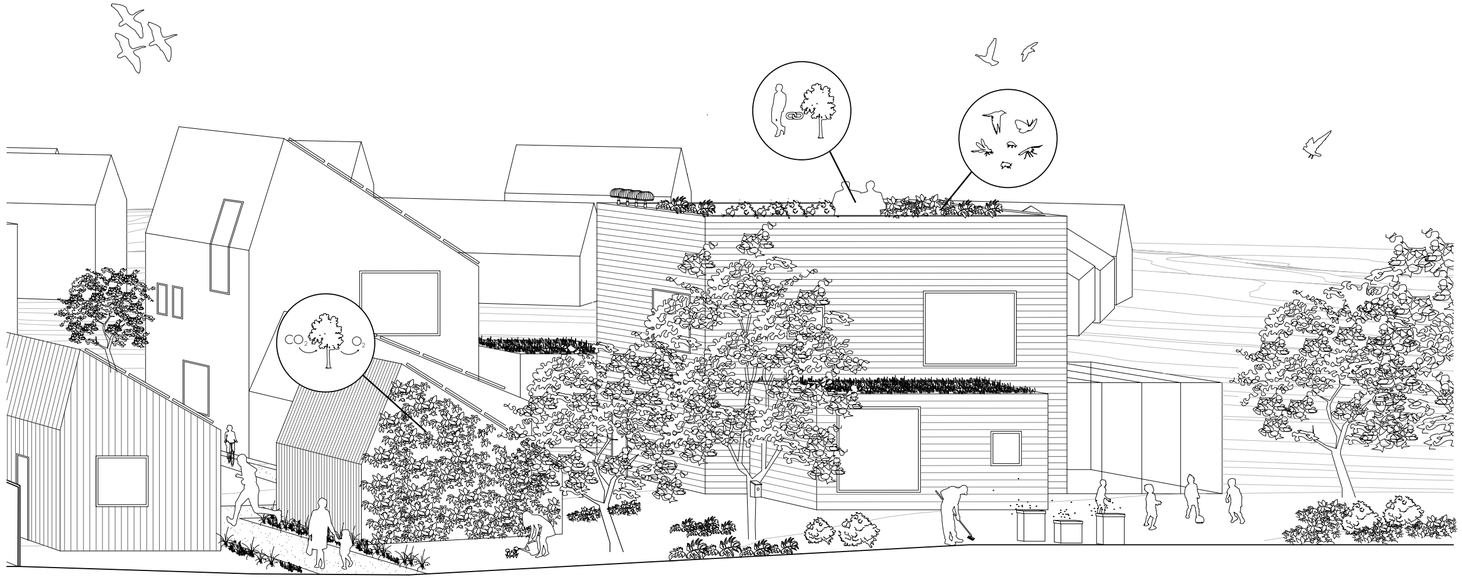
To reduce the household's electricity use energy efficient household appliance is installed and to reduce electricity use furthermore some kitchen appliance as the stove runs on gas. Detailed electricity meters is also installed to make the residents aware of their consumption. With all this the average use of household electricity will be calculated as 2000 kWh per year and household.

This household electricity is to be produced locally and all buildings with a flat roof has five small but energy efficient, and most of all quiet, wind turbines on them. For houses with gabled roof thin film solar panel is covering the south facing surface. Thin film solar cells are not as energy efficient as regular silicon based solar cells but uses less material and does not cost or need as much energy to produce. Thin film solar cells can also be transparent and mounted on glass (Energimyndigheten, 2013). Solar cells will therefore also be added on patios. When the solar cells needs to be exchanged, they will be replaced with Grätzel cells, an organic solar cell which is now being researched on for a better and more secure efficiency (Block & Bokalder, 2009).



IMPROVEMENT OF AIR QUALITY

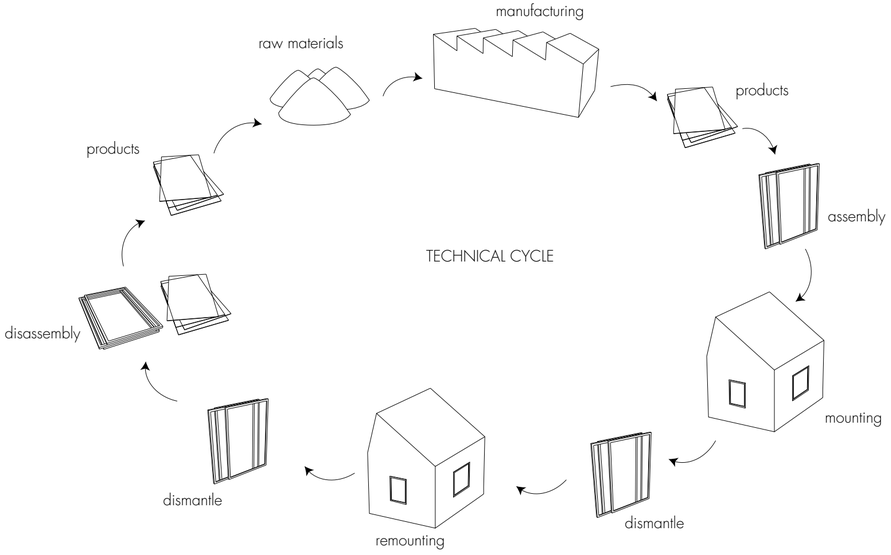
Today indoor air quality can be as bad as tree to eight times more polluted than the outside air (Guldager Jørgensen, Lyngsgaard 2013). This is partly due to emissions from building materials and furniture but also from pollution due to ventilation systems (Bülow, s.a). Because of this using healthy, non emitting materials as much as possible is essential. This also reduce the need for ventilation significantly and by using natural ventilation, pollution from ventilation systems is also avoided. To save energy the supply air is taken through a pipe in the ground, where the air gets preheated during winter and cooled down during summer. Another part of increasing the air quality of the area is all the vegetation that naturally cleans air and absorb carbon dioxide.



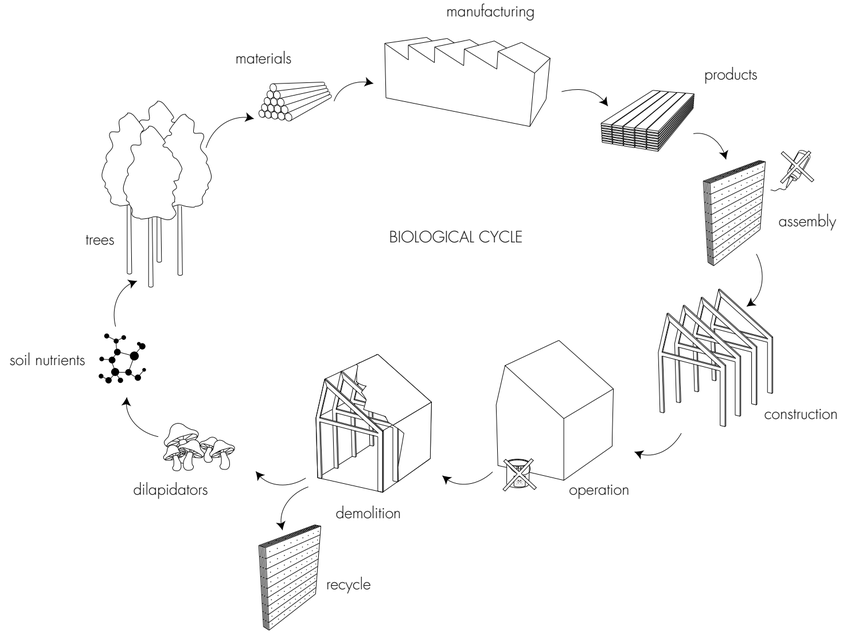
INCREASED BIODIVERSITY

To increase biodiversity effects many of my other topics, for instance plants help clean air and instead of seeing carbon dioxide as something bad it can be seen as a resource for feeding plants that absorb carbon dioxide. It can also serve as connecting people to nature, increasing the knowledge and care for nature. This project has several biodiversity increasing elements with roof top gardens and green facades on common buildings, a local pond and a green corridor along the main street.

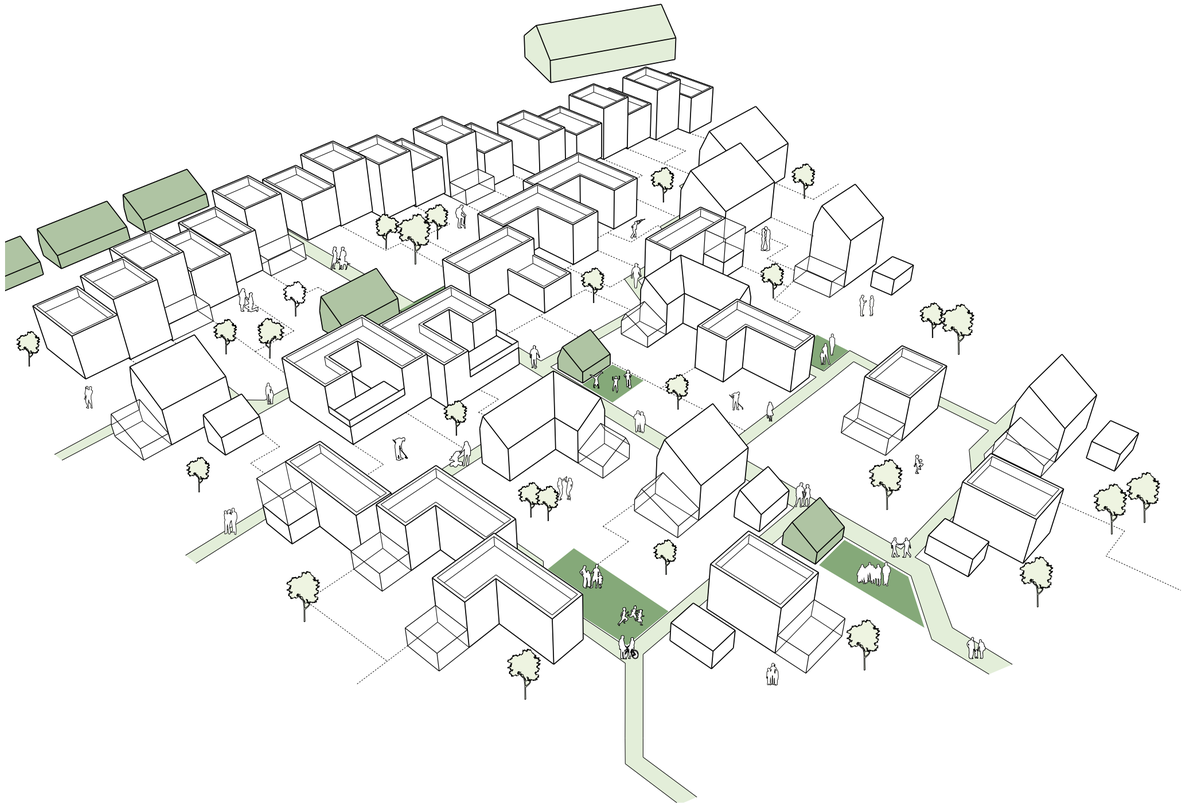
MATERIAL CYCLES

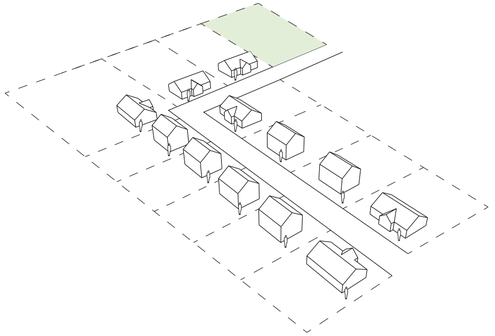


All the materials used in buildings in this area shall be part of either the biological or the technical cycle. In order to make this it is important to design the building with the mind set of what comes next, it must be easy to separate materials from each other and consider what materials can be reused or not. For instance glass for windows, a material that if it is designed in a smart way does not loose value and can be used again and again for different products.



I have chosen to have massive wood as construction material, a biological material, but to make it stay in the biological cycle it is important to avoid toxic glue when putting the elements together, instead the elements will be joined with wooden plugs. This also minimise the hazardous emissions. It is also important to keep the wood away from toxic paints and impregnation during the buildings operational phase, this in order to keep it clean and if it is not possible to reuse the material when the building is demolished the wood can be biologically decomposed and become nutrients for a new tree.





SOCIAL DIVERSITY

In a regularly planned residential area it is not unusual with a quite homogenous group of people and interaction between them is not really encouraged. You have your own lawn with a fence or possible a hedge surrounding it. Instead the various kind of housing typologies will suit a more diverse range of people and also the flexible garden lots will erase the boundaries and create a more open green area and open up for interaction not at least in connection to the common buildings and joint green areas set aside for common activities. Also, the walking paths inside the area act as an arena for spontaneous meetings.

VIEW OF GARDEN LOTS BETWEEN THE ROW HOUSES AND SOME SEMI-DETACHED HOUSES

CARBON CALCULATIONS

The area consists of 39 houses whereof 7 is semidetached and will be calculated as two households, there is therefore a total of 46 households within the area. The average number of persons per household in Hjo is 2,16 but since that include households living in apartments I will assume that the number is a little bit higher in Knäpplan and calculate with 2,5 person per household.

Energy

Since all energy needed for heating and hot water is assumed to come from a nearby bio gas plant a total of 0,8 tonne carbon dioxide per person can be deducted.

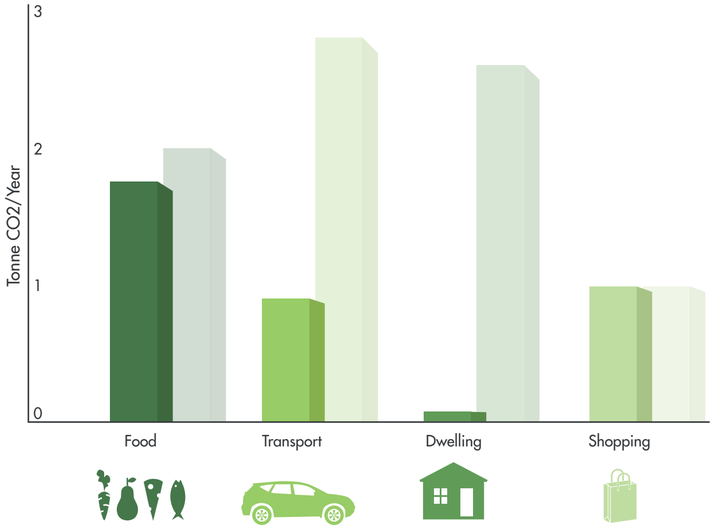
Wind power: There are 31 houses with five wind turbines each in this acre, each wind turbine is estimated to produce 100 Watt in wind of 5 metres per second (Fellman, 2011). Which is the speed that I will use for my calculations. This means that each wind turbine will produce 876 kWh/year and a total of 135 780 kWh/year will be produced within the area.

Solar power: All houses with gabled roofs will have thin film solar cells on them, this includes the roofs of the car pool garages as well. An average of 120 kWh/m2 (Energimyndigheten, 2013) annually will be used for calculations with some adjustments according to the angle of the solar cells. Most roofs face about 20 degrees east from south and will be calculated with 95 % efficiency and the roofs facing more to the west will be calculated with 85 % efficiency (Stridh, 2013). This results in a total energy production of 129 173 kWh per year within the area.

Solar power together with wind power will thus produce a total of 264 953 kWh/year which divided on all household is 5760 kWh/year and household. Since the estimated electricity use is only 2000 kWh/year and household this gives a surplus of 3760 kWh/year. Also, if solar panels is added on all patios another 61 459 kWh/year or 1336 kWh per household and year can be added. This can either be sold and thereby lowering the carbon footprint by compensating for another family's electricity use. Since 2000 kWh is quite low the number used for calculating compensating a family living somewhere else will be 3000 kWh, so for each 3000 kWh one household sell 0,8 tonne carbon dioxide will be discounted from each person's carbon consumption. Another way to spend the surplus electricity is to use electric cars and thereby reduce the carbon consumption in the transport category.

With a person living i Hjo going 7920 km by car per year, one household in my area will be estimated to go 19 800 km in one year. Assuming that an electric car uses 2 kWh per 10 km (Göteborg Energi, s.a) a total of 3960 kWh per year will be needed.
Material

Trees absorb carbon dioxide, and this is also the case when it is cut down and used as building material.



How carbon consumption would look like if taking advantage of all opportunities in the area. Total of about 3,7 tonne

If calculating on a life cycle of 50 years per house and with a total mass of 30 m^3 (Discussed with Jonas Lundberg) per detached house or one household and assuming that 1 m^3 hold 1 tonne carbon dioxide (Träguiden, s.a), each person can deduct 0,25 tonne carbon from the category dwelling. As wood is often considered less energy demanding to produce another symbolic 0,1 tonne can be deducted from the dwelling category investment and maintenance.

Growing food

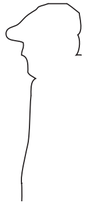
Vegetables is a quite small post and only accounts for barely 0,3 tonne carbon dioxide per person and year. But every little helps and based on the area 500 m^2 that can provide four persons with vegetables for a year, the growable areas, including roof gardens in the area of 10 261 m^2 can provide 82 persons with vegetables. With 2,5 persons per household this does not sum up with the total 46 household, only 33. But with considering that everybody might not be interested in growing their own vegetables and with close by allotment gardens the opportunity to grow is still there.

Based on these different calculations I will now look into a few different scenarios of how the carbon consumption of the inhabitants in the area will differ depending on how they live. Numbers concerning other areas of food and shopping will not be accurately calculated but more of a symbolic value.

CARBON SCENARIOS

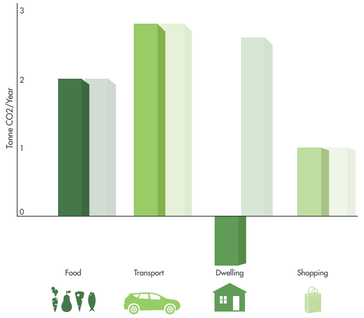
Mrs Svensson

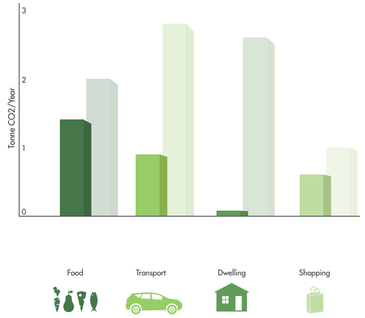
Mrs Svensson symbolise the average Swede and in this case specifically a citizen of Hjo. She lives in one of the detached house together with her family, she drives a regular gasoline car, eats a regular diet with a normal amount of meat and consume just about average. This is what her carbon consumption will look like living in this area with at total of 5,2 tonne per year.



Mr Lind

Mr Lind is a happy retiree who lives together with his wife in a row house along the main street. His favourite hobby is gardening and he grows all of their vegetables on his own, But in their garden of 375 m^2 he even produces more than they can eat and he sells the surplus to the corner shop next door. Sometimes he uses one of the electric car pool cars, but mostly he bikes around the town. Since he already has most of what he needs, he consumes less than average. This is how his carbon consumption look like with a total of about 3 tonne carbon emissions per year.



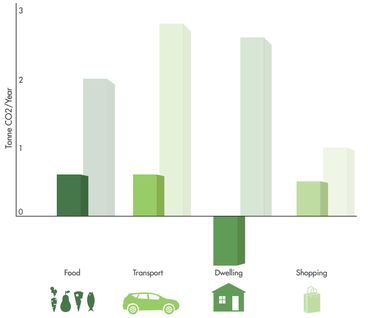


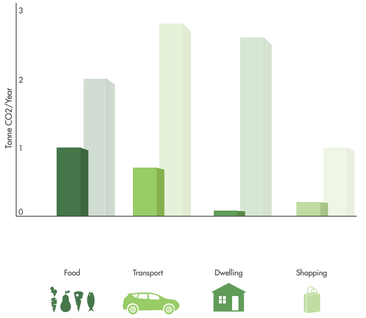
Miss Green

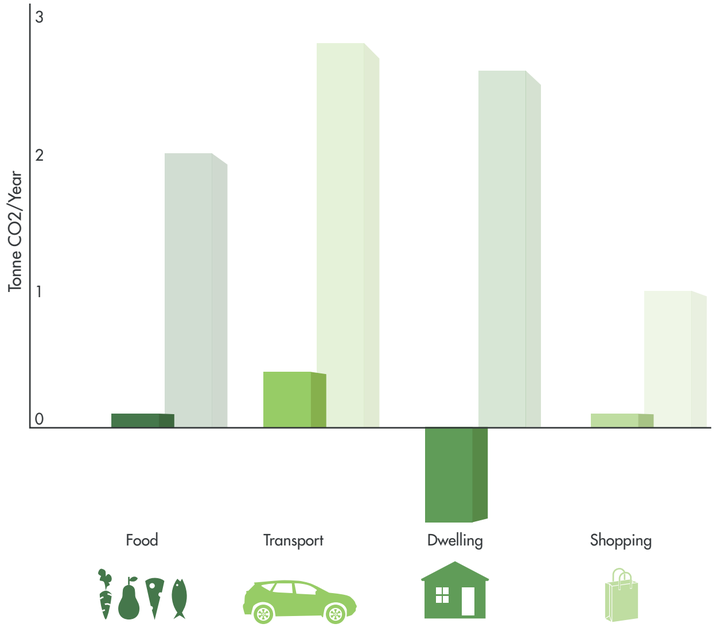
Miss Green is studying in Skövde but since she loves the countryside and some friends of her asked if she wanted to join their collective she chose to live in Hjo, and since the bus passes just outside the area it is no problem at all. One of the things she likes best of living together is to share things, then you don't have to buy so many things. It is also nice to cook together and since all of them are vegans it is great to have the possibility to grow their own vegetables. This is how Miss Greens carbon consumption look like and she reaches down to only 1 tonne carbon per year.

Mr Sund

Mr Sund is an eco-aware citizen and chose to move to the area because of its sustainable profile. He is very conscious of how much he consumes and prefer second hand shopping. Concerning food he buys what he can locally and organic and when he occasionally eats meat he always choose the most eco friendly alternative. He avoids all kinds of fossil fuels and is very pleased with the car pool. This is how his carbon consumption look like and he ends up at a total amount of 2 tonne per year.







To give a symbolic picture of how much we would need to change our lifestyle in order to become totally carbon neutral I will try to make an estimation of how radical I believe we have to change. This will only be my speculations since the exact numbers are difficult to reach, but I believe that we have to make dramatical cuts in our consumption patterns. Basically, I believe the shopping category must come down to almost zero, only locally produced and carbon neutral products can be consumed. Food is a difficult category, we need to eat to survive. Being a vegan and grow all the food on your own is probably the only solution to cut down the carbon emissions that drastically. It would also include avoiding restaurants where you can not trace the food source. In the transport category absolutely no fossil fuel dependent travels would be allowed, including public transport, only vehicles driven on renewable energy, and also produced with renewable energy would be allowed. And yet I believe that our dwellings, beside radical cuts in our electricity consumption, need to produce more renewable energy than it consumes in order to compensate for the other categories. Which with today's emission would require much more effective technology than there is. This demonstrates that much more than the built environment needs to change, but also how important the dwelling is.

BIRD PERSPECTIVE

DISCUSSION

The idea for my thesis spur from my own childhood, growing up in a small town in the countryside. This is a major contrast to the dense mixed city that has been the centre of the discussion about sustainable development in school, the countryside perspective is most often lacking. The fact that most of my classmates couldn't even imagine a town where local busses within the city does not exist, or that it only takes less than an hour to walk through the entire city, housing areas included, made me want to lift the question of living in the countryside in my thesis. Also a new housing area is being planned in my old hometown Hjo and I wanted to see how to develop a housing area that in comparison to this planned area has sustainability as a starting point. When I started to read about the subject, I found out that a large part of the Swedish population lives in the countryside and in detached houses. I realised that there is a major challenge that we need to focus on which often is eluded with an urban perspective. The dense mixed city is important but we can not forget that such a large part of the population is living in the countryside.

The aim of this thesis was to examine if it is possible to compensate for the more car dependent lifestyle that often comes with countryside living. Even if I could not reach the level of two tonne carbon dioxide per person only by the design of my area, I still believe it is possible to reach a sustainable lifestyle where this type of dwelling is a key factor. The emissions over two tonne is mostly due to the fact that some categories are difficult to influence with the built environment. I can not affect how much the residents of the area consume in products such as clothes and electronics or how much meat they choose to eat nor how many travels with airplanes they do. I believe that by making the sustainable solutions visible, an awareness will rise and hopefully affect the choices people make in other categories as well. Carbon dioxide emissions is not the only environmental issue, it has in my thesis been an useful tool for measuring our environmental impact. I believe that circular flow thinking is as important. I believe that by; using healthy materials, care for the entire life cycle and take care of as much as possible locally we closes the loops and decrease our environmental impact significantly. For instance, growing our own vegetables can only reduce our carbon footprint with 0,3 tonne but on the other hand we become less dependent on imported products from parts of the world where they need it more. Growing your own vegetables also results in a greater respect for our food and hopefully reduce the food waste. As oil, and consequently fuel will become more and more expensive, and the world population will increase, the price of food will rise dramatically in the upcoming decades and we need to seize the valuable land we have.

During my process I have realised how the habit of living in a detached house has changed throughout the years. How it has gone from being a possibility to be self-sustaining with food and an effective small sized living to a more recreational place. The square metres has increased quite dramatically in the last decades. In this case it might have been better in the old days, and maybe we will have to learn from that time, that we can live smaller, at least during the colder season when we in our climate need to heat our homes. In my proposal I challenge the regular plot. To promote smaller residences the plot is divided in two parts. One strictly regulated building area and one green area which is changeable in size and commonly owned. This solution results in an area which is more flexible over time, where social interaction is fundamental and a more sharing lifestyle encouraged. And by decentralise the importance of the car a more people-friendly environment can take place.

I hope that my proposal will initiate a discussion of countryside living and spread information of the households environmental impact. That we have to consider all ways of living and not just focus on the urban situation. People will continue to live in the countryside and it is about time we push that market in a more sustainable direction.

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