



Faculty of Science and Technology

MASTER'S THESIS

Study program/ Specialization: Byutvikling og Urban Design Urban Development and Design	Spring semester, 2011 Open
Writer: Lene Bjørnø (Writer's signature)
Faculty supervisor: Ib Omland External supervisor(s):	
Titel of thesis: The Concept of Urban Scale Area Efficiency With a Case Study of Urban Sjøfront, Stavanger, Norway	
Credits (ECTS): 30	
Key words: Sustainable Development Area Efficiency Urban Design	Pages: 127 + enclosure: 1:200.Illustration Plan Stavanger, Date/year

THE CONCEPT OF URBAN SCALE AREA EFFICIENCY

With a case study of Urban Sjøfront, Stavanger, Norway

Master Thesis
Lene Bjørnø
University of Stavanger
Spring 2011

|TITLE SHEET|

PROJECT TITLE: The Concept of Urban Scale Area Efficiency.
With a Case Study of Urban Sjøfront, Stavanger, Norway.

MASTER THESIS:
Submitted for the fulfilment of the requirements of the MSc. in Urban Development and Design at the University of Stavanger

PROJECT DURATION: February 1th 2011 to June 15th 2011

PAGES: 127 + 1:200 Illustration Plan.

LENE BJØRNØ
Master Student
Urban Development and Design
University of Stavanger

|ABSTRACT|

This thesis focuses on area efficiency in the urban scale. It uses Urban Sjøfront in Stavanger as a case study. Area efficiency can be defined as reducing the need and use of new built form and land, through using excising areas more efficient.

The first aim of the thesis is to show area efficiency as a valid way of creating a sustainable city. Through chapter three, the thesis further investigate different theories concerning area efficiency in the urban environment, concluding with two characteristics of urban area efficiency: Shared monofunctional space and shared multifunctional space. The area efficient theories studied, together with social urban theories from among other Gehl (2003) and Oldenburg's (1989) third places, builds the theoretical framework for the thesis. This framework is used to create an analysis and testing tool, in order to analyse the area efficiency in the case study of Urban Sjøfront. The thesis proposes two ways of analysing area efficiency. The first is the "pure" or spatial, relating only the built environment and land. The second is the "social" area efficiency, relating to creating dense areas that also are good to live in, through also providing access to qualities and functions.

On the basis of the analysis and as well research on how people in the area live and view their living, threats and problems are identified in the case study area. Solutions for the problems are then suggested, through conceptual suggestions, followed by a design for a specific plot in the Urban Sjøfront case study area.

Concerning the threats to area efficiency in the case study, the main findings can be said to be the lack of sharing space and functions. This can be seen as a result of privacy concerns. The thesis also look at the social aspect of densification, debating that access to different functions is an important concern in order to reduce the space use per person, and still create good living conditions. It also question the actual urbanity in Urban Sjøfront, or if the area is developing to become yet another residential area.

|ACKNOWLEDGEMENTS|

Although a thesis often can feel like a lonely walk, some important persons need to be given extra thanks.

Ib Omland has been my supervisor for this project as well as several other projects in the five years of my education. Throughout the study, he has inspired and given support and feedback. The "open door" praxis that both he and the others professors at the university keep, has been highly appreciated.

Lucas Griffith, fellow of Urban Design and Development at the University of Stavanger, have also helped me structure and clarify my thoughts and concepts.

Throughout the five year long study, Einar Holven have been a great resource. Not just for me, but for most of the Urban Design students at UiS. Always being available, helping with maps, prints and materials for models. He deserve a big thanks for always being there for us students.

I would also like to thank my parents, for in the best way possible supporting me through this five years of study. And as well Christoph Messagie, for moral support and interesting discussion throughout the project.

ABSTRACT	5
ACKNOWLEDGEMENT	5
CONTENT	6
1 INTRODUCTION 	
Background, Choosing theme and case.....	9
Objectives and research questions.....	10
Definitions of concepts.....	10
Spatial limitations.....	10
Thematic limitations.....	10
Structure of the report.....	11
Methods.....	11
Data.....	12
2 BACKGROUND 	
Introduction.....	15
Sustainable development.....	15
What is sustainable development?.....	15
How do we measure Sustainable Development?.....	19
The urban metabolism concerning the built form.....	20
3 THEORY AREA EFFICIENCY 	
Introduction.....	23
The concept of Area efficiency.....	23
The theory studied.....	24
Area efficiency in different scales of the urban fabric.....	24
Area efficiency in Housing.....	24
Area efficiency for housing areas.....	26
Area efficiency through common functions/common facilities on the neighbourhood scale.....	27
Area efficiency in office buildings.....	27
Multiple use and co-localization.....	29
Land use.....	29
How much can the recourse consumption be reduced through area efficiency?.....	29
More effects of Area Efficiency.....	31
The Economical Aspect.....	31
The social aspect.....	31
Discussion and Conclusion.....	34
4 METHODS DEVELOPING WAYS TO ANALYSE AREA EFFICIENCY 	
Introduction.....	39
Introducing the area efficiency toolbox.....	42
Step one: Analysing the functions in the area.....	42
Step two: Urban scale area efficiency.....	44
Step three: Building scale area efficiency.....	45
Step four: Functions and their qualities in the area.....	47

|CONTENT|

5 CASE STUDY TESTING – DATA PROGRAM-DESIGN	
Introduction.....	49
Presenting the area.....	49
The Municipality of Stavanger’s approach to the concept of area efficiency.....	49
What characterize the housing units in Stavanger?.....	51
What characterize the households in Stavanger?.....	52
Why do they live the way they do in Norway?.....	55
Discussion and conclusion.....	56
Test study Badedammen.....	57
Introducing the case specific study of Urban Sjøfront.....	59
Analyse according to method.....	60
Step one.....	60
Step two.....	65
Step three.....	66
Results/comments to the data found in the analysis of Urban Sjøfront.....	80
Conceptual suggestions in response to analyse.....	82
Presenting the design project.....	89
Design principles.....	92
The building added.....	93
The urban Square.....	95
Proposed situation plan.....	97
Sections.....	99
6 IMPLICATIONS AFTER WORD	
Introduction.....	101
Implications.....	101
After word, ways further.....	103
REFERENCES	
Literature list.....	105
Illustrations.....	108
APPENDIX	

|INTRODUCTION|

1

BACKGROUND, CHOOSING THEME AND CASE

In the fall of 2010, a five year old boy walked through the basement of his grandparent's house. "Grandma, what do you use this room for? And what is this one for?" The grandma explained that they used to be the rooms of his dad and uncle, but what they were used for today? Well mainly storage, and to be honest, they were rarely used. "Grandma" the boy replied, "I think you and granddad have too much space!" This young bright boy is my nephew, and he questioned a subject I had been thinking about for a while. Why are we not more critical to the private space use, and why does it seem like the Norwegian dream is a villa in a sub-urban area?

After taking some courses on sustainable development and urban design, I started to question the sustainability aspect in the Norwegian dream of villa and a garden. Statistics show that the m² per person in Norway has gone up from about 28 m² per person in 1960 (Berge 2003) to 52 m² in 2002. (SBB "m² per person" 2004) After living in both Stockholm and Rotterdam, it was strange coming back to my home city Stavanger, where it felt like nobody lived in the city. "Everybody" seemed to live in a wooden house, in mono functional housing area, with a suburban atmosphere. I missed my nearby park, the shop I would walk to and my bar and café on the corner. I was used to have all these things in my street. Suddenly I was back in my childhood home, with the big private garden and where we use the car when going to the shop. When mentioning to my friends, that I wanted a flat in the city, they all assumed that this would just be temporary, till I got children. Then I should find a

row house in one of the big housing areas, with that small garden and nearby playground. Walking through Stavanger's new "urban areas" like Badedammen, I could really understand them. It seems like the focus on city development have been primarily on density and not really on creating good places to live.

It seems like most of the inhabitants in Stavanger want to live urban, but still have a private garden and detached house. The City of Stavanger have through their Climate and Environment Plan 2010-2025 and the Covenant of Mayors stated that they by 2020 want to reduce the CO₂ emissions with 20% from the 1991 levels, equivalent to 30% of today's level. (Stavanger Kommune) The plans talks about passive houses and lowering the energy use per m². With my parents situation and their 190m² "Husbandhus" from 1975, in the back of my mind I started wondering why nobody talk about energy use per person. Green and sustainable buildings are always presented with energy use per m². There is rarely, if ever a focus on how efficient the house is in terms of space, how many people it can "hold" per m². And after searching for flats in Stavanger, I was surprised how many new 70m² flats I could find with only one decent sized bedroom.

All of this gave me my idea for my thesis. I wanted to research and develop the part of the sustainable urban development that currently seem to have little focus, area efficiency. Not just for housing, but also as a part of the urban design and city development. How can we build more area efficient houses, office buildings and public spaces, and can these in some way be integrated, so space

can be used even more efficient. Not only with a sustainable focus, but also from a social point of view.

OBJECTIVES AND RESEARCH QUESTIONS

The aim of the research

Contribute to knowledge on how sustainable development can be conducted through urban design, with a focus on urban area efficient planning.

Give focus to area efficiency as a valid way of sustainable urban development and design.

Test the level of area efficiency on an urban scale, in an urban planning area in the City of Stavanger Norway, and challenge the traditional way of urban planning, as well as the way of living.

Main research question

- How can area efficiency contribute to sustainable urban development?
- How can area efficiency be analysed and tested on the urban scale?
- How can area efficiency be applied to the urban scale, through urban planning and design, in the specific case of Urban Sjøfront in Stavanger.

DEFINITIONS OF CONCEPTS

Bed spaces

Relates to how many beds are drawn in to the plan. Double bed is counted as two.

BRA

Is defined as all the m² inside the outer walls of the flat, inner walls included, external storage excluded.

Dekar

One dekar is 1000m².

Hems

Relates to the Norwegian term Hems, meaning a loft. A hems is a double floor that is not separated from the rest of the room with walls.

Life cycle standard

Relates to the Norwegian concept of "Livsløpsstandard", meaning:

- Entry with out stairs to the unit.

- Living room, kitchen, bathroom and one bedroom all need to be on the same floor. A wheelchair with a diameter of 1.5 meter needs to be able to turn in all these rooms.
- All doorways relating to the former mentioned rooms should have a minimum width of 80 cm, and a maximum threshold of 20mm.

Living space

Is defined as living room and kitchen, if the kitchen is not in a separate room.

People, in the context of the Area Efficiency Analyses

Relates to the probable amount of people who will live in the flat. The criteria set are:

- If the size of the second bedroom is less than 8m², it's not viewed as a bedroom for an adult, and the room is not considered as a bedroom for a third person. In flats with more than two bedrooms, the bedrooms can be smaller than 8m², and still provide good family flats.
- Flats with just one bedroom and common space under 20m², are viewed as one person flats.
- If a hems is the only bedroom, the flat is viewed as a single person flat, due to lack of noise control between living space and the space to sleep.
- Studio flats are viewed as one person flats.

Studio

Flat that doesn't have a separate bedroom, but where it's intended to sleep in the living space.

Visiting Standard

Relates to the Norwegian concept of "Besøksstandard". The same criteria apply as for "livsløpsstandard", apart from the rooms being hallway, bathroom and living space. Bedrooms don't have these criteria.

SPATIAL LIMITATIONS

The concepts of both sustainable urban development and area efficiency are universal and not geographically determined. From this general state, I wanted to look at in what way this can affect the planning of the City of Stavanger. Making good dense living areas, which can be an alternative to what I experience as the Norwegian housing dream, the villa in a suburban area. The case study is limited to the area of Urban Sjøfront, defined by plan 1785 Breivig, Lervig, Spilderhaugvigå, approved April 2002 and plan 1901 Spilderhaug Storhaug Bydel, approved September 2006.

THEMATIC LIMITATIONS

The aim of this thesis is to research and comment on area efficient

solutions in the view of a sustainable urban development. Area efficiency can be defined as using areas more efficient, in order to reduce the need of new built form and new built land.

STRUCTURE OF THE REPORT

The structure of the report can be seen in figure 1.1.

METHODS

In this thesis, case study has been chosen as the method to approach the research questions put up. The further will briefly show how the research has been conducted and the next paragraph will go through the data used.

The concept of area efficiency and the analyse tool was developed through general and universal theories. The thesis further wanted to test the theories on a specific case in the City of Stavanger, to detect sight specific qualities and concerns to the area efficiency in

the specific case. From this, the thesis wanted to propose an area efficient design for this specific sight, relating to the problems and qualities in the case.

As Ying (2009) points out, a case study should be used if the main research questions are "how" or "why" questions, being asked about a contemporary set of events, over which the investigator has little or no control" (Ying 2009: p 13)

Case studies can either be single or multiple. Multiple cases seek to generalise by comparing two or more cases, while single cases can be used to look at typical or unique examples. Since the concept of area efficiency wanted to be tested in a specific area, proposing a design for a specific sight, a single case study design was chosen. The case study holds multiple units of analysis, and can according to Ying (2009) there for qualify as a single embedded single case study. One of the weaknesses of a single case study is that it doesn't give room for comparison, but the thesis did not

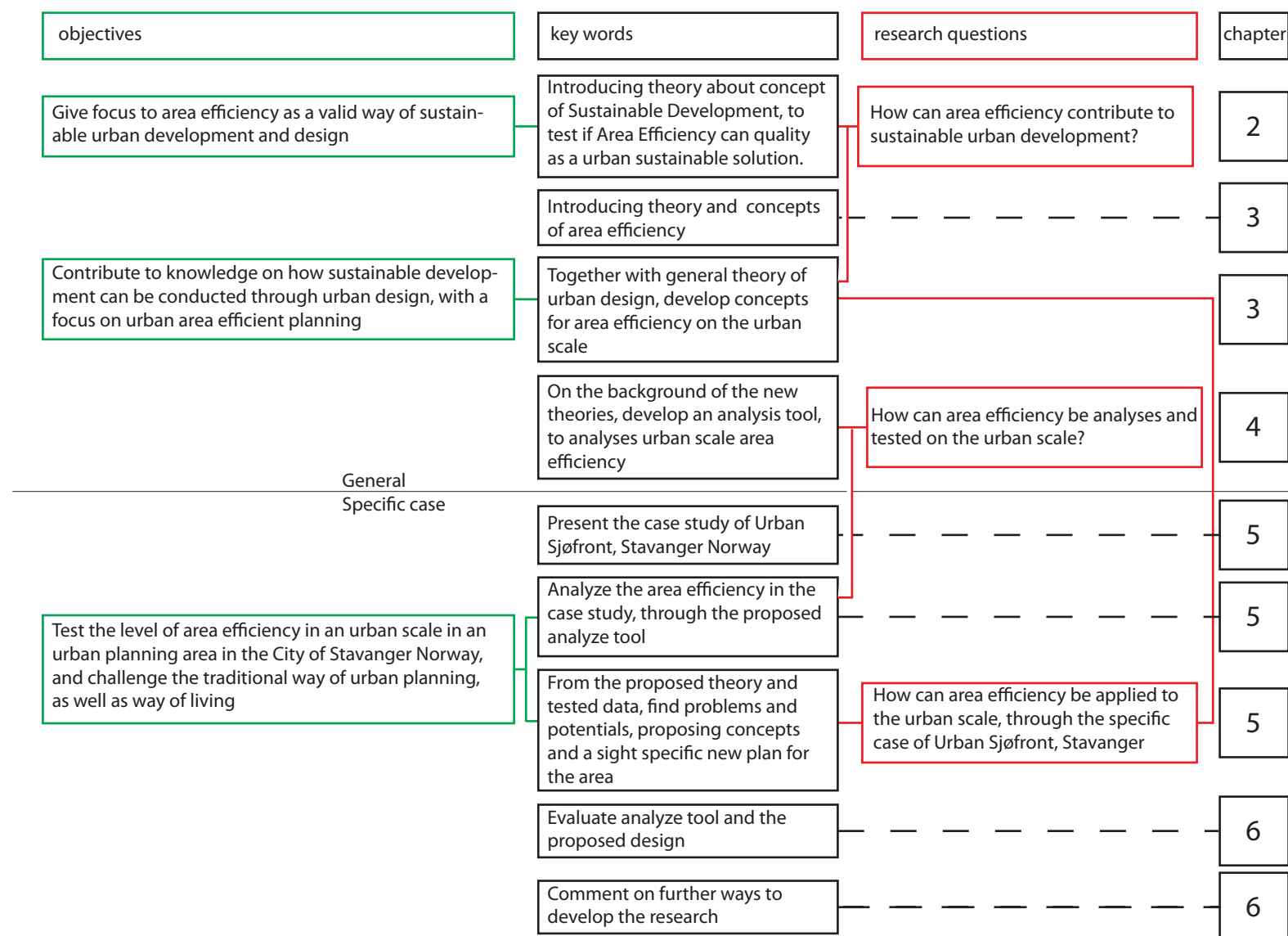


Figure 1.1 The structure of the report

either set out to find general standard measurements for how area efficiency was conducted in real life, just general theories through literature review. Single case study can be beneficially used, when a specific phenomena is viewed as unique in itself. A pilot test study was conducted, to test and improve the proposed analysis. The next paragraph will go through the types of data collected.

DATA COLLECTION

STATISTICS

The statistics that have been used, are from Statistics Sentral Byrå (SSB), in English called Statistic Norway, and Stavanger Statistikken, the statistics from the Municipality of Stavanger.

Reliability

SSB produce statistics from different parts of the Norwegian society, and should be viewed as a reliable source. The municipality of Stavanger get parts of their statistics from SSB, but also their own numbers and calculations. Mistakes can always happen. Either that I have misunderstood the data and categories, or that there are mistakes or sources of errors in the data. Since the data are secondary data, collected by other researchers, I have little control over how the data have been collected, and to evaluate if there are weaknesses with the data. (Blaikie 2000) I have aimed to be critical to all data, comparing different sources if possible, to avoid errors.

BUILDING PLANS

Data from the different housing projects have been collected from The Municipality of Stavanger, who has drawings of most of the buildings in the city in their archives. The municipality has been a good source for getting building plans. The two projects that are under constructions, also have their building plans available on internet. Following, the different projects studied will be described with how the data is collected.

Lervik Park

All drawings were available on the internet. The drawings found had scale, with each room being measured, as well as the BRA for each flat. The drawings are signed by the architect company in charge, relating to the drawings found at the municipality. When calculating the total area use and ground floor, drawings from the municipality has been used.

Tou Park

All drawings were available on the internet. The drawings were presented in scale, and each room was already measured, as well as the BRA for each flat. When calculating the ground floor and total area use, drawings from the Municipality have been used.

Haugesundsgaten

All drawings were gathered at the Municipality of Stavanger. The drawings were in scale.

Building A, had BRA and millimetre measures. Each room has been calculated from this. To ensure that no mistakes were made concerning the calculation, all calculations were double checked, and also measured on the drawing. Due some rounded corners, some of the flats were scanned to PDF, and imported to Auto Cad. Here the PDF was scaled to correct size, by using known numbers on the drawing. The calculations were then made in Auto cad, and checked against known numbers on the drawing. All measures in Auto Cad were taken from the middle of the lines in the PDF.

Building B, had BRA for the flat and millimetre measures. Each room was calculated from these measures.

Building C had BRA for the flat, as well as m² for each room.

Siriskjær 2

The drawings were gathered at the Municipality of Stavanger. They were in 1:50 scales, with millimetre measurement. All calculations were made from the millimetre measurement written on the drawings. The calculations were double checked, and also checked by measuring on the drawing, to discover mistakes in the calculation.

Siriskjær 4 and 6

The two buildings are identical, only mirrored. The drawings were collected at the Municipality of Stavanger. All drawings were in 1:50 scales, with millimetre measurements written on the drawings. The data collected was calculated from these measurements, double checked and measured on the drawing to detect possible calculations errors.

Støperigaten 25

The drawings were collected at the Municipality of Stavanger. These drawings were scaled from A1 size to A3 size, which made some of the numbers hard to read. The architect office that made them was therefore contacted, although they failed to provide better drawings. The drawings provided had BRA and m² for some rooms, as well as millimetre measurements written on the drawings. The rooms missing m² were calculated from these.

Reliability

All drawings used are architect drawings. The drawings from the Municipality are “work drawings”, drawings made for constructing the inner walls. The measurements here are millimetre, and should be accurate and reliable. Changes can of course have been made, as well of the person owning the flat. The drawing represents the planned, and what the architect intended should be built. When

calculating the space, mistakes can happen, from typing in wrong numbers, or misunderstanding the drawing. To reduce the risk of this, calculations have been double checked. Also by measuring with a ruler, to secure that added numbers are correct.

In the collected BRA data, each room of the individual flat is calculated and then added together. This number is then drawn from the total BRA, giving the wall space. This is also a way of detecting errors. If the wall space is abnormal or negative, it gives a signal to check the numbers further.

All architects drawings are secondary data, and can of course contain errors when being made. Since the drawings collected are “as built” drawings, they should be accurate, and have been checked by an engineer to detect errors, although errors were found.

Deviations found

In the calculation, some deviations were found in the plans of Lervik Brygge

Sjøkvartalet

Flat B427, bedroom was not measured, but was calculated to 9.5m². Living space was 27 on the drawing, but was calculated to 25.2.

Flat C308, living space was presented as 42,5m² on the drawing, but was calculated to 29,0m².

Hageby 4

A101, B101 and C101, hallway area was not measured in the drawing.

The drawings of all the deviations found, were imported to Auto Cad, where they were scaled after the scale bar on the drawings. To test that the scale was correct, known m² were tested. The missing or incorrect rooms, were then measured again. To further test that no new mistakes were made, the total m² of all the rooms were viewed together with the total BRA, to see if the wall space seemed appropriate.

Possible ways of improvement

If all drawings were gathered in Auto Cad files from the architects, a more accurate calculations could have happened. The reason this alternative wasn't chosen, is that files of buildings this size are heavy and hard to manage. The files are also hard to get hold of. I concluded that the risk of deviations to be smaller than the possible errors being made. It also became clear, that providing these Auto Cad drawings would be quite hard, when contacting one of the architect offices.

PLOT SIZES

All plot sizes have been gathered from the database at the municipality.

Reliability

The reliability should be good, since these are measurements that come from the municipality, and are based on legal documents regarding land ownership. There could of course be errors done both in the surveying, as well as registration in the database.

Possible improvements

The plot sizes for Lervik Brygge were calculated for the whole project, and did there for not make sense to include. Surveying could have been a possible solution both to check the validation and to get the numbers for this project.

MAPS

The thesis uses two different types of maps, Auto Cad maps and air photos gathered through www.norgeskart.no and www.finn.no. The maps on [finn.no](http://www.finn.no) are based on data from [norkart](http://www.norkart.no). These maps are used when the accuracy of the maps are not so important, but when the maps are included to illustrate. Maps that require accuracy and is being used for plans, are made from Auto Cad maps based on data from Stavanger Kommune EUREF89 UTM-sone 32.

Reliability

Maps are a potential source of error, if they are not updated. Visits to the area were done in order secure that the maps used for details are accurate, concerning new or demolished buildings. Concerning other measurements in the map, like distance and area, these numbers are not tested against the reality on sight.

Possible improvements

When building, the area should be surveyed, in order to check that all measurements are correct. This thesis keep a detail level where the Auto Cad map should provide the needed accuracy, and surveying on sight have there for not been made.

AREA PLANS AND BUILDING PLANS

The area plans, or “Regulerings Plan” in Norwegian, are all collected at the Municipality of Stavanger.

Reliability

These are legal plans with restrictions for how the area can be developed. These sources of info should be valid. Though they are secondary data, it's hard to see how they can be tested further.

OBSERVATION AND SIGHT VISITS

The sight in the case study has been visited several times. In order

to get the best impression possible, the sight and area have been visited at different times of the day, different days of the week, and at different types of weather. When visiting I have biked, walked and driven through the area, to get different ways of speed and views.

Reliability

When visiting a place, observation can arguably happen in two ways, qualitative and quantitative. Observation can happen quantitative, by registration. Counting trees or measuring road width is observations that will arguably not be influenced by the observer. More qualitative measurements, like moods, feelings and preferences, like if a space feel unsecured or trafficked, will be dependent on who the observer is. Cultural, gender, age, experience, preferences etc. will all influence the observer (Aase and Fossåskaret, 2007). In order to prevent misunderstanding, the observations and decisions made, have been categorized and defined. I have as well included arguments for why certain decisions were made.

LAND USE MAPS

All land use maps are based on information from www.finn.no, www.norgeskart.no as well as observations on sight and development plans, "Regulerings Plan" in Norwegian, provided by the Municipality of Stavanger. The maps used are Auto Cad maps.

Reliability

Mistakes can occur in the land use maps, if the maps or development plans have old information. To prevent this, observations on sight have been made. Arguably, mistakes can still be made, since ownership and use some times is hard to decide.

LAND USE MEASUREMENTS

Land use measurements have mainly been made from Auto Cad maps, measuring the m² of the roads and the m² of the total area. The numbers for the parks and public spaces have been gathered from the valid development plans (reguleringsplan).

Reliability

When measuring the road space from Auto Cad, mistakes can happen, and the accuracy can also be questioned. Measurements from the development plans should be accurate, although the accuracy can also be questioned here.

INTRODUCTION

This chapter sets out to give focus to area efficiency as a valid solution to create sustainable cities. Area efficiency can be defined as using areas more efficient, in order to reduce the need of new built form and new built land. The background chapter will briefly present the concept of sustainable development. This in order to see how urban scale area efficiency can qualify as a sustainable solution. It will as well create an understanding of how this thesis defines and understand the concept of sustainable urban development. This chapter will also look at how sustainable development can be measured, to see how this can relate to area efficiency. In the end of the chapter, the urban metabolism will be introduced. To see that a reduction in the built form not only influence the land use, but also the use of resources.

SUSTAINABLE DEVELOPMENT

A quick search for “sustainable development” on google.com give about 20 600 000 hits. (13.01.2011) The last decades the term sustainable development has become a well used catchphrase some would say. Some researchers argue that it’s one of the most fundamental challenges we as humans stand before today. Although there are disagreements to whether the global climate change is actually caused by humans. There does seem to be a more or less general agreement that there is a need for action concerning exploitation of resources and pollution. The main problem seems to be that there is little or no consensus on a common understanding of the phrase sustainable development. (Connelly 2007; Maas 2010; Tunström 2010)

What is sustainable development?

The Brundtland Commission

The term sustainable development was first introduced by the World Commission on Environment and Development (WCED), better known as the Brundtland Commission, in 1987. Their report entitled “Our Common Future” formulated the standard definition of sustainable development. “development that meets the needs of the present without jeopardizing the ability of future generations to meet their own needs” (WCED 1987: p 43) The report points out an alarming trend, concerning that a small part of the world live their good life’s on the expense of others. The report has been criticized for not giving a concrete definition of “needs”, reflecting whether the needs of today really are needs, or merely desires. (Luke 2005) The report did give a shout to the world, that the exploitation of resources, destruction of natural life (plants and species) and pollution of soil, water and air needs to stop. It pointed out that this is something all nations will be influenced by, and therefore there is a need of global collaboration to solve the issues.

Historic review of Green ideas

The ideas to respect and harvest what Mother Nature gives, and not exploit the resources unrestrained, are of course not ideas that were first brought to life in 1987. Throughout the history, people have learned to respect the earth, and live at one with it. The great Indian emperor Ashoka who lived from 304 to 232 BC, saw the need to protect the wildlife, through banning the right to hunt for

sport. Hunting of animals was only allowed for limited food contribution, encouraging people live by vegetarianism. (Environmental graffiti 2008) Ashoka also saw the importance of the friendship between human kind and nature. It's claimed that he one said: "Find me one plant that does not have a medical value to it and I will give you my kingdom." (Global environmental forum 2003) The plant was of course never found.

Taking a big leap in time, Gifford Pinchot was the first Chief for the United States Forest Service, from 1905 to 1910. He reformed the management and development of the US forests, by focusing on planned use and renewal through conservation. He created the term conservation ethic, and thought this should be applied to all natural recourses. (Forest History 2011)

About the same time another American Aldo Leopold, developed an ecological ethic, which focused on the need of predators in the wilderness. The idea at the time was to remove predators, due to the wish for roads and natural resorts for human recreation. Leopold focused on the importance to keep the wilderness "wild", and saw a need to keep and protect the biodiversity and ecology. By the 1930s, he had become the foremost expert on wild life management in the US. (Meine 1988)

Several others could be mentioned, but the two Americans de-

scribed, all put focus to the problems that the industrialization brought on. As well as the importance to harvest from the nature in an efficient but planned way. To protect species against extinction, both animals and plants, but also manage our natural recourses in such a way that we don't run out.

The common understanding of Sustainable Development

It can be argued, that most people associate sustainable development with the diagram consisting of three circles being economic, environment and social. Sustainable development is found where they overlap. Figure 2.1 show four different approaches to the diagram.

Ian Lowe, the president of the Australian Conservation Foundation, interpreted the current situation more as figure 2.2. He points out that economy seems to be the biggest and most important circle, while environment and social justice seem to come as a second and third concern. He calls this the Mickey Mouse model. (Manoochehri 2010)

Many would argue that the diagram should be like figure 2.3, where the biggest and most important concern is the environment. The environmental concerns can be said to be the core problem and social justice and eventually economics should come as a part of that. (Manoochehri 2010)

Different scales of planning

The sustainability debate happens in different scales of the society, from local to global. The different climate conferences that are being held more and more frequent the last decades, try to solve problems on a global level. This through raising awareness and making global agreements and policies. These agreements then, together with the national agreements, set the standard for local planning policies, like the Climate and Environmental Plan 2010 – 2015 for the Municipality of Stavanger. This plan is made after regulations made by the Norwegian Ministry of Environment, but as well form the Covenant of Mayors signed by the municipality, which is a initiative from the European Union. (Stavanger Kommune "City of the Future" 2009)

Planners and urban designers, follow the policies and guidelines given by a Municipality or Regional plan, set for the area planned. Although these are often seen as the goals to archive, ideally they should be perceived merely the benchmark, the minimum to reach.

The "1234 Framework"

Manoochehri (2010) have developed the "1234 framework", in order to understand sustainable development better. With a focus on environmental sustainability, this framework seeks out to sum up what sustainability is really about, and how it can be conducted.

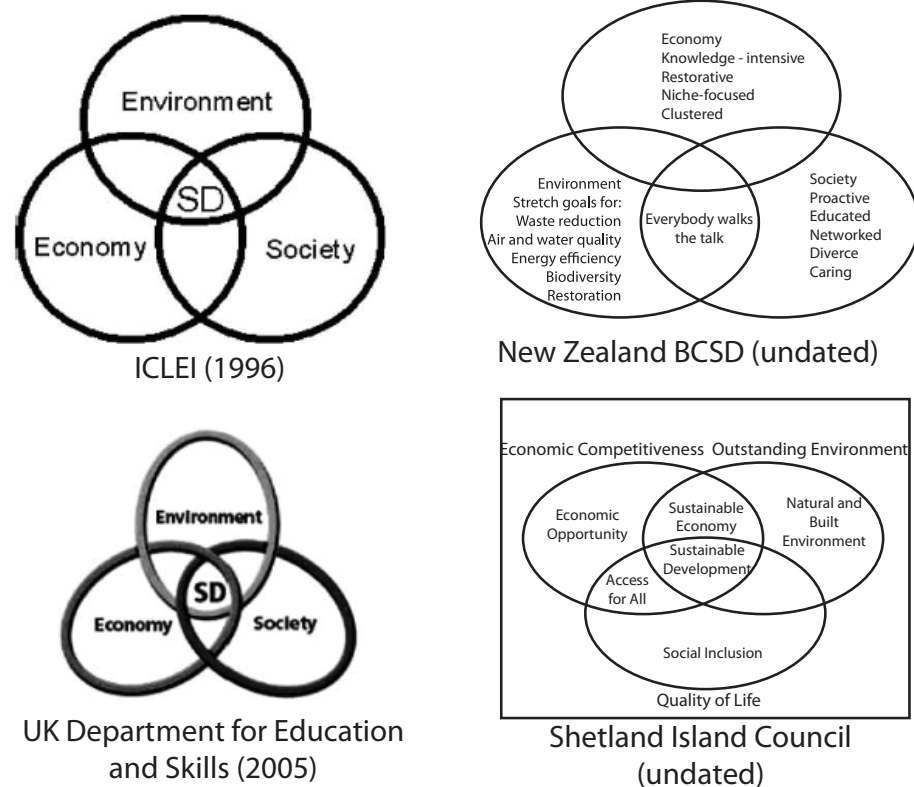


Figure 2.1 Different interpretation of the three circles of Sustainable Development. (Connely 2007)

This thesis will use the “1234 framework” as its theory base, in order to understand the sustainable development term. A graphic explanation can be seen in appendix A.

The first step, the material crises

The first step in the “1234 framework” is to understand that there is a crisis in the material culture. There is an over use of recourses, leaving several of them in danger of being threatened. The material culture can be seen as a flow, shown in figure 2.4. Recourses like minerals, fossils etc. are added trough a media, being water, soil, land or space. In order to give applications like food, power, goods, buildings, mobility etc, to provide wanted functions such as welfare, value, experience etc. Since people crave more and more functions through their applications, the media get stressed and in the next step the also the recourses.

The second step, the problem

Step two, display the problem. This is divided in two parts, nature vulnerability and biophysical recourse limit. This also relates to the historical ideas previous mentioned. We understand that there is a biophysical recourse limit, relating to the natural limits the earth have. The limits are relating to stocks, absorption, services, and inputs. Stocks are understood as both renewable and none renewable recourses, which the earth has “stocked up”. Oil and minerals are none renewable recourses, they have a limit and will eventually run out. Renewable recourses also can be threatened, like fish stocks or forests, which can be extinguished if not properly managed. The globe also has a limit of how much it can absorb of pollution and waste. This is one of the measurements in the concept of the Global Footprint, which will be introduced later as a way of measurement. The globe also provides several services, like recycling nutrients and showing resilience to changes. There seem to be a limit of how much the globe can cope with, and Manoochehri (2010) uses the global climate change as an example. Inputs are exemplified as solar and tidal, these are recourses that the globe give unlimited, and therefore should be more explored.

The second part of the problem is natural vulnerability. This relates to species, ecosystems and landscapes. The International Union for Conservation of Nature and Natural Resources, reported in their Red list in 2007, that 39% of the worlds plants and animals were in risk for extinguishing. The World Wildlife Fund, WWF, comment that the trend of more and more species being threaten of extinction, seem to go on, and there are no views of change. They report that a reduction of spices will influence the ecosystems. (Earth Times 2007) Ecosystems are also being threatened by toxins, new built land, together with exploitation of both vegetation and animals, to mention a few. There are also concerns to changes in landscape. As an example, in the county of Rogaland, Norway, there is a big concern for changing good productive agriculture

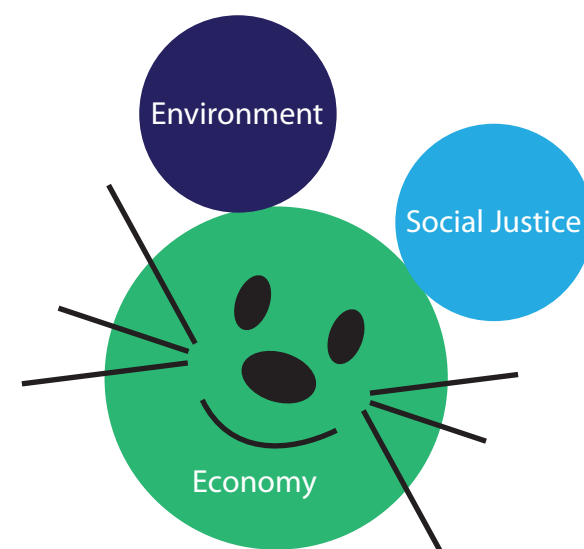


Figure 2.2 Ian Lows' Mickey Mouse interpretation of the Sustainable Development.



Figure 2.3 Manoochehri 's (2010) opinion on how the Sustainable Development circles should be.

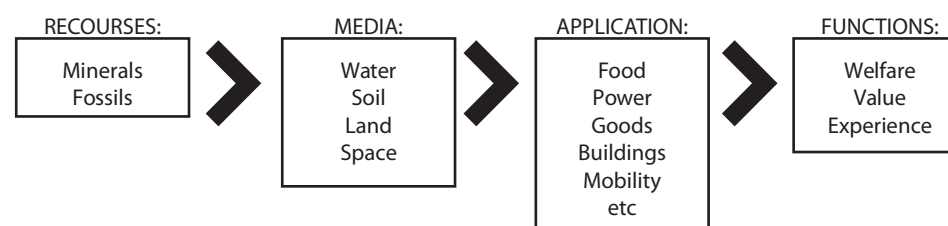


Figure 2.4 Step one in Manoochehri's 1234 Framework

land in to build land, due to the cities rapid growth. (Rogaland Fylkeskommune 2000)

According to Manoochehri (2010), the lifestyle of some of the world inhabitants, push the limits of the globe, both the biophysical limit and the natural vulnerability, by wanting more than the world can give. Manoochehri points out that these two parts of the problem can be defined as the real sustainability concerns.

The third step, the solutions

The “frameworks” next step is to point out solutions to the problem. For the last decades it seems like the focus have been to make global policies, through conferences. Manoochehri (2010) points out that although policies are important, it’s crucial to understand that they are not solutions. A solution is something that actually fixes things. The “framework” points out three types of solutions through supply, application and behaviour. Supply relates to how recourses are taken out from the earth, and relate to stock conservation and nature preservation. Stock conservations can be seen in coherence to Pinchot ideas. Looking after our recourse, by managing them in the best way possible, in order to get the most out of them. This should be done by working with nature, instead of trying to control it. This also counts for the nature preservation, by understanding that the presence of nature is vital. Through ecosystems and biota existing in the wildlife, but also to understand that the nature is an important part of the cities. Pollution reduction is also a part of the supply idea, focusing on using fewer toxins and creating as little emission as possible.

Applications can be understood as using the recourses in a more efficient way. In this way, the need of taking out new recourses will be reduced. This can happen trough technology, for instance by developing and producing cars that run on less petrol per kilometre. Another way is to recycle or reuse parts of old cars, instead of producing new parts. Better application can also happen in the built form. If the need for space can be reduced, through more efficient space use, area efficiency clearly can qualify as an application solution. This reduction in m2 built form per person will reduce the land area and building materials needed. It will also reduce the energy and water in production, and energy in operation, as this chapter further will show, through presenting the urban metabolism.

The last solution relates to behaviour, and can be said to be the most debated part. How much can planners, politicians, architects, urban designers etc, change people’s behaviour and way of living? It’s clear that if the consumption behaviour is reduced, there will be a reduction in the need to produce more items and functions. The behaviour question is also a part of an ethical question. A large part of the world’s population doesn’t really have much choice of behaviour, due to poverty. Social sustainability theories argue that

the preferred behaviour of a few, has resulted in limited behaviour of others.

The fourth step, enablers

The last step is the enablers, the step that seek to get the solutions going. According to the “framework”, there are four: information, prices, laws and quality. Information is believed to be an important factor to drive change. The last few years the information given on sustainable and green living has been growing. Although seen together with the growing trends of CO₂ emissions, shown in figure 2.5, it’s questionable if all this information has really helped. More people are aware of the concerns. It can be argued that it is hard to see what you as an individual really should do, and as well to decide to radically change your behaviour. Information is not only important for the inhabitants, it’s also curtail to educate planners and designers. It can be argued that the professionals also get “stuck”, not knowing who to listen to and what “real” sustainable development actually is. Or being caught between sustainable ideas and political decisions.

According to economical theories, demand and supply will influence the price. (Hoff 2005) If sustainable solutions and products are cheaper than equal unsustainable ones, the consumer will theoretically choose the sustainable. The price enabler is partly dependent on the law enabler. There is a need for governments to create laws, that allow sustainable solutions to be economical competitive against unsustainable alternatives. An example can be planning laws and regulations, requiring a certain density or built form, in order to secure a sustainable urban development.

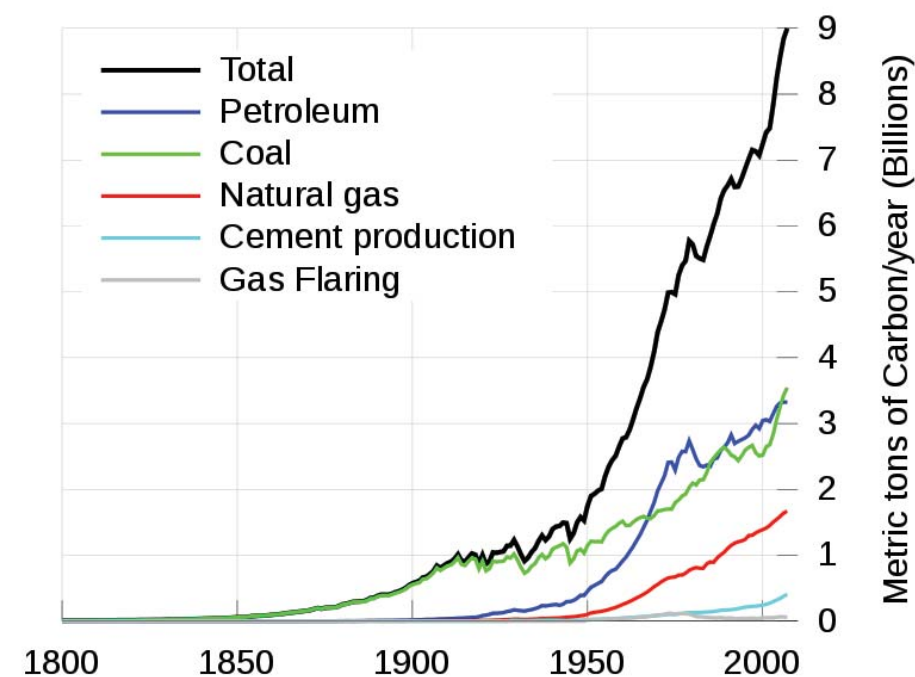


Fig 2.5 Global annual fossil fuel carbon dioxide emissions through year 2004, in million metric tons of carbon. (The Carbon dioxide Information Analysis Center 2011)

The last enabler is quality. This focuses on getting the consumer to choose sustainable solutions and products through design, innovations, narratives and value. In contrast to the former mentioned enablers, who have more of a policy and political character, the concern of quality is more related to design. Architecture, product design, and of course urban planning and design are examples. The idea is to design cities or products where the inhabitants choose to live sustainable, because they want to. This can conclude that design then become an important tool to enable sustainable cities.

It can be argued that the “1234 framework” sums up the problems and challenges we stand before in a good way. It presents solutions, and how these solutions can be reached, through certain enablers. The “framework” can, among others be criticized for being too simplistic, and not putting politics and economics in to the equation.

How do we measure Sustainable Development?

Sustainability can be measured in different scales, and there are several different tools to measure this. Some of these tools try to measure the sustainability of country or a region, others look at policy plans and programs, organizations or products, while other again have been developed to look at buildings, like the LEED or BREEAM. (US. Green Building Council 2011; Breeam 2011)

Different tools for different measures

When there is no real consensus of what sustainable development actually is, it seems like a contrary that there are tools to test it. In a study done by Finveden and Moberg (2004), they try to address different tools used for assessing environmental impact, finding out what they measure and how they should be used. They placed the different tools in a graph with impacts on one axis and objects on the other. The objects are understood as what the tools try to measure. Like a plan, a program, a project, a region, a nation, an organization, a product, a function or a substance. Impacts are understood as what focus the tool try to measure. Some measure just natural resources, like the Ecological Footprint tool. Others look at natural resources and environmental impacts, like Environmental impact assessments (Konsekvensanalyse in Norwegian). This tool is required by for instance The Norwegian Road Administration, Statens Vegvesen, for projects over a certain finance scale and size. (Statens Vegvesen 2006) Other tools again, look at the economic aspect including natural resources and environmental impacts. The Cost Benefits Analyses is an example of this. This process tool is often used in planning, finding which plan to choose, when different alternatives are given. All impacts are measured, and quantified, giving a price to environmental concerns.

Finveden and Moberg’s study show, that it’s hard to find tools to measure “true” sustainability. The same way, Winni Maas (2010) argues that there is no tool to measure how “green” a city is. The effect of individual buildings can to a certain extent be measured, but with the tools given today, he claims there are no ways to assess “whether New York City is greener than the Dutch new town Almere”, (Maas 2010: p 282). “A city is more than a conglomeration of certified green buildings” (Maas 2010: p 283) The city contains of several systems, and each building is relying on these systems, like transport, waste, water, energy etc. The build and unbuild forms between the buildings are also a factor of great importance. Parks, open spaces, vegetation, roads, water etc. Buildings do not stand alone, they are a part of a bigger puzzle. It can be argued that this is the challenges of the urban designers, to get this puzzle to work. Maas also points out that when looking at the city as a whole, there is an opportunity to use policies, taxes and laws to influence the development, also relating back to Manoochehri’s (2010) enablers.

The ecological footprint

Ecological footprint is as earlier mentioned a tool that looks just at the environmental part. It can be used to measure a country, a district a city or a smaller area, a lifestyle or even a product. The tool enables to “estimate the resource consumption and waste assimilation requirements of a defined human population or economy in terms of a corresponding productive land area” (Wackernagel and Rees 1996: p 290) In other words, find out how much land is actually needed to support for example a city. It measures both the land that the city is built on, but also the land needed to produce the resources used, and to absorb the waste and pollution created. Wackernagel and Rees (1996) use the picture of a glass hemisphere, cutting the city off from the world. They then measure how large this hemisphere need to be, in order to let the city under be self sustained exclusively on the ecosystem contained. The metric for the tool is hectares land per capita. This gives an indication of “carrying capacity”. This can be understood as; with the current population and lifestyle, how many people can this earth carry.

The footprint tool has been used by different organizations such as the World Wildlife Fund. In their “Living Planet Report 2008” they determined that in 2005, the global footprint of the world was 17.5 billion global hectares (gha), equivalent to 2.7 gha per person. The actual productive area in the globe, the bio-capacity was just 13.6 billion gha, or 2.1 gha per person, meaning that the globe has 30 % more demand, than it sustainability can supply. (WWF 2008) Norway has a global footprint of 6.9 gha per person. Due to the low person per hectare rate, the bio-capacity is 6.1 gha. The Netherlands, who have a high person per hectare rate, have a global footprint of 4 gha, but a bio-capacity of only 1.1 gha. (all numbers are from the Living Planet Report 2008: p 32- 40) It can be argued,

that the gha should not depend on the county's density of people, but more how much the globe have available. When evaluating it this way, Norway needs to reduce their gha by more than two thirds. It is arguably clear that an expansion of built form, is a threat to the ecological footprint. Both through resources and land use. A focus on are efficiency can therefore be seen as a way to reduce the footprint.

The footprint tool have been criticized for instance for not dealing with economical or social aspects (Wheeler and Beatley 2009) and for not showing more concern to toxins that the researchers don't know how nature will react on, like mercury. (Finnveden 2010) What the global footprint do show, is a need of concern towards recourse use and pollution. It also gives credibility to the "1234 framework".

THE URBAN METABOLISM CONCERNING THE BUILT FORM

"From the perspective of global resources and sustainability, the world's material consumption should be halved in relation to today's level and, from a global principle of equality, the industrialised countries, which today account for 80% of the total material consumption, should reduce their material output by factor 10, i.e. consume only 10% of today's level. Such a trend would also have immediate, positive effects on energy consumption and, consequently, on greenhouse gas emissions. Less material consumption – whether through less consumption or smarter solutions – would be a very effective instrument in the battle against greenhouse gases."

(Stavanger Kommune "City of the Future" 2009: p 23)

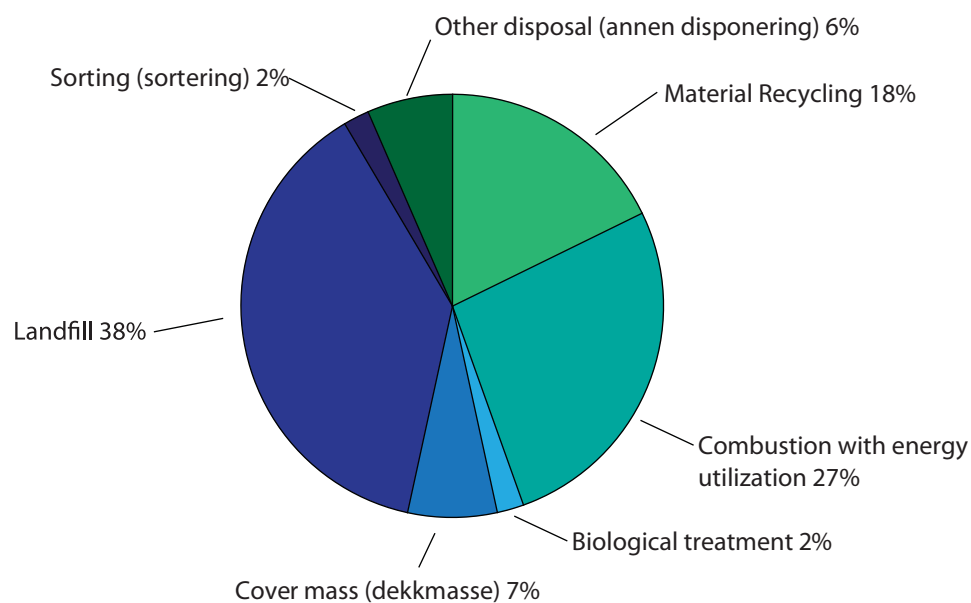


Diagram 2.1 Disposal of waste from new buildings, rehabilitations and demolition in Norway 2004

Consumption and the urban metabolism.

Wheeler and Beatly (2009) argue that "The flow of natural resources into cities and wastes out of them, represents one of the largest challenges to urban sustainability." (Wheeler and Beatly 2009: p 157) The urban metabolism can be defined as "the flow of recourses and products through the urban system for the benefit of urban populations" (Girardet 1999: p 157)

The metabolism of the cities differs to most other ecosystems, by being linear, and not circular. Most ecosystems have a metabolism where output from some organisms, are the input of others, making it a circular system. This circle is the base, which provides the ecosystem to be able to stay sustained. The cities metabolism has more the quality of a pump. Recourses get pushed trough in a linear way, and most often end up as waste in a landfill. (Girardet 1999; Svane 2009)

"Raw materials are extracted from nature, combined and processed into consumer goods that ultimately end up as rubbish witch can't be beneficially re-absorbed into the natural world." (Girardet 1999: p 158)

This arguably show the importance to reduce the amount of resources being used, and as well to change the metabolism for linear to circular.

Recourses are being taken out form nature as raw materials, processed in to different components that again are being used to produce different products that are requested by the urban environment. It's important to understand that energy is needed in all different faces of the production. Pollution also occurs, not only when a product is being used, but also when it's produced or recycled.

Consumption happens on different levels of the urban scale, although this paragraph will focus on the consumption relating to the built environment. A building is first build, then used and maintain and eventually demolish. The building is composed of different components, and arguably all of them, apart form installations as bathrooms and kitchens, will depend on the m2 built. All materials used are developed form raw materials or recycled ones, meaning they all need energy and transportation to be manufactured.

A building normally has an expected life span of 50 to 200 years. (Svane 2010) A reduction in built form will there for influence the use in a long time span. Demolishing buildings also require energy, water and transport, and it also produce waste. In 2004, the Norwegian building industry produced 1.24 million tons of waste. 36% of the waste came from demolition, 20% form new built and 44% from rehabilitation. (SSB "Avfall" 2006) As diagram 2.1 show, 38% of the waste from the building industry ends up in the landfill, and

only 18% is being recycled.

The building is also storage of items consumed by its user, making the building look like a pump. (Svane 2009) Clothes, food, tools and electronics are not necessarily items connected to the building, but they are parts of the consumption of the people who use them. Together with air, and water, these things get pushed through the building. Svane (2010) points out that a flat has a yearly flow of 800 ton air, 150 ton water, 2 ton food and daily goods, energy equivalent to 5 to 8 tons, more than 150 ton sewage and 0.5 to 1 ton of solid waste. The numbers depend on the size of the housing unit and the household, he argues. How much materials, energy, water and land that can be reduced, through a reduction in built m², will briefly be described in chapter three.

This chapter has shown that according to the “1234 Framework” and the ecological footprint measurement, area efficiency can arguably qualify as a valid sustainable solution. As the urban metabolism also show, not just through reducing land use, but also through a reduction in both materials, water and energy use. The next step will be to find out how area efficiency can be conducted on the urban scale. Chapter three will therefore present theories on how area efficiency can be conducted, and develop new concepts for urban scale area efficiency. This to develop principles to how a focus on area efficiency, can lead to a more sustainable city.

Img 3.1 Nytorget in Stavanger. The parking space is converted in to a market square every Saturday.



|THEORY|AREA EFFICIENCY|

3

INTRODUCTION

From arguing that area efficiency is an urban sustainable solution in the previous chapter, the thesis will go on to investigate how area efficiency can occur on the urban scale. This chapter will present different theories concerning area efficiency for housing units, residential neighbourhoods and office buildings. The area of urban scale area efficiency seems to be a research subject that is barely touched over the years. The former mentioned theories will therefore be used in order to develop new concepts and theory for the urban scale area efficiency. The chapter will also present two more reasons to focus on area efficiency, the economical and the social concerns.

Since there arguably is a limit to how little m² people can live on, before it starts to affect peoples quality of life, the thesis will propose two different ways of analysing or testing area efficiency. The “pure” that only relates to the m² use of buildings and land, and the social. The social area efficiency concept take the users welfare and quality of life into consideration, by using the theories of both area efficiency as well as urban theories of social needs and behaviour. The aim is to create areas that are both area efficient, but also good to live in. Area efficiency can also give bigger “friction” between people, meaning if people live closer and tighter they have to deal with each other, both in good and bad. A positive effect can be that people feel safe and not alone, and the negative part can be that this “friction” becomes a problem concerning privacy. All this will be further addressed in this chapter.

Area efficiency (arealeffektivisering in Norwegian), is a term that according to Berge (2003), previous have been given little or no focus in the sustainable urban development. Relating to Manoochehri’s “1234 Framework”, it can be characterized as an application solution. From studying the urban metabolism in chapter 2, it can be concluded that by reducing the amount of living space and built form, we among others also reduce:

- The amount of resources used in building and producing.
- The amount of pollution and toxins being discharged, both during building, using and demolition.
- The energy that’s needed, both in building, using and demolition.
- The amount of water, mainly in building and demolishing.
- The land use, preventing agriculture or natural areas being changed in to built land.

There is also a common understanding, for instance from the “The Climate and Environment Plan 2010-2025” for the City of Stavanger, that the amount of car traffic can be reduced through a denser city. The density can provide a better customer base, which can facilitate a better public transport network. Shorter distances can also give shorter trips, which again can give other modes of transport, like walking and biking.

THE CONCEPT OF AREA EFFICIENCY

Byggenæringens miljøsekretariat (2009) claim “Area efficiency is

about exploiting the built areas better” (translated by author). When searching through literature, I found little research on area efficiency on the urban scale. There are different studies and research on the different parts of the urban form, such as, how area efficiency can be adapted or used for individual housing units, housing areas and for office buildings. In addition there are also theories on land use, the affect of mix and dense functions, and building form. There seem to be little research where the urban space is seen as a whole, and on how the different individual buildings or functions can benefit from each other.

The theory studied

The theory has been studied through literature review, searching for different theories on area efficiency. Berge (2003) have been looking at area efficiency for houses, mainly detached or semi detached units. In his study, he focuses on how the functions of living can happen in a more space efficient way. His findings are highly relevant for detached housing, but also flats. Many of his findings can also be said to be valid for an urban scale. Høyland and Støa (2002) focus on adaptable housing areas. They start in the housing unit, discovering many of the same concepts as Berge (2003), but then look beyond the four walls of the individual housing unit. They focus on how the housing areas can be more efficient, by sharing functions between the units. Arge (2003) have been looking at the office buildings, and how they can be more adaptable, providing a low m² per workspace.

AREA EFFICIENCY IN DIFFERENT SCALES OF THE URBAN FABRIC

The next paragraphs will present theories found on area efficiency in the different scales of the urban form.

Area efficiency in Housing

Berge (2003) defines area efficiency as the house' production ability, divided in to theoretical-, practical-, and used- production capability. The theoretical and practical capability relates to the planning stage, while the used capability is how the house actual is being used, so dependent on the users.

Theoretical Production capability

Theoretical capability relates to the room program, concerning dimensions and numbers of rooms and functions. Berge (2003) points out that there are three different groups or stages where this type of area efficiency can happen: in the programming, in the design of the plan and in the aesthetics.

In the programming face

In the programming measures, there are multiple solutions to reduce the space. Common functions is one of them. Collective housing is one example of this Here different household units

share different functions within a household. Students often live like this, sharing a kitchen, living space and/or bathroom. This will be furthered addressed later. Common laundry rooms or storage space are other examples, where different units share these functions with other units in the building. This also relates to sharing of functions in housing areas, as Høyland and Støa (2002) talks about. According to Berge (2003) the individual housing unit, potential can reduction the space with about 2-6%, by sharing common functions with other units. Another benefits that Berge (2003) points out, is that the sharing of space and functions, also can make the neighbourhoods more attractive, This through adding common functions such as sauna, kindergarten or a greenhouse, to mention a few. It can be argued that Berge (2003) is a bit careful in his calculations, and that a bigger reduction can happen, if the units share other functions, such as guest rooms or dining rooms, which will be addressed later.

Double usage of function is another way to reduce the space. The potential here is a 5 -15% reduction in m², according to Berge (2003). In the housing unit, this can for instance be applied by using the same room for different functions, where the use don't overlap in time. An example can be the guest room also being the study. There are also functions that arguably can overlap in time, meaning the functions can be used at the same time without causing problems. An example can the kitchen and the laundry and even the kitchen being the study for the kids. The idea is to prevent so called function specific rooms or mono functional rooms, that have been a trend in detached housing the last decades. (Baastrup 2001)

Compression of function can reduce the area with 1 to 5%, depending on what part of the fixtures is changed (Berge 2003). This



Picture 3.2 Doc, space saving system, bunk-bed and couch. Transformable and area efficient furniture form Resource Furniture (2008)

idea comes from caravans, air planes or trains, where the space is limited. Functions therefore need to be compressed. For instance by changing the depth of the kitchen bench from 600mm to 400mm, to reduce the amount of “dead” space. This will also give reduction in materials and transport cost for the producers. Furniture that can be used for multiple purposes is also an example, as seen in picture 3.2.

By differentiate the functions by temperature, the housing unit can be organized so that functions and spaces that doesn't have to be heated, are placed outside the heated living areas. Storage space is now more often a part of the heated area in a flat or house. If the storage space is 10m², this can be 10 to 15 % of the total living space in a 3 or 4 bedroom flat, and take recourses in both the building and the operation period. (Berge 2003)

Walls also take up space, and an inner wall of 8m with a thickness of 4” will use 1m² of floor space. A reduction in rooms, will therefore reduce the need of space. A house with a very open plan will, on the other hand, not have the possibility to separate between different temperature zones, or sound from different users.

In the design of the plan

The main function of a hallway is to work as the communication or movement area between different parts of the house, without creating negative friction or disturb other rooms or functions. The movement area can in many cases share space with other functions, like storage, library, etc., especially in flats with just one or two people. Berge (2003) points out that reduced hallway area, have a potential m² reduction of 5 to 10% in the unit.

Using space/volumes more efficient, is another source to reducing space. Berge points out that the volume of the space in a unit rarely is used to the maximum. This goes for storage under stairs, or the space between wardrobes/cupboards and the sealing for kitchens or bedrooms. The m³ under or over beds can also provide a great place for storage. Using the volumes more efficient, the space needed can be reduced with 1 to 3%. (Berge 2003)

By working through the plan focusing on optimizing the placement of components and elements like doors, kitchen furniture, chimneys etc, the space can be reduced without jeopardizing functionality or comfort. If the doors at the end of the hallway are placed on a bit of an angle, the hallway can be narrower. An other example is avoiding kitchen islands, that is known to be very space inefficient. (Berge 2003)

Aesthetic measures

The visual experience of a room is dependent on the width, but also the height. A small room will be experienced as smaller, if

the sealing is lowered. In contrast, small spaces can be experienced as bigger, if the height of the sealing is increased. There is of course a limit to the equation, before the experience becomes absurd. An expansion in height, will give more external wall, which again will give more use of materials and as well a bigger heat loss. Berge (2003) calculates that if a one story detached house in Oslo decreases the volume with 12.5%, to 2.7m ceiling height, the extra energy use will correspond to an increase of 2.5% in the floor space. For Tromsø which has a tougher climate, it will correspond to 5% more floor space. The material use will go up with 3% in a villa and 5% in a block building.

Views and openings also have a visual effect, which can make the space feel bigger. Both views within the building, but also views out of the building, will have an effect. Axis within the building can be achieved through the plan, but also by using glass inside the building, in doors or walls.

The Practical production Capability

Normally when buildings are raised, they are planned to have a life span of 50 to 200 years or more. (Svane 2010) It's hard to predict the future, but is reasonable to believe that peoples needs and preferences will keep changing. As Berge (2003) points out, the last decades there seems to be a trend that every function is getting its own room. This can be seen as a result of the growth in wealth, and the majority of villa housing. It's important to create buildings that are not resilient to change, and that easily can change and adapt to the needs of the current situation. This can happen in different ways, explained as flowed.

Generality

Generality is understood as the house's ability to adapt to changes in the household. Either that the household changes in size, or that one of the residents experience a change in life quality. This can happen through permanent or temporal disabilities that requires for instance a wheelchair. Life cycle standard, “livsløpsstandard” in Norwegian, is an example of planning regulatory that focuses on this. The idea is that if you get injured, or when you get old, you can still live a good life in your home. This requires that the home is planned in such a way that a wheelchair can be turned and go through the doors of the hallway, living room, kitchen, bathroom and at least one bedroom. It can be argued that the life cycle standard create housing that uses more m² than necessary, due to the extra space needed for turning a wheelchair.

Flexibility

Berge (2003) have defined flexibility in buildings, as the buildings way to adapt to the changes in the need of space that the household can have over time. If the family situation changes, the flexibility will allow the inner room division to be changed. It is then

important to make sure arrangements for water, sewage and power don't prevent this. Light walls that easily can be dismantled and changed, are a theoretical ideal for this. This also relates to the following chapter about office buildings. Flexibility can also happen between flats, if one living unit can be divided in two or more fully fledged living units. By allowing the size of the living unit to be reduced/increased with the reduction/growth of the household using it, this can be a strong contributor to keeping the m² per person down. This type of "dynamic housing" can with optimal circumstances, decrease the living-production between 20 to 50%. (Raaen 1995) A criticism against this can be, that all households need "heavy" and recourse demanding installations, such as kitchens and bathrooms. The dividable part could potentially never be used as intended, if the household doesn't want to or doesn't need to rent it out. It can be argued, that this mean a big investment in equipment, that might not give any area efficient result, but just the contrary, more use of space.

Elasticity

A common feature is that row houses, two family houses or detached houses have a possibility to expand, if a change in living situation should occur. This can be viewed as elasticity. (Berge 2003) A built extension can arguably be said to be irreversible, since it doesn't make sense to remove the extension when the need for more space is no longer there. A better way of elasticity is to have rooms that can be used with the changes of the seasons, like winter gardens or glassed balconies. These can provide extra living space in spring, summer or early fall. Without extra heating.

The used production capability

The architect or planner can design the best living areas, concerning practical and theoretical production capacity, as previous mentioned. But the last piece in the puzzle is of course the user. Planners or architects can never force the users, but can provide quality solutions that hopefully will work for the users. This also relates to the "1234 frameworks" behaviour solution, where quality and design are enablers to affect this. According to Berge (2003) the used production capability tells how the housing unit is being used at a specific time. It can't be measured collectively, but needs to be measured individually for each housing unit. It's also reasonable to believe that the specific unit will have changing result over time, as the household changes both in size and age composition.

Area efficiency for housing areas

Høyland and Støa (2002) look at adaptable housing areas, pointing out the same three categories as Berge (2003), generality, flexibility and elasticity. They have divided the solutions in two different categories. The ones that demands physical changes, and the ones that don't demand physical changes.

"Traditionally it has been focused on the individual living unit, when it comes to adaptability in housing context. Seen from a sustainable view, it's just as relevant to discuss this on a housing- and neighbourhood level. If we wish to facilitate attractive living environments. This is not necessarily connected to the certain housing unit, but maybe just as much to the local community"

(Høyland and Støa 2002: p 26, translated by author)

Solutions for adaptable housing areas, that don't demand any physical changes

Looking at solutions that don't demand any physical changes, Høyland and Støa (2002) point out solutions that use generality and elasticity.

Generality

Generality on the neighbourhood scale is understood as the need for a wide range of housing types and sizes, also mentioned by Berge (2003). According to Høyland and Støa (2002) this has two main reasons. Firstly, this gives the inhabitants the chance to change type or size housing unit when the household changes size, but still stay within the area. If an area efficient neighbourhood is attractive and experienced as a good place to live. This can then lead to people choosing a more area efficient type of housing, like flats, instead of moving to another area with less efficient housing units like row houses or villas. The same occur when there is a reduction of people in the household unit. Either due to the children moving out, or the that couple get divorced or widowed. A diversified neighbourhood then makes it possible to move to a smaller unit, without leaving the preferred area. The researchers also point out that there is no guarantee that the household will move to a smaller unit. Although it can be argued, that a diversified neighbourhood do provide a better chance of the household to move, than if the opportunity wasn't present.

The second reason is the concern of segregation and creating areas that consist of household types that are similar in size, age and social status. This can exclude people, but also attract people. If people identify themselves with an area, this can be an important attractor. Arguably it can provide social areas where people feel at home and get involved in the neighbourhood. This part is not necessarily area efficient, but can relate to the reason mentioned previous. Young people get attached to the neighbourhood and choose to buy a bigger flat in the area when their family grows, instead of moving to the less dense suburbs.

Elasticity

During different phases of life, the need of space changes. But the need of space can also change during the year, the week or even

the day. Høyland and Støa (2002) points out that people seem to plan not only for the space they need on a daily basis, but also for special occasion. This being birthday parties, the Christmas dinner, when they get overnight visits or celebrating the confirmation of their child. Shared common rooms are examples where the residents have access to this type of space, outside their private unit, when it's needed. This can reduce the space needed in the specific housing unit. Since the common space is shared between several other units, the m² per person can be kept low. At the same time, the households still have space and functions available. As Berge (2003) also points out, this can also happen with co-housing or collective housing. The households can consist of small units sharing many functions, like student housing. Here it could only be your bedroom that is private. Others units may just share bike storage. Høyland and Støa use "Borettslaget Kollektivet", "The Collective", in Oslo as an example. This cooperation housing was established in 1975, and has 138 flats of different sizes that share 815 m² common areas. These common areas are used for dining and party rooms, kindergarten, laundry, gym room etc. There is also a dinner room, where about two thirds of the residents eat dinner every day. As the researchers say, people who live in these types of housing like the idea of sharing and the social aspect of this. Arguably they can't be said to be a representative selection of the population.

Solutions for adaptable housing areas, which demand physical changes

The solutions that demand physical changes are just mentioned briefly by Høyland and Støa (2002). As an example of generality, they mention spaces that can have different use. This can for instance happen with units that can be both housing and other functions. It's a bit hard to understand how temporally they see these changes. One way of understanding this, is that an office building can be converted into housing, and have the potential to be converted back to office if needed. Especially since these are solutions that demand a physical change. Flexibility can happen through a built environment that is shaped in such a way, that changes to the individual unit can be done without creating a visual chaos. Structural changes, making the housing units larger or dividing them in to smaller units, providing physical changes over time, should be a part of the elastically idea. Then the build environment can change, without jeopardizing the quality of outdoor areas, or the maximum density of the area.

Area efficiency through common

functions/common facilities on the neighbourhood scale

As mentioned earlier, common functions and facilities can be shared between households. This can either happen between units, or through different households sharing one living unit. Collective housing for students are a typical example of different households sharing a housing unit, while common laundry rooms

are an example of space shared between different units.

Selvaag is a housing company that has a concept they call "plus housing". This is aimed towards senior households, or households where the children have moved out. Selvaag builds apartment blocks that have

"access to a varied and extensive service area, where you will find a staffed reception, guest rooms that can be rented when you get to visitors, fitness room, banquet/dining room and kitchen. All stylishly decorated and fully equipped."

(Selvaag 2011, translated by the author)

The company doesn't necessarily have an area efficient profile, but develops quality solutions to ease the life of the residents. Their ideas arguably do represent area efficient solutions, by suggesting shared functions such as guest rooms and rooms for bigger parties. Both solutions that can reduce the amount of space needed in the individual flat. In the given example these spaces are shared within a housing complex, but could also be services provided for a neighbourhood or larger area.

"Grendehus", or community buildings can be found in certain villages in Norway. These are buildings mainly built on "dugnad" voluntary work, by the inhabitants. They become a private/public space, which can be rented for private festivities, birthday parties or weddings etc, or common celebrations for the village. In this way they work both as a gathering place for the village, as well as way of reducing the need of large individual residential units.

Area efficiency in office buildings

"As a rule of thumb, the average office employer is present in his office about 40% of the office time" (Byggenæringens miljøsekretariat 2009, translated by the author) Office buildings have the same potential as residential buildings, to become area efficient. Arge (2003) also points out elasticity, generality and flexibility as terms to make office buildings adaptable.

Elasticity

Elasticity measures in office space is defines as the office buildings ability to adjust to the changing needs of space. In other words, to join or divide the space needed. The elasticity can according to Arge (2003) be achieved when the body of the building is organized and shaped in way that makes it possible to have separate access points. In this way, different parts of the building can be divided into smaller individual units. A separation of functions, where workspace functions, common functions and special functional are separated from each other, is also important. Concerning area efficiency, access points can be an important factor. This because

if the need of space goes down for one of the tenants, the tenant easily can rent out the space they don't need. If the tenant expects this decrease to be temporary, they might not want to move. The possibility to reduce the space and rent it out will then also benefit them.

The idea of function separation can also allow an office building to be used by different companies. Telenor's administration building in Krogstad Bergen, is an example of this. Special functions such as meeting rooms, cafeteria, café and auditoriums are located at the entry level, along a "Street". The Telenor building is currently just used by one company, but can easily be changed into hosting multiple companies. The entry floor can then be common space, where the special functions can be shared between the different tenants. Each floor above the ground floor, have office spaces with toilets and mini kitchens, supporting a specific number of work spaces. This way of sharing functions and space between different units, also relates to the ideas of a more efficient space use, reducing the m2 per office space.

Generality

Generality relates to the ability the office building has to meet changing functional demands, without changing its features. According to Arge (2003), there are two important factors, the depth of the building and the height of the floors. According to her, there is a common understanding that a building depth of 16 to 17 meters, gives optimal conditions for different combinations of office layouts. Arge (2003) refers to Niels Torp Arkitekter AS, that claims

that both project based office layouts and traditional cell offices with double corridors that contain common functions in the mid zone, work good with 17 meters depth. See figure 3.1. Buildings with a depth that makes all of its space usable, will also be area efficient.

Concerning the height of the floors, Arge (2003) points out that the total floor height always will be a result of a balance between the highest allowed cornice height and the generality of the building. She gives 2.7 meter net height, or 3.3 to 3.4 meter total height as the best, to be able to use the whole depth of the building. She also mentions the technical grid as an important factor, in order to be able to change the structure of the office.

Flexibility

Arge (2003) defines flexibility as physical flexibility. This relates to the office buildings ability to meet changing functional demands, meaning it should be easy to adapt the building, if the use changes. This can be done through a modularity network, where all modules are given the same size and type. System walls can then be used to divide of spaces in this modular network. The system walls are "light" walls, which easily can be taken down and put up again in a different pattern, if the layout of the office space needs to be changed. Ceilings are also an important part of the flexibility. Arge (2003) points out that a continual, a one levelled sound tight ceiling is the most flexible. This is because walls can be moved and added, without the need of big changes in the ceiling. Flexibility might not directly be related to area efficiency, but it does relate to

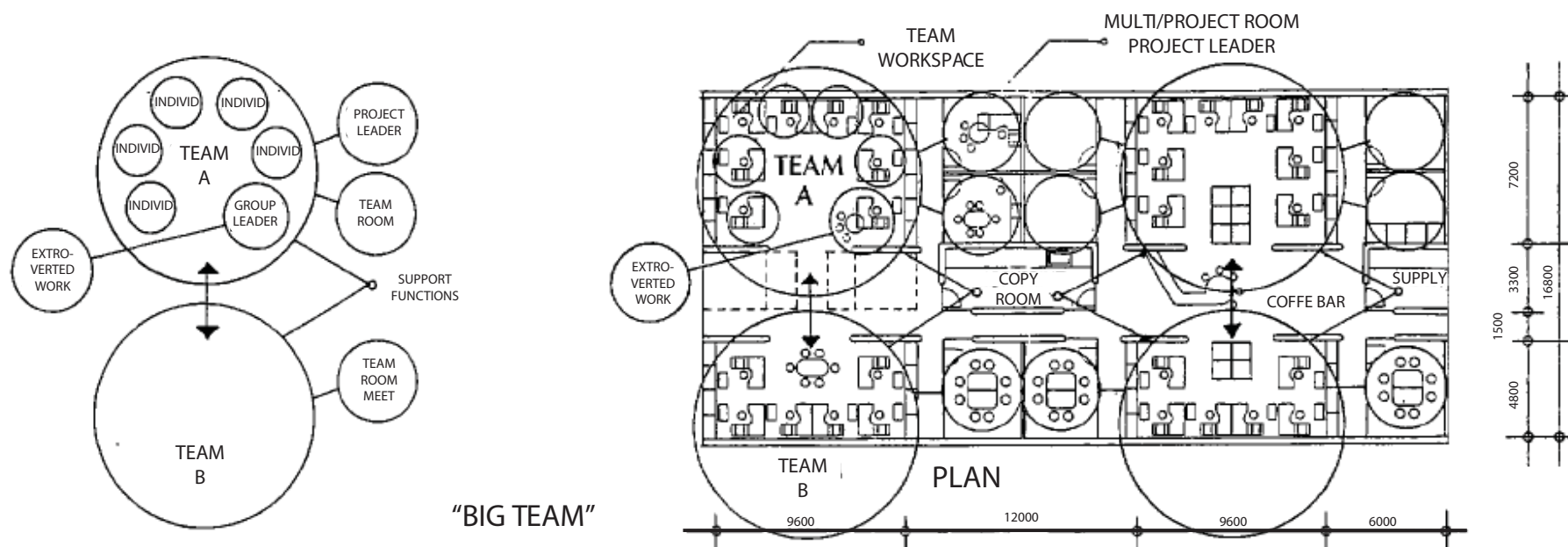


Figure 3.1 Sketch of team based office solutions, made by Niels Torp Arkitekter AS (Arge 2003 p 11)

elasticity, and the possibility to change offices in to different units.

Multiple use and co-localisation

Byggenæringens miljøsekretariat (2009) uses schools as an example of collocation and multiple uses. Schools are built in a way that allows them to also be used for sport, culture or other activities after the school day is over. In this way the spaces are being used more efficient and over a longer period of time. This also means that there is no need to have specific buildings for the different activities. Another example is the area on Nytorget in Stavanger. This area is used for parking every day except form Saturday, when the parking lot transforms in to a market. See picture 3.1 in the beginning of the chapter.

Land use

“The more dense the population of a city is the less are the distance that have to be covered. The moral, therefore, is that we must increase the density of the centres of our cities, where business affairs are carried on.”

(Le Corbusier 1987: p 166)

The built form can be said to affect the use of land in two ways. Through the type of building chosen and how the buildings are organized. There are two characteristic ways of organizing the built environment. One being the modernistic thoughts that Le Corbusier was a front figure for, zoning. This type provides housing in one area, industry in another and offices and services in a third. The idea was to divide the polluted industrial areas form the housing areas and give the inhabitants healthy and green areas to live. (Le Corbusier 1987) The more current view among urban planners, is to mix the different uses to avoid so called sleeping areas, and to provide more vital neighbourhoods that demand less transport. (Carmona et. all 2003) Industrial areas are kept away from the rest, but in today's service and information society the majority of workers can be sat to work in office buildings. The mixed use of functions, therefor arguably no longer provide pollution problems.

When looking at the type of buildings, villas with gardens are arguably the most inefficient way to build, due to the amount of land needed to facilitate one household. According to Fiskaa (2004) villa housing has 1 to 1.5 housings per dekar, and a plot usage, TU, of 15 to 20%. Family houses for two of four families, have 2 to 3 houses per dekar, and a TU of 35 to 40%. Row houses are more efficient, but still have just 3 to 4 houses per dekar, and TU of 49 to 45%. Block buildings will off course depend on how many floors the block have. In Norway, there is a demand for an elevator, if the block has more than 4 floors. Fiskaa (2004) there for points out, that blocks are most often found with either four or more than seven floors. It can be argued that this statement is no longer valid, and it seems to be the planning regulation that determine

the number of floors. A block building with three to four floors can have 8 to 10 housings per dekar, and a TU of 100%. Ellis (2004), have also looked the land use concerning different housing types. His research show that stacked flats with five floors, have 8 to 11 dwellings per dekar. While high rise stacked flats, with more than 8 floors, can have 20 to 30 dwellings per dekar.

HOW MUCH CAN THE RESOURCE CONSUMPTION BE REDUCED THROUGH AREA EFFICIENCY?

From the presented concept of urban metabolism in chapter two, it was concluded that a reduction in built m2 would lead to a reduction in materials, energy, water and built land. Indirectly there would also be a reduction in pollution and CO2 emissions, which occurs both in productions of materials, transport and construction. The next paragraphs will try and present in what way area efficiency can influence the different reductions put up.

Reduction in energy

In Norway, the total energy use associated to buildings are about 80 TWh. This is 37% of the total energy use in Norway, all sectors included. While the energy used for housing is about 51 TWh, or 24% of the total energy use in the country. (Thue 2003) When looking at the total energy use of a building, is calculated that the use of the building require 90% of the energy, the production of the materials 6.25% and to build it take 3.75% of the total energy use for the building. (Hovde 2003) Use and type of building materials, will of course also reflect on the energy use, and it can be argued that exact numbers are hard to portray.

According to Berge (2003) the energy used in production, maintenance and demolition, is strongly determined on the material used, hence the m2 built. He also points out that some of the energy use relating to the usage of the building will be affected by the m2. The energy use for heating is of course strongly affected by the m2. Lighting will be affected in some way, all though it relates more to the amount of people living in the unit, and if they turn the lights off when they don't use them. Energy use for electrical equipment and warm water also relates more to the size of the household and their habits, than to the m2. Berge have calculated that a reduction in m2 by 10% will reduce the energy use with almost 5%, while an m2 reduction of 30% will reduce the energy by 15%.

Reduction in materials

The use of building materials clearly increases with the size of area built, although this is only valid for certain types of materials. All housing units have a bathroom and kitchen, regardless the size. The use of materials will also be depending on type of room. Bathrooms or kitchens require more materials that an un-insulated storage booth.

It can be argued that a reduction in m² also reduce the need of furniture. Again there is furniture that is required whether it's a big or small living unit, like bed, wardrobe, table etc. The amount of furniture and appliances will also depend on the users. In small spaces, furniture need to be more flexible and a dining table might also function as the working desk. It can be argued that flats normally are furniture with "what there is room for", so an area reduction can lead to a reduction in furniture.

Berge (2003) points out that the m² use is biggest in villas, and the biggest potential to save materials through reducing the space, is found here. Figure 3.2 show Berge's (2003) calculations on the reduction in material use, concerning type of building. As seen, the graphs are steepest with a reduction from about 80m² towards 40m². When a housing unit get over a certain size, a small reduction in area don't seem to have that big of an impact. The graph also shows that if the national building mass changes form a majority of detached housing, to a majority of block flats, there will also be a decrease in materials used. Seeing that a 100m² villa will use about 90% of the material use per m² of a 40m² villa, while a 100m² flat in a block will only use about 55% of the materials.

A reduction in water

The water use in Norway for 2009 was about 706 mill cubic meters per year, through the communal water system. 42% of this was directly related to the households. (SSB Kommunal vannforsyning, 2010) The water usage of the flat arguably relates little to the m², but more to the households since and habits. In the unit, water is used for shower, personal hygiene, toilets, cooking, dishing and

laundry. Cleaning is the only one depending on the m², but it's arguably an insignificantly small quanta.

The water use concerning m² mainly refer to the building industry. Here a large proton of water is used, both in material production and on site. Water is being used in different part of production, and in the same way as energy use, some parts are more dependent on the m². Water that is used for producing materials for the construction and as well for demolition, will all be reduced with a decrease in m² use. The specific material used, will also depend on the water usage, since some materials need more water in production than other. Concrete is one example of a material that needs a substantial amount of water.

Reduction in office space

Office buildings can be just like apartment blocks, with sharing functions and creating efficient space. Telenor Bergen reduced their office space form 46m² per workspace to 20m² per workspace when they moved to their new office building in Krogstad, Bergen. The new building had reduced dead space like hallways and added a more efficient use of meeting rooms. (Byggenæringens miljøsekretariat 2009) If all companies can reduce their office space the same way, the need of office space would arguably be halved.

Reduction in land use

In the city of Stavanger, about ¾ of the households are row-, detached houses or villas. (Stavanger Statistikken, "Hustyper", 2011) These types of houses require a larger piece of land than block or apartment buildings. A reduction of m² per person and more extensive use of flats/more stories buildings, will of course affect the amount of land that is built on. Concerning the numbers by Fiskaa (2004), presented in the paragraph concerning Land Use, villas have 1 to 1.5 housing per dekar, while a 4 floor block building have 8 to 10 units per dekar. In other words, 1 dekar of land can give room for one or two detected villas or 8 to 10 flats. Still keeping a rather low scale built environment with only four floors. Block buildings today, have a strong trend of building common parking underground, so that parking doesn't require more land.

Denser areas can also reduce the need of journeys made by car, and change the mode of transport to biking or walking. This will of course also influence the CO₂ emissions and use of fossil fuels. Density can also have an effect on the public transportation, and with more people per km², the customer basis is larger, making it more economical to provide a system with higher number of routes and frequency.

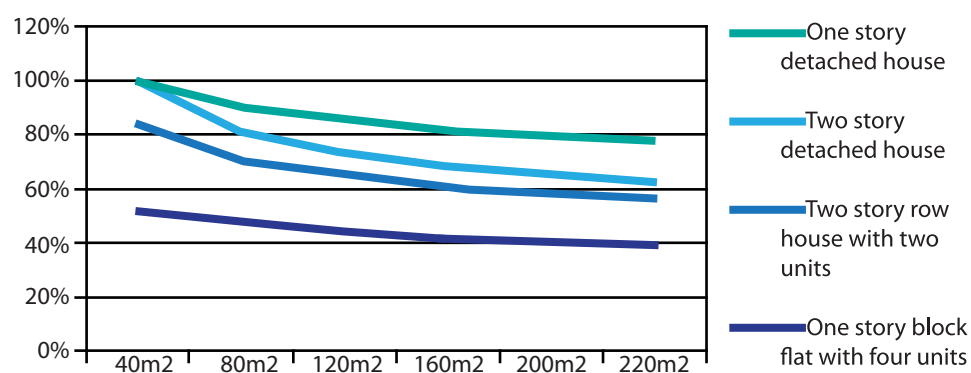


Figure 3.2 "Relative material use in volume, per m² usage area, for different housing types with different size, given in % by the use of a 40m² villa with two floors that represents the highest material need per m². The housing units are all equipped with quadratic plans. Internal walls are not added. The thickness on the outer wall is 250mm, sealing and floor 350mm. Internal floor separators are decided to be 250mm and the housing is equipped with front doors and windows corresponding to 20% of the usage area." (Berge 2003, p 24, translated by author.)

MORE EFFECTS OF AREA EFFICIENCY

Sustainable development is already presented as the main reason for choosing area efficiency planning, but there are also other benefits and concerns that can be solved. In the chapter concerning area efficiency in housing areas, the social aspect is briefly mentioned. Housing- and urban areas are important social arenas. The economical aspect is also mentioned in different chapters, and economy can also be a reason to focus on area efficiency, both on a micro or personal scale, but also on a global scale.

The Economical Aspect

Real estate prices and personal economy

A factor that can be said to affect how people live, is the economy and real estate prices. Since the 1990's the house prices in the big cities in Norway have been increased a great deal. Graph B.1 and B.2 in appendix B shows the growth in flat and detached house prices in the fourth largest cities in Norway, and as well Sandnes, the neighbour city of Stavanger. From the graphs it can be seen that the housing market haven't followed the consumer price index. In September 2010, Stavanger grew past Oslo, the countries capital, concerning price per m² for flats. From the two graphs it can also be seen that the price for the flat have grown more than for the detached house. It's also clear that the recession in 2007 had less affect on Sandnes and Stavanger than the other cities.

The average Norwegian household use about 1/3 of their budget for household costs, and then furniture and appliances is not counted in. (SSB "utgifter" 2010) In 1991 the Norwegian "styringsrente" (LIBOR) was 8.5% at Norges Bank, while it in Jan 2010 was 2.0%. (Norges Bank 2011). The low interest can arguably affect the inhabitant's possibility to buy. SSB reports that the living expenses of the average Norwegian households have gone up 81% from 1997 to 2007 in Norway. Most of the increase has happened after 2004, and it's mainly due to higher mortgages, interests and rent. The consumer price index has gone up with 20% in the same period. The increase in mortgage have been highest among young couples, with a rise of about 500 000 NOK between 2004 and 2007. (SSB "Gjeldsvekst" 2008)

As shown in previous chapters, area efficient housing use less land area and resources, and should therefore be cheaper to both build and buy. The value of a house will of course also depend on the market economy, and what the market is willing to pay. (Hoff 2005)

The housing developers are also depending on the price of land, materials and labour to decide whether to start a project or not. They need to know that they can sell the properties to a certain price, to be sure to make a profit. The EU projects that the cost of materials will go up the coming decades. This due to a building explosion in the eastern world, as well as a reduction in materials

stocks on the global level. (Euractive 2007;Europa.eu 2007) This also gives economical reasons to choose area efficient development for the future. Arguably, the economical climate can give a situation where the prices are so high, that the only way for people to afford to own a home, will be if it's built area efficient. It's then important to not just create dense areas, but also to create areas that are good to live in.

The social aspect

In a way, area efficiency can be said to be about rethinking how we want to live. Not only in the aspect of sustainability, but also in the prospect of ethics. Is it fair that we in the western world live our good lives on the expenses of the third world poor? At the same time, area efficiency also becomes an aspect of privacy vs. sharing and being social. The further paragraphs, will present social urban theories, concerning the importance of meeting places and social interactions as factors to create good urban environments.

"A sufficient density of activity and people has often been regarded as a prerequisite of vitality, and for creating and sustaining viable mixed use."

(Carmona et al 2003: p 179-180)

Norwegian cities can arguably be categorised as rather zoned, with Stavanger as no exception. Stavanger has few areas where housing, office and services are mixed, see map 5.1 page 48. The main urban structure in this city can arguably be characterized as a small district center with shops, a post office, a doctor and other services. This district center is surrounded by rather large housing area. These housing areas mainly contain detached-, row-, chain- and two family houses. In Stavanger these house types provide 71% of the housing units. (Stavanger Statistikken "Hustyper" 2011) In the 50's these housing areas might have been livelier, due to the majority of mothers that were home with their children. Today these areas can be characterized as quite "sleepy" between eight in the morning and four in the afternoon.

"If we valued fraternity as much as independence, and democracy as much as free enterprise, our zoning codes would not enforce the social isolation that plagues our modern neighbourhoods, but would require some form of public gathering place every block or two"

(Oldenburg 1989: p 164)

The point Oldenburg makes, can be claimed to be very valid in the much of built environment of Norway, maybe even Scandinavia. Very often the only common grounds in housing areas are roads, bus stops and playgrounds. Playgrounds arguably have an important role in many neighbourhoods, and become a meeting place

for parents that for different reasons are home with their children. But what about those who don't have any children in the age group between one and seven?

In the suburbs people often live in spacious houses. The only thing they share with their neighbour is the border of their land, and the road leading to the rest of the world. There is arguably little forced interaction. The gardens are most often private, and often protected from outside views. The suburbs also provide good parking, mainly on own ground. The use of car can also be said to create less social interaction, and the inhabitants can drive where they need to go. The housing units are most often private, not sharing any functions with others. This also reduces the social interaction, since this will only occur if people are invited, or stop by. Some argue that people have become more and more individualistic, and as Oldenburg (1989) points out, people get more social isolated. There seems to be a trend where people themselves want to decide and control who they want to be around, and when. This can also exclude people. The last decades, there has also been a trend of bank and post offices shutting down their serviced offices, making more of these transactions happen on the internet or over phone. This also reduces the little social contact that many of those who used these functions had.

Høyland and Støa (2002) say that segregated neighbourhoods can give people an ownership to the area. The same feather flocks together. Neighbourhoods can be attractive to a certain crowd, but then also exclude others.

As Jane Jacobs observes,

"[cities] are full of people with whom contact is significant, useful, and enjoyable, but "you don't want them in your hair, and they do not want you in theirs either""
(Oldenburg 1989: p 164)

Privacy is wanted, but a city with no social interaction arguably become stultified, without meaning, and so does the social life of the individual. The debate seems to come back to the balance of privacy and sociality. All people need to retreat, to be protected, and to feel safe and on their own. But people also need to feel that they are not all alone, that they are a part of something bigger. (Ingrid Gehl 1971)

The importance of the "The third place"

As earlier mentioned, the problem with many housing areas is that they lack neutral common places and spaces. Oldenburg (1989) presents the theory of third places. He says that there is a need of a neutral ground. A place that is not housing nor work, but a place to escape, relax, be social, enjoy life, etc. He presents this third place as the leveller of class and culture. Here there is no hierarchy, like in the work place, or status symbols to show your rank.

In denser areas that have different flat sizes and different types of ownership, together with a mix of shops, residents and offices, there is arguably a bigger chance that the area is used by people with different age, income, culture, education, etc. These areas have, just as much as in the segregated housing areas, a need of a common place, where people can meet.

Conversation is the main activity in the third places. "A comparison of cultures readily reveals that the popularity of conversation in a society is closely related to the popularity of third places." (Oldenburg 1989: p 165) Oldenburg refers to a study done by Tibor Scitovsky in the 1970's, where he statistically confirmed

"the rate of pub visitation in England or café visitation in France is high and corresponds to an obvious fondness for sociable conversation. [...] Socializing rather than drinking is clearly most people's main occupation"

(Oldenburg 1989: p 165)

It seems to be a common understanding that for instance in the Mediterranean countries, they use their outdoor public areas, like piazzas, parks, streets or bazaars, for conversations and sociability, like the third place. The Norwegian climate is often used as an explanation to why the population doesn't use the outdoor areas in the same way. This might just underline the importance of third places in the built environment. In Norwegian housing areas, the building act have made requirements concerning minimum sizes of playgrounds, with minimum distances from each house given. However, there are rarely, not to say ever, requirements of cafes, pubs, libraries, common buildings or other built gathering points.

An example of third places in Norway, can be the cafés in the shopping malls. Here senior citizens often gather to meet friends. According to Oldenburg (1989) third places should have the quality of being places where you can go alone and almost know for sure, that you can meet somebody you know, or have met before. Like the Book Café at the University of Stavanger, where the students go between lectures to get a coffee, to relax, discuss projects or simply just talk about what they did in the weekend. It holds a relative frequent crowd, and is a good place to become friends of your friend's friends. Older children can have the same experience at the local football field, where they know that most lightly there will be somebody they can play with. Maybe the newest third places are the gyms. If you are a frequent member, you start learning the faces of the fellow visitors, and maybe even start to have small conversations or hellos.

Oldenburg (1989) further points out that accessibility and opening hours are important for third places. They should be open on the busy hours of the day, but also on the quiet. They should also be

located close to the home, or on the way to or from an activity like work, shopping etc. In certain areas people who hang on the corner, frequent the streets or sit in public places are viewed as negative behaviour. Oldenburg points out that these people have created the public space to a third place. Here they can watch people, meet others, relax, and have something else than what they have at home or at work.

“What attracts people the most, it would appear, is other people”
(Whyte 1980: p 227)

Jan Gehl (2003) introduces his theory on different outdoor activities. He says some activities we have to do, like go to work, go to the shop, get the mail etc. Other activities are optional, like go for a walk to get some air, or sit and enjoy the sun. Gehl argue that this last type, depend on the quality of the physical outdoor environment. The final type of activities he proposes, is the social activities. These activities come as a result of the two former. When more people do the necessary or optional actives, social interaction can occur. This interaction can be passive, through just watching people or ears dropping on a conversation. Or it can be more active, by randomly meeting your neighbour or a friend, making a conversation about the weather, or plans for doing something together.

If you do a hike in the Norwegian mountains, and you meet somebody, it's common courtesy to say hi, maybe even have a small conversation about the distance to the top or the conditions on the path. If somebody come and sit next to you on a bench in the city, people get surprised or almost scared if you talk to them.

Although it's not in Oldenburg's definition, it can be argued that third places also can be somewhere you go alone, just to be alone among others. Not only to meet a friend, or a group of friends. In the view of Gehl (2003) and Whyte (1980), people are social creatures that are attracted to places and spaces that have other people. Sometimes people just like to watch, or be watched. To get inspired, see new things or get new impulses. In the same way as people go to the movies, the theatre or a concert to get entertained, people also seem to get entertained by watching normal people in daily activities. In this way people also get viewed them self. People seek conformity and acceptance, and they express their views and opinions through the way they dress, their attitude or where they choose to go and be seen. It can be argued, that an upcoming trend in larger cities, is for young independent workers to use the cafes as their workplace. Some feel more inspired when working in the middle of the buzz of a café, instead of alone in a quiet office.

A fear of sharing?

Høyland and Støa (2002) talks about the housing ladder, just like there is a career ladder. People generally start their “housing career” when they move out of the homes of their parents, around the age of 19. Some to study, some due to their first job. As students or trainees, their income is relative low, and the choice of housing is rather limited. Many choose to share a flat, or live in more organized student accommodations. The space is limited, and many of the living functions are share with others, like kitchen, bathroom, laundry etc. People quickly learn that they have to deal with others, and who haven't lived with a person who never remembers to clean the dishes or take out the trash when it is their time?

Most people seem to enjoy the social aspect of this way of living at a young age. In this time of life, there is less responsibility and people seem to seek the social life. When the finance situation becomes more stabile, through a job and higher income, there is a chance to move up the ladder. In Norway it almost seems to be frowned upon if people don't. The life situations also often changes, and it might include moving together with a partner, wanting to start a family life together. The wish to share seems to be less. People are maybe not moving as much as when they were younger, and might want to own their own things.

It can almost seem like the further up the housing ladder people come, the less they choose to share with others. From sharing a flat and several functions, to sharing nothing apart the border on their housing plots. 36% of all housing units in Stavanger are villas, sharing no walls with others. 19.1 % are two family houses and 15.9% are row houses, meaning 35% share one wall or ceiling/floor with somebody else. 24.8% are flats, meaning they share at least two walls/floor/sealing with others, but probably four or five. (Stavanger Statistikken “Housing Types” 2011)

When people share walls, floors or ceilings with their neighbours, they are almost forced to take part in their life. Depending on the quality of sound insulation, walking, slamming doors, and maybe even the weak sound of talk or a TV, can be heard. This “friction” can by many be felt like a problem, and irritation and interference with privacy. On the other hand, it's a felt presents, that can provide safety, knowing you are not alone.

When sharing, people have to deal with each other. In common laundry rooms there are often rules and limited times when the different users have accessibility. For many this can be viewed as a restriction of their freedom. Another way to view it is exactly freedom. If the washing machine breaks down, most common laundries have a company that looks after them. They take care of the repairs, and maybe replaces the broken one while it's being fixed. Most lightly these machines are also better than the one you

would buy private, since several people bear the cost. In the same way people share land, through parks and recreational areas. Most people seem to agree that public beaches are a good way of sharing, because few could stand the price of buying a house with access to the water.

The speed of our life's

When driving in a car the only thing to do if you see somebody you know, is wave. If we walk or bike, we have the possibility to stop and have a conversation. The speed and choice of mobility arguably decides our sociability, and also what we experience, as well as how. When we walk or bike, we have a slower speed, and can experience things we pass in a different way. When we take public transportation, it can have slower speed than the car, but in contrast to when we drive, we don't have to pay attention to the traffic. We can relax and enjoy the scenery or a book. Walkable areas are arguably also more flexible, we can decide to stop if we see something interesting, to talk if we meet somebody, to smell, hear and sense. If we walk by the baker and see something tempting, we can just stop and go in. In this matter, a bike ride or a walk is much more flexible than a car ride. It might take longer, but it will probably give more impressions. There is no need to look for a car park and only shop at the shopping malls or the suburban food shops. It can therefore be argued that denser mixed walkable areas are better social areas, as well as more sustainable.

DISCUSSION AND CONCLUSION

The theory studied and presented, show area efficiency that is just researched within the different parts of the urban form through housing units, housing areas and offices. No theory or research was found that looked at urban fabric as a whole. It can also be argued that in today's planning world, especially in Norway, there seem to be more focus on energy reduction through passive/active housing, than reducing the m². The exception might be the focus on mixed use. The next part of this chapter will try to sum up the theories found. Through them and the theories presented about social concerns in the urban scale, the thesis will propose two ways of conducting of area efficiency in the urban scale. The sustainable findings in chapter two will also be debated. The discussion will start with the role of the urban planner, to find out what urban planning can and should include.

The role of the urban designer

What is the role of the urban planner and designer? "Urban design is typically defined in terms of architecture and town planning" Gosling and Maitland (1984) claims. (Carmona et. all 2003: p 5) While the UK's Social Science Research Council get their view from Bentley and Butina (1991) "locating urban design at "the interface between architecture, landscape architecture and town planning,

drawing on the design traditions of architecture and landscape architecture, and the environmental management and social science tradition of contemporary planning"" (Carmona et. all 2003: p 5)

Urban planner and designers are trained in different scales of planning. From overall regional planning, through development plans (reguleringsplan in Norwegian), to building plots, street and squares. The city is preferably not just a collection of plots of land, where developers do what they think will be the most profitable, or? Personally, I understand the city as an urban fabric, a system, where the different pieces affect each other. The system has different scales, from regional and down to a specific building. In order to provide good living and working conditions, good neighbourhoods, good districts, good cities and good regions, as the theory previous presented show, it can arguably be important to understand how the different functions and scales interact. The size and layouts of the houses, should be reflected in the services provided outside the building. A villa house with a private garden, needs a different public space than a 28m² flat with a French balcony. An urban designer should know, and maybe even decide, the functions and qualities inside the buildings. This in order to provide good outdoor areas that can give good living conditions for the residents. Who will live here? Single people or families? The character of a street that has shops/cafes/etc. in the first floor is very different than a street that is just residential. An area could therefore benefit from being planned as a whole, and not a conglomerate of different projects. The urban planner and designer should puzzle these different projects together. This can provide a whole and full picture, where the urban designer also can combine different spaces and functions between the projects, in order to achieve an urban scale area efficiency. The urban planner has the development plan as a tool for this. The plan might not determine use, since the planner can't force things to be built or used, but the plan can limit and restrict the use of other functions. These plans normally doesn't determine flat sizes or specific users. This can arguably make the plans not as strong.

Sustainability and urban design.

From chapter two, it can be concluded that as a general idea, we want to preserve the globe for future generations. The global footprint tells us that we are using resources that we sustainably don't have and therefore shouldn't use. The Norwegian global footprint is as previous mentioned, 6.9 global hectares per person. While the world currently have a capacity or availability of 2.1 global hectares per person, if all would be divide equal.

The general sustainability idea of preserving the globe seems easy to understand, but it seems hard to find agreements on how to do this, when global politics and economy is included. Since there are no real consensus to what sustainable development is, it seems

hard to act on it. “Green” or “sustainable” have become a word used and abused by people wanting to sell everything from flights and cars to holidays, houses and clothes. One of the factors that make people even more confused is arguably all the different ways of measuring sustainability. Just from the few measures presented in the theory chapter, it seems clear that since there doesn’t seem to be a common consensus to how sustainability actually should be conducted or defined, it’s hard to find a common way of measuring it. The lack of consensus towards measuring, is the reason why this thesis will not aim to use any of these measures in its analyse.

The “1234 framework” presented by Manoochehri (2010) presents a way of structuring the problem. It’s not debating CO2 quotas or hybrid cars, but presenting problems, solutions and enablers. The framework claims that the current problem is that the biophysical limit is being threatened through over using resources. The natural vulnerability, the earth’s capability to adjust to changes, seems to be pushed more than it can cope. These two statements have good conformity with the measures and theory of Wackernagel’s Global Footprint. With this as a starting point, the framework looks at the solutions. One of the solutions mentioned is the better application of resources. With this we can understand using the resources we need in a more efficient way, in order to reduce the extraction of new resources. Area efficiency can be characterized to be an example of this. As seen in the previous chapter, it can arguably be hard to measure how much resources exactly can be reduced, through reducing m² built area. But it’s clear that it will have an impact, both on land, energy, materials and water.

In chapter five, the City of Stavanger’s Climate and Environment Plan 2010-2025 will be presented. One of the sustainable development aspects the plan focus on, is wanting to cut energy use in buildings. The plan propose this happening through reducing the kWh per m². One could argue that this way of measuring, will not solve the whole problem. Yes, a low kWh per m² is good, and it’s a big part of reducing our resource use, but is a 100m² housing unit that’s occupied by one person and uses 5 kWh per m² to heat, more sustainable than the same sized unit occupied by four people when it uses 6 kWh per m²? It could be argued that the plan doesn’t include the matters of reducing space, in a clear way. This will be further debated in chapter five, and can also be seen in appendix C.

In a study done by Bradly (2010), she asked two different neighbourhoods in Stockholm how they would characterize their level of sustainability. The first area was detached homes with relative high income, a high m² per person, and ownership of one or two cars. The second area was immigrants, with a low income, mainly living in flats, with a small m² per person and low ownership of cars. She discovered that the first area viewed themselves as rather sustain-

able. They recycled, some bought climate quotas when they flew on holiday and some biked to work. When she interviewed the second area, they felt bad because they didn’t recycle, and they didn’t really think about the sustainable problems. It’s obvious to see that the first area didn’t really live that sustainable, even if they thought so. This is arguably also a part of the dilemma, how much should peoples lives have to change?

The “1234 framework” also points out four enablers for change: price, laws, information and design. These are tools to enable or drive the solutions for sustainable development, but there is of course no guarantee that they will succeed. On the urban scale, price and laws are enablers left up to the politicians. It can be argued that urban designers also have a responsibility to inform the politicians. Pointing out criteria for making choices, and as well through what laws and policies are needed on the urban scale. Development plans, “reguleringsplan” in Norwegian, is an example of a document where this can happen. These plans are made by planners and give restrictions, such as building type, height, usage of the plot (“tomteutnyttelse” in Norwegian), together with other aesthetic demands. The plans do need to be approved by the politicians, but is arguably one of the tools the planners have to drive sustainable solutions. Relating to the evaluation of the two development plans of Urban Sjøfront in appendix D, it can be questioned how strong these area plans really are. Most of the built form that is built after the new plans are mainly residential. Not mixed use, as the original plans proposes.

In planning theory, the role of information and participation is strongly debated. Some theories argue that information and participation from the inhabitants are good ways for the planners to both inform the inhabitants, and as well to understand the planning areas better. Other theories argue that participation, don’t necessarily give good strong solutions, but try to legitimize and find solutions that everybody can agree on, and as a result become weak.

Design is the last enabler the framework mentions, and this is clearly an important tool of the urban planner and designer. It can be questioned if design always is an enabler, since there is not really a way to force or control that the user actually use the house, office space, public space etc. the way the designer intended. The design enabler do relate to for instance the theories of Jan Gehl (2003), that good outdoor spaces with good facilitation for different activities will attract people. If people thrive and enjoy their neighbourhood, they most likely want to stay. This also relates to Høyland and Støa (2002), which point out the importance of good dense neighbourhoods, as a factor to get young people to stay in flats instead of moving to less area efficient row houses when they get children. The job of urban sustainable designers must there for be to develop urban areas that are area efficient, but at the same

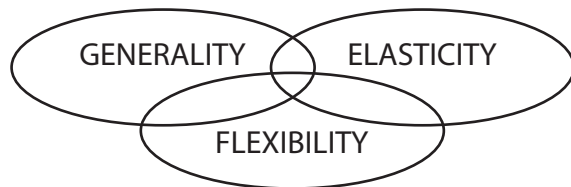


Figure 3.3 Showing functions / ways / qualities to create space / build form that is not static, but that can change or adapt to new or different needs.

time provide quality and good living environments to the inhabitants.

Area efficiency and urban design, introducing two main concepts.

Area efficiency is in the same way as sustainable development a concept that is universal and not dependent to any geographically area. Area efficiency is about reducing the need of m² built form, through smarter and more efficient solutions in the built form. As seen in the theory studied and presented, generality, flexibility and elasticity are words that mentioned for housing, office and neighbourhoods. The different terms have different specifics, depending on what type of built form they are looking at, but they share the same principles. These principles, shown in figure 3.3, all concerns the built form's way of adjusting to changes. It can be argued that the three principles can be hard to separate, but the idea for all of them is that the use of the built form is not static. The use of the built form has a temporal change in needs, this can be hours, days, seasons, years, or even decades. In order to meet this temporary change in needs, the built form need to be general, flexible and elastic enough to allow the changes to occur.

Through the theories presented, it can be argued that there are two different main concepts of area efficiency that occur. This thesis therefore introduce two main concepts for the urban scale area efficiency: Shared multifunctional spaces and shared monofunctional spaces. These concepts happen on different layers of the urban

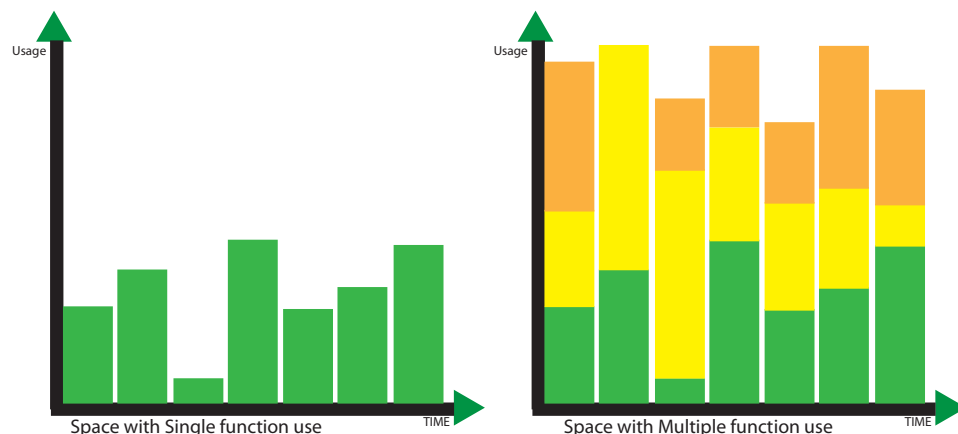


Figure 3.4 Temporal shared multifunctional space.

built form. From the specific household to a building complex, a neighbourhood and a city. In the theory studied, these concepts have only been applied with in the unit described, e.g. household, housing area or office. When applying it to the urban scale, the different units can intervene, for instance by spaces being shared between a housing block and an office building. In this way the whole urban scale becomes one unit, increasing the area efficiency even more.

Sharing multifunctional spaces

Sharing multifunctional spaces can be understood as a defined space being used for different functions, at different times of the day/week/year/ etc. This is a way of increasing the use of the space, by allowing the space not to be mono functional, but flexible enough to facilitate different functions or activities.

Within the house, this can happen through having rooms that are not specialized and as well connecting functions that don't overlap in time. A guest room can also function as a study, since these functions rarely overlap. (Berge 2003)

Schools are often example for shared multifunctional space, where the classrooms are used for teaching during the day, but children activities, meetings, clubs etc in the night. (Byggenæringens miljøsekreteriat 2009)

Multifunctional space sharing over time can also happen on a larger scale, and with the time frame being more than a day. In Stavanger, the public space around the central harbour has the last few years been transformed in to hosting the beach volleyball would tour, a short week every summer.

Multifunctional spaces shared over time can be done in all scales of the urban environment. A parking area for an office can be used as a basketball court after work hours, or a football stadium being used for concerts.

Like figure 3.4 show, function sharing is a way of using a space more efficient, and thereby reducing the amount of space needed. This reduces the use of land and recourses, and in an urban view, it can create less traffic and also give a neighbourhood feeling, if

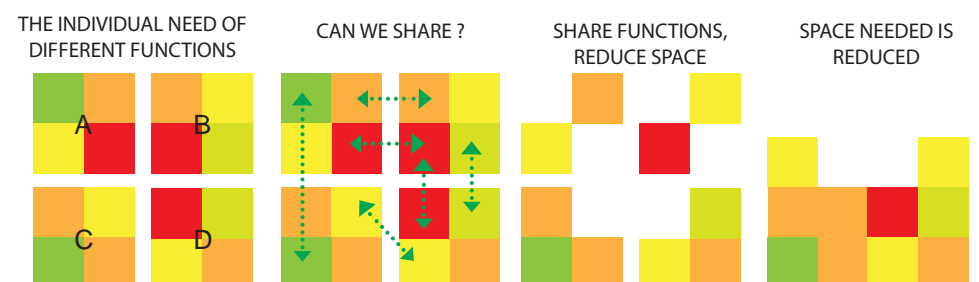


Figure 3.5 The concept of monofunctional space sharing.

spaces in the neighbourhood are used more.

Challenges concerning multifunctional space sharing

Problems with multifunctional space sharing are arguably the management and person friction. If a person leave their car in the parking area after work hours, it's hard for the team to play basketball. Management and clear "rules" are important, but the aim must be to create such a well driven system, that the users don't understand that different functions take place at different times.

When sharing multifunctional spaces, there some important factors to considerate, as follows.

The generality of the space. The space must have the generality to adapt to all functions, without much work needed.

- Auditoriums work well for lectures, but not so good for sports. If small changes need to be made, there needs to be systems that make sure they the changes are reversed for the next user.

Systems. There must be systems, which regulate the use and time. This so that the different users know that things are

- available, when they are booked.

User Regulation. In buildings where not all the space will be common, there must be systems that give access only to the

- shared space.

Sharing monofunctional space

Sharing monofunctional space can be explained as several individuals, households, employees, companies or citizens sharing a certain space that holds a specific function.

Collective housing is one example of this, where several household units share different common functions in a household. There is a distinction between private and shared space, and the household can have different grades of how many functions they share, like bathroom, kitchen, living space, laundry etc.

The monofunctional space sharing can also happen between households, for instance within an apartment building. Shared laundry rooms or bike storage are maybe the most common ways today.

In the city space sharing already occur, like libraries, swimming facilities, parks and roads, to mention a few.

There are several benefits of sharing monofunctional space. It reduces the space needed, but it can also reduce the amount of applications needed. If five households share a laundry room, this means that the amount of washing machines and tumble dryers can be reduced from five to one, alternatively two. Since five households share the cost of this machine, they can also reduce the cost per household, and can even buy a better and more dura-

ble machine. In the urban form, we also see the benefits of bigger parks instead of private gardens. The aim should be to share functions that have a low frequency of use. Relating to the laundry rooms, a family with three children might use their washing machine daily, while a one person household might use it once or twice a week, and there for more easily can share.

Challenges concerning shared mono functional space

Problems concerning mono functional space sharing is again maintaining the system. Those of us who have lived in shared student housing, know that different people have different opinions of what an acceptable condition of clean is. And that there is always somebody that gets the washing machine just before you. Just like a bus, there is a limit to how many people can use the system before it gets over crowded. The main concern about sharing is there for to create a system that is reliable and flexible, and in that way can compete with owning your own things or space. This is especially important in an economic climate where people can afford not to share.

Shared monofunctional space and shared multifunctional space and localization as a factor to drive the two others

Oldenburg (1989) talks about the importance of localization of third places. He claims that these spaces need to be on the way from work to home, or in easy reach of one of these places. The same can be argued with the spaces and functions Gehl (2003) calls optional activities. These are separated from the necessary activities that people need to do, like going to work, to the shop, to school etc. It can be argued that Gehl's (2003) optional activities and the following social activities, not only relays on the quality of the outdoor spaces, but also on the accessibility of them, hence closeness to home, work or school. In order to create good neighbourhoods, there is therefore a need to add more functions than just housing or office. By locating these added functions and spaces in such a way that most people easily can reach them, good neighbourhoods most lightly can be provided. With Gehl's (2003) ideas of social activities providing people to thrive, it can be concluded that area efficient neighbourhoods can compete with the suburbs areas with detached housing, as long as good functions are provided.

Area efficiency on the urban level

As mentioned earlier, by breaking up the strict privatised boundaries between different functions, the space of the city can be used more efficient. Dense urban areas have more people per km², meaning that there should be a need of space or functions being shared, since there is limited space available. Area efficiency can there for arguably also be a way of reducing and controlling the city growth. Through using the space and built form that is already there in a more efficient way. Instead of letting the city grow outwards, it can grow inwards. The urban areas can also have an eco-

conomic reason to share space and functions, since the m2 price can be higher here than in the suburbs. If more people share a function or space, the cost is arguably divided on more people.

Area efficiency on the scale of the specific sight or area

Although area efficiency is a general and universal concept, it arguably needs to be adjusted to the specific area when being implemented. Different parts of the world, has different cultures and different ways of living and creating urban environments. Some urban areas are already dense, and little can be done to reduce the m2 per person even more. In order to get the area efficient implementations to work, it can be argued that a study of the specific area is needed. This to point out what the current sight specific problems are, and what needs to be focused on when finding solutions. And as well to understand the more psychological reasons behind how people live.

As a conclusive last draw, I think it's clear that zoning and detached housing is not a sustainable way to live. There is a need for denser, polyfunctional urban areas, which provide the inhabitants with a wide range of shared quality functions. The built environment need to have a focus on quality and well kept areas. In a positivistic view, people are social creatures and a life in walking or biking speed, make us experience the world and all its people, smells, sounds, climate, in such a greater way, than speeding it queuing in our car, or behind blinds in a private villa.

This chapter have introduced different concepts of area efficiency on different layers of the urban form like housing, office and neighbourhoods. It can be argued, that there seems to be a limitation to how low the m2 space use per person can go, before it could affect the quality of peoples life. Through theories for both area efficiency as well as social urban theories, the chapter further introduces two ways that area efficiency can be conducted on the urban scale. Through sharing monofunctional space or sharing multifunctional space. The two concepts try to reduce the m2 per person, with out reducing the functions and spaces available, hence the quality of peoples life. The next step will then be to develop a way of analysing or testing area efficiency on the urban scale, in order to se possibilities and problems concerning area efficiency. In the next chapter an analyse tool will be presented, created on the grounds of the theory in this chapter and the new found concepts. The analyse will be used in chapter five to analyse the area efficiency in the selected case study area of Urban Sjøfront in Stavanger. The analyse will reveal sight specific concerns and qualities of area efficiency, and will lead to programmed suggestions and a sight specific design relating to urban scale area efficiency.

INTRODUCTION

One of the research questions put up, was to find out how area efficiency could be analysed or tested. This chapter will present an analyse toolbox, developed through the area efficiency and social urban theories studied and developed in chapter three. The toolbox will be used further for analysing the area efficiency in the case study, shown in chapter five.

The theory chapter concluded that area efficiency could occur through two different concepts. Either monofunctional space can be shared among different people, like a public beach or a common laundry room. Or space can change functions over time, and there for be used more efficient and by more people. In the urban scale, space can have different levels of ownership and accessibility. A space can be public or private, but it can also be private for a group or public for a certain type of people. It can be argued that space can be public, semi public, semi private and private. (Newman 1972) While the streets are public, the café is semi public. The cafe is for everybody, but if you don't buy anything, you most lightly have to leave. The laundry room is shared, but just between a certain group, making it semi private, and your home is of course private.

Introducing two ways of analysing urban area efficiency. There are arguably also two ways of analysing area efficiency. The first type can be categorized as the "pure" area efficiency, the spatial and ecological, also relating to the ideas of the ecological footprint of Wackernagel. Here the focus is to use the least built

and land area possible. This type of area efficiency can be measured through people per m² building or land, just like a density measure. The measure can be used to compare and calculate the "real" area efficiency. Arguably, there is a limit to how far area efficiency can go. How low m² people can live on, before it starts to affect the quality of their life. The other type of area efficiency analyse introduced, is there for the "social" area efficiency. Here the quality of life and happiness is being taken in to the equation. The social area efficiency focus on a low m² of building or land, but still providing people with access to functions. The idea is that if people have access to functions and quality solutions, the m² use per person can be reduced with out jeopardizing the quality of life. The "social" part of area efficiency is arguably not easy to measure quantitative, and there fore become more a qualitative part of the analysis. Social area efficiency takes the use of shared monofunctional spaces and shared multifunctional spaces to reduce the m² per person.

Figure 4.1 and 4.2 try to show how peoples "satisfaction" or quality of life is related to space use. The diagram is based on Maslow's Hierarchy of needs, seen in figure 4.3. As figures 4.1 and 4.2 show, by sharing space and functions, the total m² use per person can be reduced, but since functions are still provided, the "satisfactions" can be kept up.

Introducing two types of scales when analysing urban area efficiency

When analysing and testing the urban area efficiency, it can be

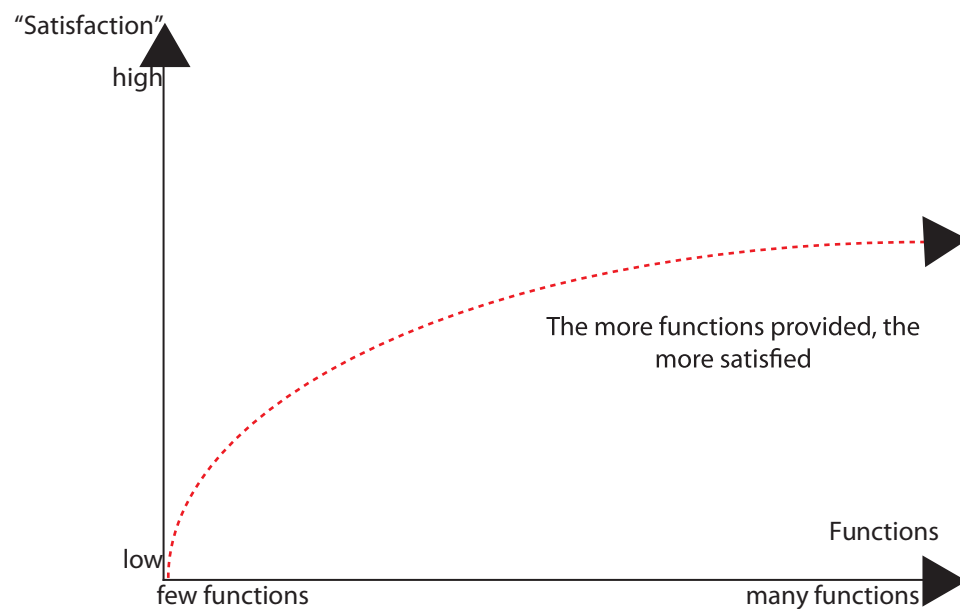


Figure 4.1 A low provision of functions will give a low level of happiness or quality of life. According to Maslow's hierarchy of needs, there are certain needs that are crucial to happiness. These basic needs need to be provided, then other types will add on the happiness, making the curve curved, not linear.

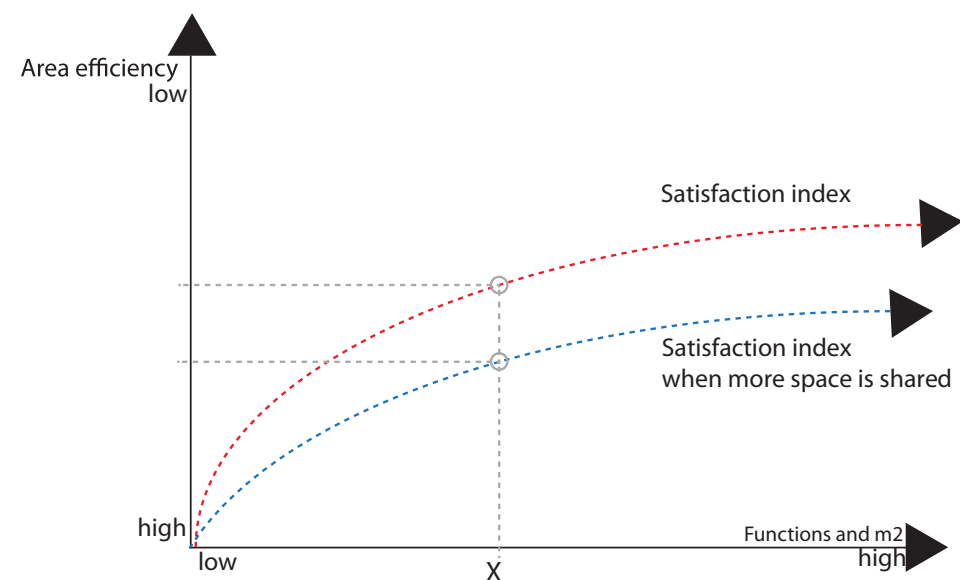


Figure 4.2 The satisfaction depends on the functions available. By sharing functions and space, the same number of functions X, can give a higher area efficiency.

divided in to two scales. The public space at the urban scale and semi public/ private space at the architectural/building scale. The public urban space is arguably available for all, while the building scale is more private or semiprivate. The building scale is dividend in two: The private unit, and the shared space between the private units, if the private unit for instance is in a block building. When adding this to the two ways of analysing area efficiency, "pure" or spatial and "social", a matrix appear, shown in figure 4.4. From this matrix and the theories studied in chapter four, this thesis has developed a tool or framework to analyse the area efficiency.

The tool has two intentions. First to be a analyse tool and to describe and test the urban area efficiency analytical. The tool is aiming to point out an ideal solution relating to the theory, and from this analysing and describing the existing. In the next step, the tool can work as a planning or programming tool. Either for new areas or for transforming existing areas, pointing out threats and missing functions. Step four in the tool holds a description of how different needs in housing and office, can be facilitated in the urban environment. For instance that the need of outdoor spaces can be provided either through a private garden, or a public park. When planning areas, this should be the first step the of the program. Here, the level of shared space will be decided.

Ways of analysing

The tool is both qualitative and quantitative, depending on what scale and type of area efficiency is analysed. The "pure" area efficiency can be tested through different measures. Since just one case study is chosen, this thesis can't give standard measurements to the "pure" spatial area efficiency. The numbers found are used to describe the measures, and compare the different units tested, finding characteristics within the case study of Urban Sjøfront. "Pure" area efficiency can for instance be tested as people per m², providing a quantitative measure. Either for m² per person in a building or m² per person shared space.

When looking at the "social" area efficiency, the functions provided are described, and this can be said to be more qualitative. The tool tries to locate factors that can provide good areas to live in, hence a more qualitative analyse. The analyse will describe functions or concerns, and can as previous mentioned be the basis for making a new program for the area.

Explanation to the different steps of the tool

As mentioned, the tool analyses on two different scales of the urban environment. Step one and two, looks at area efficiency on the urban scale, hence the public space. First step is to locate the functions in the area, adding them to the function wheel, determine if they are located in the neighbourhood, nearby, district or city scale. The idea is that if more functions are located in the neigh-

bourhood, relating to the ideas of Oldenburg (1989) and Jan Gehl (2003), this can affect the functions that are provided in the housing unit, as well as creating good and livable neighbourhoods. This step looks at the social area efficiency. Step two, looks at how the public spaces on the urban scale are shared. If these spaces are shared between different people and if they change function over time. This step also hold a calculation of m2 of common outdoor space, like roads, parks, squares and other public space. To describe the land use for the area that's not occupied by buildings. This step therefore looks both at the social and "pure" area efficiency.

Step three looks at the semi public/ private space at the architectural/building scale, focusing on social area efficiency the individual unit, but as well, "pure" area efficiency measuring the use of built space and land. The last, is highly quantitative, and can be measured with different parameters like beds per m2 built form. The "social" area efficiency is described through different functions and qualities available to the units.

Step four function as a check list or description tool, to see on what scale of the urban form the functions of a specific unit or building are provided. By "filling out the form", pointing out on what scale the unit or building have provided the different functions, the tool gives an impression if the unit is mainly private or if it shares functions on a building scale level or public scale. It also give an indication if all functions needed are present, to theoretically create good living conditions. This step can, as previous mentioned also function in the planning of new areas. It then provides a framework for choosing what level of the urban scale, as well as what privacy level, the functions should be provided on. This step only point out the theoretical solutions, implying that different people have different preferences. While some people thrive with sharing and using the city, others might find this stressful, and prefer to live in a quiet area. On a "pure" area efficient scale, the more of the functions that are provided shared, the better, and on the social area efficient scale, the more functions that are provided, the better.

The tool is made to describe the area efficiency in order to point out problems and qualities concerning the urban area efficiency. It can then be used to create a program for improving the social area efficiency for the area. The further pages will present the proposed analyse toolbox.

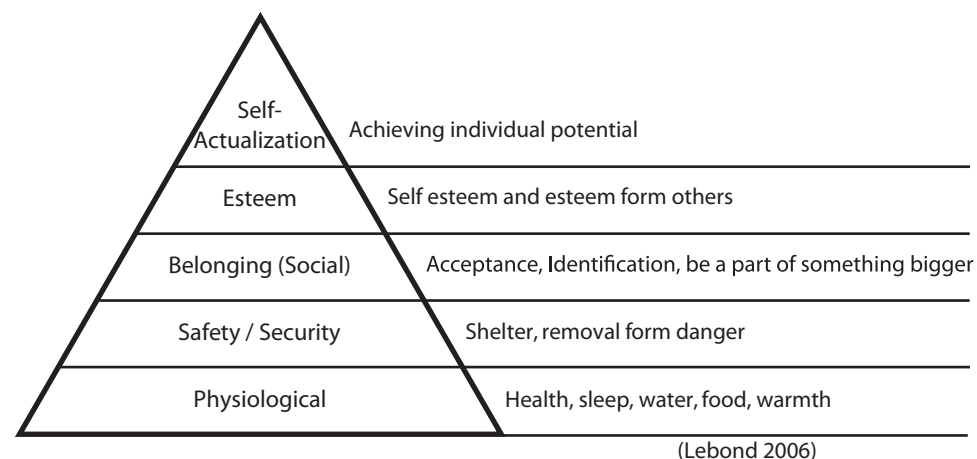


Figure 4.3 Maslow's hierarchy of needs, relating to the spatial needs seen in figure 4.1 and 4.2

		AREA EFFICIENCY	
		"Pure"/ SPATIAL / ENVIRONMENTAL Density Measure	SOCIAL Analyse/describe
SCALE	THE URBAN SCALE Public	Measure land use	Find and describe the shared multi functional spaces and shared mono functional spaces the area
	THE ARCHITECTURAL / BUILDING SCALE Semi private / private	Measure bed/people/flats per m2 built area above ground/Plot/ground floor/BRA/ Measure space use in the individual unit	Find and describe qualities of the different units concerning shared space and space use

Figure 4.4 The concepts behind the toolbox for analysing area efficiency on an urban scale

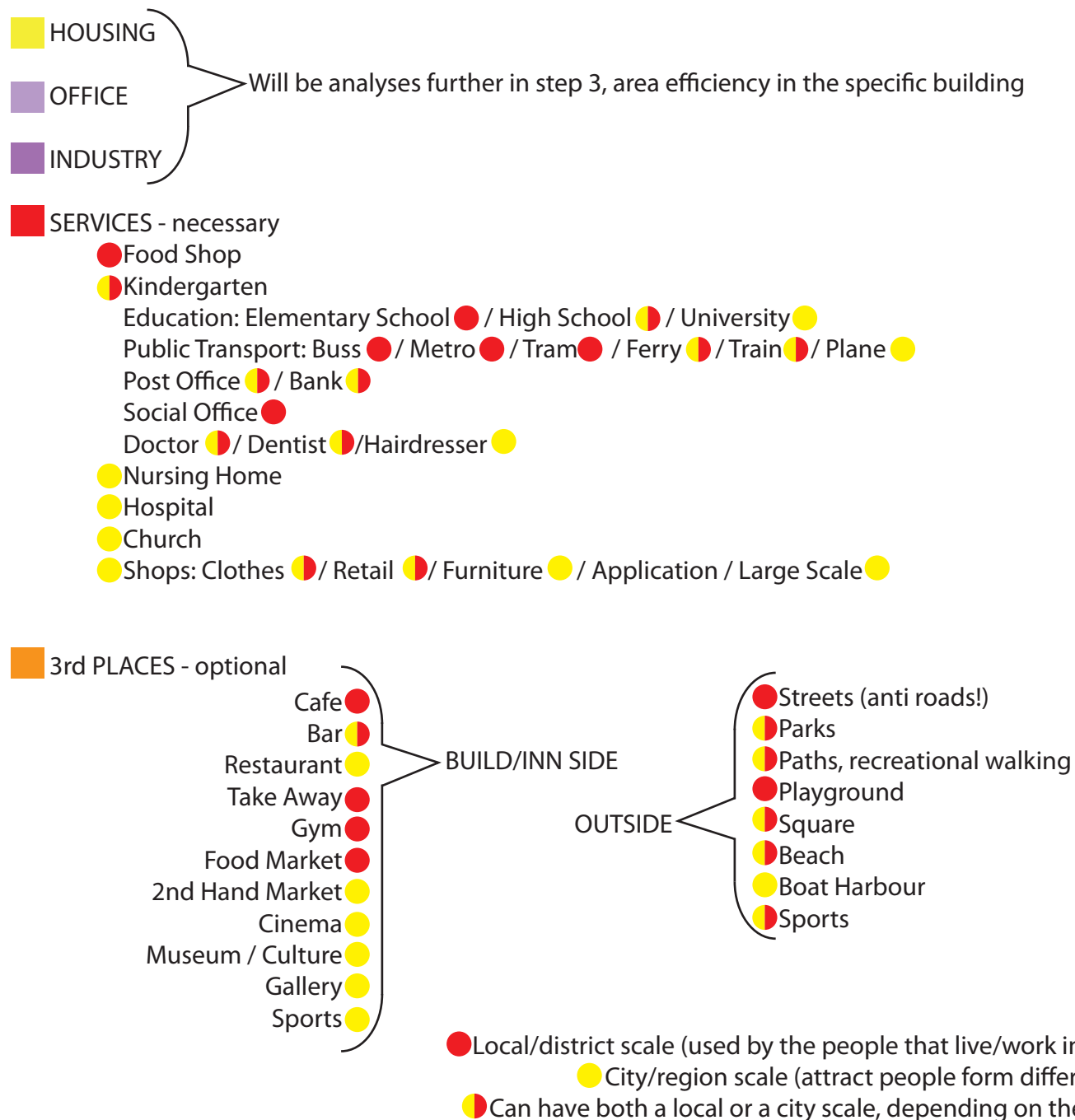
INTRODUCING THE AREA EFFICIENT TOOLBOX

1 ANALYSIS OF FUNCTIONS IN THE AREA

First step of the toolbox is to locate what functions exists in the area. There are five different types of area use: Housing, office, industry, services and 3rd places. Services relate to the necessary functions in Jan Gehl's (2003) theories, being functions that is used more or less on a daily basis, or that should be provided to service the society. 3rd places or optional places, relate to the theories of Oldenburg (1989). The concept is expanded to also relate to Gehl's theories about social or optional spaces or functions. These are spaces that theoretical will be used, if they are being provided and the quality and accessibility are present.

Spaces are divided in to local or city scale. Local functions are mainly used by the local workers or inhabitants. If these functions are missing in the area, the inhabitants are left to travel to get their necessary functions. Contrary, city scale functions attract people with no affiliation to the area, into the area.

FUNCTIONS TO BE LOCATED IN THE AREA



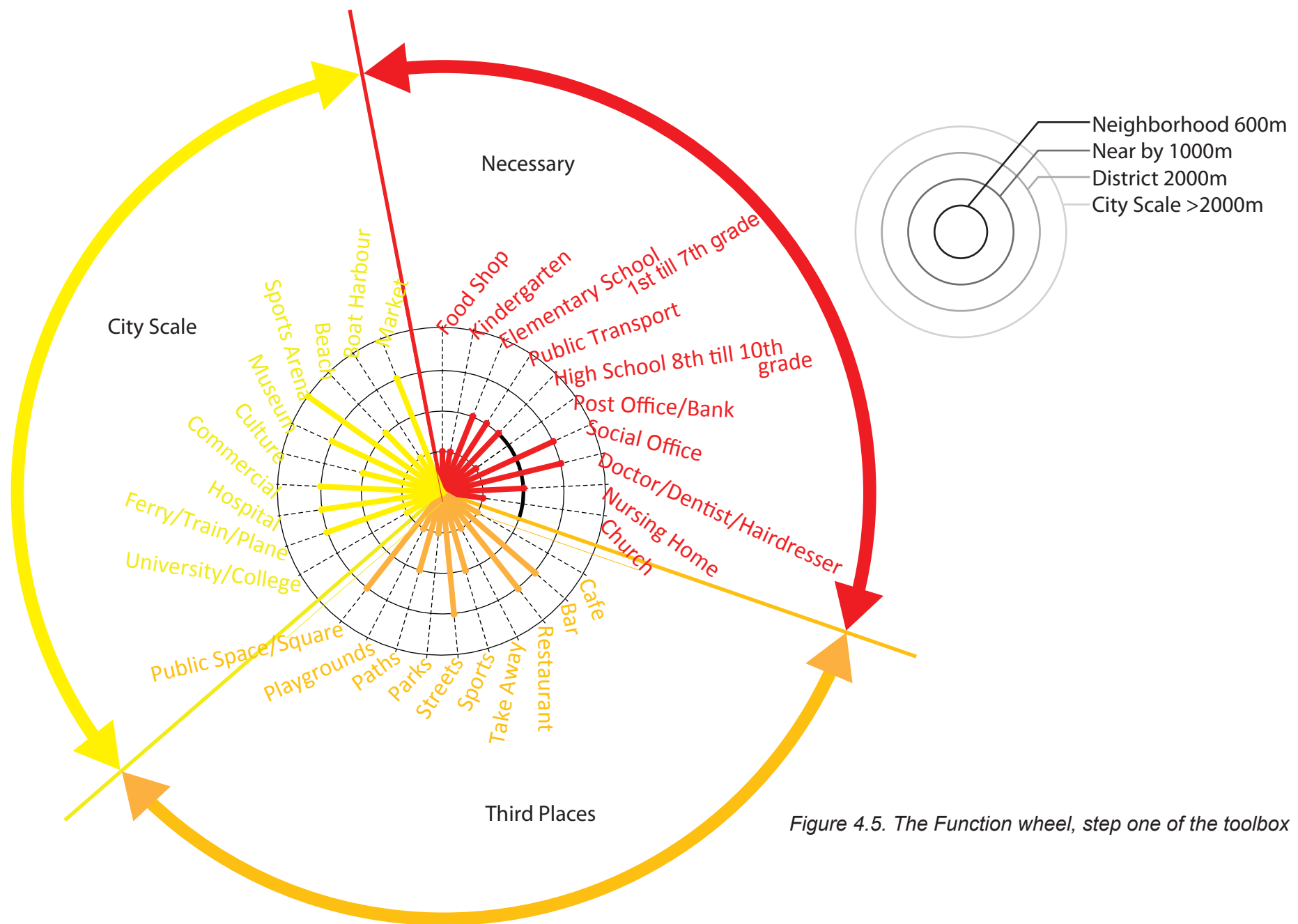


Figure 4.5. The Function wheel, step one of the toolbox

Figure 4.5 graphically shows step one of the toolbox. The area analyzed is being presented in this diagram, showing how far away each function is. The distance should be found by making circles of 600m radius, placed in each specific function, and then see if the circles cover the whole studied area. If not, the 1000m “near by” circle should be tested. The lines in the wheel will stop, depending on how far away the functions are, being the neighborhood, nearby, the district or the city. Necessary functions as food shops, kindergarten and elementary school should be found in the neighborhood. High school, post office, bank, doctor, dentist, hairdresser, nursing home and church, is not require on the neighborhood, but will also work well if they are located in the nearby area. The Third Places should preferably be located in the neighborhood, and these should also hold a certain quality, and accessibility. The “City Scale”, is functions that doesn't need to be provided in the neighborhood, but will if present, attract people in to the area, as well as been in walking distance for the people in the

neighborhood.

If the diagram manly has lines ending in the city or district circle, the neighborhood will be car dependent, and the inhabitants need to go out of the area to fill their needs. If the diagram has several lines ending in the neighborhood, it can show sign of an attractive area, with several functions and shared spaces.

The diagram should be used together with a land use map, describing where the different functions are located, and how many there are of the different types, as well as the quality and upkeep. This step mainly provides a qualitative analysis of the urban scale area efficiency, as well as a description of what type of area it is.

The idea is that the more access to public functions the inhabitants have, the less functions needs to be available in the private unit. The private space m2, can then be reduced, but the quality of live can arguably be kept up

② URBAN SCALE AREA EFFICIENCY

On the neighborhood scale, locating overlaps of functions and space that's shared between different people.

OVERLAPS OF FUNCTIONS AND SHARED SPACE

Are there areas that changes function over time? day/night/week/season/year/etc.
Multiple use areas.

Are there functions/spaces that are shared between different people / buildings / offices etc.?
Public/ semi public?

Step number two relates to the urban scale, looking at shared multi- and mono functional public spaces. Spaces that are used for different activities at different times of the day, week, year etc, needs to be mapped, and described what functions they are used for, and when. Shared spaces should also be registered on a map, with a estimation of how many people use it, and who these people are. Some spaces also attract people from other neighborhoods, like beaches or sports facilities. This should also be described.

Pure area efficiency can be calculated as people using the space divided by the m2, giving an intensity ratio, providing a quantitative measurement. Some of these spaces will have different amount of users, depending on the time of year, climate or other factors, so it can arguably be hard to give correct numbers to this. The social area efficiency will be analysed through mapping and describing the qualities and shared functions in the area. Through this, the analysis arguably can give good indications on whether the neighborhood studied has good public spaces and a good usage of the space available, relating more to the social part of area efficiency.

Ways of describing:

Function	m2	Shared yes/no	Users local/city	Changes function? yes/no	When?
Parking					
Public Space					
Parks					
Roads					
Etc.					

Figure 4.6 Ways of analysing urban scale area efficiency

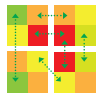
③ BUILDING SCALE AREA EFFICIENCY

Focusing on the buildings and what happens inside them, step three looks at the private and semi private parts of the buildings, mainly relating to housing and office buildings. The step divide the building in to two different types of space, the specific unit, flat or office space and the space shared between them. The private unit is mainly measured after the standards found through Berge (2003) and Høyland and Støa (2002).

AREA EFFICIENCY IN THE SPECIFIC BUILDING

In the specific unit in the building

- Space where functions can change over time? Multi functional spaces are good, mono functional not.
- How big are the internal hallways? The smaller percentage of the total flat size, the better.
- Are spaces divided in temperature differentiated functions, ex. storage not same temperature as living space?
- Can the unit be divided in smaller units?
- Can the room plan of the unit easily be divided again? Rooms added if needed?



Between units in the building

- Are there functions that are shared between different people / households / offices etc.?
 - Common functions
- Are there areas that changes function over time?
 - Multiple use areas
- Is there a mixed type of units?
 - Size, who are they intended for? (Generality)
- If there are good views, are they shared between the flats?
 - How are the views and light conditions for the different flats?

Step three looks at the architectural or building scale of the urban form. This step doesn't only relate to the social area efficiency, but can also be used to describe more "pure" area efficiency. The building scale relate both to housing, office and industry.

"Pure" area efficiency in the specific building can be analysed rather quantitative, and given numbers, relating to m² use. Since a building is occupied by a certain number of people, this can easily be related to the m² use.

The building can be analysed either as the specific unit, or as the whole building. In the analysis, the specific unit is described from the qualities it holds, while the building is tested through use of m² of built form and land, divided on people or beds, as shown in figure 4.7.

When looking at the building, it should also be evaluated if the building gives something to the neighborhood. If it's providing functions that are public or semi public, also relating to step two. Type of flat is also a way of understanding what type of people that will live in the area, and as Høyland and Støa (2002) points out, there should be a division of different flats, also relating to the type of households that exist in the city.

Ways of describing the unit

1. Beds per dwelling vs. People per dwelling
2. Beds per m² flat vs. People per flat
3. % of dwelling dedicated to
 - Bedroom
 - Kitchen and living
 - Storage
 - Hallway
 - Stairs
 - Walls

Ways of describing space between the units in the building

1. Common space per units sharing
 - Kitchen
 - Laundry
 - Etc.

Ways of measuring the building

- Beds, People, Flats per

 1. m² Total Area Above Ground
 2. Dekar Plot
 3. m² Ground floor
 4. m² BRA

Fig 4.7 Ways of analysing area efficiency on the architectural scale

Analysing “pure” area efficiency in the urban built form

When analysing the area use in a building, the “pure” spatial area efficiency for the building is found. For measuring this, two different categories are being used: objects and area measures. The area measures give a m² value, while the objects are included to compare different studies. The objects are beds, people and flats.

Beds are understood as the potential number of people that will live in a flat, how many beds the architect have drawn in to the units. It could be argued that for some building plans, the bed is just drawn in to a room to show that it legally can be used as a bedroom. For a room to qualify as a bedroom, the building act have set up certain demands, like minimum size of window, m³ room, etc. It could be that the architect didn't intend the room to be a bedroom used on a daily basis, but as a guest room or a study. Rooms with double beds, are of course counted as two beds.

People relate to the phenomena mentioned above, and present the number of people that is lightly to live in the unit. The criteria used in this measurement, are

- If the size of the second bedroom is less than 8m², it's not viewed as a bedroom for an adult, and the room is not considered as a third bedroom. In flats with more than two bedrooms, the bedrooms can be smaller than 8m², and arguably still provide good family flats.
- Flats with just one bedroom and living space under 20m², are viewed as one person flats. If a hems is the only bedroom, the flat is viewed as a single person flat, due to lack of noise control between living space and the place to sleep.
- Studio flats are viewed as one person flats.

This object holds a qualitative measure to it, since it's based on different criteria, and the likelihood of what people will prefer.

Flat is the last object, and it's arguably not a measure, since flats difference in size. The object is included more as an indicator.

The area measures introduced, relate to m² and are total area above ground, plot, ground floor and BRA.

Total area above ground, relates to the m² of all buildings above ground, measured from outer walls. It also include gallery hallways and stairways providing walkways for the units. Garages or storage that is below ground floor, is not calculated in to the equation. This space is not taking up any land. In the projects viewed, some of them have a raised garden above the parking in the ground floor. This area is also removed form the equation, since the land can still be used for common outdoor space, se figure 5.6. The ground floor area, that has buildings on top, is of course calculated as area above ground floor. Each floor is calculated individual. Terraces and balconies are not calculated in to the area, it only includes the building that has a roof and walls. Space that is used for other purposes than housing or functions that don't relate to housing, is not included. This will include office space, retail, kindergarten etc.

The plot is defined as the piece of land that legally belong to the building. The plot is measured in dekar. 1 dekar is 1000 m².

Ground floor is defined in the same way as total area, and consist of the building that is located on the same level as the landscape around. If parts of the ground floor has a garden, terrace or other outdoor space that is on the same level as the street, e.g. its semi private or public, this m² is removed form the ground floor. Ground floor is only the first floor of the building, that is above ground.

BRA is calculated as all space in the unit, minus outer walls. BRA relates to the unit. In this thesis, hems is not included in the BRA.

OBJECTS:	AREA MEASURES:
Beds	Total area above ground
People	Plot
Flats	Ground floor
	BRA

Fig 4.8 Objects and Area Measures.

4 FUNCTIONS AND THEIR QUALITIES IN THE AREA

COMPARE FUNCTIONS PROVIDED AT BUILDING UNIT- AND URBAN SCALE

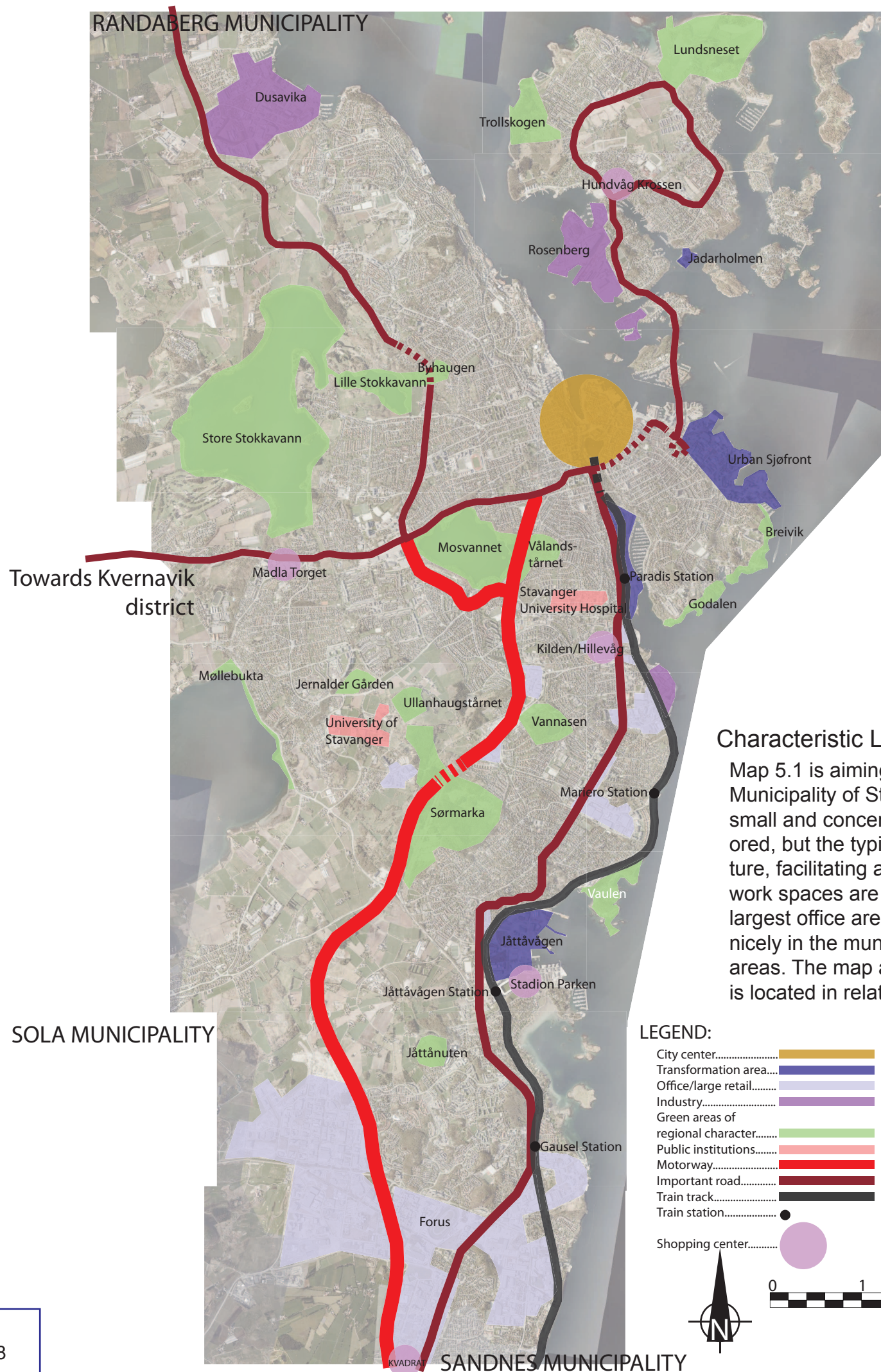
NEEDS	BUILDING SCALE	URBAN SCALE
HOUSING:		
Physiological:		
Sleep	● Bedroom	
Personal hygiene	● Bathroom	
	● Laundry	
Eat / Cook	● Kitchen	● Food shop / Cafe / Take Away / Market
Relax	● Living space	● 3rd Places / Parks
Enjoy fresh air	● Balcony / Terrace / Garden	● Public Space / Parks / Streets / Paths / Playgrounds
Mobility	● Car / Bike	● Public Transport / Shared Cars or Bikes
Sports	● Gym / Home Equipment	● Sport Fields / Center / Gyms
Safety / Security:		
Clear private space		
Store: bike/car/stuff	● Garage / storage	
Belonging / social:		
Host guest	● Dining/socialize	● 3rd Places
	● Guest room	● Hotel / B&B / Hostel
OFFICES:		
Concentrate for work	● Office space	
Meeting / presentation	● Meeting room	
	● Auditorium	
Greet / Organise	● Reception	
Copy / Print	● Printer / Copier	● Printing Company
Eat / Drink	● Cafeteria	● Cafe / Restaurant
	● Coffee Corner	
Storage	● Parking Car/Bike	● Parking Car / Bike
	● Wardrobes / Showers	● Gym
Mobility	● Company Car / Bike	● Share Cars / Bikes
		● Public Transport

PRIVATE UNIT ● / SHARED ● / CAN BE PRIVATE OR SHARED ●

Step four is a checking system, relating to Maslow's hierarchy of needs (Lebond 2006) and Ingrid Gehl's (1971) psychological living needs. This step is more qualitative and relates to the social area efficiency. This step should evaluate if the specific housing or office units have all functions provided for them, either within the unit the building or the urban area. This is especially important for area efficient flats, with few functions in each unit. If the unit is intended for students with no car, it needs to be evaluated if the public transport in the area is good enough. Flats with no garden, require public parks, etc. All housing units should have a minimum of functions available, within a given maximum distance. This relates to providing quality neighborhoods and to design good

areas to live in. This quality can make dense and area efficient areas, a valid and even preferred option to the suburban area inefficient neighborhoods. According to Gehl's (2003) theories, the physical quality of the environment also will affect the use, this should also be evaluated.

This step can also function as a planning tool, when new projects or areas are being developed. The higher the number of private solutions is in a project, the less is being shared, and arguably, the more space is needed, and the less area efficient the neighborhood will be. The quantitative data needed, are found in step three.



|CASE STUDY|

|TESTING - DATA|PROGRAM - DESIGN|

INTRODUCTION

This thesis has introduced the theories of area efficiency, and through the tool in chapter four, presented two ways of analysing the area efficiency: “Social” and “pure”. This is done in order to test the area efficiency on an case study in Stavanger Norway, and to find threats and problems. This chapter will first briefly present the municipality of Stavanger’s approach to area efficiency, in order to see if the city has a focus on this. Statistics for how people live in Stavanger is then presented, to get an better understanding of problems concerning households sizes and area use in the city. The analyse tool presented in chapter four, is then carried out. Revealing problems concerning the “social” area efficiency in the area, as well as measuring the “pure” area efficiency for seven residential of the buildings in the area. These buildings are being used to show trends and concerns towards the area efficiency for residential buildings in Urban Sjøfront. The analysis will conclude, pointing out weaknesses and issues of concern for both “social” and “pure” area efficiency. This will make the foundation for presenting conceptual suggestions for improvement. The chapter will then present an area efficient urban design for an specific sight in the case study area.

PRESENTING THE AREA

Stavanger is with its 126 021 inhabitants, the fourth largest city in Norway. Together with its nearby cities Sandnes, Sola and Randaberg, the area had a population of about 225 677 in the beginning of 2011. (Stavanger Statistikken “Befolkning” 2011)

When choosing my specific case area, I decided to look at “Urban Sjøfront”, the Urban Seafront. This is a big transformation area, located close to the cities commercial center, as seen in map 5.1. The area is limited by the two regulation plans Plan 1785 Brevig, Lervig, Spilerhaugvigå approved April 2002 and Plan 1901 Spilderhaug Storhaug Bydel approved September 2006, seen in map 5.2, page 58. A nonprofit company owned by 21 of the landowners and actors in the area was established in 2002, with the name of Urban Sjøfront AS. The aim of the company is to create a common plan and collaboration between the actors. This to create a more comprehensive area, that if all different developers should just do it individually. (Øst+: Urban Sjøfront 2011)

The area is in 2011 in the middle of its transformation. This means that certain projects are built, some are just planned and others are about to be built. This gave me an opportunity to both test the current built and planned, but also develop a new plan for a specific part of the area that isn’t yet built.

This chapter will start with a brief introduction to the Municipality of Stavangers approach to the concept of area efficiency, to see if area efficiency is a part of their sustainable strategy.

The Municipality of Stavanger’s approach to the concept of area efficiency The Climate and Environment Plan 2010-2025 for the City of Stavanger, Norway is a “long-term policy plan for the city’s contribution

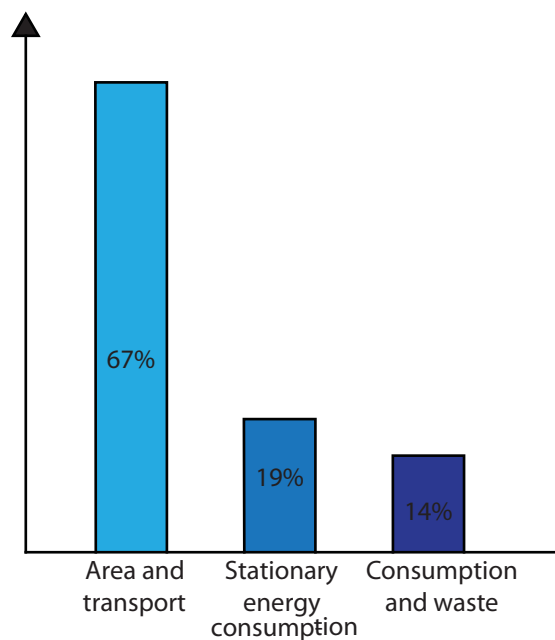


Figure 5.1 Distribution of greenhouse gas emission in the city of Stavanger

to meeting the national targets that were agreed in the parliamentary climate compromise of January 2008” (p 0) The plan looks at strategies and ways to reduce the city’s CO₂ emissions, and how to become a more Sustainable City.

The City of Stavanger, have through their *Climate and Environment plan 2010-2025*, the *Cities of the Future* and *Covenant of Mayors*, created a goal to reduce their CO₂ emissions with 20% from the 1991 levels, by 2020. This is equivalent to a 30% reduction from the 2008 levels. The reduction is in compliance with the requirements in the guidelines given by The Norwegian Ministry of Environment in 2008, and as well the Covenant of Mayors, signed by the Mayor, Leif Johann Sevland in September 2008. Covenant of Mayors is an initiative from the European Commission, in order to bring together mayors of “Europe’s most pioneering cities”, (p 3) to exchange practice and approach to improve energy efficiently in the urban environment. (Cities of the future, City of Stavanger 2009)

The Climate and Environmental plan 2010-2025, focus on how the municipality can reduce the CO₂ emissions, to reach the goal of 20% reduction by 2020. The plan looks at three different areas for reduction: area and transport, stationary energy consumption and consumption and waste. As fig 5.1 shows, area and transport is clearly the highest contributor of CO₂ emissions.

Within these three different areas, the plan state priority areas and strategies, as presented in table C.1 and C.2 in appendix C. The targets concerning area use and transportation, all focus on reducing the CO₂ emissions for cars. Mainly to get the cars more environmental friendly, but also to focus on a denser built form along public transportation axis. In this way a better public transportation

system can be provided, that hopefully more people will use. There is also a hope that this densification will lead to less distances, which again will lead to a change of transport form cars to biking or walking. The plan also mentions to make the different areas in the city more self sufficient, again to generate less traffic.

Concerning the stationary energy, there are different targets, but one of them is to focus on the development and knowledge of passive houses, hence reduce the kWh use per m². There is nothing mentioned about reducing the m² per person, or the energy per person.

When it comes to consumption, there are several points given. The Cities of the Future have an interesting statement.

“From the perspective of global resources and sustainability, the world’s material consumption should be halved in relation to today’s level and, from a global principle of equality, the industrialised countries, which today account for 80% of the total material consumption, should reduce their material output by factor 10, i.e. consume only 10% of today’s level. Such a trend would also have immediate, positive effects on energy consumption and, consequently, on greenhouse gas emissions. Less material consumption – whether through less consumption or smarter solutions – would be a very effective instrument in the battle against greenhouse gases.

In stark contrast to this perspective, however, are the very limited possibilities which Norwegian municipalities have for doing something with consumption and material input. Hardly any instruments exist at local level for limiting general consumption in society or in manufacturing patterns in industry.”

(Cities of the future, City of Stavanger 2009: pp 23-24)

It can be argued that the Municipality of Stavanger here point to an important problem. We can’t just reduce the energy use, drive less or recycle, there is a real need to change the consumption. If we can reduce the space we live on, start sharing space and items, this might be a way to reduce our consumption of both land and materials. From the theory studied, it’s clear that area efficiency will contribute to a reduction in land use, together with use of materials, energy and water. The municipality also want to reduce the car use, by building denser and more concentrated, something that also apply to an area efficiency idea. In a way you can say that area efficiency can contribute to all the different focus areas that the municipality has put out. It could be that the municipality views area efficiency as a part of this, but it’s not pointed out specifically as a solution.

What characterize the housing units in Stavanger?

Relating to the “pure” and spatial part of the area efficiency, the concept is arguably universal. Area use can be measured in the same way, independent of where it is measured. The “social” part of area efficiency on the other hand, partly relates to how people thrive, and will arguably depend on the local culture and norms of the area measured.

When evaluating my case study, I therefore felt that it was important to look at the current area use and ways of living, and the background for why this had occurred. This to discover the local threats and problems relating to area efficiency, and to be able understand what type of solutions could be given to increase both the “social” and “spatial” area efficiency. The case is not only going to be used for measuring, but also for proposing how area efficient development can occur in the area, and as well for a specific sight.

As previous mentioned, looking at the trends of housing in Norway the last 40 years, we can see that the m2 living space per person has gone up drastically, from about 28 m2 per person in 1960 (Berge 2003) to 52 m2 in 2002. (SBB “Hustyper” 2011) During the same period, the number of persons per household went down from 3.3 persons per household in 1960 to 2.3 in 2001. (Berge 2003) My impression of Stavanger is that most people live rather spacious, in detached or row/chain or two family houses. I wanted to verify my assumptions and find out how the population in Stavanger actually live, to see if there really is a need to reduce the living space, and how this can occur.

Looking at the type of housing in Stavanger, it's clear that the majority of the built form consist of detached, row, chain and double family houses. 72% of the housing units qualify in this category, leaving only 24.8% of the units to be block buildings, see diagram 5.1. The urban fabric is arguably influenced by building types, and it can be said that these wooden small scale houses give Stavanger its typical character. A part of this wooden structure is preserved as the “Trehusbebyggelse” or Wooden housing area. This area cover 41.10 km2 or 6.04 % of the total area of the municipality. (Stavanger-Statistikken “Areal bruk” 2010)

Stavanger is divided in nine different districts. Like diagram 5.2 shows, there is a rather big distinction between the different districts, concerning types of housing. It can be argued that most of the districts, with the exception of the main city center, the axis Lagårdsveien and the transformation area in Badedammen and Urban Sjøfront, have a more or less suburban character. Also shown in map 5.1, “Characteristic land use Stavanger”. This character is mainly due to the type of buildings being detached-, row-, two family housing, and with a lack of mixed use of functions. Storhaug

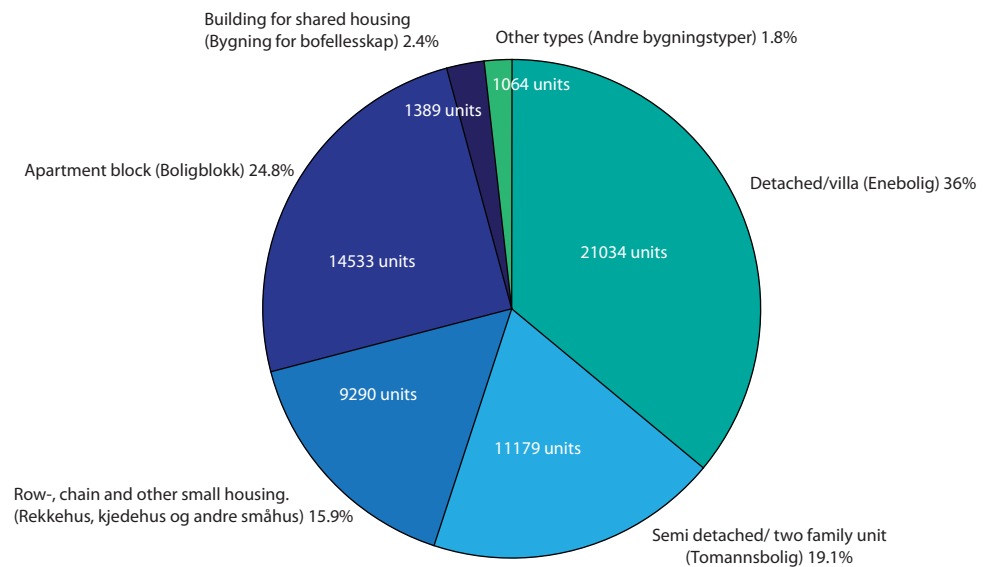


Diagram 5.1 Types of Housing in Stavanger Jan. 2011 (Stavanger Statistikken “Type of Housing”2011)

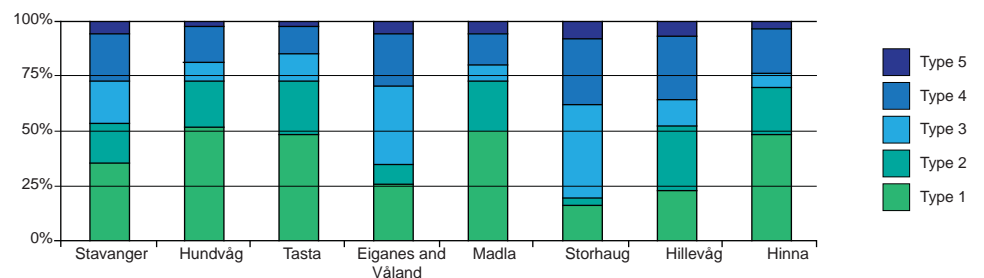


Diagram 5.2 Housing after district and type. Numbers from Jan. 09 (Stavanger Statistikken “Type bolig” 2010)

Type 1: Detached housing.

Type 2: Vertically divided two family housing, row-, chain-, terrace- and atrium housing.

Type 3: Horizontally divided two family housing and other small housing with three or more units.

Type 4: Block buildings and large built together housing buildings with three floors or more.

Type 5: housing in other buildings than housing, sheltered accommodation and student accommodation.

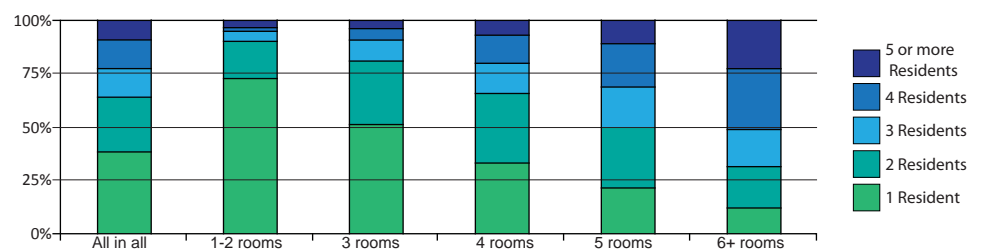


Diagram 5.3 Number of people in the household, according to number of rooms, Nov. 2001 (Stavanger Statistikken “Personer per husholding” 2010)

have the largest number of block buildings, mainly due to the development of Badedammen and Urban Sjøfront.

Diagram 5.3 shows the relation between rooms and people in the household. It's clear that the majority of the Stavanger population live in households that consist of the same, or more rooms than the number of people. This can also be seen in relation to the national numbers, that show that the amount on people who are living on limited space have gone down from 16% in 1980 to just 6% in 2007. At the same time, the number of people living spacious has gone up from 26 to 42%. (SSB "Trangbodd" 2010). The definition of limited space is that there are more people than rooms, and spacious living is defined when there are two or more rooms more than the number of people. In these statistics a room is defined by being over 6m² and that it can be used the whole year. Kitchen, bathrooms and hallways are excluded.

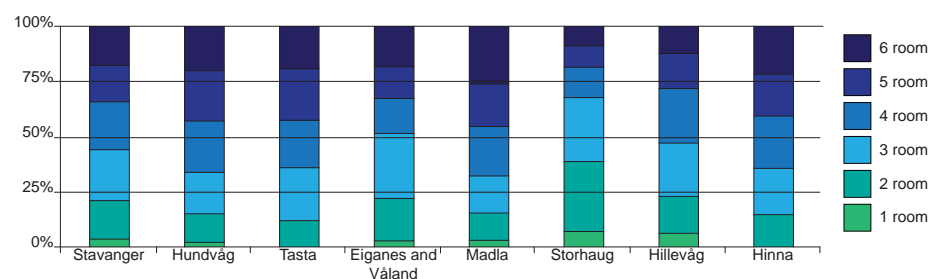


Diagram 5.4 Households according to district and number of rooms. Numbers from Jan. 09. (Stavanger Statistikken "Antall rom per husholdning" 2010)

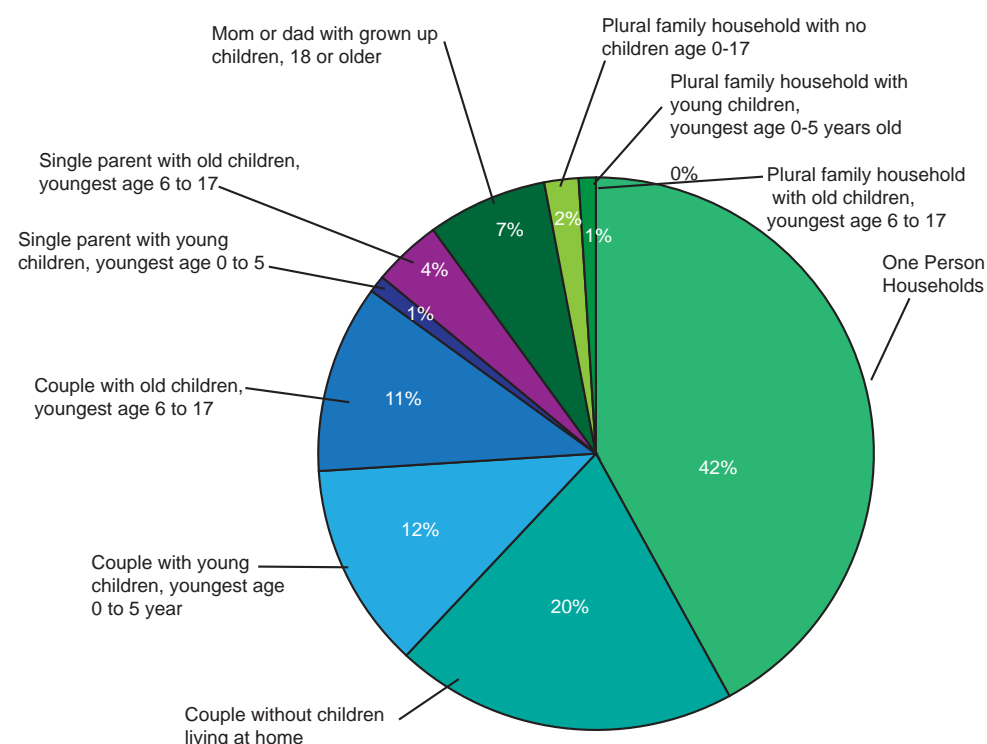


Diagram 5.5 Households types in Stavanger. (Stavanger Statistikken "Befolkning" 2011)

From diagram 5.3 we can see that in Stavanger, half of all the three room flats are occupied by households consisting of just one person, and Stavanger generally have a rather large group who lives in what SSB defines as spacious households.

Diagram 5.4 shows the relationship between district and number of rooms. This table seen together with diagram 5.1 showing house types in the different districts, allow us to understand the urban pattern a bit better. Storhaug stands out as the district with the highest number of one and two room units, and have from diagram 5.1 the highest amount of block buildings. This type of housing units should arguably affect the urban pattern, with more shared and public space and functions, since the space within the units are more limited.

The Remanens-effect

The elderly wave, or "eldrebølgen" in Norwegian, is an interesting population phenomenon in Norway. This phenomenon occurs mainly due to two reasons, the large brood of children that came after the 2nd world war and the fact that people live longer. In 1950 the life expectancy was about 70 years for men and 73 years for woman. In 2000 the age is 76 for men and 81.4 for woman. (SSB, "Forventet levealder" 2002) According to Berge (2003) most people seem to remain living in their family houses when their children move out and their life situation and need of space changes.

"Moving causes big emotional, social practical and economical costs, that exceeds the advantages a smaller and often more easy to maintain housing can offer."
(Berge 2003: p 17 translated by author)

This lead to large villas or detached houses being populated by one or two people, from the time the children move out to the parents pass away, or are too sick to live at home. This phenomenon is called the Remanens-effect. (Kjær 2000)

What characterize the households in Stavanger?

After studying household's types and sizes, I wanted to get a better view of who lives in these households, and how people use and view their homes.

A change in welfare and gender roles

A lot have changed in the family structure since 1900, and the statistics concerning housing units and increase of m² per person, can be understood as a part of this. Norway has, like most other western counties, developed from a country based on primary industry, producing commodities, like farming and fishing. It then had a secondary industry that develop the commodities, and is now a country with a strong tertiary industry, focusing on service. From

being a relative poor country, Norway have developed to become one of the richest countries in the world, mainly due to the exploration of oil and gas in the North Sea starting in 1969. Together with the woman's liberation, it can be argued that these are two of the factors that have led to a change in household composition and area use.

In 1960 only 22.1% of all women between 25 and 64 were working outside of the home. The most common "career" was being a housewife, taking care of children and looking after the home. This meant that the home was occupied more or less 24 hours of the day. 50 years later 76.5% of women between 25 and 66 are working. (SSB "Kvinner i arbeidslivet" 2010) The majority of women has moved their workspace away from the home. Most children now spend their days in the kindergarten or after school care. The home has arguably lost several functions, and it can be assumed that the house is being occupied fewer hours now than 50 years ago. Despite this, the m² per person has gone up.

Is the traditional family no longer an obvious?

From the media and divorce statistics, it seems like the typical family with two adults and two children are no longer granted. The family structure has been changing the last decades, and it seems like the modern family can just as well consist of a mix of mine, yours and our children. This new structure, where there is shared custody of children, creates households where the number of people changes from week to week. This also creates a need for more living space. From diagram 5.5 we can see that in Stavanger there are only 5% of the households that are single parents with children, and 1 % that are plural family households with children under 18. This creates a rather small part of the households. The statistic doesn't say anything about shared custody, and a certain percentage of the single parents with children could have single custody of the child. It does on the other hand, question the myth that the divorced family is one of the main reasons for increased area use.

Diagram 5.5 also shows that in 2010, only 23 % of the households in Stavanger are couples with the youngest child being between 0 and 17, and 5% of all households are single parents with children in the same age. Together with the plural family households, where 1 % of the households contain children, we can conclude that 29% of the households in Stavanger have one child or more between 0 and 17 years old. These types of households require more space and also a different type of space. We also see that 14% of the households have children in kindergarten age, 0 to 5 years old.

The age for first birth for both mother and father has also gone up. 1960-65 the average age was 24 for mom and 27.5 years for dad. Until the 1990s the average age for mom stayed quite stable, but in 2009 average age was 28.1 years old. Dad's average age in

2009 was 30.9. (SSB "Gjennomstitsalder førstefødte" 2010) The increase in age could probably be explained by the increase of people taking higher education, and the as well increase in working woman. 20% of the households contain couples with no children living at home, these can be couples where the children have moved out, or couples that don't have children at all. There are also 2% of the households that consist of plural families with no children age 0 to 17, and 7% of the households are single parents with children over 18 years. For these two numbers, the statistic doesn't specify if these children have moved out, or are still living at home. There is reason to believe that a certain percentage of the households with a single parent, that the children over 18 have moved out. It could therefore be that these households should be counted as one person households.

There is also a strong trend for one person households. In 1960s 14 % of all households in Norway existed of just one person, while in 2010 the number was 39.8%. (SSB "Personer per Husholdning" 2010) In Stavanger 19.2% of the population, or 42% of the households contain one person in 2010. When looking at what age group that live alone, table 5.1 shows that on a national level, the age group that have grown most, is people between 30 and 44 years. This group grew with over 200% from 1987 to 2004. Similar numbers are found for the age group of 16 to 29 and slightly smaller for 45 to 66 years old. The group above 67 grew a bit, but compared to the increases this age group has had in population, it has stayed rather intact.

The big growth in one person households can be said to be a big threat to the area efficiency. Also when we see that age group of 30 to 44 have over doubled. This is a group that is no longer in their establishment phase, and it can be assumed that together with the age group of 45 to 66, they have a stronger economy, and can buy larger housing units. The problem with one person households is that every household requires certain functions, like bathroom, kitchen, living space, bedroom etc. In this way we can say that each flat needs a minimum m². If two people live in the unit, the space doesn't necessarily have to double. A 60m² flat can work well for two people, but 30m² can feel small for one.

Berge (2003) points out that another trend seen in villas since the 80's, is the increase of specialized rooms, like gym rooms, saunas, walk in closet etc. There has also been a strong trend of taking back functions to the private unit. Shared laundry rooms and storage spaces no longer seem to be normal for apartment blocks. As also mentioned in chapter three, people seem to want their houses to be more and more private, having control over their personal spaces. It can also be questioned if this is a result of the increased welfare, and the fact people in general don't have to share functions anymore, due to economical reasons. It can also be interpreted-

ed that the household is not just for living, but a place to show others who you are and that you have succeeded, by having a large house. (Høyland and Støa 2002) One person households together with the trend of privatisation of functions therefore become a big threat to the area efficiency.

When looking at table 5.2, we see that 23.2% of the households in Stavanger consist of two people. 12.1% of the households consist of three, while 13.1% of four and just 7.3% of five people or more. This should conclude that about 2/3 of the households only need one bedroom, since they are occupied by one or two people. Also relating to diagram 5.5 where we see that 20% are couples with no kids living at home and 42% live alone. The need of two bedroom flats is then only 12.1 %, while the need of three bedroom flats or more are just a bit over 20%. Table 5.2 show statistics from Storhaug, where the specific project site is located. The statistics show that the percentage of one person households here are higher than the average for the city, occupying 58.7% of the households. In this part of the city only 18.7% of the households contain three or more people.

How do people spend their time?

By looking at how much time people spend on different activities, a better view on how people live and how they use their house can be created. Statistics are made on a national level, and SSB have made time consumption studies every 10th year since 1970. (SSB "tidsbruk" 2001) This data can in some cases give a good understanding in how life is changing. Considering the Norwegian or Nordic people spend most of their day in a building, time use can help to see the trends that are changing.

Compared to the 1970s people spend 66 minutes more on spare time activities in 2000. A positive thing is that the percentage who do sports and outdoor activities have gone up from 26 to 31% in the 40 years, and also entertainment and cultural activities have gone up from 7 to 12%. Between the 70's and the 80's there per-

centage that were social went up from 70 to 80%, the rate have been quite stable during the 90's, and in 2000 82% spend the average of 2 hours and 5 minutes socializing. Time spent on reading has gone down both in percentage and time, and the TV has become more popular and time consuming, with 82% spending 2 hours and 7 minutes in front of the TV per day. About the same amount of time that was spent socializing. People spend less time on housework, but more people do it. This could mean that the people in the household share it, or it could be a result of being less people per household. In 2000 over half of the people, spend almost half an hour a day shopping for the household. There is reason to believe that people buy less every time they shop, but go to the shop more often. This could mean less need for a large food storing space. The amount of time used for sleeping have been quite stable in the 40 years studied, though less time is spent on personal hygiene and meals.

The data presented, arguably make it's hard to separate how much time is spent in the house, and if people use the house different now than before. In the statistic presented, just 46% had paid work. The workforce is defined at the part of the population between 15 and 74, that are employed or that are looking for a job. The Norwegian workforce in the end of 2010 consisted of 52.9% of the total population. Added the 12.5% of the population that are in school age, 5 to 14 years old, this show that 65.4% of the population is engage in work or school. The weakness of this statistic is that it doesn't say anything about the type of work, if it's part time or full time. There is also reason to believe that a part of the population that is not included in the workforce are students or pupils getting an education, and in that matter, spend their days away from the home. The part that's in the age group of the workforce, but do not work, count 21.2% of the total population, and added the 7.2% of the population that's over 75 years old, this means that 28.25% are staying at home. (The last 6.28% of the population are children age 0 to 4.) (SSB "Yrkesdeltakelse"2010) The statistic shows a blurry picture, but it shows that the statistics on time use concerning % of

Table 5.1 Number of single households, divided by age, from 1986-2003 for Norway. (SSB "Enperson husholdninger" 2005)

	1987	1991	1995	1997	1998	2001	2002	2004
Total	568 000	699 300	827 800	834 500	835 500	868 100	866 900	905 100
16-29 years.....	113 000	142 300	188 500	201 000	207 400	210 100	212 300	226 600
30-44 years.....	93 000	136 000	160 300	175 700	164 900	175 500	181 900	194 800
45-66 years.....	133 000	145 700	183 100	192 300	192 200	214 600	202 300	221 800
67 years and older.....	229 100	275 300	296 000	265 500	271 000	267 900	270 400	262 000

Table 5.2 People in the households in Stavanger and Storhaug in 2011. (Stavanger Statistikken "Personer per Husholdning" 2010)

People in the Household	Stavanger		Storhaug	
	% of Population	% of Households	% of Population	% of Households
1	19,1	42,0	33,7	58,7
2	23,2	25,5	26,0	22,7
3	16,5	12,1	15,1	8,8
4	23,8	13,1	14,8	6,5
5+	17,4	7,3	10,3	3,4

people working, probably isn't all correct for 2011. This means that at least one third of the population don't have a job, and the house then arguably becomes more important for them.

From the statistics, spare time activities have gone up, although it's not clear to see where all of them take place. TV watching has gone up, an activity that can be assumed to happen inside the house, while socialization can both happen within the house but also outside.

Why do they live the way they do in Norway?

Economy and political influence can be said to affect the trends and attitudes towards how people choose to live. Why doesn't anybody question the space use, and why does it seem so important for people in Norway to own their own house?

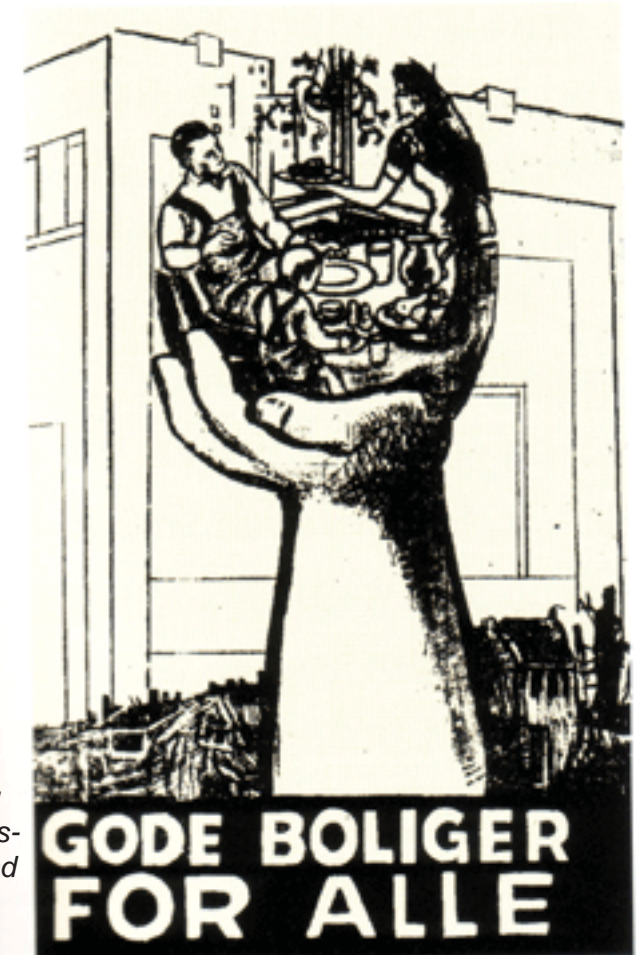
Housing politics in Norway

The political agenda in Norway has arguably been that it's a quality and strength to own your own house. After the 2nd world war, the country was in need for rebuilding. There was a great shortage of housing, both due to destruction of the war, but mainly due to lack of economy to build. The socialistic thought was strong in Norway, and in 1946 the Husbanken, "The Housing Bank", was established. The overarching goal, was to provide good and healthy living environment for the inhabitants. Husbanken was a governmental initiative to secure that "normal workers" and also the low paid part of the population had the chance to build and own good homes. Housing, health and work have been three central terms in the Norwegian welfare state. The two main goals have been to allow people to own their own housing, and to build housing where the inhabitant could live a good life throughout the entire life span. The so called "livsløpsstandard" life cycle standard, arguably have been an important planning tool. The focus was to build housing where unforeseen changes in quality of life, still would allow people to live a good life in their house. This can be a broken leg that will put people in a wheelchair for a few months, more permanent injury, or changes that occur when people get older. In the 90's, houses that were built with this "livsløpsstandard" was awarded with higher loans from Husbanken. (Husbanken, "Historikk" 2011; Husbanken "Boligpolitikk" 2011)

The house, more than just a roof over your head.

The statistics show how people live and how much space they use. This can be said to be important knowledge when trying to adapt area efficiency in to the Norwegian way of living. But another important part is to find out what picture Norwegians have of the concept of living, what the home means to them. These are more qualitative data, connected to feelings, preceptors, traditions etc.

Høyland and Støa (2002) present different reasons why Norway is



Img 5.1 "Good Housing For All" Poster from Husbanken after the Second World War.

on the top in the world when it comes to m² per person, and what relationship Norwegians have to their living space. The most important part of this they think, is the general prosperity and focus on social housing policy that Norway has had. Relating to the previous, the government it has been an aim, to provide good housing for all. Most Norwegians also buy and own their homes, which lead to a different investment compared to renting. The general wealth has also led people investing money and time on redecorating and maintaining their homes.

It's clear that the housing politics have been a strong factor to the view of what good living is. Most of the inhabitants have grown up in a detached house or row house in the suburbs. The memories of the free childhood, maybe even with a stay at home mom, could be the childhood that they might think see as the best for their own children. Especially in Stavanger. The climate is another factor that Høyland and Støa (2002) points to. In countries with a warmer climate, people spend more time outdoor, while the cold climate in Norway ensures or forces the inhabitants to spend most of their day inside. (Svane 2010) This puts more focus on the built environment, and "The homes in our culture [the Norwegian/Nordic] is an important social arena." (Høyland and Støa 2002: p 5 translated by the author) While other cultures meet their friends outside the home, parties and gatherings in Norway, more often seem to be held at private homes, they argue.

Another important factor can be said to be the status the housing have.

“The property is an important symbol to demonstrate status, and to have plenty of space have from ancient times been associated with prosperity and wealth.”

(Høyland and Støa 2002: p 5 translated by the author)

For many people it's a goal to climb the “housing ladder”, starting with a small flat, and where to goal is a big villa.

It can be argued that the trends in the Norwegian housing culture are changing. People travel more, and urbanity can be said to have become a much used trend word the last decade. But urbanity in Stavanger might be different than urbanity in New York, Barcelona or London. Although there is a change in services offered through cafes, restaurants, shops and other services. It can be argued that it's important to understand the role of the house in the Norwegian society, in order to be able to change the use of space.

DISCUSSION AND CONCLUSION

In Norway, the m² living space per person has gone up from about 28 m² per person in 1960 (Berge 2003) to 52 m² in 2002 (SBB). The increase in welfare can be seen as one of the reasons for this. It's also a trend that more and more functions are kept with inn the private housing unit, hence less and less function and spaces are shared. As Støa and Høyland (2002) argues, this can also be seen with public student housing, that traditionally have been collective housing. According to them, more of the student housing being built today is built as small flats, with private bathrooms and kitchens, or units where only two people share these facilities.

Stavanger has a great tradition of wooden small scale houses, with almost 75% of the housing units classifying as detached, row, chain, or two family housing. These wooden housing areas create a strong character, and are a part of the city's identity. Stavanger has, in contrary to the other big cities in Norway, such as Oslo, Bergen and Trondheim not a long tradition for block buildings and rental homes. Haaland (1999) argues that one explanation to this, can be that the politicians in Stavanger historically valued the possibility to own your own house. Together with little tradition to build in brick, and builders and craftsmen coming from the local fjords that were used to build in wood. This turned Stavanger in to the wooden house city that character some of its urban form. The lack of traditions for block buildings and as well for mixed use areas, can arguably be one of the reasons why the city struggles to develop good dense neighbourhoods.

It seems to be a trend where private owned space is a way of showing success in life. And that the 24.8% of the households in Stavanger that live in flats in block buildings are only waiting to

get enough money to move to a row or detracted house. Is dense urban living something we only do when we are young? Why is urban living not for children? Badedammen have 1760 inhabitants and of these 125 or 7.1% are children age 0 to 17, according to the Leveårsundersøkelse 2010 from Stavanger Kommune.

It's mainly after the 2nd world war that block buildings were built in Stavanger. This due to lack of housing, but as well speculation and modernistic ideas. It's clear that the majority of the Norwegian and as well Stavanger's population, have had their childhood in a row or detached house. Their childhood could have good memories, and probably the mom stayed home to look after the children. The young of today that are in the phase of establishing a family are around roughly around 25 to 35 years old, meaning they grew up around 76/86. During this time the number of mothers that stayed home with their children, decreased strongly. So can there be a new wave of young parents in the coming, that don't have a glorified view of the detached house as a goal of their housing career? What we know for sure, is that especially in Stavanger, there is a need of densification, mainly due to the limited brown fields available. Most of the development areas are being areas transformed form industry. In these areas, like Badedammen and Urban Sjøfront, a denser type housing is built. This creates a need of dense areas that also are good to live in.

In Norway and Stavanger it can be argued that most people live rather spacious, and there is a growing trend of one person households, especially in the age of 30 to 44, but also 45 to 66. This is an age group that most lightly have a rather good economy, and therefore can be a strong buyer in the market. This might be seen through the fact that 50% of the 3 room flats are occupied by one person households, together with 28% of the 4 rooms. 29% of the households are families with youngest child between 0 and 17 and about 30% of the housing units in the city have 5 rooms or more, although we see that 50% of the 5 room households are occupied by households consisting of one or two people, while for 6 rooms units, 50% are occupied by one, two or three people households.

When looking at the numbers showing how many people there are in the different households, especially looking at the area of Storhaug, it can be questioned if these “urban and dense” areas really are as area efficient as they set out to be. Although Storhaug is a part of the city with a rather large wooden house structure, it is also strongly affected by the urban development of Badedammen and the areas in and around Urban Sjøfront. With 58.7% of the household in this area consisting of just one person, the “real” area efficiency of these building structures arguably can be questioned.

The statistics have also shown that the way people live, changes over the years. It seems hard to predict how the living situations

will be in the future. Will more people live alone, or will the birth age go down, and family life start earlier? Preferences to housing might also change, and it's hard to predict whether the future generations will value urbanity or suburban living. One assumption can be that the quality of dense and urban areas, will affect the answer.

How to get people to choose area efficient?

As Høyland and Støa (2002) suggest, the status for choosing area efficient housing, needs to get higher. They point out that most of the inhabitants thinks of the detached house as the best way of living. This housing form represent the most inefficient way of living. Both concerning area efficient within the house, but as well within the built form. Qualities found in detached houses or residential areas, should be implemented in flats and a denser built form. As pervious mentioned the trend seem to be that young people live dense when they are young and have a restricted economy. When they plan on starting a family, they seek other ways of living, in less dense areas with row or detached houses. Høyland and Støa (2002) points out that it's exactly the family with children that are the important part in the puzzle. If the trend can be changed, and families with children can find the qualities they want form a detached house with inn the denser built form. This can make the flat more competitive to the detached housing.

One of the qualities with the detached home is the possibility for expansion when the household grows. More flexible solutions in flats, where the m2 can grow or shrink with the amount of people living there, can be one way of making the flats more competitive. It seems as well that Norwegians have a strong connection to their neighbourhood, and are reluctant to move, when the need of space is changed. This especially accounts when the children move out of the house, and the parents keep living there, and referred to as the "Remanens-effect". (Berge 2003)

A better understanding of the different part of our built environment, arguably could benefit the area efficiency. With a focus on creating good mixed neighbourhoods, where different functions are provided with inn the housing units, between the units in the building and in the urban area sounding the buildings. Zoned areas arguably belong to the past. If people are going to live denser, there is a need of a different way of planning. Mixed use, co-location and quality can be said to be essential features, in order to make these areas attractive and good to live in. This will be further addressed in the following chapter, concerning proposed solutions.

TEST STUDY, BADEDAMMEN

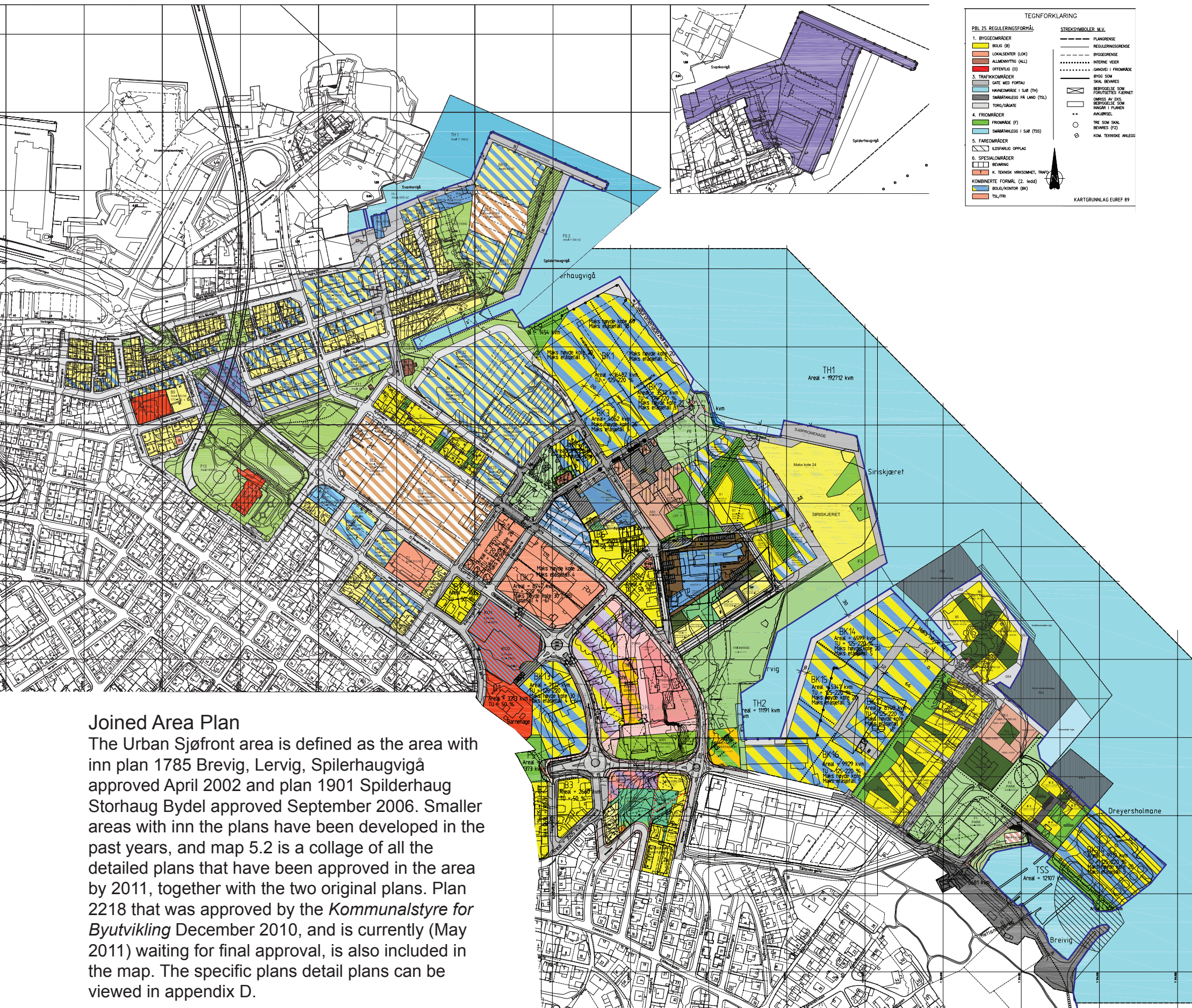
According to Ying (2009) when doing a case study, it can either hold a single case or multiple cases. The design chosen is a single case, since area efficiency seeks to be analysed and tested and proposed solved in the specific area of Urban Sjøfront, Stavanger

Norway. As Ying (2009) also points out, one of the weaknesses of single case study, is that there is no possibility to compare results between cases. I therefore felt it was important to choose another case study in the city, as reference study. This in order to test and improve my proposed analyse toolbox. I wanted to look at an area that is similar to Urban Sjøfront, hence densification and proximity to the city center of Stavanger. I also found it important that the area already was developed and built. This to be able to see the area completed, and be able to walk through and view it. I found the area appropriate to these criteria's to be the area of Badedammen. This is also an area of transformation, shifting form industry to housing. The area is located next to Urban Sjøfront, and is recently build. It has been critiqued for not being a good housing area, and Badedammen came last on the Municipalities survey concerning Living conditions in 2010. (Stavanger Kommune, "Levekårsundersøkelsen" 2010)

Through this area, I wanted to test my analysis tool. I also wanted to understand in what way densification can be negative to urban areas, something that of course should be avoided. In the light of research objectives and time constraints, the in depth view of each flat seemed to be less of a value to this study, hence step 3. Also relating to the fact that my main case holds an analysis of several buildings. My aim was more to test the other parts of my developed analyse.

The test study can be viewed in appendix E. The main findings was that the built form strongly influence the experience of the area. The area had several "dead facades", facades with no windows on street level. This also created a "dead" feeling to the area. The lack of functions was also clear, and this arguably also provided to the "dead" atmosphere. Another discovery was that shared space with no furniture doesn't really contribute to the area, also relating to Gehl's (2003) theories of quality of space.

The findings were adopted and implemented in the analysis toolbox.



Joined Area Plan

The Urban Sjøfront area is defined as the area with inn plan 1785 Brevig, Lervig, Spilerhaugviga approved April 2002 and plan 1901 Spilderhaug Storhaug Bydel approved September 2006. Smaller areas with inn the plans have been developed in the past years, and map 5.2 is a collage of all the detailed plans that have been approved in the area by 2011, together with the two original plans. Plan 2218 that was approved by the *Kommunalstyre for Byutvikling* December 2010, and is currently (May 2011) waiting for final approval, is also included in the map. The specific plans detail plans can be viewed in appendix D.

Map 5.2 Joined area plan for Urban Sjøfront.

INTRODUCING THE CASE SPECIFIC STUDY OF URBAN SJØFRONT

The following of the chapter will present

An analysis of Urban Sjøfront, through the toolbox presented in chapter four.

Step one will look at the functions provided in the area.

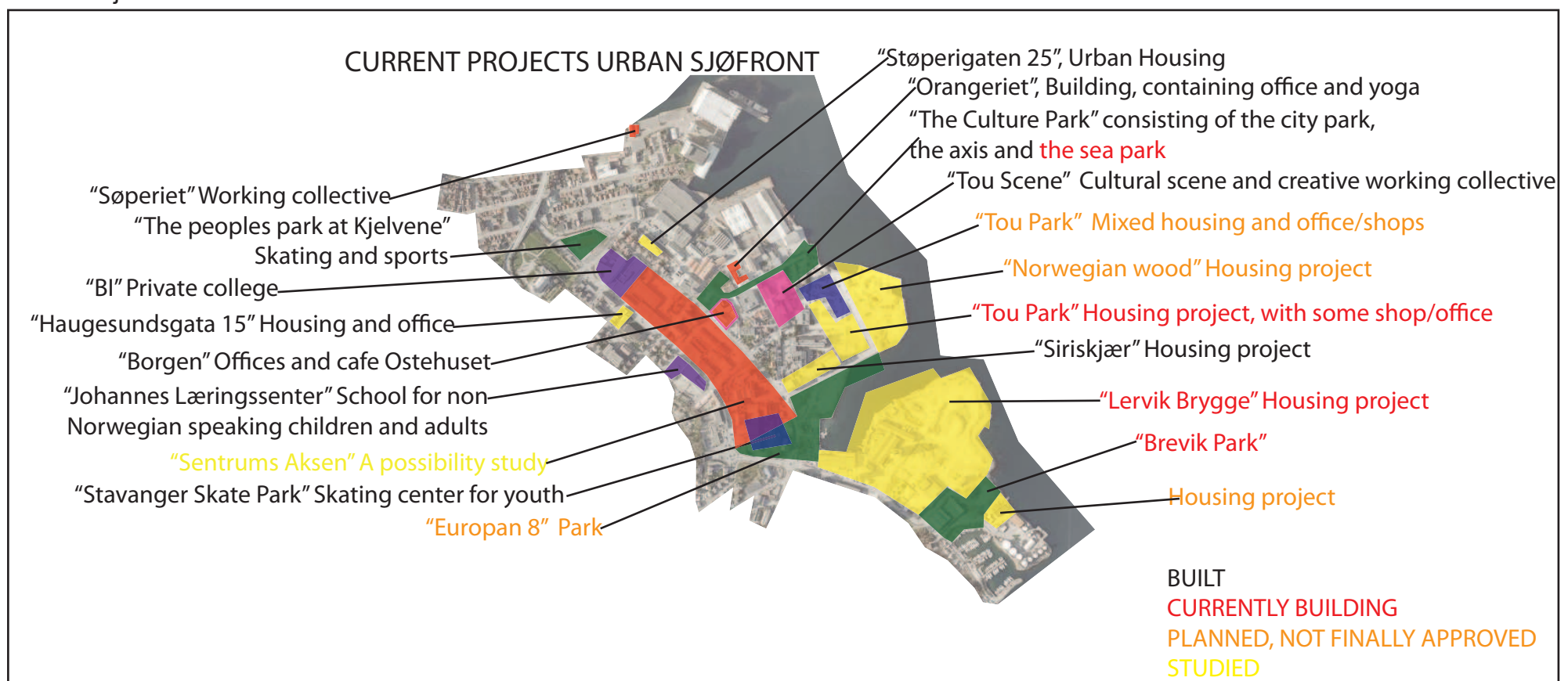
Step two will locate different public space, and evaluate how these are shared, and if they have multiple use.

Step three will analyze the area efficiency on the building scale. Since there are no office buildings built after the new plans were made, this step of the analysis will look at seven different housing projects in the area, all built after the new area plans of plan 1785 and plan 1901. The social area efficiency for the buildings will first be presented individually, and then compared to find trends in the social urban area efficiency for new housing complexes in the area. The “pure” and spatial area efficiency will be compared from the sample, and evaluated to find trends and problems.

A conclusion to the analysis, showing the findings concerning area efficiency in the area.

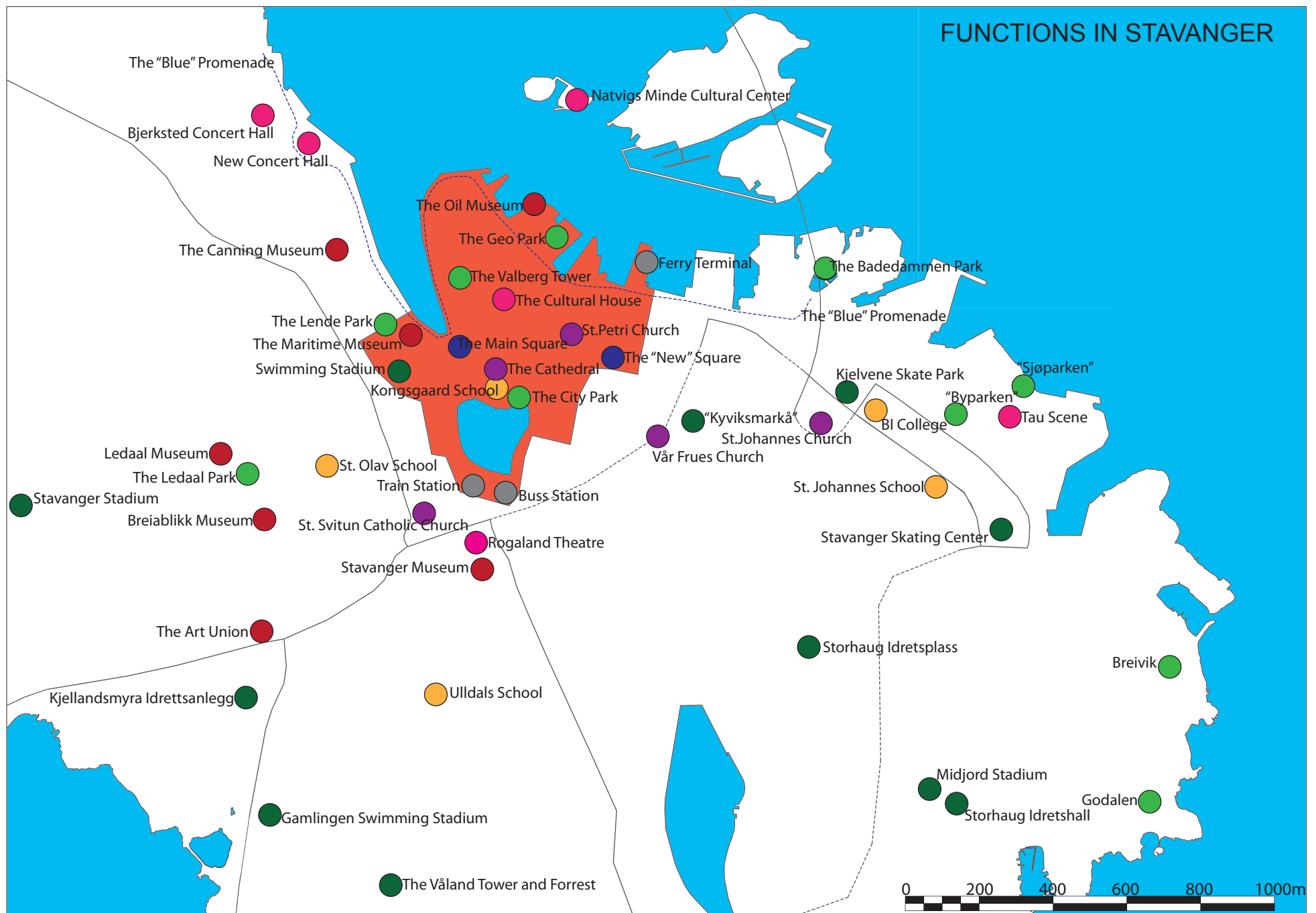
Conceptual suggestions to how area efficiency can be conducted in the urban scale of the area

A proposed plan for an specific sight in the area of Urban Sjøfront.

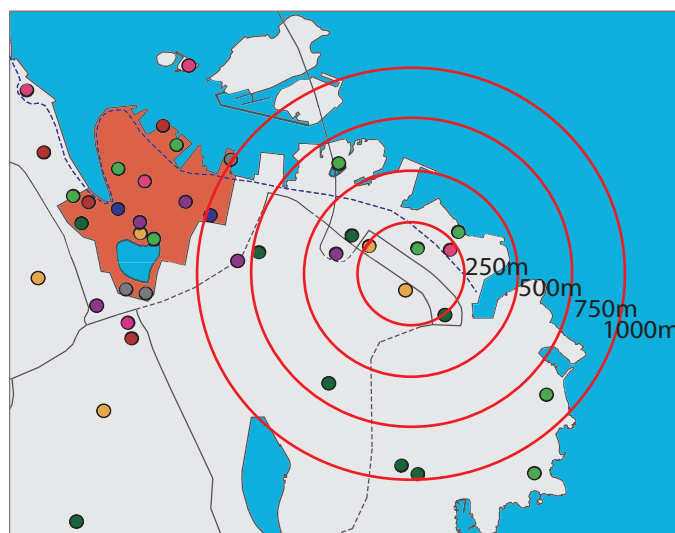


Map 5.3 Current projects in Urban Sjøfront, built, building and planned by May 2011.

FUNCTIONS IN STAVANGER



Map 5.4 Different functions in the nearby area of Urban Sjøfront



Map 5.4 show the functions located in the area around the case study area of Urban Sjøfront. The map should be seen in context to step one in the toolbox, and the maps relating to this. Map 5.5 show the distance in a direct line, with the center in the area where the project is taken, and relates to the function wheel figure 5.3, in step one of the toolbox.

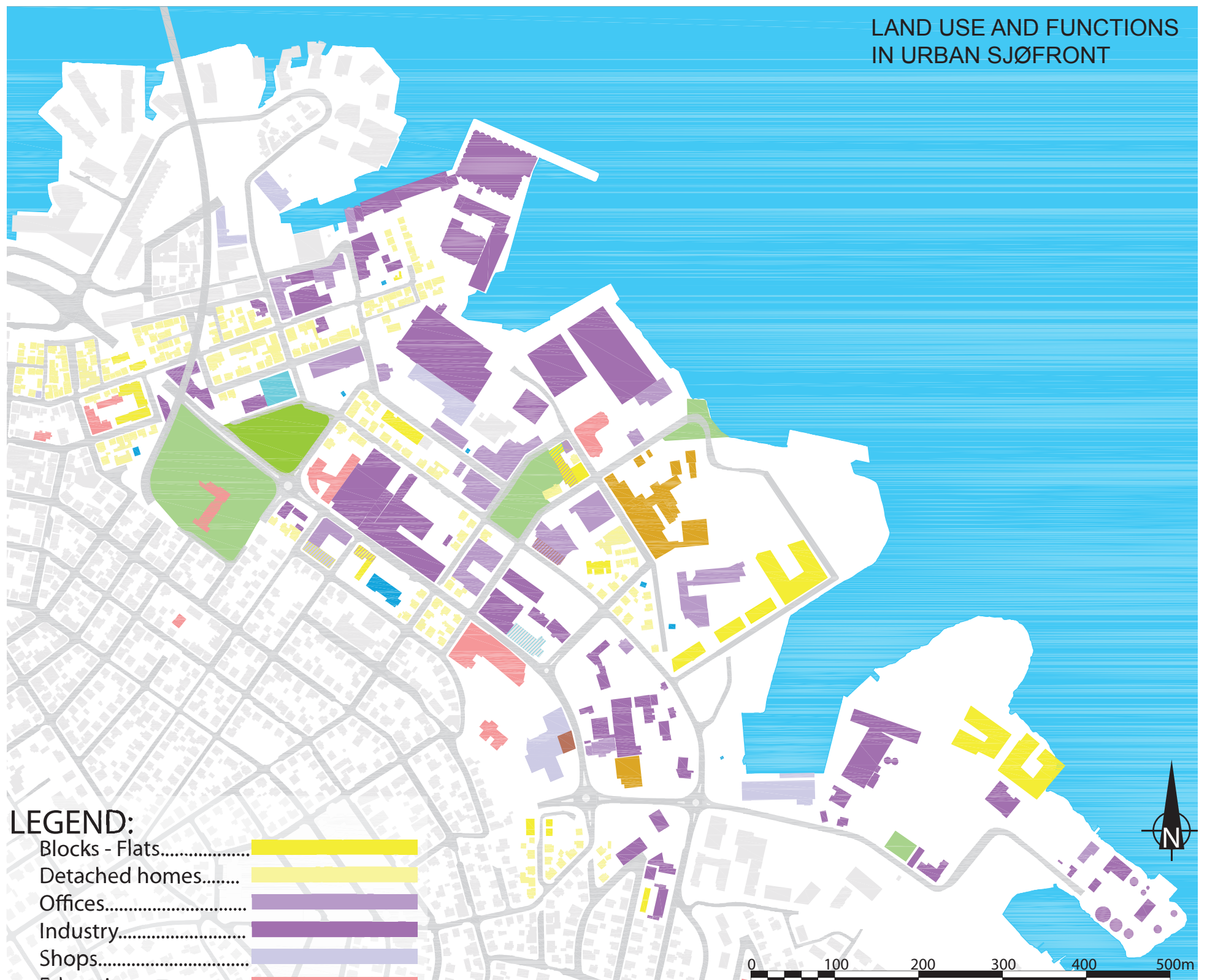
Map 5.5 Distances form the project area to different functions

Functions

- Square
- Transportation
- Parks
- Sports
- Culture
- Church
- Museum
- Education
- The "Blue Promenade"
- Main Roads
- The Commercial City Center
















LAND USE AND FUNCTIONS IN URBAN SJØFRONT



Map 5.6 Land use and Functions in Urban Sjøfront.

LEGEND:

Blocks - Flats.....	
Detached homes.....	
Offices.....	
Industry.....	
Shops.....	
Education.....	
Culture.....	
Takeaway restaurant...	
Church.....	
Park.....	
Sports.....	
Technical Buildings.....	
Outside the area.....	

Map 5.6 show the current land use in the area of Urban Sjøfront, and is a part of step one in the toolbox. As the map show, there is still a rather large amount of industry in the area. There are some housing, both residential blocks and detached housing. There is a large extent of detached housing, especially to the north. The south of the area currently have a lack of green areas. Tou Scene provides a large cultural institution in the area.

FUNCTIONS IN THE URBAN SJØFRONT AREA

- Services - necessary
- Third places - optional
- Parks, green areas
- ● ● Attract people from outside the area
- Bus number 4
- Comuter bus number X74



Map 5.7 Functions located in the Case Study Area, step one of the toolbox.

LOCATE FUNCTIONS IN THE AREA



Figure 5.2 Functions located in the Case Study Area, step one of the toolbox.

There are three different gyms in the area, providing a good variation of training like yoga, marshal art and weight gym. These also attract people on the city scale, due to their specialization.

Ostehuset is the only cafe in the area with regular opening hours. Monday to Friday they are open from 08 to 19, and Saturday 09 to 17 and Sunday 10 to 17 hours. The cafe attracts people for lunch and they also serve dinner, together with pastries, bread, coffees, smoothies etc. They are allowed to serve alcohol, and also do takeaway. The Bar and Cafe in Tou Scene is only open when there are arrangements or venues at Tou Scene. Together with Ostehuset, this cafe can also be rented for private parties, and both venues also provide catering. Tou Scene has two stages, but also space for gallery and working collectives. There are no restaurants in the area, but you can pick up a takeaway pizza at Pizzabakeren, or as previous mentioned at Ostehuset.

The area also has two galleries, but it can be argued that these don't really provide anything to the area, due to the fact that they are not viewable from the street, and don't have windows or displays.

Stavanger Skate Forening provide good areas for young skaters. Not only for skaters in the nearby area, but it also attracts people from the whole city and even the region. The skaters also have the area in the Kjelvene Park, with outdoor ramps. This park also has 2 basketball courts and a handball/football court, joined together, providing space that changes functions over time.

There are some parks in the area, and the path going to Breivik and Godalen with its beaches, starts in the area. In general you can say that there is a relative fair provision of green areas, and closeness to bigger recreational areas. There is also a boat

harbor in the area.

The case study has a good supply of food shops, spread around in the area. There are just two shops in the area selling other items than food, being the Europris shop, that has a varied assortment of different things to a cheap price, and the Boat shop. The area also have a post office, located in one of the shops. There are no doctor, dentist, physiotherapist etc in the area, and the social office for this area is located in the city center. There is a hairdresser and a tanning salon.

There is one international school for children class 1 to 10 and adults learning Norwegian. There are also one kindergarten in the area, and two more near buy, plus two smaller "family" kindergartens.

The first sight, the functions in map 5.7, looks like the area has a fair distribution of functions, but looking more specific, it doesn't remind much of an urban area. There are no proper streets, providing facades and creating urban rooms. Shops and functions are spread around in the area. There is just one cafe, which closes at 19 on weekdays and 17 in the weekend. Tou Scene is a cultural provider in the area, and can be sad to be an important factor. It attracts people on a city scale, and is an important piece in the development. It's also important in an area efficiency matter, since it has space that easily can change function. The BI school could have had the same functions, but the cafe is located on the 2nd floor. It's only open till 15 on weekdays and is not open during the weekends. Lecture rooms are also not open to public use.

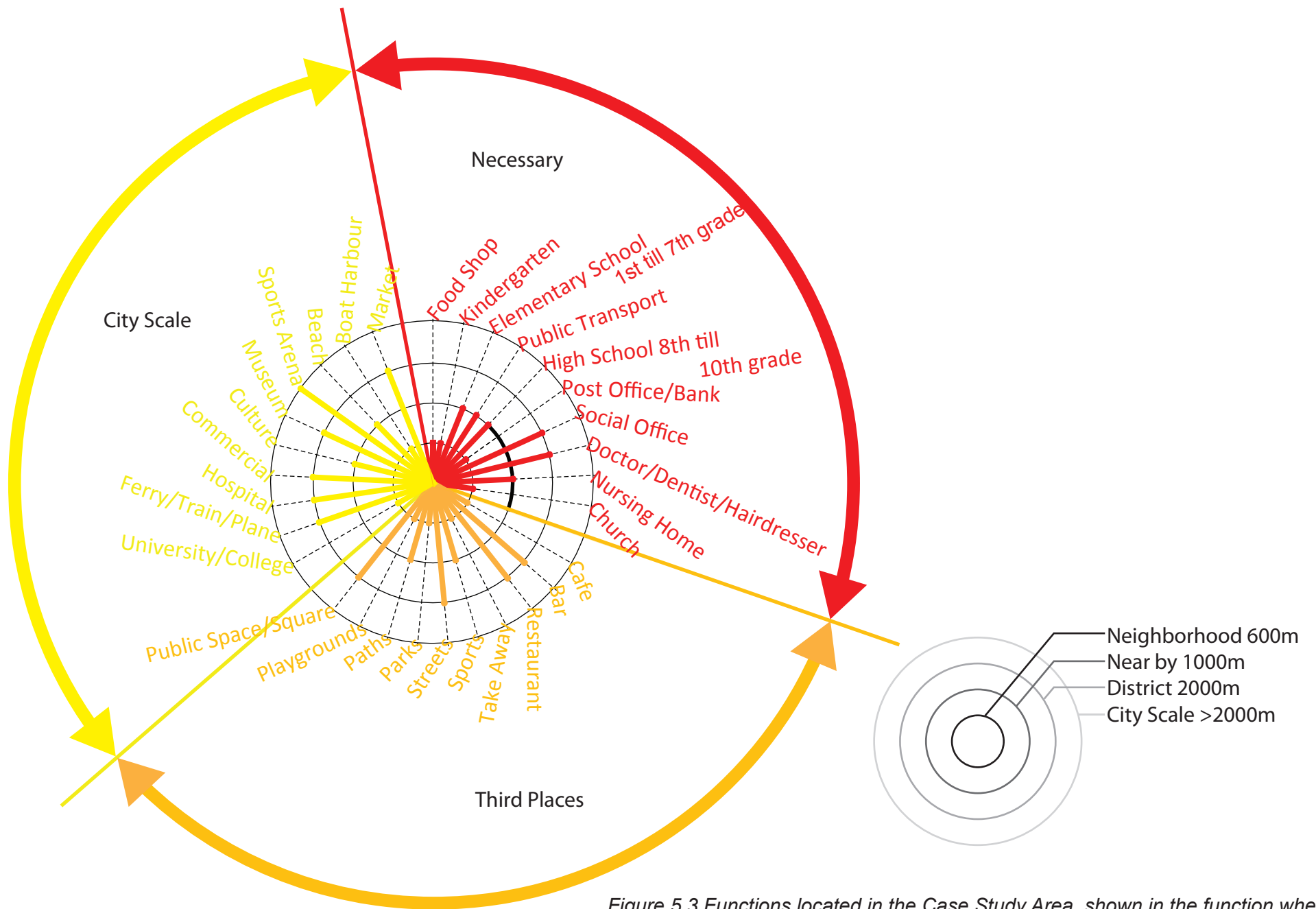


Figure 5.3 Functions located in the Case Study Area, shown in the function wheel.

As seen in figure 5.3, the Urban Sjøfront area have a good distribution of both kindergartens and food shops in the area. The area arguably could benefit from more third places. These are mainly found in the nearby area, being the city center. The do area benefit from having the city center in district distance, although this can both be a positive factor as well as a problem. Urban Sjøfront can be developed as a expansion of the city center, due to its proximity. The way it is today, it seems that the area is located so close to the center, that it's is assumed that the workers and residents can use the functions in city center as their neighborhood area.

ANALYSE OF FUNCTIONS AND SHARED SPACE

Measuring:					
Function	m2	Shared Yes/No	Changes function? Yes/No	When?	
Public Space					
Johannes Læringscenter	2790	semi public	no		
Tou Scene	ca. 3368	semi public	no		
BI College	ca. 1315	semi public	no		
Parks					
St. Johannes Church Park	14640	public	(yes)	Randomly used for flee markets	
Kjelvene People Park	5371	public	(yes)	Different activities /sports can occur,	
Byparken	3125	public	no	depending on the user	
Sjøparken	4086	public	no		
Roads					
All roads excluding sidewalks	60281				
Total m2 for the whole Urban Sjøfront area 527 559.					

Step two looks at how public or semi public space is divided between different users. The public areas in the case study can be seen in figure 5.4. and map 5.8. There are three public spaces, BI college, Johannes Læringscenter, being schools and Tou Scene being a cultural institution. These all have a semi public character, mainly due to the fact that they are located next to semi public buildings, and the space mainly relate to these. There are also four parks in the area, that all have a public feel. Kjelvene people park have partly change in functions, since there are basketball courts combined with handball and football courts. St.Johannes church park have the same, since this park randomly is used for flee markets, but not on a regular basis. In general you can say that currently the area have a little percentage of shared and public space. There are several new parks being planned in the area. These have not been included, since the analysis show the current state, including projects that has been started building by February 2011. Two planned parks can be seen with dotted lines in map 5.8. Details of these project can be found in appendix D. The study also show the percentage of space being used for roads. The numbers doesn't include sidewalks, but show that 11.43% of the area is covered by space that only is being used by cars and potentially bikes. The rest of the area, minus the sidewalks are generally private property, relating to step three in the toolbox.

The next pages will present step three of the toolbox, analysing the built form. Since there are no office buildings built in the area after the plan, seven different building blocks will be presented according to step three of the toolbox. First individually, then the "pure" or spatial area efficiency of each building will be presented and compared. All the buildings can be seen in map 5.3.

Figure 5.4 Step two in the toolbox, locating shared functions and space on the urban scale.

Percentage of total area	
Public space	1.42%
Parks	5.16%
Roads	11.43%

Figure 5.5 Different function and their percentage of the total area.



Map 5.8 Public space in the area.

AREA EFFICIENCY ON THE BUILDING SCALE

The following will present an analysis of the seven different residential buildings studied in the area.

LERVIK BRYGGE

This project is still not built, but most of the flats are sold, (May 2011). The project consists of several stages, where the first stage includes Sjøkvartalet and Hageby 4, shown in image 5.2. The area is developed through plan 1785B7, where the future development of this area can be seen, see appendix D.

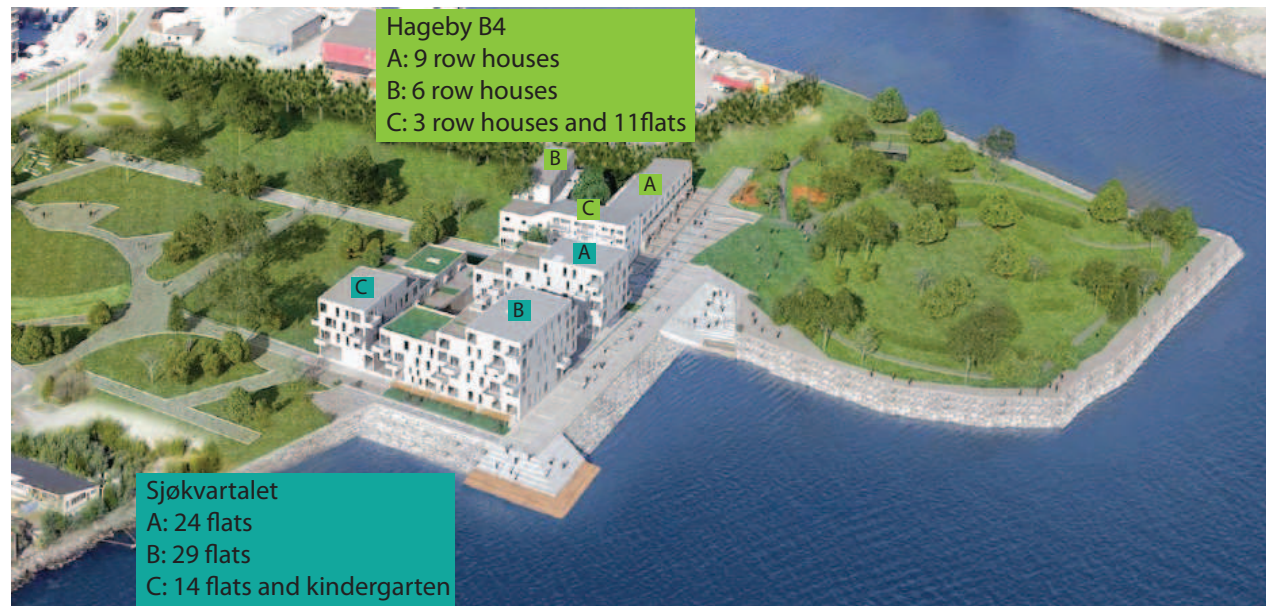


Image 5.2 Lervik Brygge development, step one.

The architects and planners for the projects is Kontor for Arkitektur og Plan; KAP, on commission from BO1 development company.

Analysis of Lervik Brygge -according to step three in the toolbox

Between the units in Lervik Brygge

Shared functions between the flats.

The garage facilities are shared, though the units are given a specific parking space.

Sjøkvartalet:

Shared hallways to enter the flats, as well as the inner courtyard.

Hageby 4:

Share a common garden between the three buildings.

Areas changing functions over time

In Sjøkvartalet bloc C, a kindergarten is planned. This space will be open for public use after the kindergarten closes.

Mixed type of units

Hageby 4 consist of

- 4 flats with one bedroom
- 7 flats with two bedrooms
- 12 + 6 = 18 row houses with four bedrooms

Sjøkvartalet consist of

- 6 flats with hems for bedroom
- 20 flats with one bedroom
- 4 flats with one bedroom and hems
- 31 flats with two bedrooms
- 6 flats with three bedrooms

In general, it can be argued that Hageby 4 is planned for families with children, while Sjøkvartalet is planned for young

people living alone or couples, that due to the high prices should have a good economy. Currently there is little division of flats, but the three planned other Hageby projects will provide about $3 \times 18 = 54$ new row houses. The plans also show another four Hageby projects, although these are not shown in the current area plan 1785B7.

Sharing of view

Hageby 4

All of the row houses have windows on two sides, and the end houses have three. In block C, three of the flats have back and front view, four have corner view and four have view just on one side.

Sjøkvartalet

All buildings have internal hallways, so there are few flats that have a back and a front view. Corner flats of course have two views, while most flats have just one facade with windows.

Generally about the individual flat

The data for Lervik Brygge can be viewed in diagram 1 in appendix F and diagram 1 in appendix G.

Most of the flats have a living space and kitchen on 40 to 55% of the total size of the flat. In Hageby 4, the row houses in building B have just 27.6% as living space and kitchen. The living room here is 13.5m² and the kitchen is the same. This is a unit that has 4 bedrooms, and it can be questioned if this unit really provides good family homes. Or if the "pure" spatial area efficiency is jeopardizing the social area efficiency, making a unit where the common space is too small for the number of people it's intended for.

Sjøkvartalet have a rather high hallway percentage, and most of the flats have between 10 and 13% of the total BRA being hallway. This can relate to the “life cycle standard”, where the hallways need to be wide enough that a wheelchair can be turned. Looking at Hageby 4, we see that the row houses in building A and C have 16.6% for hallways, while the row houses in building B have 18.5%. This is mainly due to the fact that they have 3 floors, and large amount of space is used for staircases in the individual unit. It can be argued that one floor flats also need staircases, but this space is common, and divided on all the flats on the floor. When each unit is going to have its own staircase, this requests a large amount of space, as the numbers show.

All units have storage inside the unit, and each unit have between 3.5 or 4m² storage, independent of the total BRA of the flat. This provides a large difference in the storage as % of the flat.

None of the units can be divided into smaller units. Although the row houses in Hageby 4, the units in building A and C, almost qualify for this. On the ground floor, there is one bedroom, an extra living room and a bathroom, as well as an extra entrance form the street. If the bedroom door was turned a bit, this part of the unit could be divided of, providing a good rental flat for one or two persons.

Five of the 67 flats in Sjøkvartalet can divide off an extra bedroom, meaning they can grow with the family, although it will shrink the common areas.

The units in Hageby 4 have almost double the % of walls that the ones in Sjøkvartalet, showing that the row house take up a rather large % of space for walls.

What does the project add to the area?

The Kindergarten

In Sjøkvartalet block C there will be space provided for a kindergarten. There are some in the area at the moment, but with Hageby 4 and the planned other "Hagebys" with row houses in mind, a kindergarten will be needed. According to the development papers, the playgrounds connecting to the kindergarten, will also be open for the public when the kindergarten is closed.

The Ocean Promenade

In front of Sjøkvartalet block B, a public space is planned. In the southeast in the end of the promenade, there are stairs leading down to the water. This public space gives the public access to both the water and the view. (Seen in image 5.2)

Retail Space

In block A in Sjøkvartalet there is a small retail space, that is adjacent with the promenade. This space can become a small shop, a cafe, office etc, and can facilitate both the neighborhood, but could also become an attraction for people outside the area.

The municipality of Stavanger will develop the area west for the Lervik area, providing a large new park, as seen in plan

1785B13, in appendix D.

What does the build form say?

The buildings create a facade to street leading innto the area. Hageby C, provides a facade to the street, but the first floor is higher than the street, making the facade that mediate to the street, just a wall with no windows or activity. There are stairs going down form the first floor of the flats, to access the street. Building C in Sjøkvartalet have the entrance to the kindergarten facing the street, while block A in Sjøkvartalet have small private terraces facing the street. On the corner, you find the retail space facing both the street and the promenade.

The flats on the ground floor in Sjøkvartalet are all on same level as the ground, with doors leading straight out, providing a living facade for the courtyard between the blocks, but also towards the promenade. Hageby 4 block A have the same layout as the row houses in block C, where the first floor is higher than street level. This provides a “dead” wall facing the promenade.

TOU PARK

Tou Park is the area close to Tou Scene. The full plan consist of seven building blocks, a public green area with playgrounds and the buildings connected to Tou Scene, a cultural building owned by the Municipality of Stavanger.

The first step of the project consists of the three block buildings, A, B and C. The project is planned to be ready for moving in October/December 2012. Building D was put up for sale 27th of April 2011, and is not included in the analysis. The project is part of plan 1785B9, where the next steps also are shown.

Alliance Arkitekter has developed the area and the plans for the buildings, on behalf of Tou Næringspark.



Img 5.3 Tou Park buildings A, B and C

Analysis of Tou Park

-according to step three in the toolbox

Between the units in Tou Park

Shared functions between the flats.

In building A, there will be a 400m² large roof terrace, which is shared between building A, B and C. The roof terrace is located with view of the fjords and face towards the south for sun.

There is a common garden between the three buildings, that will have places to sit and small playground areas.

The units share the parking garage that also contains storage. Each flat have a given specific space both for car and bike parking, as well as storage.

Areas changing functions over time

There are no areas in the first step of the project that change function over time.

Mixed type of units

The three building blocks contain

21 one bedroom flats

72 two bedroom flats

8 three bedroom flats

The flats are rather homogeneous when it comes to bedrooms, where 72 of the 101 flats are two bedroom flats. With the 2nd bedroom being between 6.4 and 8.3m², it could be sad that the majority of flats are thought for couples or couples with one child. With just 8% of the flats being three bedrooms, that can host a family of four, it's clear to say that this project is based on couple or single person households.

Sharing of view

Almost all flats have a back and a front facade, making them go through the building. Block A and C have external gallery hallways, while B have two internal staircases. Block A and B have good views of the landscape. The common roof garden does also provide the opportunity for good views.

Generally about the individual flat

The data for Tou Park can be found in diagram 2 appendix F and diagram 2 in appendix G.

The living space for 94 of the 101 flats, are under 40% of the total BRA. 20 to 30% of the BRA is then being used for bedrooms. When looking at the individual flats, it's clear that most of them will be used only by adults, and it can be questioned if the need or wish of big bedrooms is really higher than a large living space. Most of the main bedrooms are between 11 and 13m². If the flat has a second or third bedroom, this is mainly is between 6.4 and 7.8m². Arguably, the flats are provided with one bedroom being just a bit too big, and one just a bit too small.

The buildings also have a rather high % for hallway space, and the majority of flats have between 11 and 14.7% of the total BRA used for hallway. In 32 of the flats 14.7% of the m² is being hallway space. These flats are 62.1m², meaning 9.1 m² is hallway. With a high m² price, it can be questioned how well this works, both for the buyer, as well as the area efficiency. Building A and C have external common hallways, and flats that have facades on two sides. This creates long and rather narrow flats, which need long hallways. All the flats also have a "life cycle standard", meaning that a wheelchair can be turned in each room apart from the second bedroom, but including the hallway. This and flats going through the building, can be sad to be two of the main concern for why the hallway space is so large. Building B has internal common hallways, and although it has lower % hallway space, it still has over 10%. Building B also has flats with two facades.

All the flats have 3m² storage spaces, independent on the size of the flat. This means that some flats have high % storage, while other has a low. It can be questioned, if all flats need the same storage, or if storage should depend on the number of people in the flat.

None of the units can be divided in two smaller units, but four of the 101 flats can divide of an extra bedroom, and in four others, two of the small bedrooms can easily be joined.

What does the project add to the area?

Retail Space

Building A and B have retail or office space on the first floor facing the street. This space can be used for different purposes. The space just has one facade with windows, making it hard to use the depth of the space fully, concerning offices. Shops or cafe could be a more suitable.

The Public Park and development of Tau Scene

The final project will facilitate the area with a public park with playgrounds, a sports field and a skating ramp, as well as a development of the cultural house of Tau Scene. This will come in a later stage, and it can be sad that the first step does just provide housing with a small retail space and facades towards the street.

What does the built form say?

The three buildings create facades towards the streets that surround the buildings on three sides. All facades facing towards the street have ground floor on the same level as the street. Block C has flats on the first floor, while block A and B have retail space or office space. This creates potential “living facades” towards the street. The parking garage is located in the middle of the three buildings, with a garden on top. The garden is on the same level as the first floor, with direct access forms all external gallery walkways and internal staircases and hallways, as seen in figure 5.6. On the North West side of the building, towards the rest of the project, there is no building. The raked garden here creates a wall towards the street, and the green space between the buildings cannot be seen from the street. This gives a privacy feeling to the garden, making it not a part of the public view from the street. At the same time it gives a “dead facade” towards the street.



Img 5.4 Tou Park building C in the front. The different levels of street and garden can be seen on the right side of the image, with stairs being the facade towards the street.

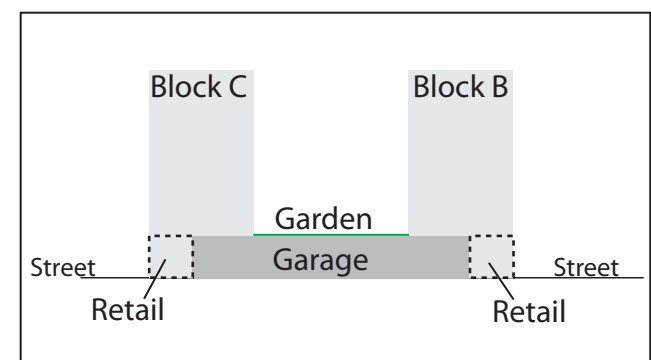


Figure 5.6 The sketch of the section of Tou Park.

STØPERIGATEN 25

The project contains one building located in the north of the Urban Sjøfront area, and is developed through plan 1901B2. The project is planned and drawn by Alliance Arkitekter, on behalf of Svithun Invest AS. The project was finished built in 2007.



Img 5.5 Facade towards west



Img 5.6 Facade towards east

Analysis of Støperigaten 25 -according to step three in the toolbox

Between the units in Støperigaten 25

Shared functions between the flats.

The flats share a garage in the lower floor, where the storage rooms for each flat also are located. There is also a common roof terrace, and external gallery walkways. On the ground floor, there is also a common room of about 30m², with a small kitchen on one of the walls. This room is thought as a room that can be rented by the residents for parties etc. The room has double doors leading out to a small common garden with a playground. There are no WC facilities in relation to the common room.

Areas changing functions over time

The common room can be used for different activities, both for private parties, and gatherings for the whole building.

Mixed type of units

Støperigaten 25 consist of 32 flats

28 flats with one bedroom and hems

4 flats with one bedroom

The units are relative small, with the 28 of the flats being 50.4m². These flat have a rental part that can be divided off, this will be reviewed in the part about the individual flat.

Sharing of view

All the flats are going through the building, giving all flats nearly the same view and light.

Generally about the individual flat

Data for Støperigaten 25 can be found in diagram 3 in appendix F and diagram 3 in appendix G.

Looking at the flats in the building, most of them have between 43 to 41% of the flat for living space. The flats have hems, and this space is not included in the total BRA, since the height of the hems is not a full ceiling height. The numbers therefore might not tell the full story. The hems is also space that is not divided off from the living space, meaning sound, smells, heat etc. travel freely. This can cause friction, if several people are living in the unit. Looking at the individual flats, all flats have 4.5 meter ceiling heights in the parts of the flat that don't have a hems. Relating to Berge (2003), the height can give a more spacious feeling, which

the m² floor space provided.

Since the flats go through the building, the hallway space is rather big, and the flats have an average of about 18.7% of the floor space being used for hallways. 28 of the flats also have two different hems', meaning that there are two staircases in the 50.4 m² large flat.

Just one of the flats has storage in the unit, and all the flats have storage in the basement.

28 of the flats are identical, providing 50.2m² floor spaces, which can be divided in two different units. This type of unit has a common entry, and is further divided in to a main unit and a rental unit. Both these units have a hems for the bedroom. If the unit wants to be used as just one unit, the rental one can be used for the bedroom, with an en suite bathroom. It can be argued that these flats show the problem debated by Berge (2003), cornering how "real" the efficiency of these units actually are. The 50m² units hold two bathrooms, one normal sized kitchen and one small kitchen. If the flat is being used as one unit, most lightly by two people, since there is just one bedroom, the extra bathroom and kitchen is not really necessary, and fairly area inefficient. The flat only become area efficient if it's used as two units, but even then it can be argued, that the unit might as well just be two separate one person households. If the unit could have been two units all the time, just shifting bedrooms between them, the bathroom and kitchen would have been used independent of how the division was.

The flats don't really have the opportunity to change the room plan.

What does the project add to the area?

The building only holds housing, and doesn't add any functions apart from that, to the area. There is a playground, but it's not well kept and have a strong private feeling.

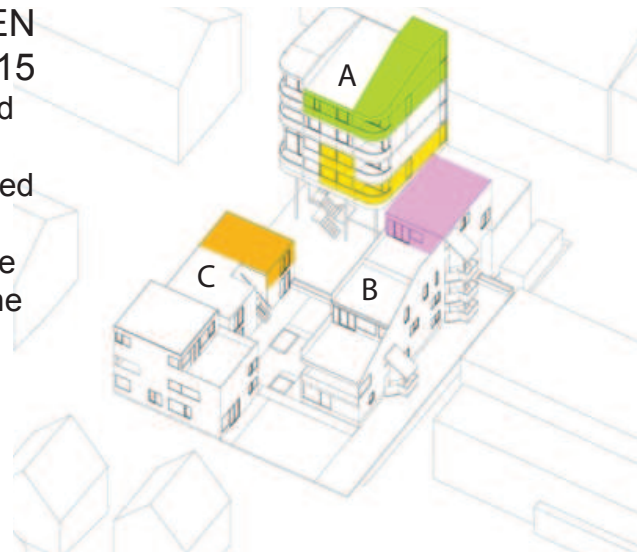
What does the build form say?

The buildings create a facade to two streets, and the facade with the external staircases works as an interesting element. The first floor is raised over the street level, and there are ramps from the street and up to the flats. The building show its "back side" towards the street, and balconies are facing the other side.

HAUGESUNDSGATEN

9,11,13 and 15

This project was built in 2006, and is planned by Helen & Hard, on behalf of Viktor Husebø. It's located with inn the plan of 1901, and consist of block A, B and C, where building A have office space on the two first floors.



Img 5.7 The three buildings in Haugesundsgaten.



Img 5.8 The facade towards Haugesundsgaten

Analysis of Haugesundsgaten

-according to step three in the toolbox

Between the units in Haugesundsgate

Shared functions between the flats

The garage and a playground are shared between the flats. Building A have internal hallways and elevator, while building B and C have external stairways.

Areas changing functions over time

There are no areas that change functions over time.

Mixed type of units

Haugesundsgaten consist of 24 flats

13 flats with one bedroom

10 flats with two bedrooms

1 flats with three bedrooms

In general, the buildings seems to be mainly for couples, single households, or families with one child. The second bedrooms are mainly between 6 or 7 m², making them a bit small as bedrooms for older children.

Sharing of view

All flats have two or more facades, providing fairly good light conditions and views for all. Some of the flats in block A also have double height in the living space, providing extra good light conditions.

Generally about the individual flat

The results can be seen in figure 2 appendix F and figure 3 appendix G.

All the flats have rooms that are rather poly functional, and the living space is over 50% of most of the flats.

The hallway area is between 6 and 13% of the flats total size.

Just one of the units has storage in the housing unit, mean-

ing there is a temperature differentiation between different functions.

None of the units can be divided in to smaller units, or change the room plan. The inner walls of building are carrying concrete walls, meaning they don't have the opportunity to be divided differently.

What does the project add to the area?

Building A have office space in the two first floors.

What does the build form say?

The buildings create a facade towards Haugesundsgaten, and this is also where the office space is, providing a nice "living facade". The buildings also give facades to the other streets adjacent.

SIRISKJÆR 2

The complex is located on the sea side, in the middle of the Urban Sjøfront area. Siriskjær 2 was the first of the three blocks being build. Its planned by Leiv Nes Arkitekter AS, on behalf of Siriskjær Eiendom. The building is a part of plan 1785B1, and was built in 2007



Img 5.9 Facades towards north east Img 5.10 Facade towards Ryfylkegaten Img 5.11 Facade towards the water

Analysis of Siriskjær 2 -according to step three in the toolbox

Between the units at Siriskjær 2

Shared functions between the flats

The building has common parking garage with storage and bike parking. There is also a playground outside, and some seating areas.

Areas changing functions over time

There are not really any areas that are multi functional.

Mixed type of units

Siriskjær 2 consists of 50 flats:

- 3 studio flats
- 30 flats with one bedroom
- 15 flats with two bedrooms
- 2 flats with three bedrooms

In general, the flats that have two bedrooms, have a second bedroom between 6.2 and 7.3m². Most of the flats are about 33 or 44 m², making them appropriate for couples or single people.

Sharing of view

The flats are not going through the building, meaning that the general amount of flats either have a view to South East or North West. The flats towards North West have afternoon sun, but no views of the water and fjords, while the South East have good views, but no sun in the evening.

Generally about the individual flat

The data from Siriskjær 2 can be seen in diagram 3 appendix F and diagram 4 appendix G.

Even though the flats in Siriskjær generally have a lower percentage of living space than the other projects studied, they the majority still have between 45 and 55%. Their rooms are rather

multi functional, like most of the other projects.

Most of the units have 5 to 6% hallway space, and the project in general arguably have a good layout concerning hallways in the units. Partly due to the fact that there are common internal hallways, and that the units are not going through the building, hence have views in only one direction, or two if they are on a corner.

Just five of the fifty flats have storage in the units, and all flats have storage in the basement.

Eight of the flats have the possibility to add an extra room, taking space from the common area. These solutions are shown in the plans, but are arguably poor solutions. The added extra room doesn't have its own entrance, and has to exit and enter through the master bedroom to get to the rest of the flat.

What does the project add to the area?

The project just contains housing, and provides no other functions to the area. There is a playground area on the back side of the building, though this has a private feeling, and does as well belong to the project.

What does the build form say?

The buildings create a facade towards the street. The first floor is raised above street level, and there is a concrete wall towards the street, creating a "dead" facade towards the street.

SIRISKJÆR 4 and 6

The two blocks are identical, but mirrored. They are located on the seaside in the middle of the area, and are part of the 1785B1 plan. The buildings are planned by Leiv Nes Arkitekter AS, on behalf of Siriskjær Eiendom. The two blocks were built in 2008.



Img 5.12 The two buildings seen from Lervik Brygge project area.



Img 5.13 Facade towards the water.

Analysis of Siriskjær 4 and 6 -according to step three in the toolbox

Between the units at Siriskjær 4 and 6

Shared functions between the flats

Each building shares a common garage with storage together with bike and car parking. There are also internal hallways, stairs and elevator that are common. Outside there is a common playground and some sitting areas.

Areas changing functions over time

There are not really any areas that change function over time.

Mixed type of units

Siriskjær 4 consists of 35 flats

21 flats with one bedroom

14 flats with two bedrooms

Siriskjær 6 consists of the same.

In general, the flats that have two bedrooms, have a second bedroom between 8 and 9m². One third of the flats are 32m², while another third is about 44m². The flats are generally for couples or single people, or three person households.

Sharing of view

The flats are not going through the building, meaning that the general amount of flats either have view to South East or North West. The flats towards North West have no views of the water and fjords, but sun in the evening, while the South East have good views, but no sun in the evening.

Generally about the individual flat

The data for Siriskjær 4 and 6, can be viewed in diagram 3 in appendix F, and diagram 4 in appendix G. The buildings will be viewed individual, but since they are identical, the description goes for both buildings.

10 of the 35 flats have less than 50% living space. The

space in the flat is rather multi functional.

Most of the flats have between 5 and 6% hallway, and together with Siriskjær 2, these buildings generally have the lowest % of hallway space. The flats all have common internal hallways, and the flats just have one facade, or two if they are located on a corner. 12 of the smaller flats have 2.28m² hallway, meaning that since the BRA is just 32m², 7.1% of the BRA is used for hallway.

Flats over 60m² have storage in the flat, something that can be said to be a good solution. Storage needs to be a minimum m², and as seen in other projects, can create a high percentage for smaller flats.

None of the flats can be divided into smaller units, and none of the flat drawings are showing in that extra bedrooms can be divided off.

Most of the flats have 3 to 4% wall space.

What does the project add to the area?

The project just contains housing, and provides no other functions to the area. There is a playground area on the opposite side of the road, though this has a private feeling, and do as well belong to the project.

What does the build form say?

The buildings create a facade towards the street. The first floor is raised above street level, and there is a concrete wall towards the street, creating a “dead” facade towards the street.

ANALYSING THE “PURE” SPATIAL AREA EFFICIENCY OF THE BUILDINGS

The following will comment on the numbers from the “pure” area efficiency in the seven studied residential blocks in the case study area.

BRA as AREA MEASURE

	Flats	Total BRA	BRA /Bed	BRA/Person	Difference
Lervik Brygge Sjøkvartalet					
A	24	1377.5	23.75	32.03	8.28
B	29	1532.2	18.24	26.42	8.18
C	14	938.0	24.05	33.50	9.45
Total	67	3847.7	21.26	29.83	8.57
Lervik Brygge Hageby 4					
A	9	1188.0	26.40	26.40	0.00
B	6	558.0	18.60	23.25	4.65
C	14	990.0	22.50	26.76	4.26
Total	29	2736.0	22.99	25.81	2.82
Tau Park					
A	43	2680.6	22.72	35.74	
B	22	1532.2	22.53	28.37	5.84
C	36	2374.2	24.73	32.98	8.24
Total	101	6587.02	23.36	32.77	9.41
Haugesundsgate					
A	6	423.4	23.52	32.57	9.05
B	10	494.1	21.48	32.94	11.46
C	8	403.3	21.23	22.41	1.18
Total	24	1320.8	22.01	28.71	6.70
Støperigaten					
	32	1620.6	18.01	19.07	1.06
Siriskjær 2					
	50	1714.9	14.78	19.94	5.16
Siriskjær 4					
	35	1800.2	21.18	25.35	4.18
Siriskjær 6					
	35	1800.2	21.18	25.35	4.18

Table 5.3 BRA as area measure, showing BRA per bed and per person.

BRA as area measure show how much private living space the building actually give on an average per bed, per person or per flat. In other words how much space each bed or person in the building have to live on, including inner walls.

The BRA doesn't relate to how much building is required to facilitate a person, this is shown in total building as area measure on the next page. The BRA there for arguably doesn't work that well as an spatial area measure alone, but give important information of what the personal unit gives the user. As seen in appendix F presenting the % of BRA used dedicated to each function, the use of the BRA can be done in different ways. A substantial % of the space can be used for storage, hallways and wall space, not only living space and bedrooms.

When looking at BRA per bed, the span on the flats researched are between 14.78m² (Siriskjær 2) and 23.36 m² (Tau Park). Compared to the average in 1960 that was 28m² per person, we can see that all the averages are under. Concerning BRA per person, some of the buildings are over the numbers from 1960.

From table 5.3, we can see that there is a big difference in BRA per bed and BRA per person for the buildings measured. Persons is defined with different parameters, as explained in page 10. This table arguably tells us that looking at how many beds a flat has, might not be a good way to calculate how many people is lightly to be living in the flat. We see that the BRA per person, for some flats are almost 1/3 higher than the BRA per bedroom, like Lervik Brygge Sjøkvartalet and Tou Park. As seen from the plans, Tou Park had rather spacious main bedrooms, but then rather small second bedrooms, meaning they didn't qualify as good bedrooms.

It is of course hard to determine how many people in the end will live in the flat, this will depend on the user. Financial times and what standard is wanted or what standard is financially possible can be sad to influence this. The number of beds indicate how many people the flat can hold, while the number for people show an estimation of how many people the flat would hold when there are quality concerns to the space available and size of bedrooms. The last therefore also relates to social area efficiency.

TOTAL AREA ABOVE GROUND as AREA MEASURE

	flats	Total BRA	Total area above ground	Total area above ground per BRA	Total area minus BRA	Total area minus BRA m2			Total area above ground m2		
						per bed	per person	per flat	per bed	per person	per flat
Lervik Brygge Sjøkvartalet											
A	24	1377.5	1811.94	1.32	434.44	7.49	10.10	18.10	31.24	42.14	75.50
B	29	1532.2	2619.27	1.71	1087.07	12.94	18.74	37.49	31.18	45.16	90.32
C	14	938.0	1063.18	1.13	125.18	3.21	4.47	8.94	27.26	37.97	75.94
Total	67	3847.7	5494.39	1.43	1646.69	9.10	12.77	24.58	30.36	42.59	82.01
Lervik Brygge Hageby 4											
A	9	1188.0	1459.80	1.23	271.80	6.04	6.04	30.20	32.44	32.44	162.20
B	6	558.0	684.00	1.23	126.00	4.20	5.25	21.00	22.80	28.50	114.00
C	14	990.0	1398.50	1.41	408.50	9.28	11.04	29.18	31.78	37.80	99.89
Total	29	2736.0	3542.3	1.29	806.30	6.78	7.61	27.80	29.77	33.42	122.15
Tau Park											
A	43	2680.6	3775.05	1.41	1094.45	9.28	14.59	25.45	31.99	50.33	87.79
B	22	1532.2	2269.37	1.48	737.17	10.84	13.65	33.51	33.37	42.03	103.15
C	36	2374.2	3456.50	1.46	1082.28	11.27	15.03	30.06	36.01	48.01	96.01
Total	101	6587.02	9500.92	1.44	2913.90	10.33	14.50	28.85	33.69	47.27	94.07
Haugesundsgate											
A	6	423.4	544.00	1.28	120.60	6.70	9.28	20.10	30.22	41.85	90.67
B	10	494.1	568.88	1.15	74.78	3.25	4.99	7.48	24.73	37.93	56.89
C	8	403.3	448.57	1.11	45.27	2.38	2.52	5.66	23.61	24.92	56.07
Total	24	1320.8	1561.45	1.18	240.65	4.01	5.23	10.03	26.02	33.94	65.06
Støperigaten											
	32	1620.6	2161.68	1.33	541.08	6.01	6.37	16.91	24.02	25.43	67.55
Siriskjær 2											
	50	1714.9	3139.92	1.83	1425.03	12.28	16.57	28.50	27.07	36.51	62.80
Siriskjær 4											
	35	1800.2	2491.20	1.38	691.01	8.13	9.73	19.74	29.31	35.09	71.18
Siriskjær 6											
	35	1800.2	2491.20	1.38	691.01	8.13	9.73	19.74	29.31	35.09	71.18

Table 5.4 Total area above ground as area measure, showing total area minus BRA per bed/person /flat and total area per bed/person/flat.

Total area above ground as an area measure show how much beds, people or flats the total built area above ground can hold. In other words how efficient the building is. The measure doesn't relate to number of floors like the plot usage measure. The part of the building that is under ground is not calculated in to the numbers. This since it's only the "footprint" of the building that is being occupied by a built form, and the part of the building that is under ground doesn't take up any land space. As an recourse measure, the whole m2 of the building should be calculated.

When we take the total area for the building, subtracted the BRA, the numbers revealing show m2 use for common spaces like hallways, staircases, storage etc that is above ground. It also show outer walls. A high number of common space can be a good sign, but only if the BRA per bed or person is low and the common space hold functions like dining rooms, guest rooms, laundry, common storage, common kitchens etc. Then this can reduce the space in the individual flat. If the common space is large and the BRA per bed is too, the building is arguably not really area efficient. Large common space could also be due to oversized hallways, and poor solutions concerning staircases.

When looking at the numbers for the buildings studied, we can see

that Siriskjær 2 who had a low BRA per bed from table 5.4, being 14.78m², now have a total area above ground of 27.07m² per bed. This mean that the average bed in Siriskjær 2 needs 12.28m² to facilitate common hallways, staircases, walls and storage outside the flat. In Siriskjær 2, only five of the fifty flats had storage in the flat, the rest had external storage above ground, this arguably come to show here.

If BRA as an area measure give the net space use per person, you can almost argue that total area of the building above ground give the gross number. In other words how many m² it actually takes to facilitate a person or a bed.

Galley walkways are also included in the total area, limiting the differenced between buildings with internal hallways and buildings with external gallery walkways. It can be argued that external hallways need less materials, but as long as they take up space, they contribute to the area efficiency measure.

The total area is calculated from each floor, calculating the buildings form the outer walls that are above ground. Space used for office or retail or other functions that do not directly belong to the flats in the building, is not included, as well as balconies.

PLOT SIZE as AREA MEASURE

	Flats	Total BRA							
Lervik Brygge Sjøkvartalet									
A	24	1377.5							
B	29	1532.2							
C	14	938.0							
Total	67	3847.7							
Lervik Brygge Hageby 4									
A	9	1188.0							
B	6	558.0							
C	14	990.0							
Total	29	2736.0							
Tau Park									
A	43	2680.6							
B	22	1532.2							
C	36	2374.2							
Total	101	6587.02	4697.00	1.40	16.66	23.37	60.04	42.79	21.50
Haugesundsgate									
A	6	423.4							
B	10	494.1							
C	8	403.3							
Total	24	1320.8	1348.00	0.98	22.47	29.30	44.51	34.12	17.80
Støperigaten									
	32	1620.6	1391.00	1.17	15.46	16.36	64.70	61.11	23.01
Siriskjær 2									
	50	1714.9	1170.00	1.47	10.09	13.60	99.15	73.50	42.74
Siriskjær 4									
	35	1800.2	2522.00						
Siriskjær 6									
	35	1800.2		1.43	14.84	17.76	67.41	56.30	27.76

Table 5.5 Plot size as area measure, showing m2 plot per BRA/bed/person and bed/person/flat per dekar.

Plot size as area measure show how many beds, people or flats the plots hold per m2, but as well, how many beds, person or flats there is per dekar. Flats/dwellings per dekar is a normal density measure, also referred to in the theory chapter. When this tool also measure people and bed per dekar, it can arguably give a better description of the actual density.

The plot size measure is of course relating to the number of floors the building have, and as well how much of the plot is being built on. A high number of floors together with a good usage of the plot will of course give a higher number.

From the buildings studied, we can see that Haugesundsgate have the highest number of m2 plot per bed, with 22.47m2. Conse-

quently they also have the lowest number of beds per dekar, with 44.51 beds per 1000m2 land. Siriskjær 2 have the highest, here almost 100 beds per 1000m2 land, over the double of what Haugesundsgate have.

The numbers from Lervik are not included, due to the fact that the plot size given by the Municipality of Stavanger, was for the whole Lervik Brygge project, not just the buildings included in step one. The numbers gave a minimal number for person per dekar, and did therefore not make any sense to include.

GROUND FLOOR as AREA MEASURE

	Flats	Total BRA	Ground floor	Ground floor			Beds person flat		
				per BRA	per bed	per person	per 100m2 ground floor		
Lervik Brygge Sjøkvartalet									
A	24	1377.5	411.73	0.30	7.10	9.58	14.09	10.44	5.83
B	29	1532.2	529.18	0.35	6.30	9.12	15.87	10.96	5.48
C	14	938.0	829.82	0.88	21.28	29.64	4.70	3.37	1.69
Total	67	3847.7	1770.73	0.46	9.78	13.73	10.22	7.29	3.78
Lervik Brygge Hageby 4									
A	9	1188.0	522.60	0.44	11.61	11.61	8.61	8.61	1.72
B	6	558.0	228.00	0.41	7.60	9.50	13.16	10.53	2.63
C	14	990.0	401.90	0.41	9.13	10.86	10.95	9.21	3.48
Total	29	2736.0	1152.50	0.42	9.68	10.87	10.33	9.20	2.52
Tau Park									
A	43	2680.6	890.00	0.33	7.54	11.87	13.26	8.43	4.83
B	22	1532.2	508.25	0.33	7.47	9.41	13.38	10.62	4.33
C	36	2374.2	691.30	0.29	7.20	9.60	13.89	10.42	5.21
Total	101	6587.02	2089.55	0.32	7.41	10.40	13.50	9.62	4.83
Haugesundsgate									
A	6	423.4	176.09	0.42	9.78	13.55	10.22	7.38	13.63
B	10	494.1	181.47	0.37	7.89	12.10	12.67	8.27	3.31
C	8	403.3	191.99	0.48	10.10	10.67	9.90	9.38	5.21
Total	24	1320.8	549.55	0.42	9.16	11.95	10.92	8.37	4.37
Støperigaten									
	32	1620.6	720.56	0.44	8.01	8.48	12.49	11.80	4.44
Siriskjær 2									
	50	1714.9	605.52	0.35	5.22	7.04	19.16	14.20	8.26
Siriskjær 4									
	35	1800.2	498.24	0.28	5.86	7.02	17.06	14.25	7.02
Siriskjær 6									
	35	1800.2	498.24	0.28	5.86	7.02	17.06	14.25	7.02

Table 5.6 Ground Floor as area measure, showing ground floor per bed/person/flat and beds/persons/flats per 100m2 ground floor.

The ground floor as area measure show how many beds or people the footprint of the building hold. Compared to the previous measure of plot size, the ground floor measure don't relate to if the plot is small or large, but measure just the area the building take up above ground. This measure relates greatly to the number of floors. The more floors, the more beds, people and flats can be divided on the m2 ground floor area.

floor per bed, does not give the highest ground floor per person. Siriskjær 2 have 19.16 beds per 100m2 ground floor. Siriskjær 4 and 6 have 17.06 m2 beds per 100m2 ground floor, but 14.25 m2 per person, 0.05 people more than Siriskjær 2.

Looking at the numbers, it's clear that highest number for ground

Comments to the building scale analysis

Since the case study analyses seven different units, a general picture and comparison can be done, to reveal typical trends and characteristics with the residential development of Urban Sjøfront. From the previous pages, seven housing complexes have been analysed according to step three in the toolbox. From the qualitative analyses presented from the individual units and what they share between each other, it can be concluded that they all are fairly private. The only thing they share is the garage, some outdoor space and hallways. Støperigaten is the only building that have a common “party room” that the residents can borrow, or that can be used for common activities. The fact that this room doesn't have WCs connecting to it, leaves a question of how well it is actually put out.

When it comes to mixed use of units, all the flats are rather similar, as shown in table 5.7. Of the 373 flats studied, 36% are one bedroom and 44% are two bedroom flats. There are just 18 units with four bedrooms, being the row houses in Hageby 4. It can be argued that the area slowly seem to become a new Badedammen project, unless there will be a change in flat types and as well functions provided. It can be argued that Urban Sjøfront now develops to be for young first time buyers, or couples or single people who have good economy and want an easy flat with nice views. The senior market arguably come to mind.

When looking at the use of the BRA in the individual flats, as shown in appendix F and G, we can see that the “life cycle” standard, create an extra space use. Some of the planning solutions also can be questioned, when 14.5% of the flat is being used for hallway, like for some of the flats in Tou Park. Decent bedroom sizes also occur as a problem in most of the projects. And it can be questioned how nice it is to live in a 6 to 7.5 m² bedroom.

It is just the projects in Støperigaten have the possibly to divide in

Bedrooms	Studio	hems	hems + 1 bedroom	1	2	3	4	Total
Lervik Brygge Sjøkvartalet		6	4	20	31	6		67
Lervik Brygge Hageby 4				4	7		18	29
Tau Park				21	72	8		101
Haugesundsgate				13	10	1		24
Støperigaten			28	4				32
Siriskjær 2				30	15	2		50
Siriskjær 4	3			21	14			35
Siriskjær 6				21	14			35
Total	3	6	32	134	163	17	18	373

to smaller units. Although the real area efficiency of these flats, as previous mentioned, can be questioned. When the bedroom is a hems, it is questionable who many couples want to live in a flat where the bedroom is not separated with walls form the living space and kitchen.

The study of the built form of the seven projects, also show that there is a trend in having the first floor containing apartments, raised 1 meter above street level. This mean that all residential windows are above the height of people walking on the sidewalks. This provide privacy for the residents, but on the other hand, “dead facades” to the streets, also as seen in Badedammen. This arguably can create a boring or dead feeling to the neighborhoods.

When looking at the pure area efficiency, the different measures presented, measure different things concerning area efficiency. While the total area above ground give a number to how many beds the built form can hold and how area efficient the building is, the plot size measure how many people the land hold. Area efficiency should relate to both these measures. How much land is being used and as well how much building is being used.

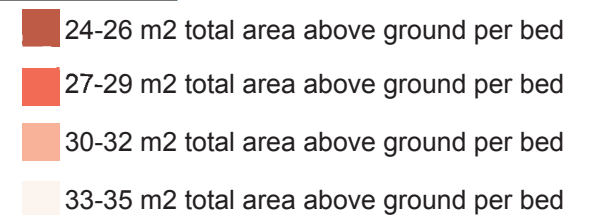
When comparing these two numbers, figure 5.4 and 5.5, we can find trends in the pure area efficiency of Urban Sjøfront. The figures show, that Støperigaten have the lowest m² total area above ground but is beaten by Siriskjær 2 when it comes to beds per plot, where Siriskjær 2 have almost 1/3 more beds than Støperigaten. This is mainly since Støperigaten only have three floors, while Siriksjar have 5. Siriksjar 2 have 27.07m² total built area per bed, but due to lack of descent sized bedrooms have 36.51m² total built area use per person. While Støperigaten have 24.02 m² total built area per bed, and 25.43 per person. This show another concern, that bedrooms and potential people living in the flat give large variation in numbers for some of the buildings.

The calculations concerning ground floor as area measure, show the footprint of the building, meaning that the plot used for the building will be shown here. This measure will of course also depend on number of floors, but will in contrary to the plot size, show the number of people just on the built land. The rest if the plot can be used for parks or public spaces. Siriskjær 2 has the highest number of beds per 100m² ground floor. Comparing the beds per dekar plot with beds per dekar ground floor, it seems like all of the numbers more or less doubles. The area plan also put a max TU, plot usage, and this can be an explanation to this.

Table 5.7 Division of flats in the project studied.



Map 5.9 Graphically showing “pure” area efficiency in the case study area.



Map 5.9 show how the “pure” area efficiency can be shown in a map. From the analysis, just seven of the housing blocks have been measured, revealing different numbers of m2 built area per bed. With colors, the map try to show the results. The more dark red, the more area efficient, hence less m2 total area per bed.

The same can then be done for all the different buildings. This will give a map that graphically give a picture to how efficient the area is. Office buildings should be given a different color, and measure office spaces per person.

The map can also show beds per dekar, displaying the land use.

Theoretical, all buildings in the area could have been measured, showing in the same way in map 5.9. When starting to analyse, it soon became clear, that since these measurements don't exist in the municipalities data, it would be quite a job to provide all of them from measuring building plans. Seven block buildings were there for chosen, since they are the new development of the area, and arguably are examples of how the development in the area will progress. The seven buildings could there for be used to conclude typical threats or qualities for the studied area.

RESULTS/ COMMENTS TO THE DATA FOUND IN THE ANALYSIS OF URBAN SJØFRONT

Form the analyses of area use in Urban Sjøfront through the three steps in the toolbox and statistics found about housing and household units in Stavanger, some conclusions to the local area efficiency in Urban Sjøfront can be made. The found threats, or problems concerning area efficiency are presented in the following.

FOR HOUSING

The increase of one person households.

All households need access to a bathroom, a kitchen, sleeping space and living space. This provides a minimum size of the housing unit. If a unit is occupied by two people, the need for space arguably doesn't double, since the two people share several functions. An increase in one person households, will therefore create an extra need of space per person, especially seen together with the lack of sharing functions between the flats.

The majority of two bedroom flats

In Lervik Brygge, 31 of 96 flats are two bedroom flats, while Tou Park has 72 out of the 101 flats being two bedrooms. Looking at the statistic for Stavanger, we see that only 12.1% of the households consist of three people. What we do see, is that 67.5% of the population consist of one or two people. Most of the second bedrooms are between 6 and 7m². This size can work for a child, but will be small for a teenager or an adult. The majority of these two bedroom flats will most lightly be occupied by a couple or a single person household, where the extra bedroom is used for a study and/or guest room. This will of course increase the space use per person. The positive aspect can be if these flats are occupied by couples where the children have moved out, and they sell their 150 to 200m² house, to live in a flat that's is less than half the size.

The lack of "exclusive" small flats.

As seen from the projects studied, most of the small one person flats are on the first or second floor, with poor views and limited light. This can be understood as they are meant for single young people looking for their first home. Then money is limited, and they need to start small. Knowing that the one person households have over doubled from 1987 to 2004, in the age range 30 to 44, it makes sense to create small efficient flats that are based for an segment that have a better economy. Views and access to common functions can replace the wish for a high m².

The "Remanens-effect"

If couples live on in their larger family houses, after the children have moved out, this is called the Remanens-effect. Two people

living in a house meant for four people, give a high m² per person. If the housing unit also is a villa, the m² is already quite high.

The lack of good family flats.

If there are few good family flats for a descent price, and at the same time there are a good range of villas and row/chain houses, the market would most lightly prefer the more space needing villas. It can be argued, that flats have gotten a bit of a bad reputation as family housing. As seen from the statistics in Appendix B, the m² price is now higher for flats then detached houses, this will theoretically also affect the choice of housing type.

The believe that the villa and row house is the best family home.

Connected to the lack of good family flats, and the "Remanens effect", this provide a craving in the market for villas and row houses, and can lead to even fewer family flats being built.

Good financial times

With a good economy and low interest, it seems like people start searching for a house by finding out what mortgage they can get, instead of identifying what they actually need. Housing can also be seen as an investment, meaning you invest in something bigger than what you really need at the moment. But might need in the future.

The "Livsløpstandard"

This is a bit of an ethical dilemma. The idea of the "life cycle standard" is that if something happen to your abilities, you can keep on living in your housing unit. If you get injured or sick, meaning you need a wheelchair for a shorter time, or for the rest of your life, your housing unit is built to tackle that. In other words all hallways and doors need to be extra wide, bedroom need to have the space to turn around a wheelchair, the same goes for the hallways, bathroom and living space. This does increase the need of space, that potentially never will be needed.

The fear of sharing

Without having any statistics, it's hard to know if the lack of sharing functions and spaces is due to a fear of it, or just that the housing developers don't think it will attract people. What is clear, is that most of the households studied share very little space and functions. Even the car parking in the garages have a given sports, and in one of the projects, Tou Park, so does the bikes.

The internal storage space

In the two projects of Lervik Brygge and Tou Park, all flats have internal storage. In Tou Park, all flats have 3m² storage. It seems strange that a one bedroom flat of 38 m² need the same storage space as a 81m² flat with three bedrooms. The percentage storage space will be 7.9% for the one bedroom, and 3.7% for the 3 bedroom. In Lervik Brygge, the storage space changes, although it does not follow the size of the flat. This static use of internal storage space provides an increase of space, that might not be needed.

The lack of dividable units.

In villas, there is often a possibility to divide off a small flat that can be rented out. Flats and row houses rarely have this opportunity. If the space need should change, there is therefore no possibility to divide of this space. The only way to reduce the space is to move to a smaller unit, relating to the problems of the “Remanens effect.”

Hallway solutions

In the project of Tou Park, flats that go through the building, and have facades on two opposite sides, have a larger percentage used for hallways, than the flats that do not go through the building. Seen in appendix F. The hallways are there for long, and in the case of Tou Park they are also extra wide, due to the “livsløpsstandard”. Siriskjær 2 have the lowest numbers for individual hallway space, and all the flats here have facades to just one side. They do of course have a larger common hallway. Poor planning of hallways could be sad to increase the space use.

FOR OFFICE BUILDINGS

Parking space

Although there are few office buildings in the area, parking is a problem, also seen in Badedammen. Office buildings have parking for their employees, but these spaces are mainly used from 8 to 5, Monday to Friday, meaning that for 15 hours of the day, they are not used, and weekends rarely at all.

The lack of sharing, together with small office buildings

Office buildings have some of the same problems as housing units. Even to the office contain few people, they still require a meeting room, a lunchroom, etc. If you have bigger offices, or several units sharing the same functions, both space and price can be divided on the different units.

FOR INDUSTRY BUILDINGS

The low usage of the land

The area still has a lot of industry. Most of these buildings are one story, providing a very inefficient use of space. In the area there are also buildings that are not in use.

FOR THE URBAN FORM

The privatisation of space

The only space that is shared between block units is the parks, streets and some playgrounds. Most housing projects have a rather privatised common space, meaning they are either not viewable from the street, or they are made in such a way, that they don't feel like a place to stay, unless you live there. More shared common space could arguably even reduce the need of public parks.

The lack of space changing function over time.

When looking at spaces that changes function over time, there are very few, if any. The courtyard at Tou Scene, is planned to be used as a outdoor cinema. The sports area in the “Kjelvene People Park” have two basketball courts on the football court, so that you can play both football and basket, just not at the same time. Most of the space has one function, meaning the user intensity is low, and little activity occur.

Mono functional buildings with a lack of sharing

When it comes to the built space, the buildings can be sad to be rather mono functional, being either housing, office, retail or industry. Few of the building are combined space, changing function or being used by different people over time. Most buildings are used just a limited period of the day, like office buildings that are empty after 17. Public buildings, like the BI college and Johannes Læringsenter can also be sad to be rather private. They also don't have any public spaces facing towards the street. BI has a café located towards the street and “Kjelvene People Park”, but it's located a floor up from the street level. The café also close at 15, and is clearly just for the students.

This will end the analysis, and the next step will be to give conceptual suggestions for how some of these problem can be solved, as well to give an area efficient program and plan to a specific plot in the case study area.

PROGRAMMED SUGGESTIONS

This part of the chapter will give suggestions to the problem areas found in the analysis. The first suggestions are purely conceptual, but do provide concepts and ideas on how area efficiency can work on urban scale. First different solutions will be presented for housing and office. Next the urban scale will be presented, showing how the two former functions can be included in the public form, creating shared mono functional and multifunctional spaces on the urban scale. Then, a specific project will be presented, showing how area efficiency can be conducted on the urban scale.

HOUSING

Type one: Households based on one person

Seeing there is a trend of one person household, there is a need to rethink the households provided for one person families. These households need to be small but attractive. Most of the small flats that are built today, are based on first time buyers with limited economy. As seen from the project studied, they are often located on first or second floor, often with limited views and lighting.

The statistics show that the growth of one person households, mainly happen between the age of 30 and 44, and also 45 to 66. There are no statistics how good economies these people have, but since they are not in the startup phase, it's reason to believe they have a rather stable economy. Instead of providing a lot of m², a good alternative can be to provide flats with views and access to functions. These flats should have rather small sleeping space, and instead focus on a larger living space. Since it's only one person living here, there are not really any problems concerning frictions between people using the different parts of the flat at the same time. Functions such as laundry or rooms for larger parties, should also be common, since these are functions that most lightly will be little used by one person. Large window space with good views can also make the flat feel bigger.

The single household statistic presented earlier in this chapter, also show a need of flats for young first time buyers. The one person households in the age group of 16 to 29 have doubled between 1987 and 2004. This means there is also a need for space efficient youth flats. This group is first time buyers, meaning they most lightly have a more limited economy, and might need just a temporary housing, till they start a family. The use of hems can then be a good alternative to provide better area efficiency. These units can also share functions like laundry, dining rooms etc. It could also be a good alternative to provide this age group with typical student housing, although they are not necessarily students. This type of housing can be a smaller unit with a bathroom, bedroom and living space with a small tea kitchen, while a bigger kitchen and living space is shared between different units.

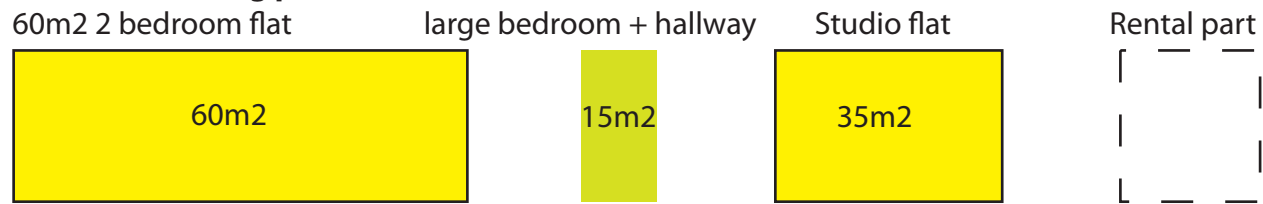
Type two: Family housing

How to make it attractive for families to live in flats? One of the benefits of detached or row houses, is that they can be extended if needed. Dynamic flats can work in the same way, with rooms being flexible to be shifted between to two different housing units. This idea is not new and for instance found in Badedammen. Here the both units are rather small, like a studio flat that can be connected to a one or rarely two bedroom flat. The proposed concept, is to instead have two larger units. The idea is to have three bedrooms, where two are large, about 12m² and one is small about 8m², together with two individual living spaces, two bathrooms and two kitchens. One of the criticisms towards the dynamic housing is that it's often two units that can either function as two or as one. There is then the problem of double kitchens and bathrooms. Here the idea is to keep two units, most of the time, preventing double functions and space, and rather let the bedrooms be shifted between them, seen in figure 5.7.

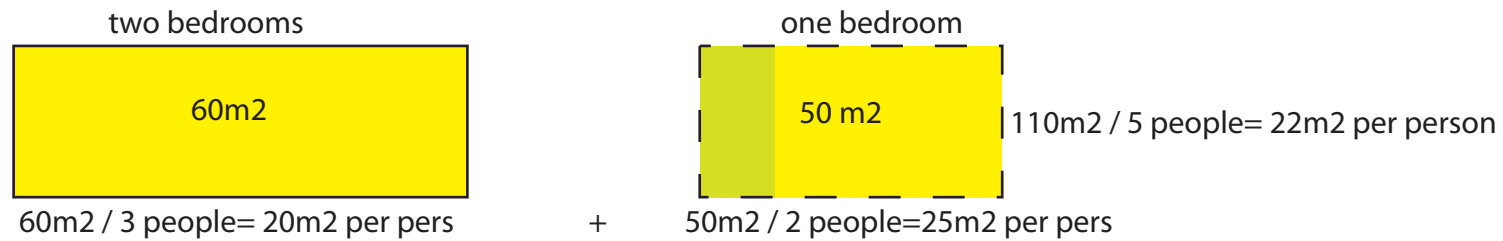
In alternative 1 figure 5.7, we see a two bedroom flat. One big parent's bedroom about 12m² and one smaller children room about 8m². This can provide a good family flat for a young family of three. In both Lervik Brygge and Tou Park, there are several of these flats, being about 60m². The other housing unit is 50m² consisting of a living space, a bathroom and a bedroom of about 12m². There are also several of these flats in the projects studied, being good housing for a couple.

The main idea is that the flat will grow and shrink with the space need of the main household. In alternative 2, we see that the household have gotten a new child, and there for take the bedroom in to their unit. This is a larger bedroom, providing more space for the children. In alternative 3, the children have become teenagers, and need of separate living space is wanted. Both units are therefore joined, providing two separate living spaces, two bathrooms two large bedrooms and one smaller. It would also be beneficial if the one of the 12m² bedroom and the 8m² bedroom could be joined and divided in to two 10m² bedrooms, for the children. In alternative 4 we see that the children have moved out, and even though the parents want to keep one of the bedrooms, as a guest room/study, we see that the total m² stay below 30m² per person. Both units will be owned by one household, renting out the smaller unit. For a young family, this will give a good income. The rental unit will be largest in the beginning, when the mortgage is largest. As the family grows and the time goes by, the rental unit gets smaller and smaller. The danger is of course that the parents keep the rental unit not rented out, after the kids have moved out, or that a 105m² flat is too expensive for a young couple to buy.

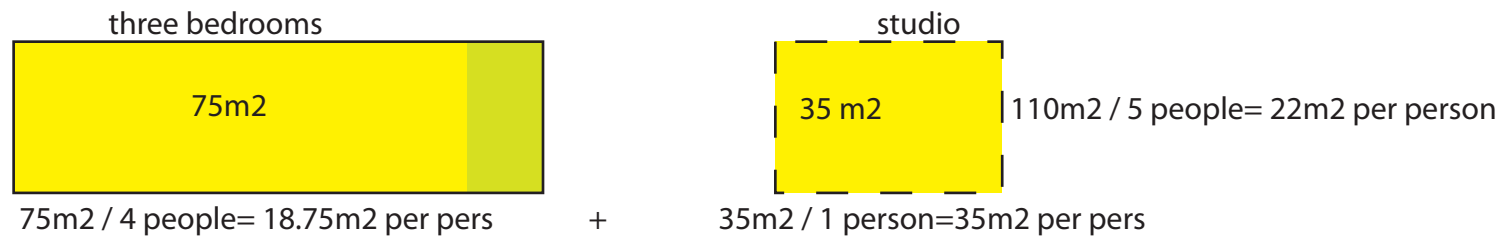
The basis/starting point:



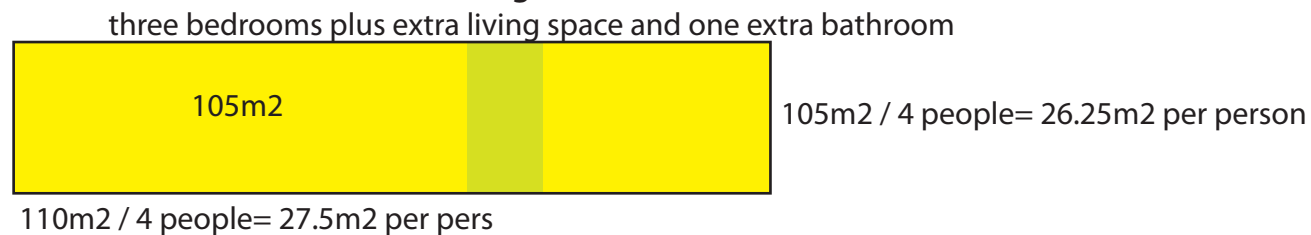
Alternative 1: Two adults one child



Alternative 2: Two adults two children



Alternative 3: Two adults two teenage children



Alternative 4: Two adults

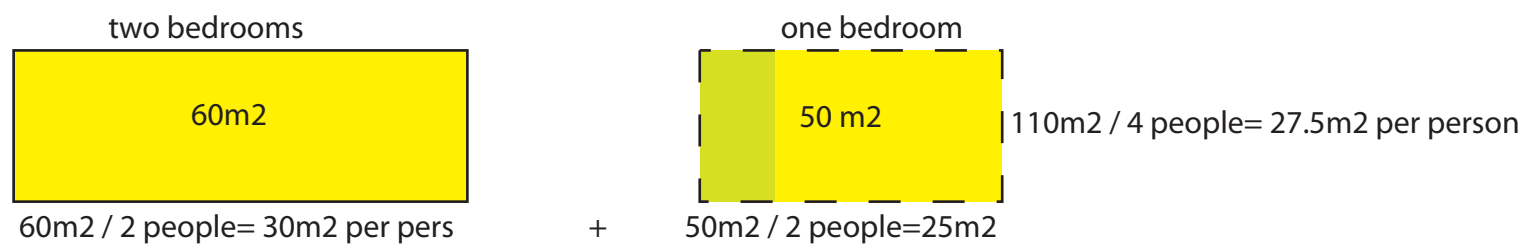


Figure 5.7 Four ways of combining a family flat of 105m², in order to get the best area efficiency.

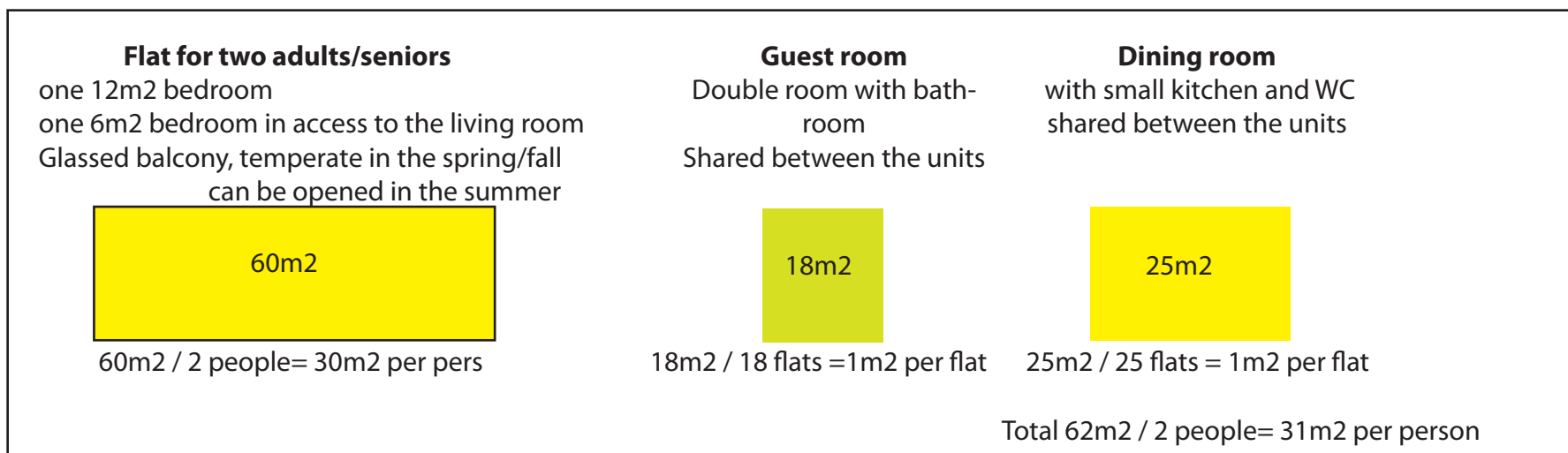


Figure 5.8 Senior Flats.

Type three: Senior flats.

Several of the flats in both Lervik Brygge and Tou Park, seem to be directed to a senior market. With a rather high price, and focus on good views, they provide easy maintenance housing for senior couples, or simply couples who don't have kids living at home any more. If these couples sell their detached houses, to live in a smaller block unit, this is very good for the area efficiency, since they will lower their m² per person and a new family can take over their house. In a city like Stavanger, with a high percentage of detached and row houses, it's good to provide more senior friendly units. These units will be occupied by two people, although there could be a need of a small extra bedroom for grandchildren or other guests. Seniors do spend lot of time in their household, since they don't go to work, and living space is there for important. Views and glazed balconies can there for bee a space efficient way to make these flats feel bigger. Access to shared guest rooms and dining rooms can be another way of reducing the space. One small guest room/study in the unit can be an advantage, for instance for grandchildren to visit. If this room is put adjacent to the living room, sliding doors in the can create a guest room, which also can be a part of the living room. To keep down the space, shared functions, as shown in figure 5.8 can be a good way of keeping the functions, but at the same time holding the space down, through shared functions and spaces. Senior flats do battle between the spatial area efficiency and social area efficiency, and shared functions and views can be ways increase the living quality, and at the same time reducing the m² per person.

“Climbing the housing ladder”

A problem found from the analysis, was that people tended to live on in the units, even tho the need of space is reduced, hence the “Remanens Effect”. As Høyland and Støa (2002) argues, a neighborhood with different types of flats, could be a factor to people moving when the need of space is reduced. Although this is merely theoretical. Combining this fact with the concerns towards a lack of good family flats, a new concept of residential buildings can occur. The idea is to provide different types of flats in the same building. To ease the change in units when space need changes, parking space and external storage should follow the person, not the flat. This in order to make the moving process easier. The family flats should aim to get the same qualities as row houses. Gardens and larger space can be examples of this. The first floor of the building can there for be used for family flats. The flats then have access to a private or common inner garden, where the children can play protected form traffic and the urban life. The units can also go over two levels, to provide larger space. The ideas of flexible housing and bedrooms that can change between two different units, can also occur. As previous mentioned, senior flats can be attractive if they have nice views and more luxury feel. The flats in the top floors of the building should therefore have these characters. The senior flats could also have shared spaces through common dining and guest rooms. Ideally, the residents would start in the first floor and end up on the top, literally climbing the “housing ladder” through quality and preferred functions, not space.

The concept of sharing

As we see from the numbers in figure 5.8, by just reducing a unit with a few m², and then doing this with several units, we free up quite a few m² in total. By sharing spaces and functions that isn't used that often, the space per unit can be reduced, but the tenant still have access to the functions, like guest rooms and dining rooms. The quality of having these types of spaces in the private unit is of course knowing that they are available when wanted. It could be that your birthday is on the same day as the neighbor, and then what? In a building complex like Tou Park, there are 101 units, divided on three buildings that have four floors. One idea

would be to have one guest room per two floors and one dining room per building. This provides 6 guest rooms and 3 dining rooms. By allowing more people to share, the system also becomes more flexible. If you get guests, you first check the availability in your own floor, and if that is taken, you check the availability for your neighbor floor. The dining room can also be located next to each other with sliding walls, making the space even more flexible. In this way you can divide or join the spaces, depending on how much space you need. The dining rooms could also have another function during the day, since they probably will be used mostly during the evening and in the weekends.

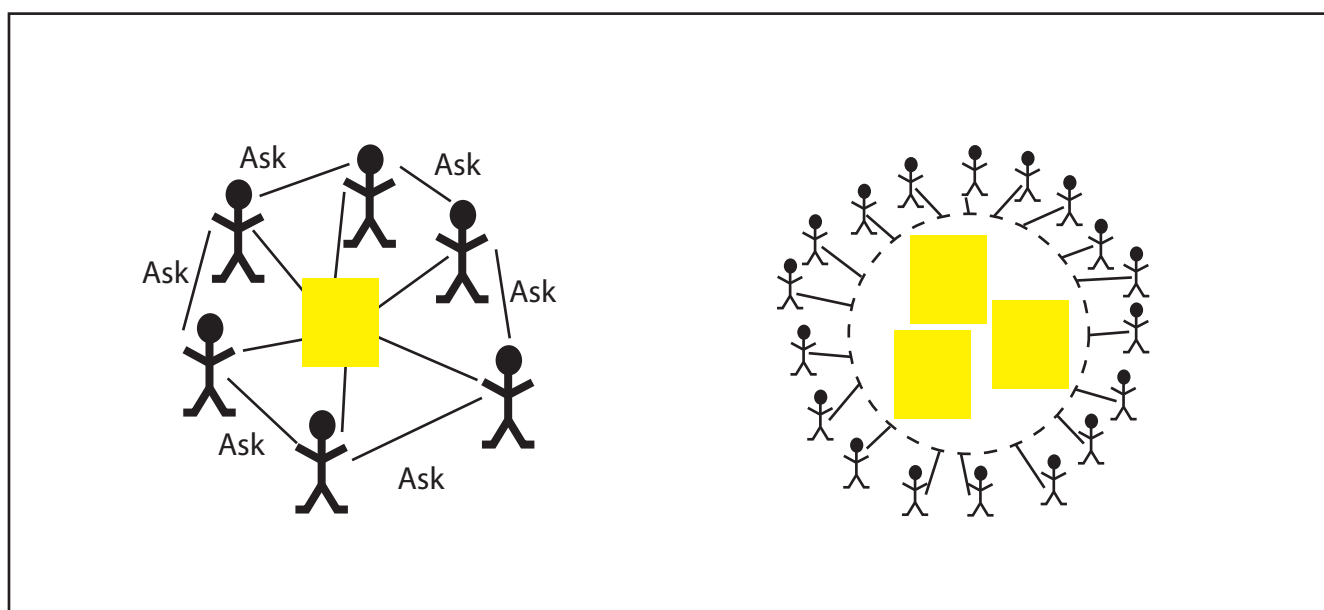


Figure 5.9 The system of sharing. The figure to the left shows a system the users need to ask each other if anybody else is planning to use the functions shared. This creates a slow and troublesome system. In the figure to the right, the dashed line represent the system, and the user only have to ask the "system", since it has control over all the users. More items being shared in the system, arguably the more flexible the system will be, even if the number items per user is the same.

OFFICE

Concerning the office space, there are no office buildings build in the area, after the approval of the plan 1785 and plan 1901. Figure 5.10 is developed after theory form Arge (2003), and some of the examples she points out. The figure shows an important part of space efficiency for office buildings, is to create common areas and shared functions. All service functions should preferably be located on the first floor, and works paces and different units should then be located on the higher floors. Arge (2003) points out the importance of creating a building that can work as a whole, but also be

divided in two smaller units, if there are different companies that will rent office space in the building. As figure 5.11 further shows, several of the functions in both office space and housing, can also facilitate the urban scale. Relating to the shared functions in figure 5.10, like cafeteria, meeting rooms, auditoriums, parking etc are all office functions that can be used by the public, especially after work hours. This so that space and functions can be shared not only between different companies or units in the specific building, but also by other people.

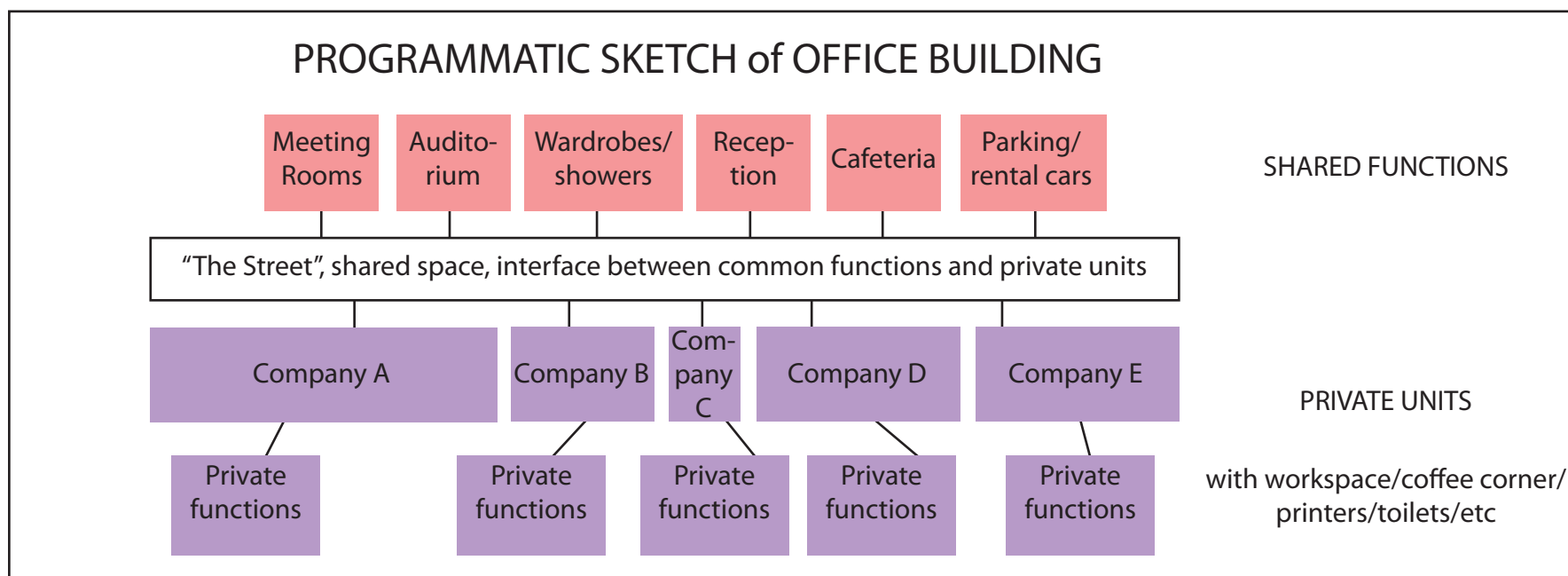


Figure 5.10 How the housing and office space can overlap, sharing space with the urban form.

PUBLIC SPACE / THE URBAN ENVIRONMENT

As figure 5.11 shows, housing and offices can both contribute functions to, and benefit from functions in the urban scale. The presented two main concepts for area efficiency are sharing mono functional and multifunctional space and functions. By allowing functions and spaces to be shared not just within the building, housing area, office etc, but sharing on the urban scale, space can be used even more efficient. Cinemas, museums, parks and beaches are already shared between people in the city. On the urban scale, the challenge is to find spaces and functions that can be shared, and create systems so that the sharing can happen with as little negative friction as possible. Can the museums also be kindergartens, or can the gyms also be used as wardrobes for office employees biking to work?

When receiving the Stavanger Municipality Culture Price of 2011, Architect Helge Schjeldrup said “Buildings that are empty, no

matter how beautiful they are, can rarely measure up to places that boils and buzzes of life”. (Stavanger Aftenblad 2011: p 24. translated by author.) Buildings that are just used limited hours of the day, are not really area efficient. If a city contains of buildings that are shared between different people and have different functions, there is arguably a greater chance that the buildings are more used, and potentially buzz of people, as well being more area efficient. The privacy concern could be sad to be the biggest challenge, but if it’s overcome, area efficiency on the urban scale, can give both social and spatial benefits.

The following will show how these concept of area efficiency on the urban scale can be conducted in program and design for a specific plot in the case study of Urban Sjøfront.

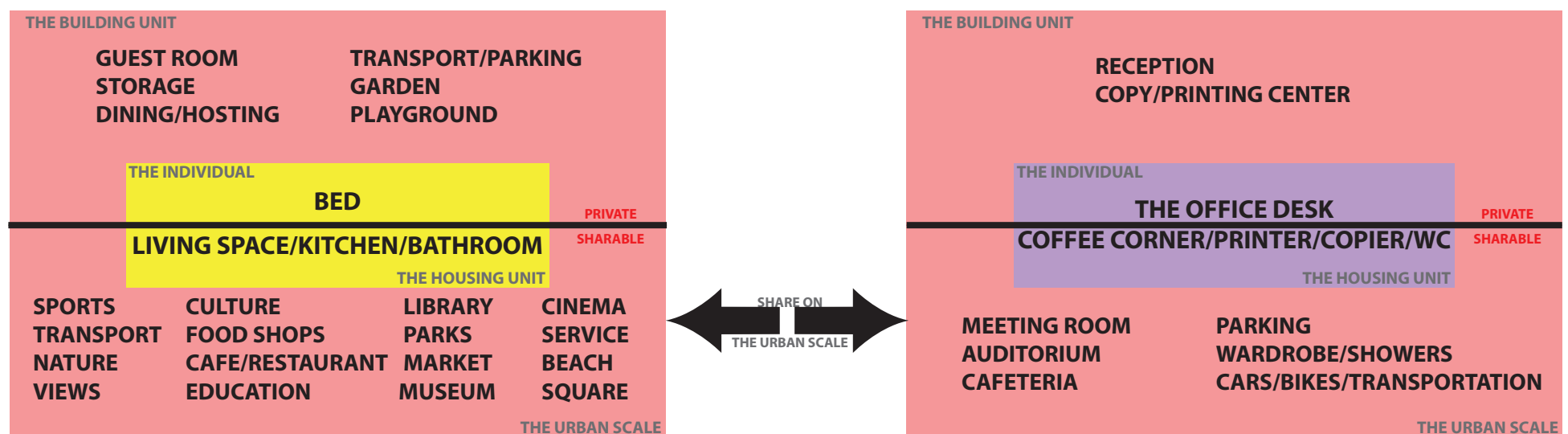


Figure 5.14 How the housing and office space can sharing space with the urban form.



1

Cars and views



2

Sjøparken - Water and fjord views



3

Small vs Big



4

Old vs new, brick vs wood



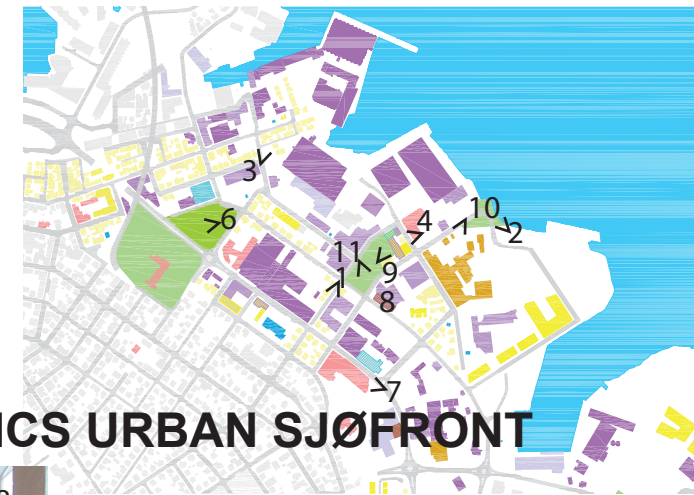
5

Flooscape form the "axis"



7

International learning



CHARACTERISTICS URBAN SJØFRONT



6

Kjelvene, - skate and ball



8

Ostehuset



Orangeriet - New life to old industry

9



10

Tou Scene - Old industry converted to new culture



11

Byparken

PRESENTING THE DESIGN PROJECT

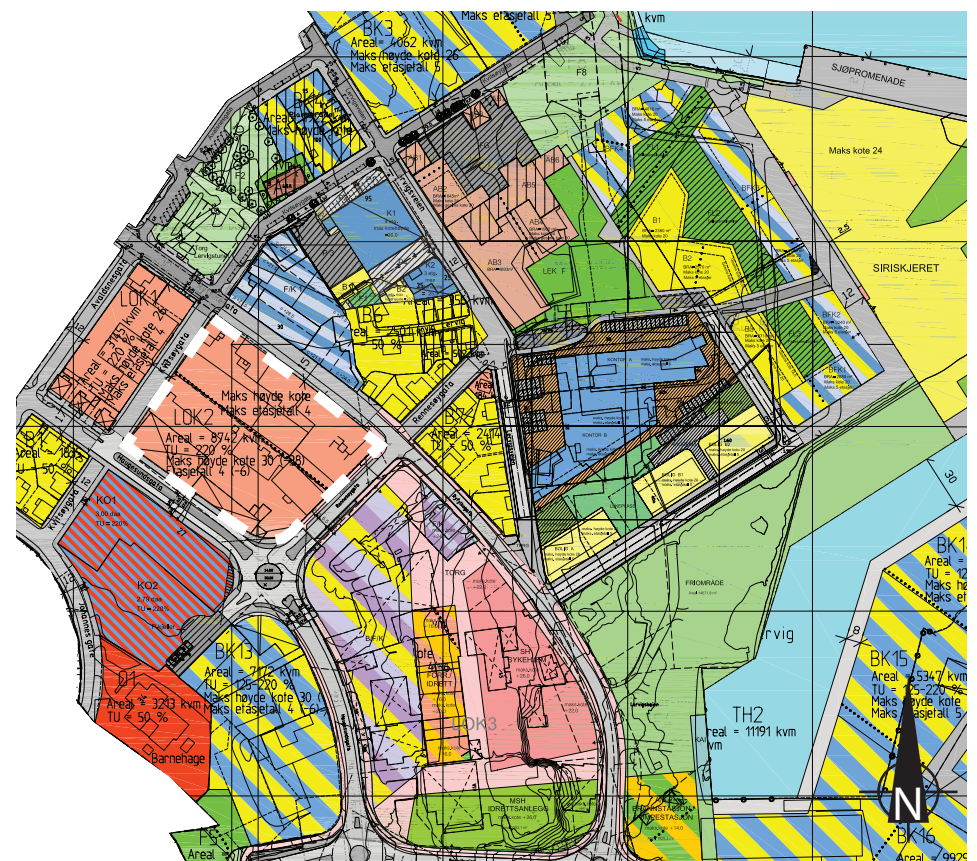
The following will present the proposed area efficient project, developed through some of the concepts of area efficiency found in the previous part of the chapter together with the developed theory from chapter four. The presentation will start with presenting the specific project area, and a short analysis, discovering qualities and problems for the specific sight.

The project area is located approximately in the middle of the Urban Sjøfront Area, marked with a white dotted line in map 5.10. The area is chosen for different reasons, but the central location and the fact that the plot is yet to be transformed can be said to be the main. The suggested light rail or tram is proposed to have its route next to the plot, and the plot is also a part of the center development in plan 1785. The location is perfect for mixed use, and arguably a good area to test out how area efficient solutions can be developed, with shared spaces on the urban scale.

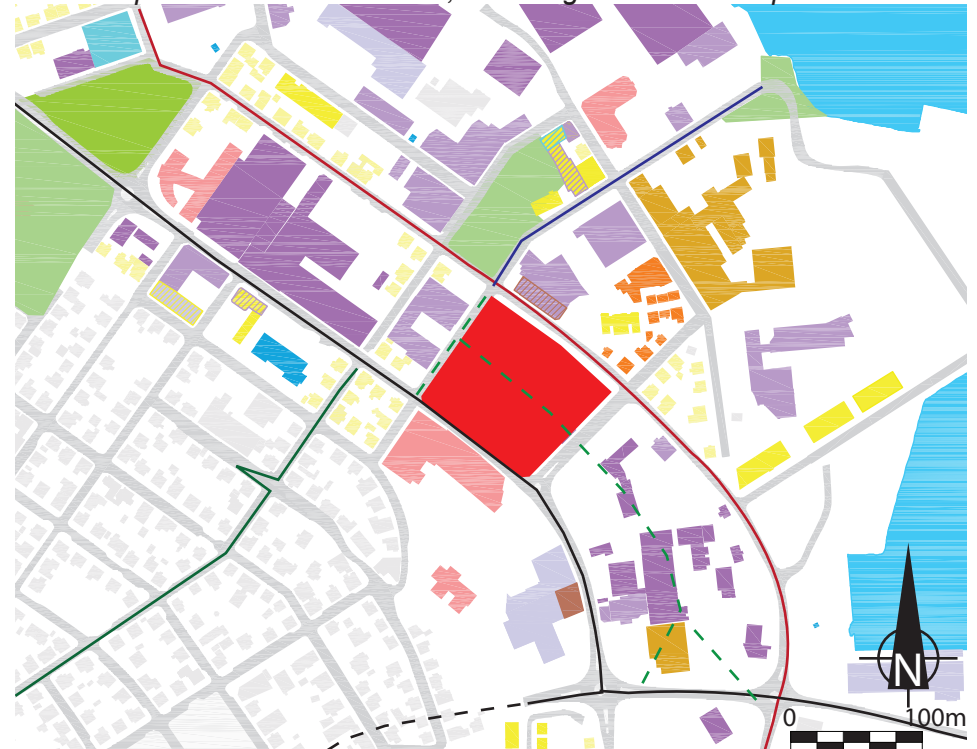
The development plan 1785 defines the project area as “Local Center”, meaning it can be used for service and commercial use, like shops, cafes, catering, office and smaller handcraft workspace, as well as public and private service. The plan further states, that ground floor should be used for trade and public targeted business, and only 25% of the BRA, can be used for housing. (Plan 1785).

The project area has buildings to all its four sides. Towards Hauge-sundsgata, you find Johannes Læringsenter. This is a school for children who don't have Norwegian as their first language, and that as well give lectures for adults learning Norwegian language and culture. Towards Kvitsøygeten, there is currently an office, and this is also part of the “Local Center” in the area plan. On the side of Ryfylkegaten, there is a new park. This side also has Ostehuset Cafe, located on the first floor, with offices on the floors above. There are as well some residential buildings here. Towards Ren-nesøygaten, the street in the south, there is the proposed plan of 2218. This plan proposes a nursing home, a sports area, as well as an mixed area of housing, commercial and offices, towards the project area. The plan was unanimously adopted by the Kommunalstyre for Byutvikling December 2010, and is currently (May 2011) waiting to be finally approved.

According to NVDB (2011), Hauge-sundsgaten have an “ADT”, average of cars passing per day of 9200 cars. This should reduce the speed on this street. Considering the increased building in the area, the traffic should go up. Ryfylkegaten is proposed as the path for the potential tram line, which is currently considered to be built in the city. This street currently have a bus route for the city, with a bus stop by the park, next to the project area.



Map 5.10 Joined Area Plan, including both built and planned areas.



- Hauge-sundsgatén, main car road towards the City Center
- View and pedestrian axis from Storhaug.
- - Tunnel towards RV44
- - Path proposed in plan 1785
- “Aksen”, the axis leading town to the sea park
- Proposed tram/light rail in Kvitsøygaten
- Proposed project area

Map 5.11 Land use and mobility in the project area.

QUALITIES FOUND IN THE AREA

Haugesundsgate.

The facades turning towards the street, are in some parts rather tall, being between 3 and 6 stories high. There are also some small wooden houses facing towards the street. The street leads from the city bridge and city center towards the Storhaug tunnel. It's a rather trafficked street, and in the proposed project it's thought as the "main" street for cars. It also seems to be the border between Urban Sjøfront on the west side, and the Storhaug plateau on the east side of the road. It's important to work on crossings of this road, connecting Storhaug and Urban Sjøfront.

Ryfylkegaten

As previously mentioned, the proposed light rail/tram is suggested in this street. The street leads people from north to south, from the city to the Breivik recreation area, and visa versa. The street has crossings leading east to west, nicely distributing people in the area, arguably making it the backbone. In the project the street is proposed as the main street, with a focus on public transport, bikes and pedestrians. Cars are of course allowed in the street, but Haugesundsgaten is the road leading cars through the area. The only cafe in the area is located in this street, and the street should have public functions like bars, shops, galleries etc.

Kvitsøygaten

This is the street on the north side of the plot, and leads down to the new park by the sea side and Tou Scene. The street is called the axis, and provides good views of the fjords. It's one of the important streets leading east west, providing a good distribution of walkways in the area. In the project, the street is wanted as an important pedestrian walkway, also relating to the work that already has been done on this street.

Avaldsnesgaten

This street visually connects the plateau on Storhaug with the Urban Sjøfront area. The street crosses straight over Storhaug, and is an important axis for views as well as pedestrians and bikes. Cars can drive out on Haugesundsgaten from the Storhaug plateau, but the street is closed for cars driving off from Haugesundsgaten and into Urban Sjøfront. In the project, this street is thought as a pedestrian axis from Storhaug and down to the Ryfylkegaten.

"Byparken" and "Sjøparken"

"Byparken" is located next to the project area, and is a great quality to the area. This is a landscape park with benches and artificial "hills" of grass, creating rooms and places to sit or lay. Together with "Sjøparken" located next to the water, the parks provide good recreational areas.

The new proposed square/public space

Plan 2018 located east for the project area, suggests a public path leading through the area, ending up towards the project area. There is a wish in the plan 1785 that there will be paths through the two plots, linking them better together.



Img 5.14 Haugesundsgaten, looking north



Img 5.15 Ryfylkegaten, looking north



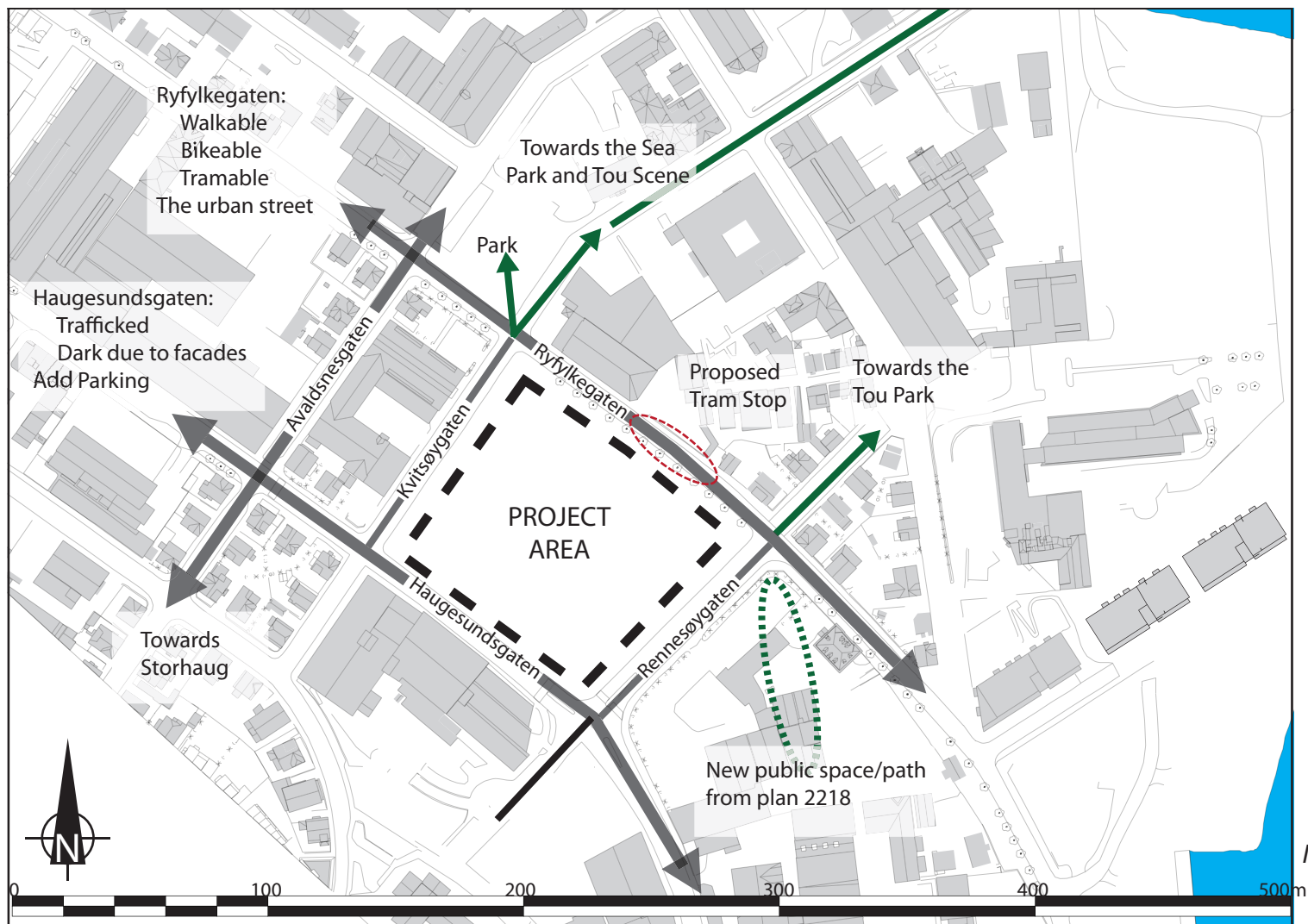
Img 5.16 Kvitsøygaten, looking east



Img 5.17 Avaldsnesgaten from Storhaug plateau



Img 5.18 Rennesøygaten crossing Haugesundsgaten



Map 5.12 Qualities in the area.

WHAT IS MISSING IN THE AREA?

Retail

There are several food shops in the area, but no other types of shops. Shops could attract people, and as well create living facades, making the streets more interesting, also after the shops are closed.

Public Transport

There is one bus route going through the area, together with a commuter bus in the rush hours. A tram or light rail going in to the city center, but alternatively also over Storhaug and down to Largårdsvegen could be a good influence on the public transportation use in the area.

An urban square

In plan 1785, the area where the “Byparken” now is located, was proposed as a square. The area could benefit of a square that can work as a gathering point and as well be a place for markets and other activities. Tou Scene do have some area that also can work as this, although a “neutral” ground located in the center of the area could be wanted.

Third places

The area has very few third places. Ostehuset is one of the few, and seem to attract a large amount of people. The new develop-

ments of Tou Park and Lervik Brygge, will lead to more people living in the area, and it's strange to believe that the inhabitants of Urban Sjøfront should use the functions of the city center as their main neighborhood.

Indoor Public Space

Tou Scene is the only public indoor space in the area. This relates to art and stage performances, and the area could also benefit from a small library or another public space that the user don't have to pay to use.

Shared Spaces

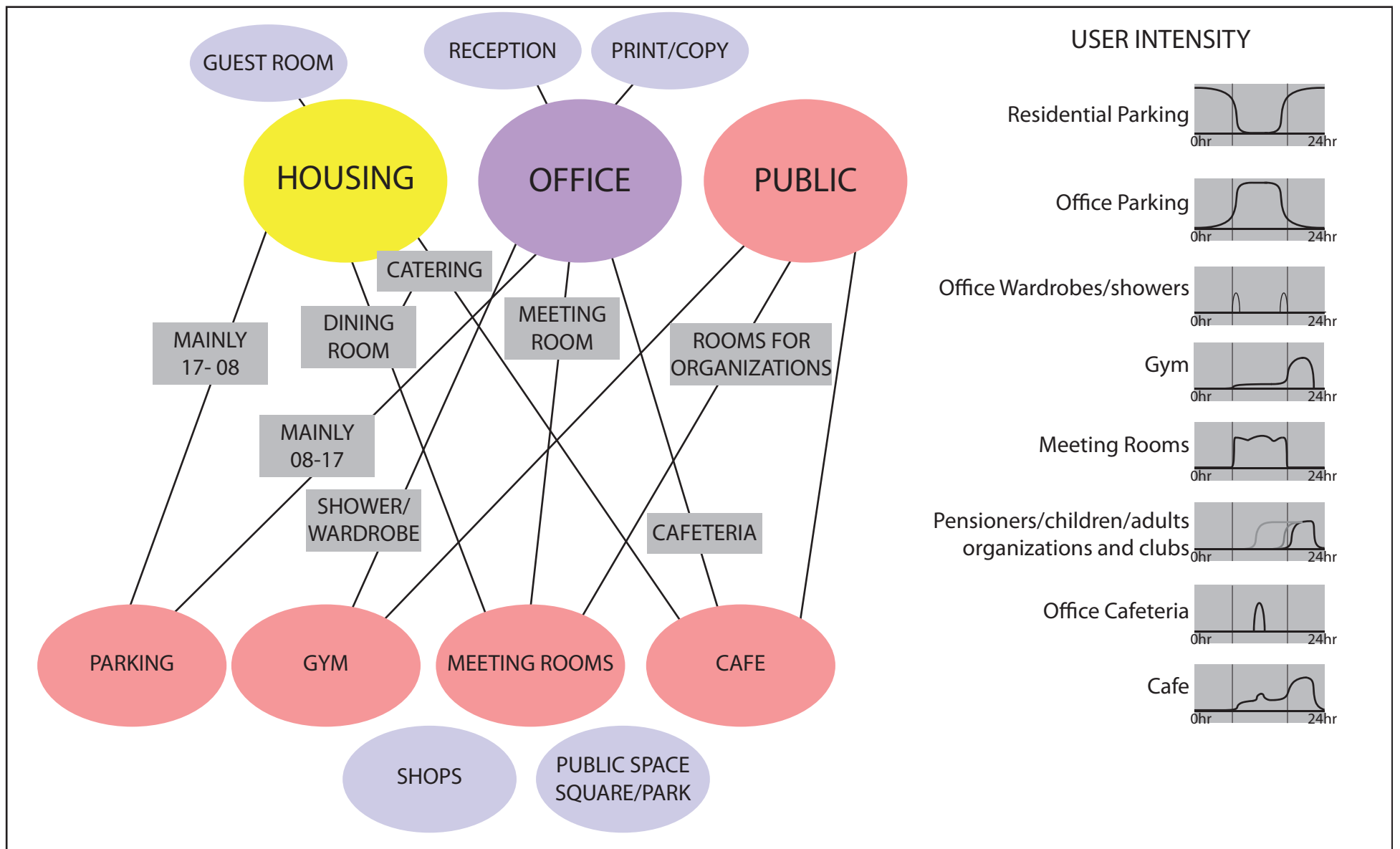
There are very few shared spaces, as map 5.8 in the analyse show. Shared spaces also bring people together, and can create ownership and identity to the area.

Living Facades

As the analysis showed, several of the facades do not give anything to the street. A road arguably need facades to be a street, and if the windows are “alive” being cafe or a shop, this creates life to the street and can attract people to either stay in the area or to come to the area.

Office

Like the land use map, map 5.6 show, there are a few offices in the area, but considering all the housing that is built, and planned to be built, there should arguably also be more offices.



DESIGN PRINCIPLES

Figure 5.12 The proposed program shown conceptual, with an estimated user intensity.

The project is of course designed from the principles of area efficiency. The main principle is to let places and functions be shared between different people on the urban scale, to create places that are used more. This means locating functions that can overlap and benefit from each other, as well as creating spaces that are flexible, and easily can change. The built form and the urban area also influence each other, and the idea is to create a built form that can contribute to the urban environment. To have a building that is not just private, but have different levels of public, semi public, semi private and private characters to it. In other words, the inside of the building influence the outside, and visa versa, so that the project can become more than just an office building, housing complex or shopping mall for that sake.

The Functions

The idea is that the building will host different functions that can share spaces and benefit from each other, like figure 5.12 show. All

of the functions suggested can benefit from each other, like the "time use intensity" figures show. It's almost like a puzzle, to find the functions and spaces that can be shared, and expanding the use and users, to see how many users and functions that can be located together.

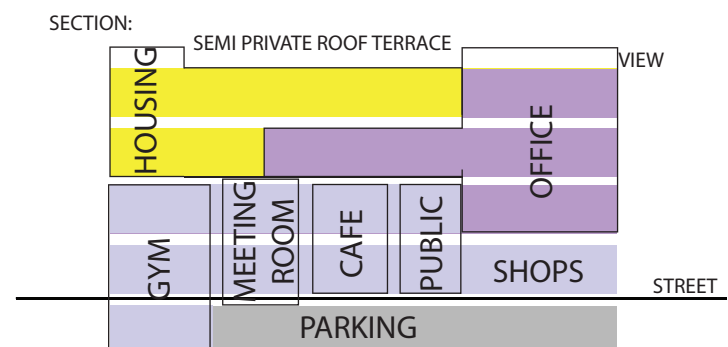
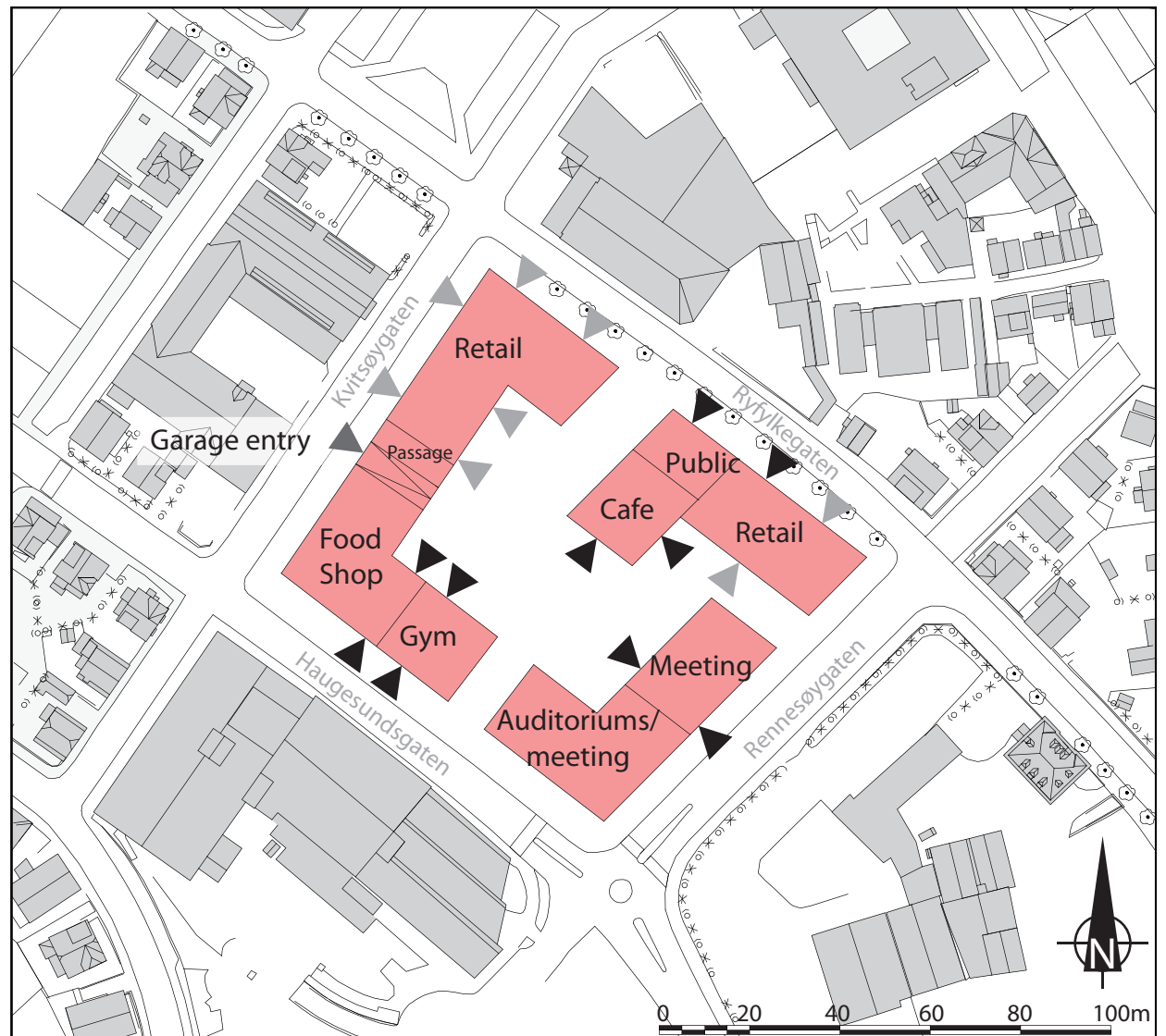


Figure 5.13 Illustration of the program seen in section.



Map 5.13 The proposed building, with first floor functions

▶ Entries depending on use
 ▶ Entries given

THE BUILDINGS ADDED

The main idea is to create a building block that focuses on area efficiency, through sharing spaces and space changing use over time. The build form is chosen to give facades to the streets, and the central space in between the building. This space is thought as a public space, giving a shared quality to the area.

The shape of the building started with a rectangle. This rectangle gave facades to all the streets surrounding. The idea was then to open the building, so that the open space in the middle could interact with the space in the adjacent streets. The idea is that the space could work as a place where people both walk through or stay. If the building would have too many openings, the functions in the building would be divided. The closed form also gives the space in the middle an enclosed and room feeling. The building has three openings, as well as a walkway through the first floor. There is an opening towards Haugesundsgaten. The idea here was to connect towards Storhaug or Johannes Læringscenter. In this street, there are also several long facades, and the opening

also gives the cars a view in. Kvitsøygaten have gotten the entry to the garage that is under ground, as well as a walkway in the first floor, to connect to the North West. Towards Rennesøygaten, the opening relates to the proposed public space that is suggested through plan 2218. The opening towards Ryfylkegaten is bigger, since it relates to what is proposed as the main street. This entry also relates to the proposed tram stop. The building is then drawn in to the space, with the cafe, to break up the big room in the center, in to smaller rooms, shown in map 5.14.

Towards the Byparken, it's chosen to have a corner facade. The Park has leveled the terrain towards this corner, and the believe is, that a facade will help define a room, since all the other blocks don't have corners.

It's important to point out that the shape of the building is conceptual, showing an idea of how the building should work. This thesis won't show the building in detail, but just as volumes, to determine the functions, and how this will affect the urban design.

FLOOR PLANS

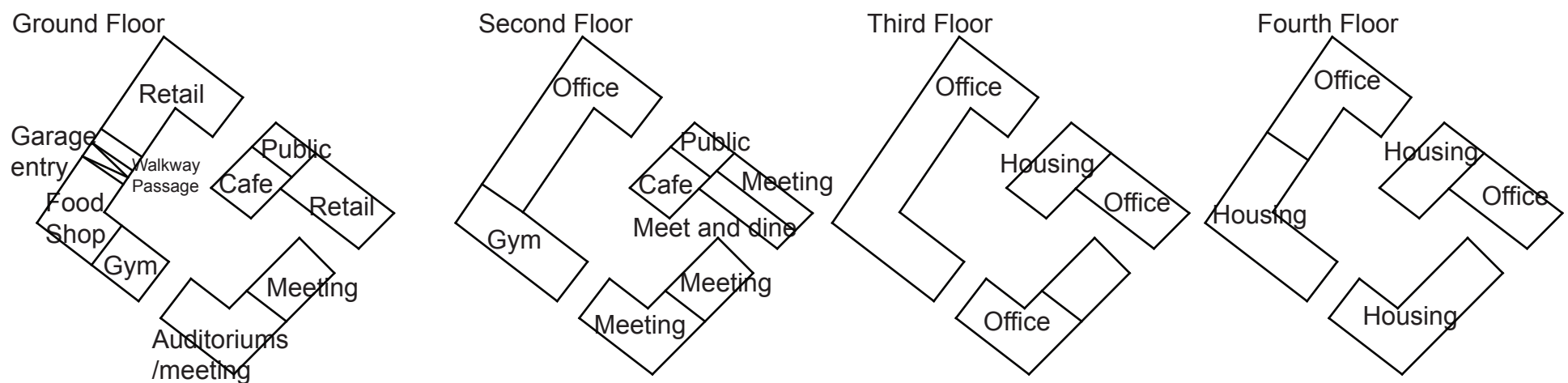


Figure 5.14 Functions on the different floors.

Functions relating to the public, are mainly found on the ground floor. Towards Haugesundsgaten there is space for a food shop and auditoriums, due to the little requirement of light both these functions require. Ryfylkegaten have functions that are more addressed to people, like retail, a public space and a cafe. The idea is to create a living facade, with “window shopping” retail and as well functions that can be open beyond 09 to 17.

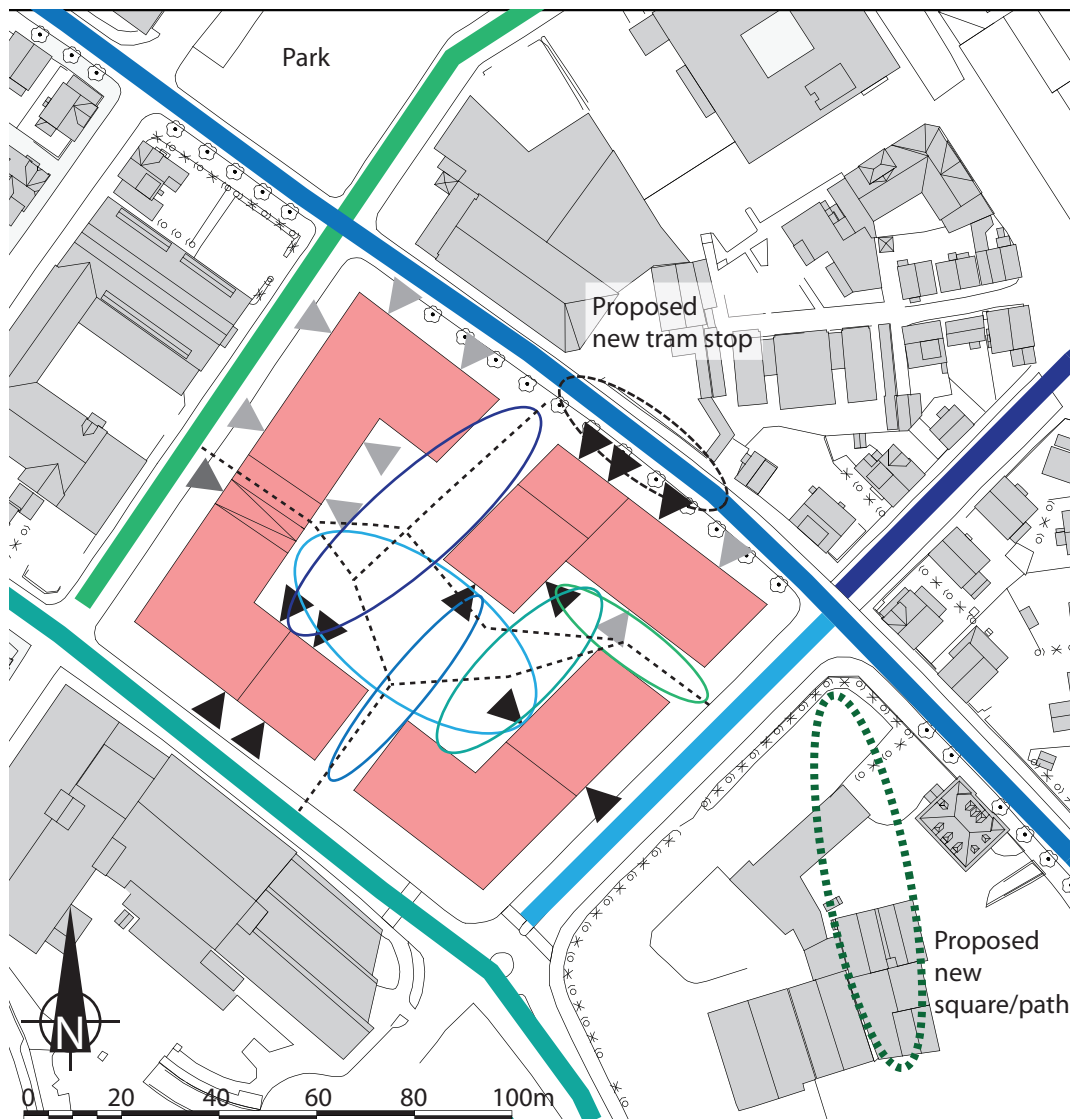
On the ground and second floor, there is a public space thought as a library or district house. On the second floor there are also meeting rooms adjacent to this space, which can function both for the offices, but also relating to the public, used by clubs, organizations etc for children or adults in the districts. The meeting and dining rooms, are located next to the cafe, so the cafe also can functions as a caterer. There should also be small kitchens in these rooms, for preparing coffee etc. These rooms are thought as meeting rooms for the offices, which can use the catering from the cafe. They can also be used for the people who live in the buildings, for private parties, common gatherings etc. The rooms could also be rented out to others in the district, to host confirmations, birthday

parties etc. The gym is located on the ground- and second floor, preferably with wardrobes in the basement. The wardrobes can be used not just for the gym guests, but also the office workers who bike to work.

Housing and office are located on the top two floors, providing better light conditions and views. Parts of the roof is proposed to be used as a roof terraces, both for the office and housing units.

The basement is thought as garage and storage, as well as wardrobes for the gym. The parking should have an overlap between housing and work, so that spaces can be used almost 24/7 instead of just between 8 and 5 or 5 and 8. There should of course be a number of buffer spaces, and some spaces could also be left for the public, either for the shops, or other residents in the area.

The width and height of the building, relate the theory presented by Arge (2003). She concludes that the width of the building should be 17 meters to get the most out of the space. The net height should according to her, be 2.7 meters, or 3.4 meters in total.



Map 5.14 The ideas for the outdoor space of the project, with streets.

- Haugesundsgaten, for car traffic.
- Ryfylkegaten - The main street. Sidewalks and street on the same level, to equalise the car and pedestrian users, and say that this is a street where the people and bikers are most important.
- Rennesøygaten - One of the entries to Urban Sjøfront form Haugesundsgaten. Row threes on both sides of the street, to follow up the three lines in Ryfylkegaten.
- The continuing of Rennesøygaten, is already narrowed, and lead on to Tou Park, with existing threes. Kvitsøygaten, let the existing "Axis" continue all the way up to the crossing of Haugesundsgaten to underline the walkway to the sea.

The square floor flows through the openings in the building, providing pedestrian friendly areas in the streets adjacent.

THE URBAN SQUARE

- out door program.

The idea - Inspiration

The idea is to create an public place or square that is open, yet has places to seek privacy. Where lots of different activities can happen at the same time between several different people, but also changing with the year, the day or the week. This open space follows the ideas of area efficiency. The aim is to give a space to the public as a whole, but also places for individuals or small groups. It's a place to gather, to meet, to hang out, or just to walk through.

Concept

The concept of the Urban Square, is to let the buildings give back to the neighborhood, by creating a public place between them. The building also creates facades towards the roads, transforming them in to streets.

Activities wanted

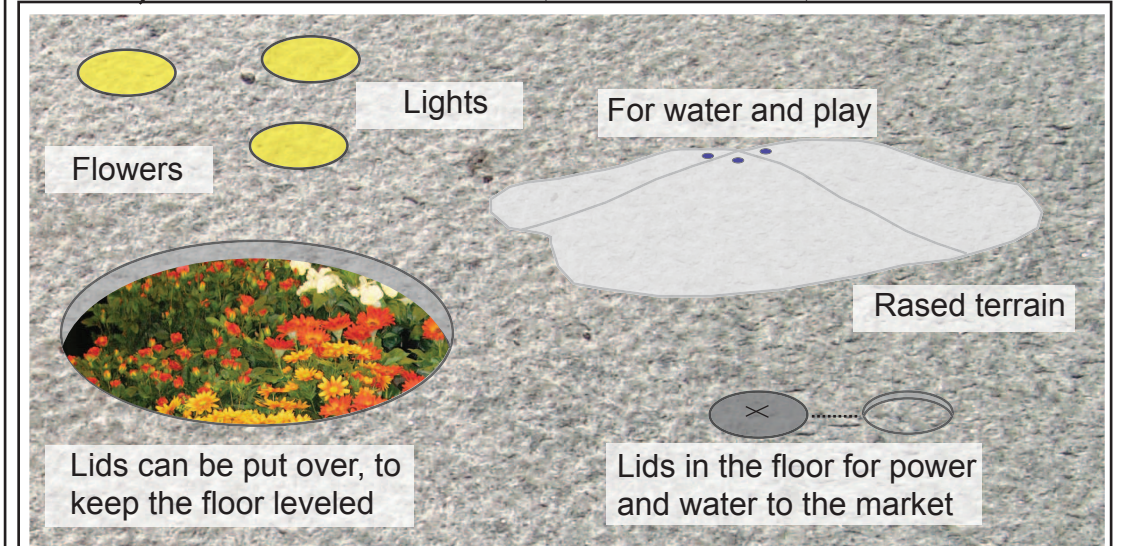
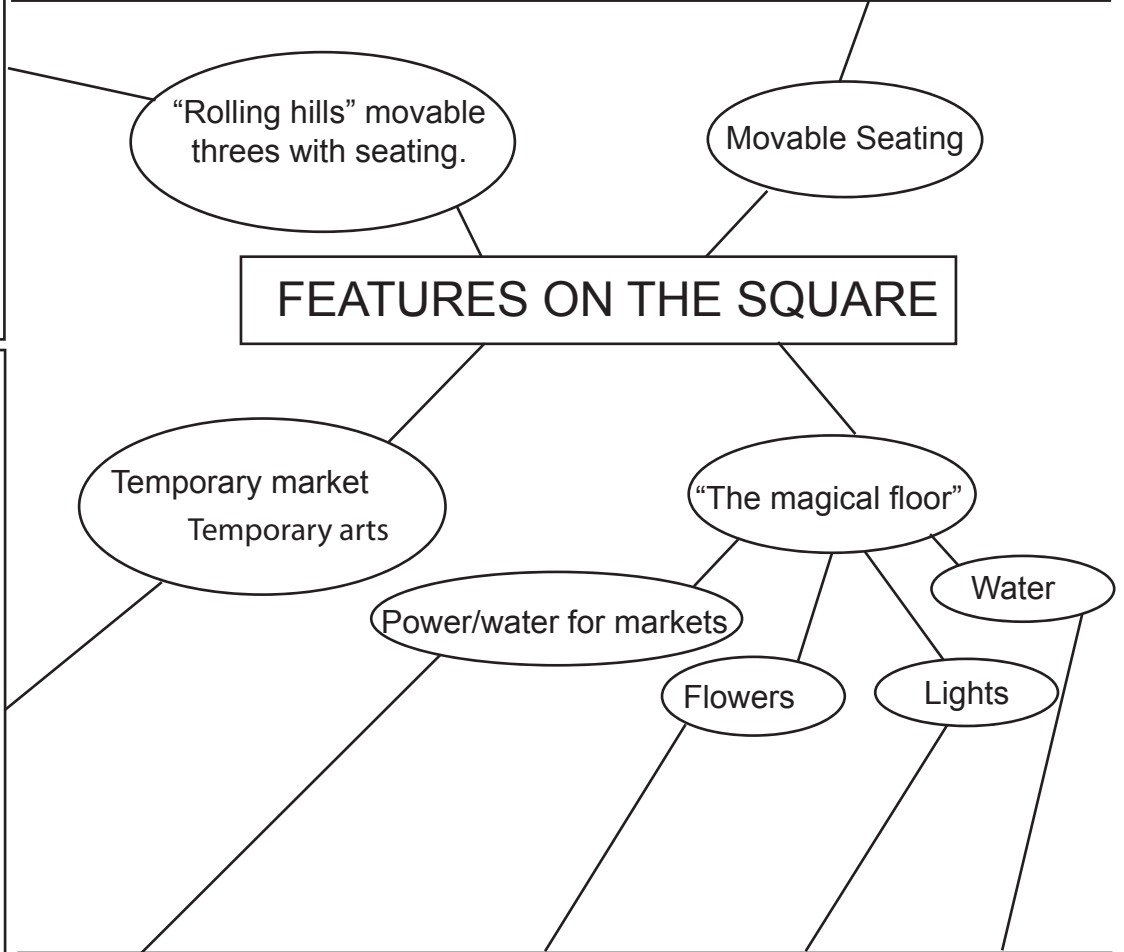
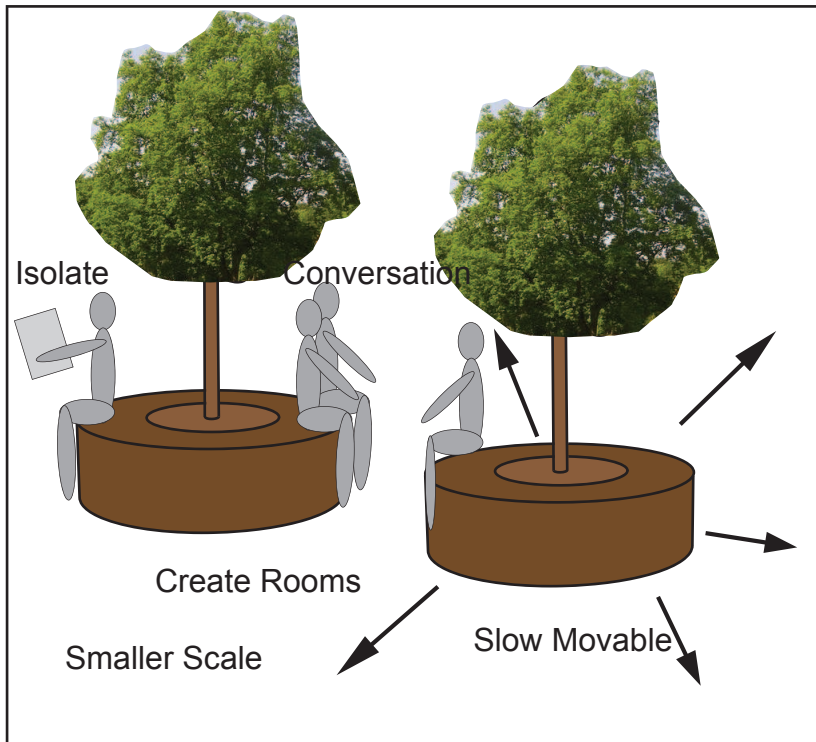
- | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|
| <ul style="list-style-type: none"> Sit down Relax, maybe even in the sun Eat your lunch/ "matpakke" Wait for the buss/tram Get a coffee Talk | } Pocket / small scale |
| <ul style="list-style-type: none"> Explore Experience | |
| <ul style="list-style-type: none"> Look Meet Walk through Sell or buy, vegetables or other items 17th of May celebration, eat ice cream and sausages | } Open / big scale |

Design principles

A transformable public space, with open space that can grow/shrink with the need of space, providing flexible furniture, so that it can host different type of venues.

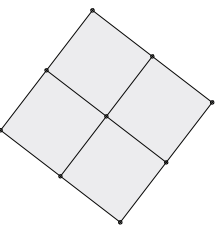
The floor is the main object, and the inspiration has been the flexibility of the theater stage. The floor holds different features, which easily can be hidden. The floor is like a treasure box, which can be open, to reveal different treasures, like plants, light or water.

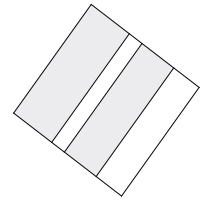
The furniture is thought flexible, meaning that it's easy to move, to create rooms or for the people using it, to choose where they want to sit, and as well how many people that want to sit together.

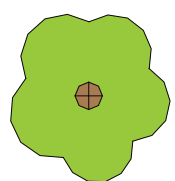


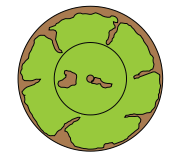
PROPOSED SITUATION PLAN




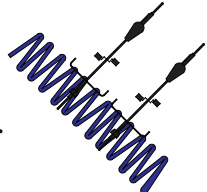
- 

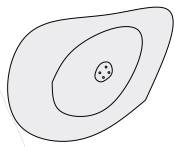
Market floor.
2.2 Meter squares, with holes in the corners to put poles for market marquees or exhibitions posters.
- 

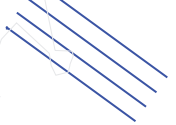
The "Urban Sjøfront Floor"
Irregular pattern in two shades of grey. Square floor flow out in the sidewalks and Ryfylkegaten.
- 

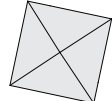
Street trees.
Excising trees in Ryfylkegaten, new trees in Rennesøygaten.
- 


Movable trees
Movable trees with space to sit.
- 


Flower Floor
Flower boxes put on the same level as the square.
- 

Spiral Bike Parking
Bike parking and play.
- 

Water Landscape
Small water fountain rased with topography in the floor.
- 

Proposed Tram Rails
Tram tracks going through Ryfylkegaten
- 

Existing buildings
- 

Proposed new buildings
- 

First floor entrances



Contour 13

Contour 14

Contour 15

KVITSØYGATA

HAGESUNDGATEN

RENNESØYGATEN

Existing cafe on first floor

Poles leading the traffic.

Tram stop, with shelter

Rased street

Garage entrance

First floor passage

4 Floors
First floor is retail
Roof for shared terrace for the offices.

4 Floors
First floor public building

4 Floors
First floor is cafe
Roof for shared residential terrace

4 Floors
First floor is retail

4 Floors
First floor is food shop
Roof for residential terrace

4 Floors
First floor is gym

4 Floors
First floor is meeting rooms

4 Floors
First floor is auditorium and meeting rooms

The idea for the square was to let it be flexible enough to host different activities. Both at the same time, and as well at different times of the day, week, year, season etc. As shown from the plans and as well page 96, there are different features on the square. All of them can be used to have multiple functions.

The rollable threes work as vegetation but also as benches. They also can be used to create rooms and nooks, as well as shade. They are slow movable, and it could be that they only can be moved with a pallet truck. Image 5.19, show threes form a park in Portugal that actually can be moved by the users.

In contrast to the slow movable threes, easy movable chairs are also thought for seating. The chairs can easily be moved around. Either for grouping together, or moving with the sun. The chairs are not drawn in to the plans since they don't have a specific place. Chairs like these are previous used in different projects, like the Rags Boulevard in Copenhagen and in Mint plaza in San Francisco, seen in image 5.20. One of the concerns can be that chairs get stolen. The chairs therefore need to be cheap. They also need to be easy to store for the winter. The chairs could become a symbol of the area, and in that way be protected by its users.

The water landscape is the only place where the floor of the square is not on one level. The landscape form a top, where some water jets are placed, like a fountain. The water will flow on the landscape, creating ponds and places for kids to play and get wet. If the water is turned off, the landscape can be fun place for skaters or bmx bikers to play. A fun feature would be, if the water could be controlled by the users. In that way, the feature could be used for different purposes depending on who wants to use it.

The spiral bike parking is shown in image 5.21 and is designed by 3RW arkitektur. The spiral is not an obvious bike parking, and can be used to also create a sculpture, as well as a play feature.

In the middle of the square, there is a 2.2 meter squared pattern. Between the squares in the pattern, there are holes to put posts for either marked marquees or for exhibition posters. This creates a square that can be used for several different activities. It is also suggested that there should be lids in the floor, where the market traders can get power and water. The exhibition poles can also be used for creating rooms and dividing up the square.

Instead of having flower pots, the square have flower beds integrated in the floor. This means that when the flowering season is over, wooden lids can be put over, creating a different pattern of the floor.

The pattern of the floor is taken from the pattern in the existing "Aksen" the axis in Kvitsøygaten, also seen in page 87. The floor

have two shades of grey, in lines with different widths. The pattern divide up the large square, as well as it can work as a leading element. The idea is also to create a common use of floor for sidewalks and squares in the area, in order to bind the area together. Some of the lines have water drainage systems for the square. The material used is thought to be granite.

The width of the tram tracks are based on standard measurements, being 1435 mm, and the 1620mm between the two different directions. The last measure is based on tram tracks in Rotterdam.



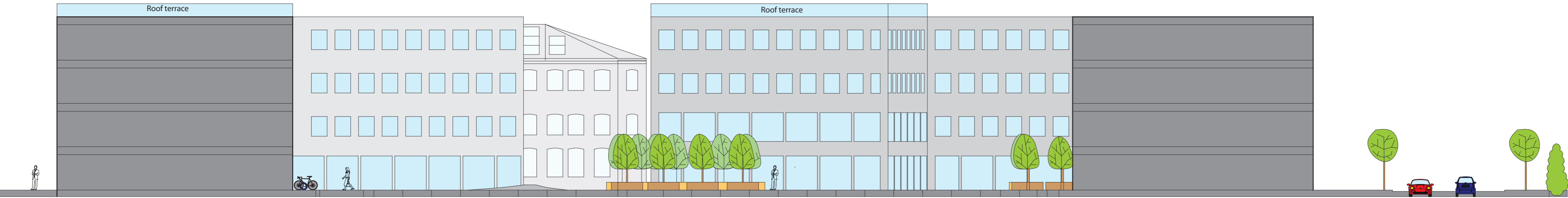
Img 5.19 Rollable three pods in Portugal.



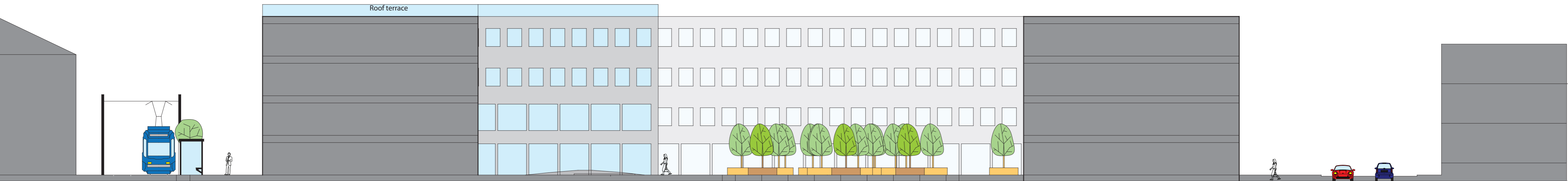
Img 5.20 Movable chairs at Mint plaza. Sit together or alone.



Img 5.21 3RW's spiral bike parking, can also be fun to play in.



SECTION A-A'
Scale 1:200



SECTION B-B'
Scale 1:200

|IMPLICATIONS|AFTER WORD|

6

INTRODUCTION

This chapter will briefly comment and discuss the analysis tool presented in chapter four and tested in chapter five, together with the design proposal that was put out in chapter five. The chapter will in the end give an after word or end conclusion, proposing ways to take the research further.

IMPLICATIONS

How to improve the analysis

The analysis tool provided in chapter four was made to analyse and test the area efficiency of the case study in Urban Sjøfront. The tool try to analyse both qualitative and quantitative.

First step is the analysis of functions in the area. This step is presented in a land use map, a list of functions, and as well in a function wheel, dependent on how far away the different functions are. The function wheel arguably doesn't say anything about the quality of the functions provided, or how many of the certain function there were. These numbers are found in the function list. It would be beneficial if the wheel also could say something on the number of specific functions. In the case study, there is just one cafe for the whole area, meaning the function is present, but at the same time it could be argued that one café is not enough for this size of area.

When finding the distances to each function in the function wheel, each function on the land use map was given a circle with a 600m radius. This circle was also added to functions that are on the

boarder or outside the area. It then became clear, if all of the built form in the area is covered with these circles. In other words, if all the buildings have 600 meter or less in linear distance to the given function. This also implies that functions providing the buildings in the defined area, not necessarily are found in the specific area. This is done to make sure that all buildings in the defined area has the access to specific functions. This way of measuring arguably removes the concerns to the shape of the area. Though it wasn't necessary for the project studied, the tool should give some calculations to how high percentage of the buildings in the case study area, should be inside these circles. If for instance 5 % of the buildings are not covered by the circles, maybe the area still should qualify for the function being in the given distance.

Step two in the analysis looks at shared space on the urban scale. This step could theoretical be a quantitative measure, testing the "pure" area efficiency through users per m². When doing the analysis on the case study, it became clear that in reality, this was a bit hard. Theoretically the shared space in the area can be given a user-intensity, but calculating how many users a space have was not that easy. The use will change with time of day, year, weather, etc. Alternatively, the space could be divided on the number of people living in the area. In the study it became clear, that some of the public spaces in the area were used just as much of people that didn't live in the area, like the skate park at "Kjelvene".

Step three in the toolbox is the easiest quantitative measure in the analysis. It show that "pure" area efficiency is easier to measure

on the building scale. The individual unit hold a quantitative analysis for the percentage of the BRA used in the flat, but then as well a more qualitative analysis when it comes to how the flat is being planned. In the case study, the different measures to test the “pure” area efficiency is just shown for residential buildings. It can just as well be done for office buildings, following the same principles, but then relating to m² per office space.

The measures presented try to focus on how the building and plot is actually used. The BRA and total area above ground relate to the building, and how the building uses its space. While plot size and ground floor relate more to the land use. Since a measure says little when it stands alone, the seven different cases provides a small sample for comparison. The buildings can be compared against each other, analysing the area efficiency for Urban Sjøfront. In order to develop a standard measurement, more type of housing and different cases would have been needed. The research design was not made to give these numbers. In order to give a standard measurement, a multiple case study should be conducted. The numbers given from the seven studies, describe BRA per people or people per dekar. Since the measure holds objects like people bed and flats, it arguably becomes easier to understand and picture the measurement. BRA per person could be compared to the former statistics for average BRA per person in Norway, and flats per dekar the density measures given in chapter tree. The main problem is that since there is no comparison or data of what is “normal”, it’s hard to say what is good and bad, compared to outside the area.

Theoretically, the whole area of the case study could be a land use map where each building had numbers showing total built m² per bed and beds per dekar for the residential buildings as well as total built m² per office space and office space per dekar. The map could then be an intensity map, like map 5.9 showing how the private owned space was being used. For instance through how many people it holds per dekar. This would describe the “pure” area efficiency for the area. The quality of the space, and if people enjoy to work or live there, is then not included. A benefit would be if the data also would combine the two different scales, the efficiency of the built form, and the efficiency of the land. These measurements both relay to area efficiency, just to two different types of recourses. It would there for arguably also be an advantage if the two numbers could be combined. Giving a weight to each of them, so that the total area efficiency of a project could be measured, and compared.

The practical problem concerning measuring area efficiency on building scale, was that the numbers needed were not available direct from any data the municipality had. Each building therefore needed to be calculated from plans found at the archives at the

municipality, or data given by the architect. This was rather time consuming, and therefore wasn’t done for all buildings in the analyse conducted. Seven housing blocs were instead chosen, as typical examples on the coming development in the area. The aim was also to test how area efficient these buildings actually were, in order to portray problems or concerns that this type of development could have.

How to improve the application of area efficiency

The proposed design for the specific plot in Urban Sjøfront is merely a discussion of how area efficiency can occur in the urban form. The program proposes how this can happen in this specific case, relating to the qualities and problems found here. The program arguably relate to the proposed concepts of area efficiency, monofunctional shared space and multifunctional shared space, which can be said to be universal.

In the analysis several problems were found to be threatening the area efficiency of Stavanger. Some of these threats can be said to be technical, like poor hallway solutions in the individual flat. These type of concerns can be fixed on the planning level, and require focus from the architects and planners. Others were more psychological and social determined. Like the view that a large house is a way to show off your wealth and success, or that people are reluctant to share spaces. These examples also relate to the economy, and the fact that people can afford to choose. In other words, area efficiency becomes a question of technical and economical but also social and psychological solutions. As a planner I can plan as much as I want, but if nobody wants to live like this, my plans are arguably pointless.

Personally, I believe that the economy is the biggest threat to area efficiency. It give people the freedom to choose easiest way out. In the proposed plan, space is being shared between different actors. The meeting rooms are not just shared between different office units, but also available to the public. A company is always interested in making a profit, but if their margins already are high, they might seek easy and comfortable solutions, instead of saving that little extra on sharing space. In a conversation with a building developer in Stavanger, my ideas were proposed. The biggest problem the developer saw, was towards the managers making the decisions concerning the choice of location. He stated that quite often these managers were not young and new thinking, but rather traditional in their selection of office space. The managers might not see the qualities and benefits that this more flexible type of office will have, but views office space as something more traditional.

Housing can arguably be seen in the same way as the office. Sharing space and functions can have many negative preconceptions. Since housing in Norway isn’t just a place to sleep, but also

is viewed as an investment, hobby and status symbol. It can arguably be hard in an economical climate like 2011, to get the idea of sharing out. After living almost a year in Holland, where both space and the economy is a bit different than in Norway, I learned the benefits from sharing both space and functions. I think the problem in Stavanger is that there are no good examples of space and function sharing. It can be argued that in Stavanger, the Badedammen area becomes the symbol of how densification is merely about living small and not about providing good neighbourhoods. Arguably these projects make it even harder to sell the idea of area efficiency and shared spaces and functions.

Area efficiency also happens on the urban scale, and Stavanger is in general good on providing larger recreational areas, as seen in map 5.1 page 48. When it comes to public space and urban parks, it can be stated that the city have a long way to go. In the typical housing areas in the city, where each house has its own garden, the need of parks is arguably not that big. In the centre of the city and the new transformation areas, the needs of parks and public spaces can be said to be crucial, in order to create good areas. The lack of these urban factors in the city center of Stavanger can have the same effect as the area of Badedammen. It can give a wrong impression of what urbanity actually is. An example can be when my parents came to visit me when I lived in a 25m² flat in the middle of Södermalm in Stockholm. My mother was surprised to see all the parks and public areas that I had in my neighbourhood, although I lived in a dense urban area.

To me this proves that the ideas that quality and design together with functions, are crucial in providing good livable neighbourhoods, that also are area efficient. An interesting project would be looking at how for instance Badedammen could be redeveloped to an area that could be known for its good outdoor public space, not just the contrary.

The design in the case study briefly give suggestions to how the streets in the area can get a better use, through making them not just for cars, but also a part of the public space. This concept could have been developed more through the city, especially in Storhaug, the area west of the project area. In the grid patten, a large percent of the land is being used for road. In the hours between the rush hours, these streets have little traffic and a great potential for being used for other things. The dilemma is of course the dangers of the traffic, and if people and traffic should be mixed.

The proposed design looks just at one plot of the case study area together with the adjacent streets. Another approach could have been to look at different smaller areas in the case study. Finding sight specific or standards ways to redesigning these areas, to become more area efficient. Parking lots are typical examples, as well

as the roads previous mentioned. A registration of urban spaces in the area that had little use or unused potential, could have been another approach, instead of looking just at one specific plot.

AFTER WORD, WAYS FURTHER

Starting this thesis, I had some research questions and some ideas of what I wanted to find out. Since I found little research for the concept of area efficiency on the urban scale, it felt like a lonely walk, trying to develop concepts and analysis. It partly felt like I had to find the road on my own. Now that I have walked through it, I see new paths of research that could have been interesting to investigate further.

My enthusiasm for the urban environment carried me through the work. On my journey, I talked to different people about my research. Both to make my study clearer for myself, but also to get views form others. One of my most inspiring conversations was with my 85 year old grandmother and here sister-in-law. My grandmother still live in here large villa with a big garden, while here sister-in-law have moved to a smaller flat, and therefore knew the problems of finding good “urban” housing. They both were curious to my research, and it was fun to hear them talk about how the space use and functions had changed during their life time. They both agreed that as long as you had peace in the county, together with food on the table, you had what you needed. They also missed the village feeling and felt that people got more isolated. The sister-in-law also told about several of her friends who had sold their villas and bought new expensive flats in Stavanger, whit horrible layouts and crammed bedrooms.

In Stavanger Aftenblad May 25th 2011, there was an article called “It gets tighter and tighter for space” (Stavanger Aftenblad 2011: p 16, translated by the author.) The article was about the future development of Stavanger. The article revealed that the municipality doesn’t want to free more land, but instead densify already existing areas. This in order to provide more housing and get the housing prices down. The municipality has realized that they can’t continue to build detached and row house areas. According to the article, the population growth in the city is 1.2 percent a year, meaning 850 new housing needs to be built each year. The average numbers of housing units being planned is 760 per year till 2015.

The project manager in “Bymiljø og Utbyggings Etaten”, (the Urban Environment and Development Department) in the Municipality of Stavanger, Grete Kvinnesland, says in a interview in the article “Despite that there also are challenges to good outdoor areas, there are still space for more housing in the oil city.” (Stavanger Aftenblad 2011: p16) She further says that if the city should be developed sustainably there is a need for collaboration between

the municipality and private actors. I think this thesis also show that there needs to be a collaboration between the different actors. To share space and functions beyond the individual unit and building, but also between residential, office and public interest. Further it can be argued that if the city should be even more dense, the municipality also needs to make more concrete quality demands to the developers. Like the area analyse for the individual housing buildings show. Even though the efficiency is presented as high, the real efficiency concerning usage of space and people per dekar and people per built m2 varies a lot. I think that when new building projects are being presented to the politicians for adoption, the two numbers of “pure” area efficiency, people per m2 total building and people per dekar, should be presented. It is crucial that these “pure” demands are put together with quality demands, relating to the “social” area efficiency. There should also be put demands to how much public space and parks should be available, given with a maximum distance of the building. This should also go for other functions, like shops, cafes etc, hence necessary and third places referred to in step one in the analysis toolbox.

The toolbox and area measures for the individual building could also be developed further. To give standards, and to create a measurement that include both the quality part and the quantities part of the area efficiency.

As mentioned earlier, the research design of this thesis did not set out to develop standard measures for area efficiency on the building scale, just to find ways of analysing this in the specific case study area. A further development of the research could be to study several building cases. The cases should include different types of office and residential buildings, in order to see if there are typical solutions that are more area efficient than others. This could for instance concern layouts of flats, gallery hallways vs. internal hallways, and if flats should be planned going through the building or just have facades on one side. A study of several buildings that have these differences could reveal what type of solutions that are the most area efficient. This would arguably relate more to architecture.

It would also be interesting to look at how much the increase in space is, when life cycle standard, “livsløpsstandard” in Norwegian, is used in a flat. From the buildings studied, it shows that flats that have this standard, have higher m2 especially for hallways. A study that actually found numbers to this, and could suggest flexible ways to organize the layout of the flat, to reduce the m2, would have been interesting.

Another thing to look further into could be how to create ideal systems for sharing space and functions. This should be done so that the user don't experience any problems, and preferably don't really

notice that the space is shared. In order to do this, a study of existing systems could be viewed.

The social aspect of area efficiency could also be interesting to research further. To find out how people actually view space. It could be interesting to see what people value with space today, and if the young of today view space different than the older generations. It would also be interesting to research if the individual view of housing form changes with the age and life situation. This to see what the changing factors possibly could be.

Sometimes it is frustrating being an urban design student, because we never really get to test our projects. We base our decisions on theory or the success of other case studies, but we never really know how reality actually would deal with our urban design.

|REFERENCES|

LITERATURE

- Aase T.H & Fossåskaret E. (2007), *Skapte virkeligheter, om produksjon og tolking av kvalitative data*, Universitetsforlaget AS
- Alliance Arkitekter AS (2011) "Støperigaten 25" <http://www.allark.no/> (03.02.11)
- Arge K. (2003) *Generalitet, fleksibilitet og elastisitet i kontorbygninger*. Prosjektrapport 640-2003. Norgesbyggeforskningsinstitutt, Oslo
- Australian Conservation Foundation (2011) "Conservation atlas" <http://www.acfonline.org.au/consumptionatlas/> (20.02.11)
- Baastrup K. (2001) *Tendenser der sætter arkitektoniske spor*. Instituttet for Fremtidforskning, København
- Berge B. (2003) *Arealforbrukets miljøbelastning i boliger*. Gaia Lista AS
- Bradly K. (2010) "Social sustainability in post-oil society" Lecture KTH (07.10.2010)
- Breeam (2011) "Breeam" <http://www.breeam.org/>(12.03.11)
- Byggenæringens miljøsekretariat (2009) "Arealeffektivitet" <http://www.byggemiljo.no/category.php/category/Arealeffektivitet/?categoryID=295> (10.02.11)
- Carmona M, Heath T, Oc T, Tiesdell S (2003) *Public Places – Urban Spaces*. Architectural Press.
- Carmona M. & Tiesdell S. (2007) *Urban Design Reader*. Architectural Press.
- Connelly S. (2007) "Mapping Sustainable Development as a Contested Concept"; *Local Environment*, 12: 3; pp 259-278.
- Earth Times (2007) "WWF: Treathened species list continues to grow" <http://www.earthtimes.org/articles/news/164930.html> (15.02.11)
- Ellis J.G. (2004) "Explaining Residential Density"; *Places: Forum of Design for the Public Realm*, 16: 2; pp 34-43
- Environmental Graffiti (2008) "Environmentalism in 250 B.C", <http://www.environmentalgraffiti.com/offbeat-news/environmentalism-in-250-bc/746> (15.02.11)
- Euractiv (2007) "Brussels warns of looming raw-materials crisis" <http://www.euractiv.com/en/sustainability/brussels-warns-looming-raw-materials-crisis/article-164342> (14.02.11)
- Europa.eu (2007) "Pressrelease, VP Verheugen" <http://europa.eu/rapid/pressReleasesAction.do?reference=IP/07/767&format=HTML&aged=0&language=EN&guiLanguage=en> (14.02.11)
- Finnveden G. & Moberg Å. (2005) "Environmental Systems Analysis Tools – an overview"; *Journal of Cleaner Production*; 13, 12; pp 1165-1173.
- Finnveden G. (2010) "Overview of methods and a framework for environmental indicators", Lecture KTH, 24.09.10
- Fiskaa H. (2004) *Innføring i fysiks detalplanlegging*. Norges Teknisk-Naturvitenskaplige Universitet.
- Forest History (2011) "Gifford Pinchot", <http://www.foresthistory.org/ASPNET/people/Pinchot/Pinchot.aspx> (11.02.11)
- Gehl I. (1971) *Bo-miljø*. Statens Byggeforskningsinstitut SBI-Raoirt 71
- Gehl J. (2003) *Livet mellom husene*. Arkitektenes Forlag
- Girardet H. (1999) "The Metabolism of Cities"; *Sustainable Urban Development Reader*. pp 157-164: Taylor & Francis Ltd.
- Global environmental forum (2003) "Ahimsa is Taking Action To Preserve Our Environment", <http://www.ahimsainternational.org/programs/GEF/join-us.html> (15.01.11)
- Haaland A. (1999) *En by tar form*. Wigestrands Forlag
- Hoff K. G. (2005) *Bedriftens økonomi*. Universitetsforlaget
- Hove P.J. (2003) "Miljøforhold og materialbruk for bygverk" http://www.bygg.ntnu.no/pbl/bm2/faginfo/forelesninger/Hovde_notat.pdf (05.03.11)
- Husbanken (2011) "Bolipolitikk" <http://www.husbanken.no/boligpolitikk/hvem-og-hva/mal-strategier-og-virkemidler-i-boligpolitikken/> (18.03.11)

- Husbanken (2011) "Historikk" <http://www.husbanken.no/om-husbanken/historikk/> (18.03.11)
- Høyland K. & Støa E. (2002) *Tilpasningsdyktige Boligområder*. Bygg og miljø, avdeling Arkietketur og byggtenkikk, SINTEF
- Kjær Christensen M. (2000) *Minimalboligen*. Kunstakademiets Arkitektskoles Forlag København
- Luke T. (2005) "Neither sustainable nor development: Reconsidering sustainability in Development." *Sustainable Development*. 13, (2005), pp 228-238.
- Lebon T. (2006) "Abraham Maslow" <http://www.timlebon.com/maslow.htm> (28.03.11)
- Le Corbusier (1987) *The City of To-Morrow and its Planning*. Dover Publication Inc.
- Lervik Brygge (2010) "Lervik Brygge" <http://www.lervigbrygge.no/> (17.01.11)
- Maas W. et al. (2010) *Green Dream*. The Why Factory and NAI Publishers.
- Manoochehri J. (2010) "Urban Sustainability" Lecture at KTH 13.09.10
- Meine C. (1988) *Aldo Leopold, His life and work*. The University of Wisconsin Press.
- Mijjolare (2011) "By og tettstedsvekst" http://miljolare.no/tema/konflikter/artikler/by_og_tettstedsvekst.php (16.02.11)
- Newman O. (1972) *Creating Defensible Space*. U.S. Department of Housing and Urban Development Office of Policy Development and Research.
- Norges Bank (2011) "Oversikt over rentemøter og endringer i styringsrenten" http://www.norges-bank.no/templates/article___67652.aspx (25.02.11)
- NVDB (2011) "National VegDataBank" <http://svvgw.vegvesen.no/http://svvnvdbapp.vegvesen.no:7778/webinnsyn/anon/index> (28.04.11)
- Oldenburg R. (1989) "The character of third places"; *Urban Design Reader*. pp 163-169: Architectural Press
- Raaen H. (1995) *Dynamiske boliger: vurdering av produksjonskapasitet for 3 alternative boligplaner*. SINTEF Arkitektur og Byggeteknikk STF62 A95007
- Rogaland Fylkeskommune (2000) "Fylkesdelsplan For Langsiktig Byutvikling På Jæren" http://www.rogfk.no/modules/module_123/proxy.asp?C=101&I=108&D=2&mid=17&sid=135&pid=33 (05.02.11)
- Selvaag (2011), "Plussbolig" <http://www.selvaag.no/bolig/Kjope/Isalg/Sider/NesttunvannetTerrasse.aspx> (17.03.11)
- SSB (2010) "Yrkesdeltakelse" <http://www.ssb.no/aku/tab-2011-05-04-01.html> (05.04.11)
- SSB (2006) "Avfall" <http://www.ssb.no/avfbyggan/> (07.03.11)
- SSB (2010) "Avfallsmengde" <http://www.ssb.no/avfregno/>(07.03.11)
- SSB (2005) "Enpersons husholdninger" <http://www.ssb.no/emner/00/02/sa81/kap1.pdf> (03.02.11)
- SSB (2008) "Forventet levealder" <http://www.ssb.no/vis/samfunnspeilet/utg/200201/08/art-2002-02-28-01.html> (05.04.11)
- SSB (2008) "Gjeldsvekst" <http://www.ssb.no/emner/05/03/bo/> (10.04.11)
- SSB (2010) "Gjennomstits alder førstefødt" <http://www.ssb.no/emner/02/02/10/fodte/arkiv/tab-2010-04-08-04.html> (05.04.11)
- SSB (2011) "Kvinner I arbeidslivet" <http://www.ssb.no/aku/tab-2011-02-02-03b.html> and http://www.ssb.no/emner/02/02/10/rapp_200905/rapp_200905.pdf tab 3.1 (05.04.11)
- SBB (2004)"m2 per Person" <http://www.ssb.no/samfunnsspeilet/utg/200404/10/tab-2004-09-15-01.html> (16.01.11)
- SSB (2010) "Person per husholdning" <http://www.ssb.no/familie/tab-2010-04-08-04.html> (16.01.11)
- SSB (2001) "Tidsbruk" <http://www.ssb.no/emner/00/02/20/sa52/kap1.pdf> (05.03.11)
- SSB (2010) "Trangbodd" http://www.ssb.no/emner/00/02/30/sos_utsyn/sa35/tab-2000-04-11-08.html (04.03.11)
- SSB (2010) "Utgifter" <http://www.ssb.no/fbu/tab-2010-06-09-05.html> (05.03.11)

- SSB (2010) "Kommunal Vannforsyning" http://www.ssb.no/vann_koetra/ (07.03.11)
- Stavanger Aftenblad (2011) "Arkitekten bak det meste" article p 24, Mai 20th 2011.
- Stavanger Aftenblad (2011) "Det blir trangere og trangere om plassen" article p 16. Mai 25th 2011.
- Stavanger Kommune (2009) "Cities of the Future, City of Stavanger" http://www.stavanger.kommune.no/Documents/Natur%20og%20milj%C3%B8/Framtidens%20byer/Cities%20for%20the%20Future_Stavanger_english_rev.pdf (15.01.11)
- Stavanger Kommune (2009) "Climate and Environment Plan 2010-2025" http://www.stavanger.kommune.no/Documents/Natur%20og%20milj%C3%B8/Aktuelt/Climate_and_environment_plan_2010-2025.pdf (15.01.11)
- Stavanger Kommune (2010) "Forbruk og Avfall" <http://www.stavanger.kommune.no/Tilbud-tjenester-og-skjema/Natur-og-miljo/Klimapakten/Forbruk-og-avfall/> (07.03.11)
- Stavanger Kommune (2010) "Levekårsundersøkelsen 2010" <http://statistikk.stavanger.kommune.no/filer/rapportlev%C3%A5r2010.pdf> (01.02.11)
- Stavanger Statistikken (2010) "Antall rom per husholdning" http://statistikk.stavanger.kommune.no/bolig_01s.html (01.02.11)
- Stavanger-Statistikken (2010) "Areal bruk" http://statistikk.stavanger.kommune.no/generelt_02s.html (01.02.11)
- Stavanger Statistikken (2011) "Befolkning" http://statistikk.stavanger.kommune.no/befolkning_01r.html (01.02.11)
- Stavanger Statistikken (2011) "Hustyper" http://statistikk.stavanger.kommune.no/bolig_01s.html (01.02.11)
- Stavanger Statistikken (2010) "Personer per husholdning" http://statistikk.stavanger.kommune.no/bolig_01s.html (01.02.11)
- Stavanger Statistikken (2011) "Type husholdninger" http://statistikk.stavanger.kommune.no/befolkning_18s.html (01.02.11)
- Stavanger Statistikken (2011) "Utviklingen av enebolig priser" <http://statistikk.stavanger.kommune.no/> (01.02.11)
- Stavanger Statistikken (2011) "Utviklingen av leilighets priser" <http://statistikk.stavanger.kommune.no/> (01.02.11)
- Svane Ö. (2010) "Planning, Design and urban Sustainable Development" Lecture KTH 01.09.10
- Svane Ö. (2008) "...but most buildings are already there Basic starting points for environmental management in the housing sector"; *Columbus F: Housing: Socioeconomic, Availability, and Development Issues*; pp 149-159; Nova Science Publishers, Inc.
- The Carbon dioxide Information Analysis Center (2011) "Global annual fossil fuel carbon dioxide emissions through year 2004, in million metric tons of carbon." <http://cdiac.esd.ornl.gov/home.html> (16.03.11)
- Thue J.V. (2003) *Energibruk i bygninger Institutt for bygg- og anleggsteknikk*, NTNU
- Tou Park (2011) "Tou Park" <http://toupark.no/> (17.01.11)
- Tunström M. (2010) "Sustainability as a concept" Lecture at KTH 02.09.10
- Øst+ (2011) "Urban Sjøfront" http://www.ostpluss.no/urban/public/openIndex?ARTICLE_ID=116 (03.03.11)
- US. Green Building Council (2011): "Leed" <http://www.usgbc.org/DisplayPage.aspx?CategoryID=19> (12.03.11)
- Statens Vegvesen (2006) *Handbok 140 Konsekvensanalyse*. Statens Vegvesen
- Wackernagel M. & Rees W. (1996) "What is an Ecological Footprint?"; *Sustainable Urban Development Reader*. pp 289-287: Taylor & Francis Ltd.
- Wheeler S. M. & Beatley T. (2009) *The Sustainable Urban Development Reader*. Taylor & Francis Ltd
- Whyte W.H. (1980) "The life of plazas"; *Urban Design Reader*. pp 226-229: Architectural Press
- World Commission on Environment and Development (1987) *Our Common Future*. Oxford University Press
- World Wildlife Foundation (2008) "Living planet Report 2008", http://assets.panda.org/downloads/living_planet_report_2008.pdf (15.02.11)

ILLUSTRATIONS

All images and illustrations are made by author unless other wise noticed. Some of the references refer to the literature list.

Page 11

Figure 1.1 The structure of the report.

Page 16

Figure 2.1 Different interpretations of the three circles of Sustainable Development.

Reference: Connely 2007

Page 17

Figure 2.2 Ian Lows' Mickey Mouse interpretation of the Sustainable Development.

Reference: Manoochehri 2010

Figure 2.3 Manoochehri 's opinion on how the Sustainable Development circles should be.

Reference: Manoochehri 2010

Figure 2.4 Step one in Manoochehri's 1234 Framework

Reference: Manoochehri 2010.

Page 18

Fig 2.5 Global annual fossil fuel carbon dioxide emissions through year 2004, in million metric tons of carbon.

Reference: The Carbon dioxide Information Analysis Center 2011

Page 20

Diagram 2.1 Disposal of waste form new buildings, rehabilitations and demolition in Norway 2004

Reference: SSB "Avfallsmengder" 2010

Page 22

Img 3.1 Nytorget in Stavanger. The parking space is converted in to a market square every Saturday.

Page 24

Picture 3.2 Doc, space saving system, bunk-bed and couch.

Credit: Resource Furniture 2008,

<http://www.resourcefurniture.com/space-savers/bunk-beds/doc> (07.03.11)

Page 28

Figure 3.1 Sketch of team based office solutions, made by Niels Torp Arkitekter AS

Reference: Arge 2003 (p 11)

Page 30

Figure 3.2 "Relative material use in volume, per m2 usage area"

Reference: Berge 2003 (p24)

Page 36

Figure 3.3 Showing functions / ways / qualities to create space / build form that is not static, but that can change or adapt to new or different needs.

Figure 3.4 Temporal shared multifunctional space

Figure 3.5 The concept of monofunctional space sharing.

Page 40

Figure 4.1 A low provision of functions will give a low level of happiness or quality of life

Figure 4.2 The satisfaction depends on the functions available

Page 41

Figure 4.3 Maslow's hierarchy of needs.

Reference: Lebond 2006

Figure 4.4 The concepts behind the toolbox for analysing area efficiency on an urban scale

Page 43

Figure 4.5. The Function wheel, step one of the toolbox

Page 44

Figure 4.6 Ways of analysing urban scale area efficiency

Page 45

Fig 4.7 Ways of analysing area efficiency on the architectural scale

Page 46

Fig 4.8 Objects and Area Measures.

Page 48

Map 5.1 Characteristic Land Use Stavanger

Map reference: finn.no

Page 50

Figure 5.1 Distribution of greenhouse gas emission in the city of Stavanger

Reference: The Climate and Environmental plan 2010-2025, Stavanger Kommune

Page 51

Diagram 5.1 Types of Housing in Stavanger Jan. 2011

Reference: Stavanger Statistikken "Type of Housing" 2011

Illustration: author

Diagram 5.2 Housing after district and type. Numbers from Jan. 09

Reference: Stavanger Statistikken "Type bolig" 2010

Diagram 5.3 Number of people in the household, according to number of rooms, Nov. 2001

Reference: Stavanger Statistikken "Personer per husholding" 2010

Page 52

Diagram 5.4 Households according to district and number of rooms.

Numbers from Jan. 09.

Reference: Stavanger Statistikken "Antall rom per husholdning" 2010

Diagram 5.5 Households types in Stavanger.

Reference: Stavanger Statistikken "Befolkning" 2011

Page 54

Table 5.1 Number of single households, divided by age, from 1986-2003 for Norway.

Reference: SSB “Enperson husholdninger” 2005

Table 5.2 People in the households in Stavanger and Storhaug in 2011.

Reference: Stavanger Statistikken “Personer per Husholdning” 2010

Page 55

Img 5.1 “Good Housing For All”

Reference: Husbanken, “Historikk” 2011

Page 58

Map 5.2 Joined area plan for Urban Sjøfront.

Reference: Development plans Plan 1785:B1 B3 B4 B7 B9 B12 B13 B14, 1901: B2, 2200 and 2218. Stavanger Kommune

Collage: Author

Page 59

Map 5.3 Current projects in Urban Sjøfront, built, building and planned by May 2011.

Map reference: finn.no

Illustration: author

Page 60

Map 5.4 Different functions in the nearby area of Urban Sjøfront

Reference: AutoCAD file

Illustration: Author

Map 5.5 Distances from the project area to different functions

Reference: AutoCAD map

Illustration: author

Page 61

Map 5.6 Land use and Functions in Urban Sjøfront.

Map reference: AutoCAD map

Illustration: author

Page 62

Map 5.7 Functions located in the Case Study Area, step one of the toolbox.

Map reference: finn.no

Illustration: author

Page 64

Figure 5.3 Functions located in the Case Study Area, shown in the function wheel

Page 65

Figure 5.4 Step two in the toolbox, locating shared functions and space on the urban scale.

Figure 5.5 Different functions and their percentage of the total area.

Map 5.8 Public space in the area.

Page 66

Image 5.2 Lervik Brygge development, step one.

Reference: Lervik Brygge 2010

Page 68

Img 5.3 Tou Park buildings A, B and C

Reference: Tou Park 2010

Page 69

Img 5.4 Tou Park building C in the front. The different levels of street and garden can be seen on the right side of the image, with stairs being the facade towards the street.

Reference: Tou Park 2010

Figure 5.6 The sketch of the section of Tou Park.

Page 70

Img 5.5 Facade towards west

Img 5.6 Facade towards east

Reference: Archidayly, 2010.

http://www.archdaily.com/37821/st%C3%B8perigaten-25-alliance-arkitekter/sg_05/ (03.03.11)

Page 71

Img 5.7 The three buildings in Haugesundsgaten.

Reference: Helen & Hard, 2010. [http://www.hha.no/work\(03.03.2011\)](http://www.hha.no/work(03.03.2011))

Img 5.8 The facade towards Haugesundsgaten

Page 72

Img 5.9 Facades towards north east

Img 5.10 Facade towards Ryfylkegaten

Img 5.11 Facade towards the water

Reference: Leiv Nes Arkitekter 2010

<http://www.lna.no/index.php?pageNum=1&page=listimg&catid=1&imgid=82> (03.03.11)

Page 73

Img 5.12 The two buildings seen from Lervik Brygge project area.

Img 5.13 Facade towards the water

Page 74 to 79

Table 5.3 BRA as area measure, showing BRA per bed and per person.

Table 5.4 Total area above ground as area measure, showing total area minus BRA per bed/person /flat and total area per bed/person/flat.

Table 5.5 Plot size as area measure, showing m² plot per BRA/bed/person and bed/person/flat per dekar.

Table 5.6 Ground Floor as area measure, showing ground floor per bed/person/flat and beds/persons/flats per 100m² ground floor.

Table 5.7 Division of flats in the project studied.

Map 5.9 Graphically showing “pure” area efficiency in the case study area.

References for all: Building plans from the Municipality in Stavanger, see data collection.

Page 83

Figure 5.7 Four ways of combining a family flat of 105m², in order to get the best area efficiency.

Page 84

Figure 5.8 Senior Flats.

Page 85

Figure 5.9 The system of sharing.

Page 86

Figure 5.10 How the housing and office space can overlap, sharing space with the urban form.

Page 87

Figure 5.14 How the housing and office space can sharing space with the urban form.

Page 88

Img Characteristics Urban Sjøfront

Page 89

Map 5.10 Joined Area Plan, including both built and planned areas.

References: plan 1785, 1785B3 1785B11 and 2218. Stavanger Kommune.

Map 5.11 Land use and mobility in the project area.

Map reference: AutoCad map

Page 90

All images are taken by author.

Page 91

Map 5.12 Qualities in the area.

Map reference: AutoCad map.

Page 92

Figure 5.12 The proposed program, conceptual, showing an estimated user intensity.

Figure 5.13 Illustration of the program seen in section.

Page 93

Map 5.13 The proposed building, with first floor functions

Map reference: AutoCad map

Page 94

Figure 5.14 Functions on the different floors.

Page 95

Map 5.16 The ideas for the outdoor space of the project, with streets.

Map reference: AutoCad map

Page 96

Image of chairs: Fermob (2011) "Luxembourg" <http://www.fermob.com/en/Browse-our-furniture/Flagship-collections/Luxembourg>

Page 97

Proposed Situation Plan

Page 98

Img 5.19 Rollable three pods in Portugal.

Reference: Lucas Griffith

Img 5.20 Movable chairs at Mint plaza.

Reference: SF street blog (2011) "mints plaza"

[http://sf.streetsblog.org/2010/12/02/sfs-mint-plaza-takes-home-epa-smart-growth-award-for-civic-spaces/\(05.05.11\)](http://sf.streetsblog.org/2010/12/02/sfs-mint-plaza-takes-home-epa-smart-growth-award-for-civic-spaces/(05.05.11))

Img 5.21 3RW's spiral bike parking, can also be fun to play in.

References: 3RW arkitekter "Kulturhuset USF Bergen"

<http://www.3rw.no/works/public/usf/index.html> (20.05.11)

Page 99

Section A-A'

Section B-B'

APPENDIX

A

Figure A.1 The principals of the 1234 framework

Reference: Manoochehri 2010

B

Graph B.1: The development of flat prices in the fourth largest cities in Norway, together with Sandnes.

Reference: Stavanger Statistikken "Utviklingen av leilighets priser" 2011

Graph B.2: The development of detached housing prices in the fourth largest cities in Norway, together with Sandnes.

Reference: Stavanger Statistikken "Utviklingen av enebolig priser" 2011

C

Table C.1: The Municipality of Stavangers strategy to reduce CO2 emission in area use and transport.

Reference: Climate and Environmental Plan 2010 – 2025

Table C.2: The Municipality of Stavangers strategy to reduce CO2 emission in stationary energy consumption.

Reference: Climate and Environmental Plan 2010 – 2025

D

Reference: Development plans Plan 1785:B1 B3 B4 B7 B9 B12 B13 B14, 1901: B2, 2200 and 2218. Stavanger Kommune

E

Map E.1 Land use in Badedammen

Map D.2 Step two in the tool box, shared space in Badedammen

Figure D.1 Ways of measuring urban scale area efficiency, step two in the analysis.

Illustration D.1 The Function wheel, step one of the toolbox

All images are taken by author

F and G

All numbers are found from building plans from the municipality

H

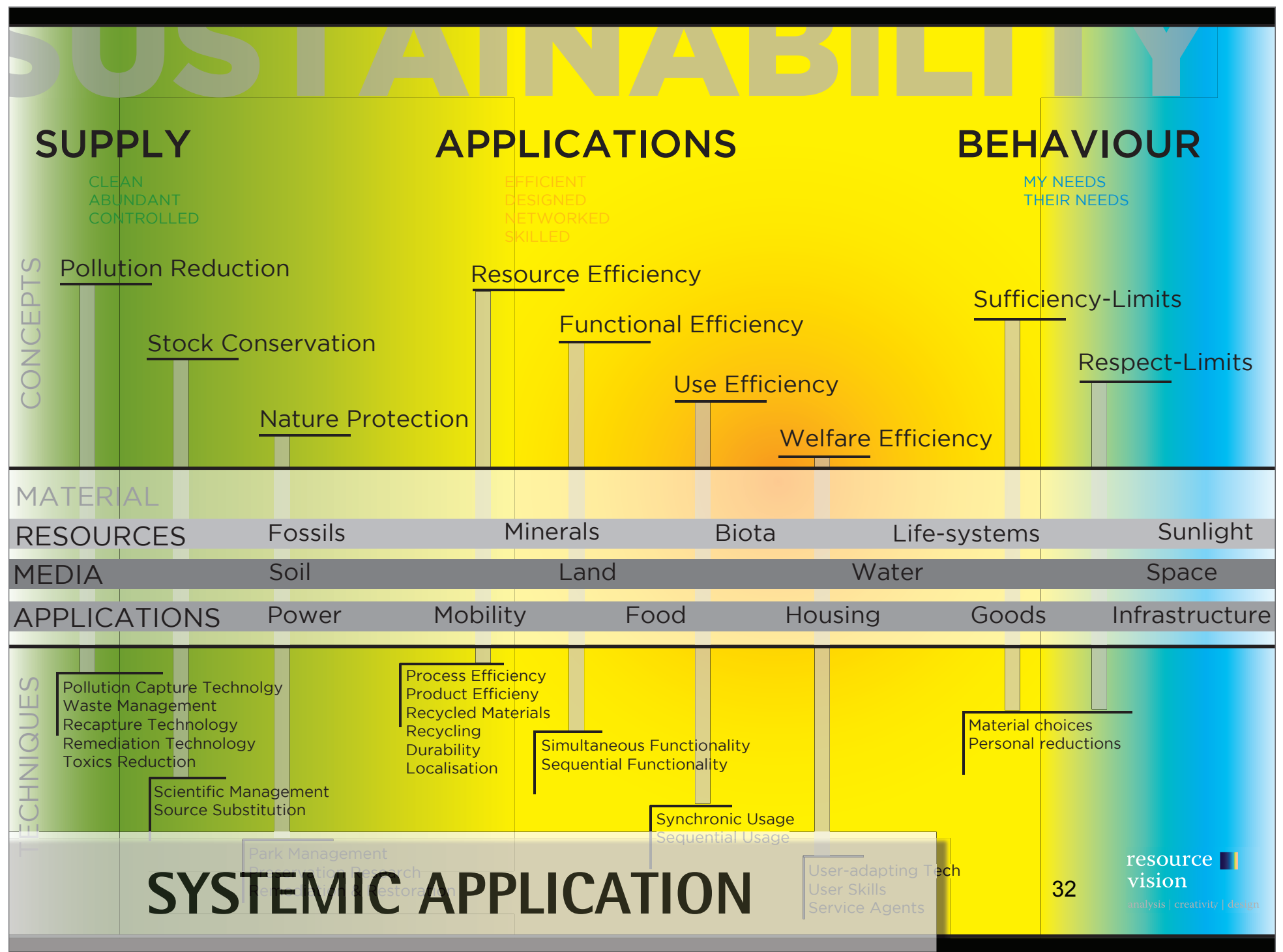
Sun diagrams

Reference: AutoCad maps.

[APPENDIX]

APPENDIX A

The concept of the "1234 Framework"

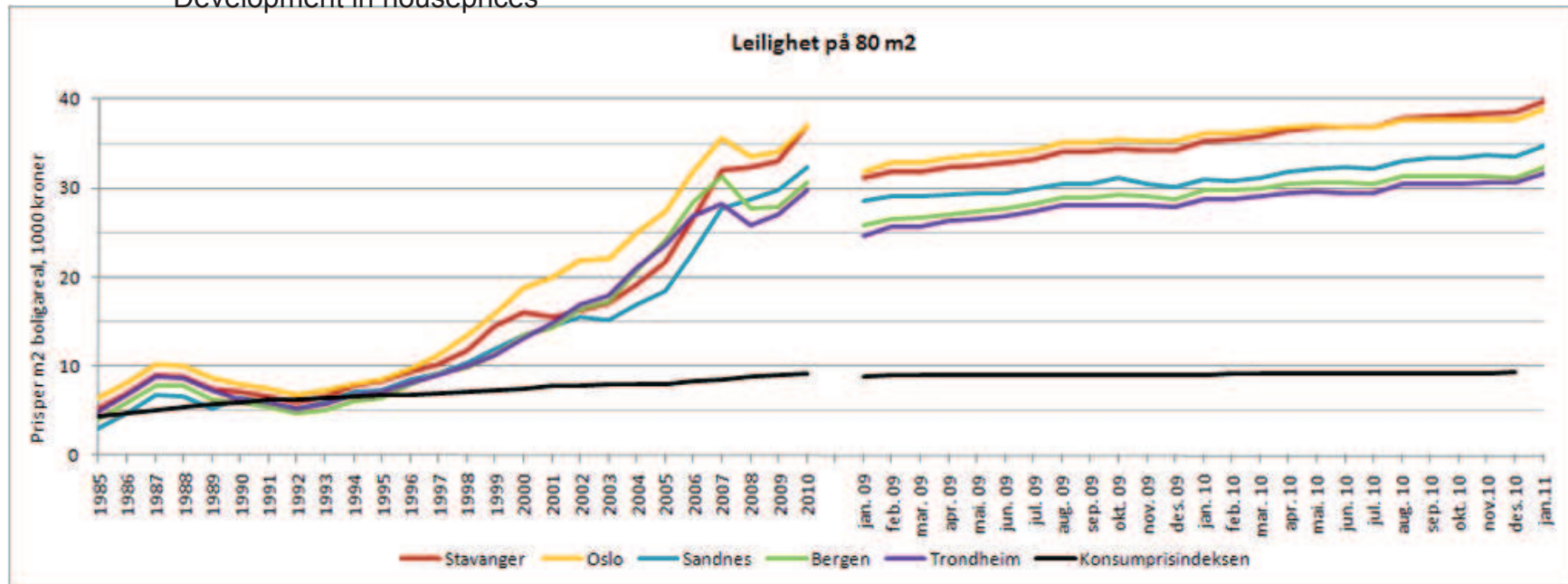


Monday, 13 September 2010

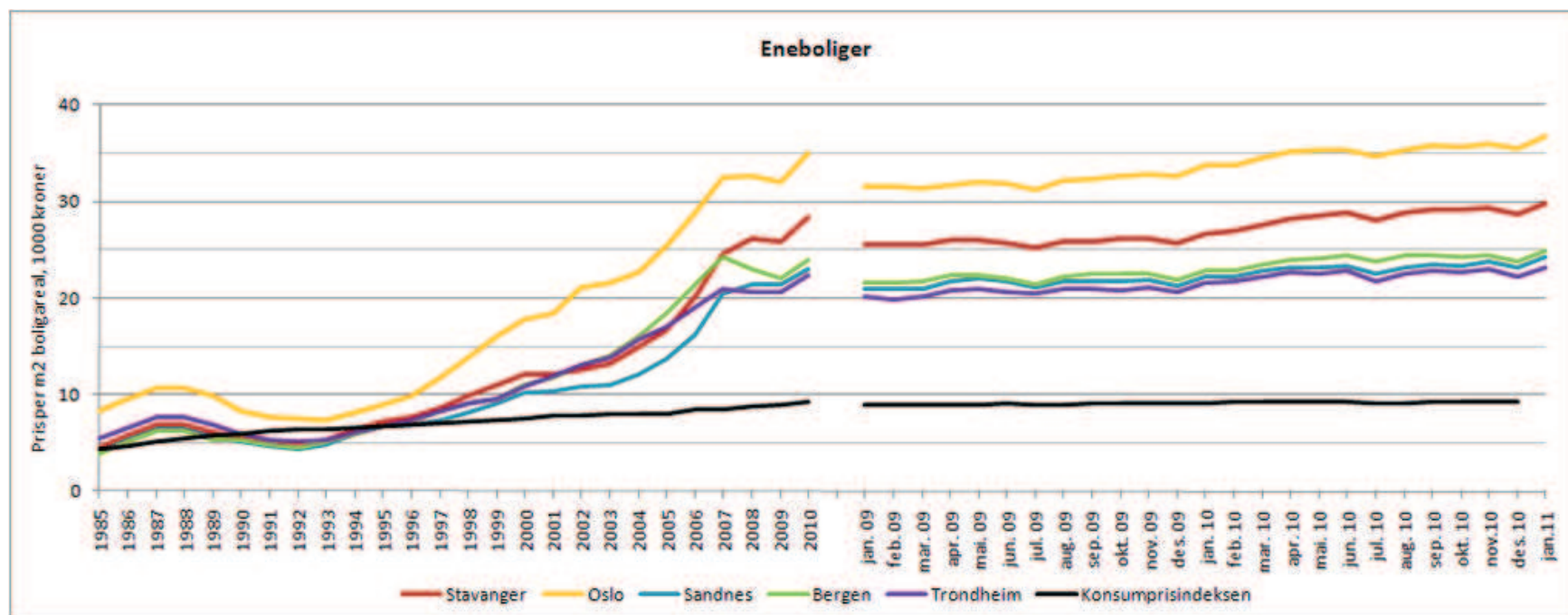
Figure A.1 The principles of the 1234 framework (Manoochehri 2010)

APPENDIX B

Development in houseprices



Graph B.1: The development of flat prices in the fourth largest cities in Norway, together with Sandnes. (Stavanger Statistikken "Utviklingen av leilighets priser 2011")



Graph B.2: The development of detached housing prices in the fourth largest cities in Norway, together with Sandnes. (Stavanger Statistikken "Utviklingen av enebolig priser 2011")

APPENDIX C

The Municipality of Stavangers strategy to reduce CO2 emission.

Area of focus	Target	Assumed CO2 reduction (ton)	Comments
Area use and transport			
Improved vehicle technology	Reduce emissions per km driven	20 000	Improved combustion engine, smaller cars, electric cars and biogas
Concentrated land development	Reduce number of km per trip	15 000	Build along axis of public transport and in self-supporting parts of the city.
More environmentally friendly transport	Reduce the emissions per km driven	5 000	Give public transport high priority. Better conditions for cycling and walking.
Transport efficiency improvement	Reduce number of km by car	5 000	Improved logistics. Intelligent transport systems and services. (ITS)
		45 000	

Table C.1: The Municipality of Stavangers strategy to reduce CO2 emission in area use and transport. The numbers are taken from the Climate and Environmental Plan 2010 - 2025

Stationary energy Consumption	Target	Assumed CO ₂ reduction locally (ton)	Assumed CO ₂ reduction globally (ton)
Regional plan for energy and heating	Develop a general plan where consumption and energy sources are evaluated	10 000	0
Existing Building	Phase out oil and propane. Reduce energy consumption in existing and new houses and industrial buildings.	25 000	150 000
Develop new buildings	Test and evaluate new pilot projects, considering the use of passive house standard.	0	0
Systems for follow-up	Systems for energy follow-up to motivate for lower consumption.	Included in the other numbers.	
Skills upgrading	Increase the regional competence	Included in the other numbers	
Total reduction		35 000	

Table C.2: The Municipality of Stavangers strategy to reduce CO2 emission in stationary energy consumption. The numbers are taken from the Climate and Environmental Plan 2010 - 2025

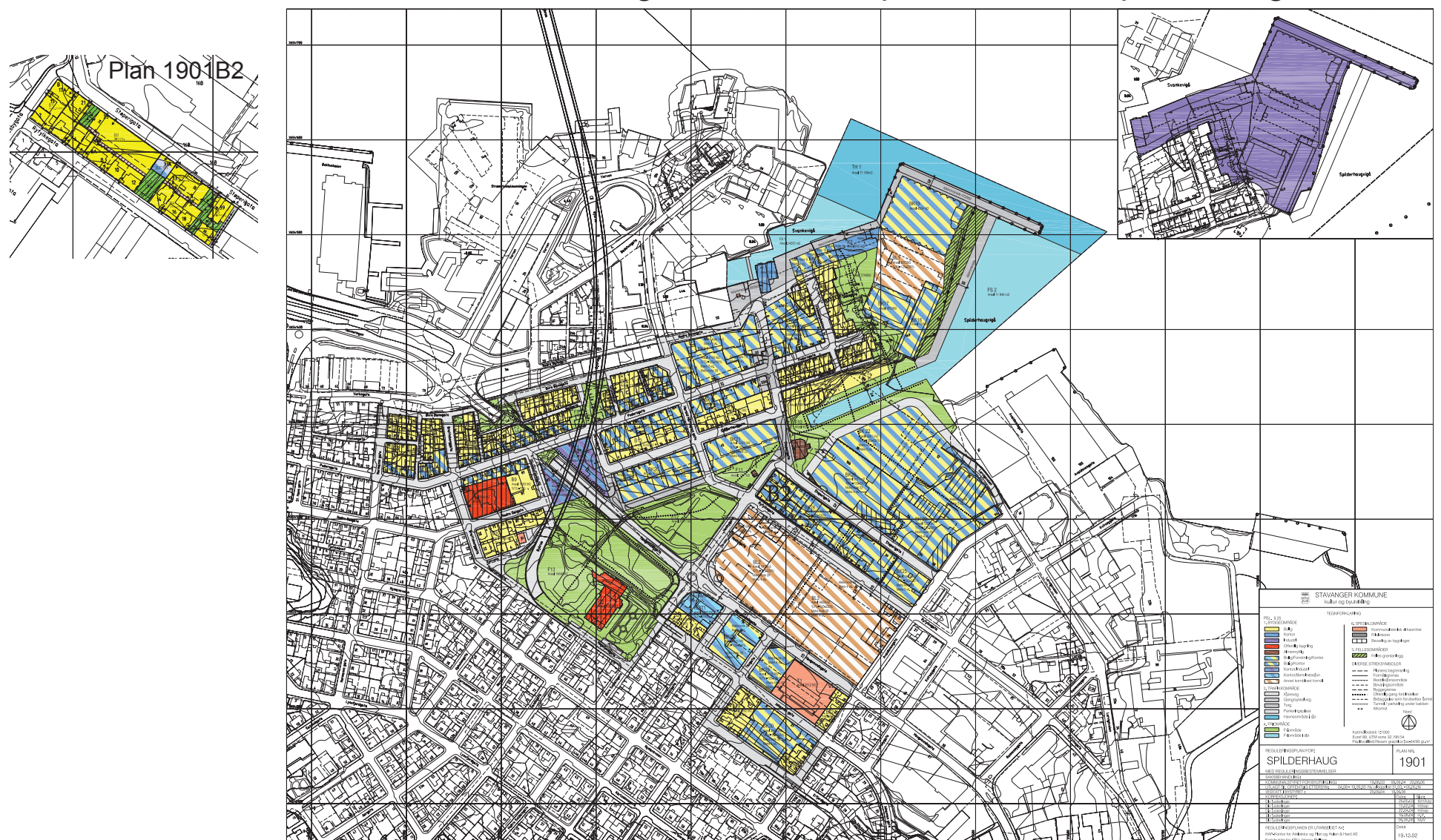
Comments to the changes in plan 1785 and 1901, Urban Sjøfront

APPENDIX D

When comparing the original plans of Urban Sjøfront, plan 1785 and plan 1901, with the new planes for parts of the area, it's clear to conclude that the original plans are just partly followed. Concerning max contour height of the buildings, and max number of floors, all the new plans follow the original plans, with the exception of plan 2200, for the area of Siriskjær. Here plan 1785 defines a max height of contour 20, while plan 2200 has put the max height to be contour 24. The major differences from the original to the developed detail plans are the use. Most of the areas in the original plans have a mixed use of housing and offices. Looking at the two largest developments in the area, plan 1785B7 Lervik Brygge and 1785B9 Tou Park, these two developments represent large housing areas. The original plans do propose that the plan can have a mix of housing and offices, or either of them. Lervik have a small retail space of about 92m² together with a kindergarten of about 770m², while the A and B buildings in Tou Park, have about 950m² retail/offices in the first floor, facing the street. This space have the depth of half the building, and only light form one side. Concerning the lightning conditions, it can be argued that the space is better suited for retail, than offices. Both projects have a rather small percentage of office/retail, compared to the housing area.

The plan does not give a demand to office space, but leaves it up to the developer to choose what type of ratio is wanted between housing and office. It can be argued that this provides a weak type of planning. The blocs between Ryfylkegaten and Haugesundsgaten are defined as center structure. These are the only plots that have a limited percent of housing. Here only 25% of the floor space can be housing, and the focus is on retail and office. It can be argued that the area is developing like so many of the other areas in the city, with a center providing retail, surrounded by a large housing area. The two original planes tell a different, and arguably better urban story than what is actually being build.

Changes in the area plan of 1901, Spiderhaug



Plan 1785B12

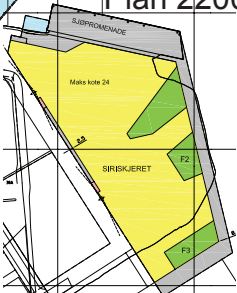


Changes in the area plan of 1785, Breivig, Lervig og Spilderhaugvigå

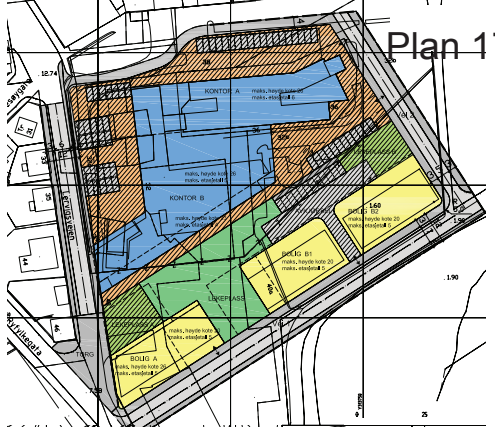
Plan 1785B7



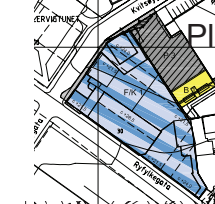
Plan 2200



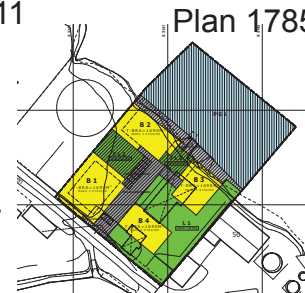
Plan 1785B1



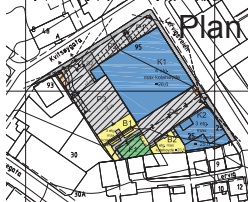
Plan 1785B11



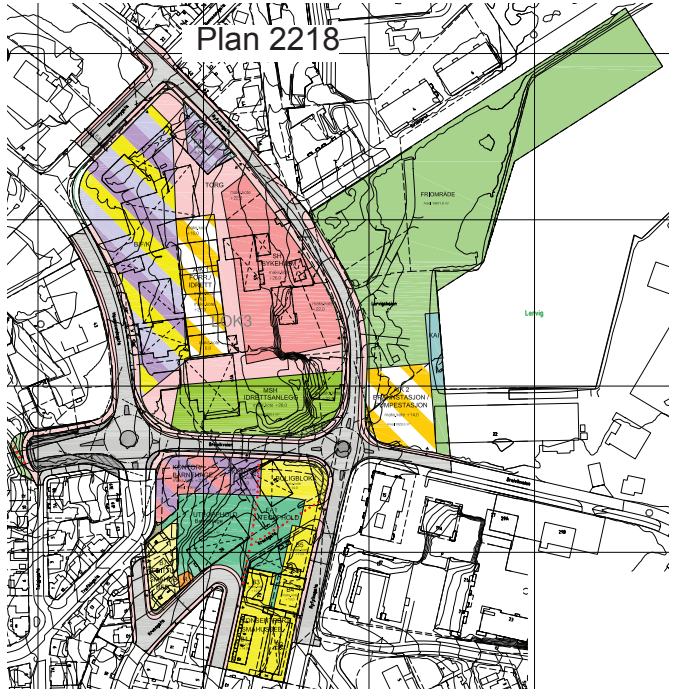
Plan 1785B14



Plan 1785B4



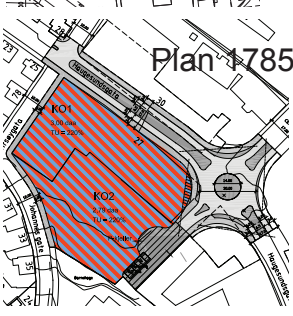
Plan 2218



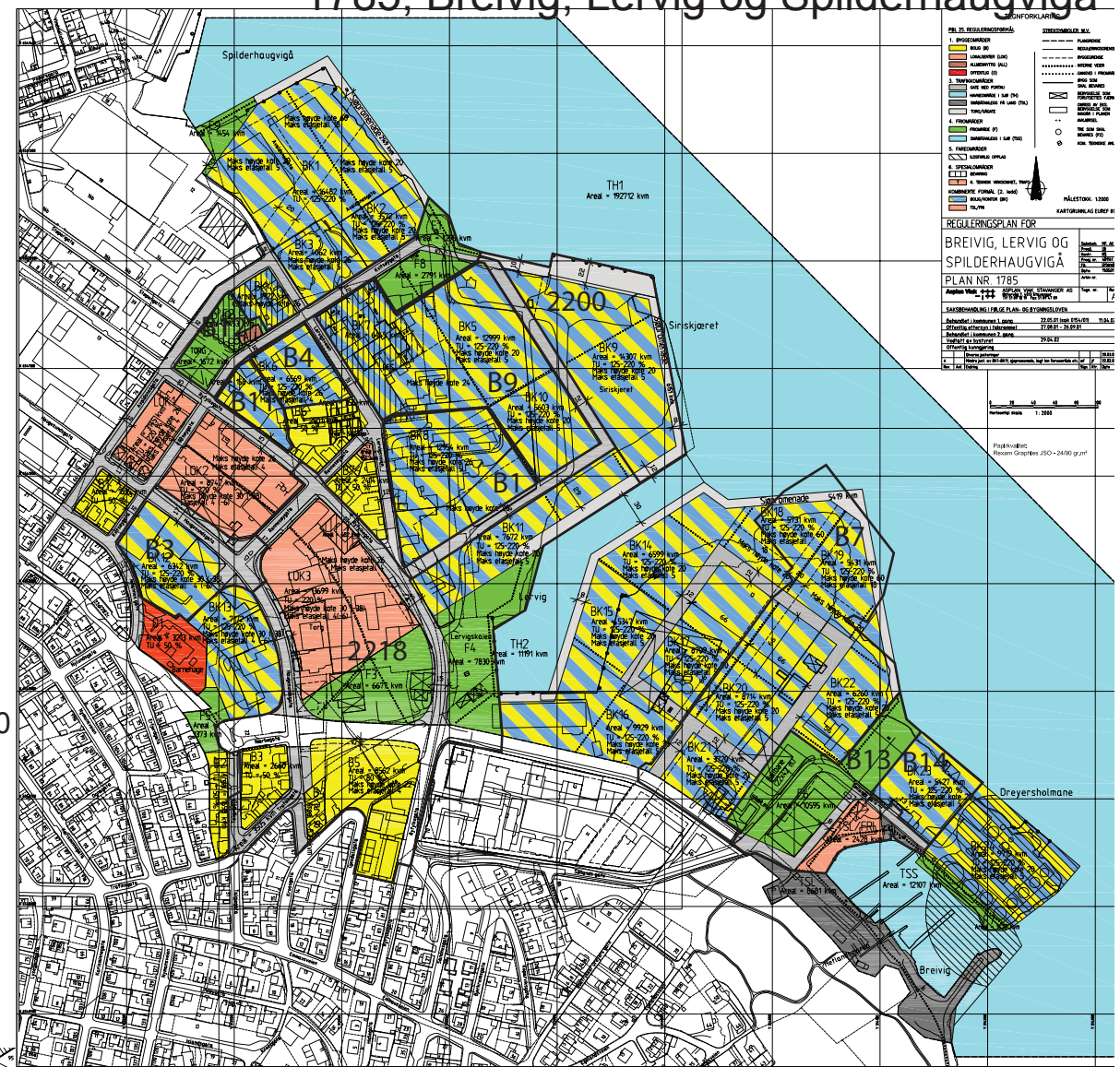
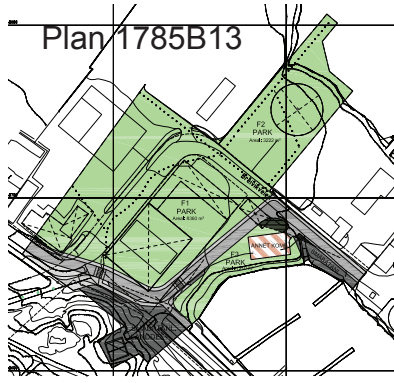
Plan 1785B9



Plan 1785B3


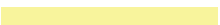




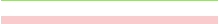









Plan 1785B13



APPENDIX E

LEGEND:

Blocks - Flats.....	
Detached homes.....	
Offices.....	
Industry.....	
Shops.....	
Park.....	
Square.....	
Urban Sjøfront.....	
Outside the area.....	
Parking.....	
Bus stop.....	
Playground.....	
"Blue Promenade".....	
Public water front.....	







Map E.1 Land use in Badedammen





ANALYSIS BADEDAMMEN STAVANGER, TEST CASE

The next pages will show the test case study of Badedammen, according to the toolbox presented in chapter four. As previous mentioned this is a test study, and not the main case.

1 Locate functions in the area

-  Housing
-  Offices
-  Industry

-  Services
 - Food shops
 -  1 Rimi
 -  2 Prix
 -  3 Flügger Farve, Paint shop

-  Optional
 -  4 Joker MC, Motorbike club
 -  5 Stavanger Dykkesenter, Diving club
 -  6 Badedammen Solsenter, Tanning saloon.
 -  7 Badedammen Park

The area close related to the city center, with all the functions the center provides, but there is a clear lack of both optional and service functions in the area.

2 Locate overlap of functions and shared space

There are no spaces that changes function over time.

The Badedammen Park is the only function and space that are shared between the users of the area. There are several housing units in the area that have restricted outdoor space, with a small balcony and some don't even have a balcony.

3 Area efficiency in the specific building

Between the units of the building

All the different building blocks share green space between them. There is also a good distribution of view, and two of the buildings, Verven 36 and 38 have common gardens for the housing units on the roof. Garage and bike parking is also shared between the housing units. Apart from that there seem to be little sharing.

4 Provision of functions and their qualities.

When looking at the qualities offered, it seems like most happen with inn the housing unit. The only functions on the urban scale that we find in Badedammen are the food shops, the park and the playgrounds.

Conclusions from the Badedammen analysis

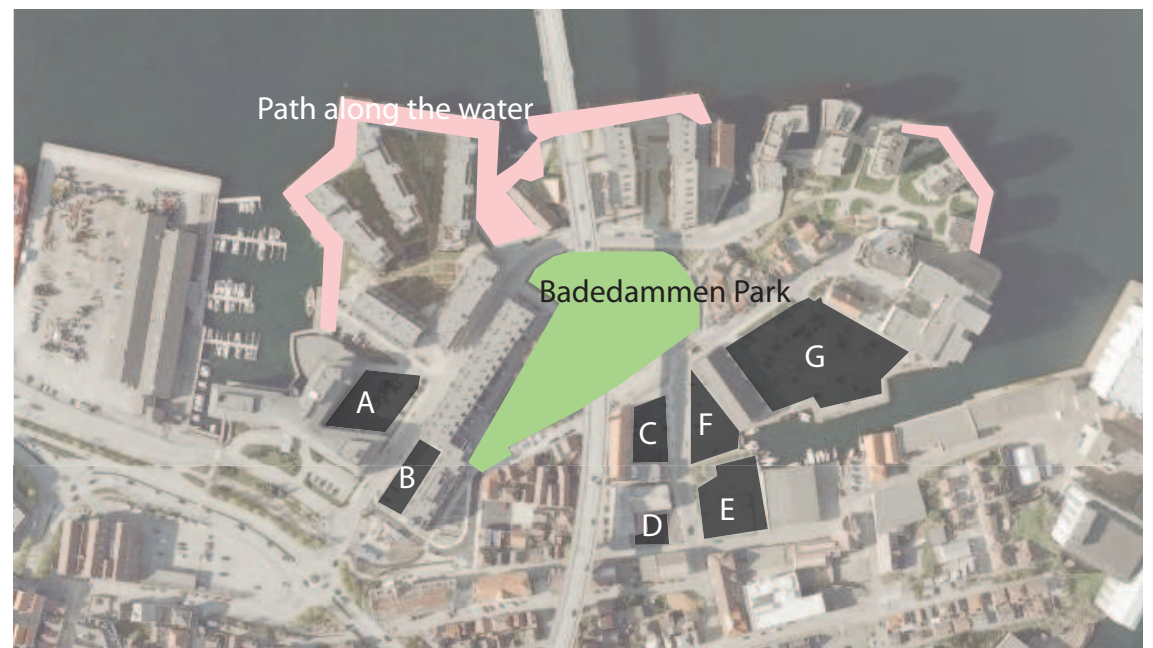
The Badedammen area has a high density of block buildings. Although there are no specific numbers for how many live in the area defined, there are reasons to believe that the density is rather high. The area studied, together with parts of the Urban Sjøfront area, have according to the Levekårsundersøkelse 2010 from the Municipality, 66% one or two room flats. This area also has 1760 inhabitants and 1417 housing units.

Conclusions from this analysis can be, that the build form together with the functions provided will affect the feeling of an area. There is a need of facades that interact with the streets, to create areas that can feel more alive. Outdoor areas are important, but they require furniture, in order to be used. Lamella housing vs. quarter buildings that providing a long facade towards the street, show that the lamella buildings in Badedammen provide views of the water and landscape. Both form all the flats, but also from the street level. In Badedammen most of the gardens between the houses are raised, to host car parking, this creates a solid facade to the street, that block the view. Since this facade has no windows, and make the street seem more dead.

There are little sharing of space and functions, and each housing block seem rather private, not really giving a lot to the area. The same can be sad for the office buildings.

The area also lack of an indoor public space, as well as indoor function for socializing and recreation. It is close to the city center, but there should be some activities in the area, like a cafe etc. The bus stops outside the area, and there is a great surface covered by parking. The parking is regulated, meaning it's only for certain housing addresses or office building.

Badedammen presents itself as a mono functional housing area, with two office buildings and a great deal of private parking. It might seem to have high spatial area efficiency, but low social area efficiency through lack of functions. Badedammen can there for be a good example of how social and spatial area efficient need to work together, in order to provide good and efficient neighborhoods.



Map E.2 Step two in the tool box, shared space in Badedammen

Ways of measuring urban scale area efficiency:

Function	m2	Shared Yes/No	Changes function? Yes/No	When?	Percentage of total area
Parks	10566	public	no		10.7%
Parking					
A	1423.5	private	no		
B	832.4	private	no		
C	919.6	private	no		
D	463.2	private	no		
E	1701.4	private	no		
F	1123.3	private	no		
G	5063.8	private	no		
Total parking	11527.2				11.7%
Roads	6881				7.0%
The total m2 of the whole area: 98221m2					

Figure E.1 Ways of measuring urban scale area efficiency, step two in the analysis

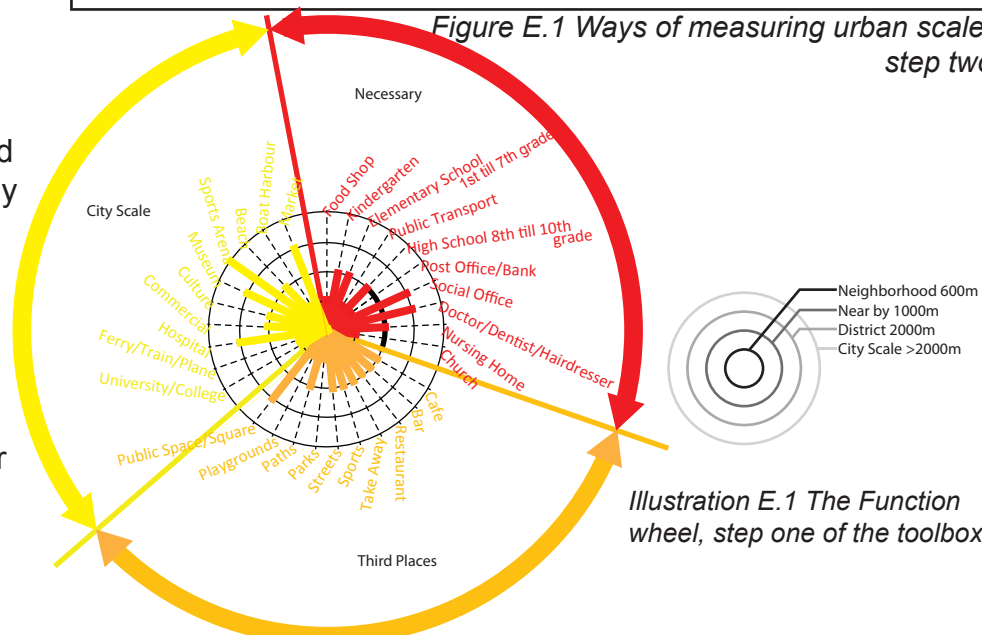


Illustration E.1 The Function wheel, step one of the toolbox



Picture 1 and 2: Gardens between the buildings are raised to facilitate parking under, this create private feel of the gardens, but it also create visual barriers for the pedestrians. There is a great lack of “living facades” facing the street, meaning there are no windows on street level.



Picture 3 and 4: The area in front of the buildings that are facing the water, have the same problem as mentioned for picture 1 and 4. There are no “living facades” towards the path along the key side, and there are as also a lack of places to sit down.



Picture 5: In two of the housing blocks there are small office spaces, both located towards the water. It can be argued, that this office space, could work better as a cafe, with outdoor space in the front. Providing a third place to the area.



Picture 6, 7 and 8: The semiprivate areas between the buildings tend to feel like left over space, with some playground equipment rather randomly placed. Picture 7 also shows a pipe from the garage ventilation standing in between the equipment.



Picture 9 and 10: There is a lot of parking in the area, although all have signs that they are private for a certain address of housing, offices or shops. Big parking spaces near the road destroy the urban feeling. As the distances grow, the road doesn't get a facade. Since the parking is regulated, office parking is generally empty after 5 p.m. and in the weekends, while the parking for the housing units is occupied visa versa.



Picture 11 and 12: There are two large office blocks in the area. The Aker building, picture 11 is removed from the road, and does not interact with the area around. The office building in picture 12 is more blending with the area, especially with the glass front, that could have been a great place for a cafeteria or another function that related outwards, being open for the public and that can give something to the neighborhood.

APPENDIX F

Discription of Flats

Flat	BRA	Nr of Bed rooms	Bed room	Nr of bath rooms	Bath rooms	Living space	Kitchen	Storage	Hall	Walls	Terrace / Balcony	Life cycle	Beds	People	Comments	
Sjøkvartalet																
3 A101 +104 +105	43.5		Hems	1	5	30		hems	7	1.5	12.5 T	visit	2		2 Typical young	
2 A102 + 103	55		14+hems	14	1	6.5		hems	8.5	2	15.5	yes	2		2	
5 A206+209+210+313+316	37.5		1	8	1	4		3.5	3.5	1	6m2 B		2		1 Typical young	
2 A207+314	60.5		1	12.5	1	4.5	D	4	3.5	2.5	10m2 B	yes	2		2 bedroom can be divided	
2 A208+215	55		1	11.5	1	4.5	D	4	3.5	2	10m2 B	yes	2		2	
1 A211	57		1	11	1	4.5	D	4	4	2	10m2 B	yes	2		2	
4 A212+318+422+524	65.5		11+6.5	17.5	1	5.5	D	4	8	2	10m2 B	yes	3		2	
2 A317+421	95.5		13.5+5.5+6	25	3.5+5	8.5	D	3	11	4.5	10m2B	yes	4		2	
2 A419+420	56		1	11.5	1	4.5	D	4	4	1	43.5 m2 B	yes	2		2	
1 A523	96.5		11+5.5+7	23.5	5+5	10	30.5	20	3.5	5	4	10 + 45.5 B	yes	4	2	
24																
2 B101+102	39		hems		1	4.5	27.5	hems 2.5	5	2	22.5 T		2		1 Typical young	
1 B103	93		15+7.5+7.5	30	5+4	9	37.5	3.5	10.5	2.5	22m2 B	yes	4		2	
1 B104	75.5		13+8	21	3.5+2	5.5	35	3.5	9	1.5	39m2 B	yes	3		2	
1 B105	71		15 + hems	15	1	5.5	43	hems	5	2.5			2		2	
1 B106	73		15+hems	15	1	5.5	45		5	2.5	18+12m2 B	yes	3		2	
1 B107	35		hems		1	5	22.5	hems	5	2.5	12.5m2 B	visit	2		1 Typical young	
2 B108+210	33		1	8	1	4	15.5	1.5	3.5	0.5			2		1 Typical young	
1 B209	80		11+7.5	18.5	1	6	36.5+6.5	3	5	4.5	10+6m2 B	yes	3		2 Typical Senior	
3 B211+318+425	80.5		13+9.5	22.5	1	5.5	37	D	3.5	9.5	10m2 B	yes	3		3 Typical senior	
2 B212+319	70.5		13+8	21	1	5.5	30	D	3.5	9	10m2 B	yes	3		2 Typical senior	
3 B213+214+320	87		13+7.5	20.5	1	5.5	46.5	D	4	8.5	10m2 B	yes	4		2 can have extra bedroom	
2 B215+322	40		1	8	1	4	19		3.5	3.5	6m2 B		2		1 Typical Senior	
4 B316+317+423+424	73.5		13+7.5	20.5	1	5.5	33	D	3.5	8.5	10m2 B	yes	3		2	
1 B321	85		13+7.5	20.5	1	5.5	44.5	D	4	8.5	9m2 B	yes	3		2	
1 B426	70.5		12.5+7.5	20	1	5.5	31	D	3.5	8.5	34.5m2 B	yes	3		2	
1 B427	52		1	9.5	1	5	25.2		4	6.5	36.5m2 B	yes	2		2	
1 B528	120		15+7.5+8.5	31	5.5+3.5	9	26.5	26	3.5+3	16.5	36.5m2 B	yes	4		4	
1 B529	124.5		13+7+8	28	6+4	10	29.5+21	13	4	14.5	4	10+48.5m2 B	yes	4	4 Priced at 7.75 mill	
29																
1 C201	45		1	9.5	1	4	22.5		3	3	2	6+27.5m2 B	no	2	2 Typical young	
3 C202+309+413	64		10.5+7	17.5	1	5	30.5	D	4	4	3	10m2 B	no	3	2	
5 C203+204+205+206+207	69/70.5		11+7	18	1	6.5	33.5	D	4	6	2	14+divm2 B	yes	3	2	
2 C308+412	51.5		1	9.5	1	4.5	29	D	3	3.5	2	6m2 B	no	2	2	
2 C310+311	83		6+12	18	1	7	41.5	D	5	9	2.5	23.5m2 B	yes	3	2 hallway can be storage	
1 C414	82		14+6	20	1	6	44	D	6	3.5	2.5	83.5m2 B	yes	3	2 price 5.45 mill	
14																
Hageby 4																
A101+02+03+04+05+06+																
9 07+08+09	137		8.5+7.1+7.5+6.4	29.5	5.2+5.2	10.4	25.5 +15.6	13.5	4.5+2.3	22.71	12.99		14m2 B	no	5	5 4.9m2 extra outdoor storage
6 B101+02+03+04+05+06	98		11+7+6.8+6.3	31.1	5.2+4.5	9.7	13.5	13.5	1.7+1.8+2	18.1	6.6	8.6 m2 B + garden	no	5	4 5.3m2 extra outdoor storage	
3 C101+102+103	137		8.5+7.1+7.5+6.4	29.5	5.2+5.2	10.4	25.5 +15.6	13.5	4.5+2.3	22.71	12.99		14m2 B	no	5	5 4.9m2 extra outdoor storage
4 C104+202+302+402	48		1	10.3	1	4.9	21		5	3.5	3.3	5.4m2 B	visit	2	2 5m2 extra outdoor storage	
4 C105+203+303+403	71		14.4+7	21.4	1	4.9	29.7	D	6.1	4.3	4.6	6.8 m2 B		3	2 5m2 extra outdoor storage	
3 C201+301+401	58		10.2+6.3	16.5	1	4.9	24	D	6	3	3.6	11.5m2 B		3	2 5m2 extra outdoor storage	
29																

Diagram F.1 Discription of Flats, Lervik Brygge

D = dividable
Visit = visit standard
T= Terrace
B= Balcony

	BRA	Nr of bed rooms	Bed room	Nr of bath rooms	Bath rooms	Living space	Kitchen	Storage	Hall	Walls	Terrace / Balcony	Life cycle	Beds	People	Comments
Tou Park															
3 A201+301+401	41.8	1	8.9	1	4.5	18.5		3	4	2.9	B	yes	2	1	
4 A102+202+203+302	69.7	9.1+6.8	15.9	1	5.4	34.2		3	7.9	3.3	B	yes	3	2	
A103+203+303+403+															
8 110+210+310+401	43	1	9.4	1	4.5	19.5		3	4	2.6	B	yes	2	1	
A104+204+304+404+															
8 109+209+309+409	71.8	12.7+7.8	20.5	1	6.1	31.2		3	8	3	B	yes	3	2	
A105+205+305+405+															
8 107+207+307+407	62.1	13.1+6.4	19.5	1	5.2	22.2		3	9.1	3.1	B	yes	3	2	
A106+206+306+406+															
8 108+208+308+408	62.1	13.1+6.4	19.5	1	5.2	22.2		3	9.1	3.1	B	yes	3	2	
4 A111+211+311+411	91.1	12.8+7.2	20	1	5.6	48.7		3	10.2	3.6	B	yes	3	2	Possible to of extra room form
43															
4 B101+201+301+401	80.2	13.4+7.3	20.7	1	5.7	37.1		3	10	3.7	Small balcony	yes	3	2	
B202+203+302+															
6 205+305+405	41.5	1	8.1	1	4.7	18.8		3	4.2	2.7	Small balcony	yes	2	1	
B103+203+303+403+															
8 104+204+304+404	85.2	13.7+8.6+7.6	29.9	1	5.2	32.2		3	9.9	5	Small balcony	yes	4	4	Bedrooms can be joined
4 B106+206+306+406	70.2	12.8+6.9	19.7	1	6.3	30.6		3.1	7.4	3.1	Small balcony	yes	3	2	
22															
4 C101+201+301+401	80.6	14.2+7.1	21.3	1	5.3	38.3		3	8.8	3.9	Small balcony	yes	3	2	
4 C102+202+203+302	60.5	11.3+6.8	18.1	1	4.8	23		3	8.2	3.4	balcony	yes	3	2	
4 C103+203+303+403	70	12.8+8.3	21.1	1	5.8	27.6		3	8.6	3.9	Small balcony	yes	3	3	
4 C104+204+304+404	70	12.8+8.3	21.1	1	5.8	27.6		3	8.6	3.9	balcony	yes	3	3	
C105+205+305+405+															
8 107+207+307+407	62.1	12.8+6.4	19.2	1	5.2	22.2		3	9.1	3.4	Small balcony	yes	3	2	
C106+206+306+406+															
8 108+208+308+408	62.1	12.8+6.4	19.2	1	5.2	22.2		3	9.1	3.4	Balcony	yes	3	2	
1 CU01	67.8		19.4	1	4.8	37.4			3.5	2.7		yes	2	2	
1 CU02	68.3		12.6	1	6.1	39.9		3.1	3.5	3.1		yes	2	2	
2 CU03+CU04	60.06		12.6	1	6.1	32.2		3.1	3.5	2.56		yes	2	2	
36															
Haugesundsgaten															
1 A31	64	10.9+5.9	16.8	1	4.6	31.2			7.3	4.1	Small balcony	no	3	2	Hallway wit storage
1 A32	60.5	10.2+5.7	15.9	1	4	34.22			4.2	2.18	Small balcony	no	3	2	
1 A43	74.8	10.9+6.1	17	1	4	41.9			7.8	4.1	Small balcony	no	3	2	
1 A54	98.7	11.9+6.7	18.6	6.8+2	8.8	55.42			10.16	5.72	Two small balconies	no	3	3	
1 A65	60.2	10+6.2	16.2		3.7	31			5.8	3.5	Small balcony	no	3	2	
1 A66	65.2	11+6	17	1.65+5	6.65	33.7			5	2.85	Small balcony	no	3	2	
6										0					
4 B11+12+13+14	39.2		7.2		4	22.2			4.2	1.6	Terrace	no	2	1	
2 B25+26	39.2		7.2		4	22.2			4.2	1.6		no	2	1	
1 B27	62.6	11.8+8	19.8		5	31.5			4.1	2.2	Balcony	no	3	2	
1 B38	54.2		13.5		4.6	29.2			5	1.9	Balcony	no	2	2	
1 B39	81.4	10.9+8.4	19.3	1.7+5.2	6.9	38.4		4.2	8.26	4.34	Balcony	no	3	3	
1 B410	60.7	10.6+6	16.6		4.3	34.4			2.7	2.7	Big balcony	no	3	2	
10															
2 C11+12	44.1		10.8		4.2	24.3			2.7	2.1	Terrace	no	2	2	
1 C13	46		10.8		4.1	26.4			3.3	1.4		no	2	2	
1 C14	46		10.8		4.1	26.4			3.3	1.4	Terrace	no	2	2	
2 C25+26	44.1		10.8		4.2	24.3			2.7	2.1		no	2	2	
1 C27	78	11.2+6.5+6.4	24.1	6.4+1.6	8	35.5			7	3.4	Balcony	no	4	4	
1 C38	56.9	12+7.5	19.5		4.6	23.4			7.5	1.9	38m2 Balcony	no	3	2	Hallway with storage
8															

D = dividable
Visit = visit standard
T = Terrace
B = Balcony

Diagram F.2 Discription of Flats, Tou Park and Haugesundsgate

	BRA	Nr of bed rooms	Bed room	Nr of bath rooms	Bath rooms	Living space	Kitchen	Storage	Hall	Walls	Terrace / Balcony	Life cycle	Beds	People	Comments
Støperigaten 15															
101+102+103+104+105+ 9 106+107+108+109	50.4	10.7	+2xhems 10.7	3.0+3.6	6.6	21.6			9.4	2.1	Terrace	no	3	3	Can be divided in to two flats
212+213+214+215+216+ 217+218+219+220+325+ 326+327+328+329+330+ 16 331	50.4	10,7	+ 2xhems 10.7	3.0+3.6	6.6	21.6			9.4	2.1	4m2 balcony	no	3	3	Can be divided in to two flats
4 110+111+221+222	43.3		10.7		4.1	17.7			9.4	1.4	Balcony	no	2	1	
2 323+324	50.4	10,7	+ hems 10.7		4.1	23.4			9.4	2.8	4m2 balcony	no	2	2	
1 332	86.6	13,6	+ hems 13.6	2+5.7	7.7	48	D	3.1	10.58	3.62	Balcony	no	3	2	
32															
Siriskjær 2															
101+201+202+211+312+ 8 412+504+603	43.87		8.83		5	25.9	D		2.4	1.74	Small balcony	no	2	2	Extra room can be divided 2 of, but poor solution
102+205+206+207+208+ 302+303+306+307+308+ 309+402+403+406+407+ 17 408+409	32.46		9.27		3.52	16			2.4	1.27	Small balcony	no	2	1	
3 103+301+401	21.43				3.46	15			2.34	0.63	Small balcony	no	1	1	
104+105+209+210+310+ 8 311+410+411	44.1	8.84+6.16	15		5.2	19.49			2.2	2.21	balcony	no	3	2	
1 106	43.2		10.14		5	24.42			2.5	1.14	Small balcony	no	2	2	
4 203+304+404+502	50.56	10.72+7.16	17.88		4.59	19.85			6.59	1.65	Small + large balcony	no	3	2	
4 204+305+405+503	54.86		8.73		3.69	37.83			3	1.61	Small balcony	no	2	2	
1 501	89.24	11.58+6.84+6.84	25.26		6.58	43.42		3.14	8.66	2.18	Large balcony	no	4	4	
2 505+604	44.38	9.3+9.4	18.7		3.68	15.46		2.75	1.92	1.87	Small balcony	no	3	3	
1 601	68.62	8.93+6.23	15.16		5.29	37.26		3.19	3.47	4.25	Large balcony	no	3	2	
1 602	105.2	15.18+7.22+7.32	29.72	6.11+1.28	7.39	60.45		2.87	2.07	2.7	Large balcony	no	4	4	
50															
Siriskjær 4															
101+102+104+201+201+ 204+301+302+304+401+ 12 402+404	32.2		7.75		4.11	15.89			2.28	2.17	Small balcony	no	2	1	
2 103+106	44.48		8.83		4.5	26.43			2.53	2.19	Small balcony	no	2	2	
105+205+208+305+308+ 7 405+408	43.58		14.74		5.2	19.88			2.4	1.36	Small balcony	no	2	2	
3 206+306+406	73.54	9.86+9	18.86		5.2	37.29	D	6.63	4.37	1.19	Two small balconies	no	3	3	
3 207+307+407	71.3	11.19+8.29	19.48		5.2	34.01	D	6.6	4.2	1.81	Small balcony	no	3	3	
3 203+303+403	59.51	12.89+8	20.89		4.5	21.8		3.58	3.38	5.36	Small balcony	no	3	3	
1 501	73.66	10+9	19		4.5	37.22		6.28	3.77	2.89	Large balcony	no	3	3	
1 502	94.9	10.94+7	17.94		6.1	61.33	D	3.1	3.5	2.93	Small balcony	no	3	2	
2 503+505	66.48	8.38+8.38	16.76		5.2	33.34	D	2.1+3	4	2.08	Balcony	no	3	3	
1 504	105.2	15.2+12.5	27.7	5.54+1.3	6.84	53.48		2.57+3	2.75	8.86	Two balconies	no	4	3	Going through flat
35															
Siriskjær 6															
101+102+104+201+201+ 204+301+302+304+401+ 12 402+404	32.2		7.75		4.11	15.89			2.28	2.17	Small balcony	no	2	1	
2 103+106	44.48		8.83		4.5	26.43			2.53	2.19	Small balcony	no	2	2	
105+205+208+305+308+ 7 405+408	43.58		14.74		5.2	19.88			2.4	1.36	Small balcony	no	2	2	
3 206+306+406	73.54	9.86+9	18.86		5.2	37.29	D	6.63	4.37	1.19	Two small balconies	no	3	3	
3 207+307+407	71.3	11.19+8.29	19.48		5.2	34.01	D	6.6	4.2	1.81	Small balcony	no	3	3	
3 203+303+403	59.51	12.89+8	20.89		4.5	21.8		3.58	3.38	5.36	Small balcony	no	3	3	
1 501	73.66	10+9	19		4.5	37.22		6.28	3.77	2.89	Large balcony	no	3	3	
1 502	94.9	10.94+7	17.94		6.1	61.33	D	3.1	3.5	2.93	Small balcony	no	3	2	
2 503+505	66.48	8.38+8.38	16.76		5.2	33.34	D	2.1+3	4	2.08	Balcony	no	3	3	
1 504	105.2	15.2+12.5	27.7	5.54+1.3	6.84	53.48		2.57+3	2.75	8.86	Two balconies	no	4	3	Going through flat
35															

Diagram F.3 Discription of Flats, Støperigaten 15 and Siriskjær 2, 4 and 6

D = dividable

Visit = visit standard

T = Terrace

B = Balcony

APPENDIX G

Total BRA	Sjøkvartalet	% of BRA							Total LS+K	Wall space	Total	
		BRA	Flats	Hallway	Storage	Bed room	Bath room	Living space				
130.5	A101 +104 +105	43.5	3	16.1		0	11.5	69.0	69.0	3.4	100.0	Hems is bedroom
110.0	A102 + 103	55.0	2	15.5		25.5	11.8	43.6	43.6	3.6	100.0	
187.5	A206+209+210+313+316	37.5	5	9.3	9.3	21.3	10.7	46.7	46.7	2.7	100.0	
121.0	A207+314	60.5	2	5.8	6.6	20.7	7.4	55.4	55.4	4.1	100.0	
110.0	A208+215	55.0	2	6.4	7.3	20.9	8.2	53.6	53.6	3.6	100.0	
57.0	A211	57.0	1	7.0	7.0	19.3	7.9	55.3	55.3	3.5	100.0	
262.0	A212+318+422+524	65.5	4	12.2	6.1	26.7	8.4	43.5	43.5	3.1	100.0	
191.0	A317+421	95.5	2	11.5	3.1	26.2	8.9	45.5	45.5	4.7	100.0	
112.0	A419+420	56.0	2	7.1	7.1	20.5	8.0	55.4	55.4	1.8	100.0	
96.5	A523	96.5	1	5.2	3.6	24.4	10.4	31.6	20.7	52.3	4.1	100.0
1377.5			24									
78.0	B101+102	39.0	2	12.8		0	11.5	70.5	70.5	5.1	100.0	Hems is bedroom
93.0	B103	93.0	1	11.3	3.8	32.3	9.7	40.3	40.3	2.7	100.0	
75.5	B104	75.5	1	11.9	4.6	27.8	7.3	46.4	46.4	2.0	100.0	
71.0	B105	71.0	1	7.0		21.1	7.7	60.6	60.6	3.5	100.0	
73.0	B106	73.0	1	6.8	0.0	20.5	7.5	61.6	61.6	3.4	100.0	
35.0	B107	35.0	1	14.3		0	14.3	64.3	64.3	7.1	100.0	Hems is bedroom
66.0	B108+210	33.0	2	10.6	4.5	24.2	12.1	47.0	47.0	1.5	100.0	
80.0	B209	80.0	1	6.3	3.8	23.1	7.5	53.8	53.8	5.6	100.0	
241.5	B211+318+425	80.5	3	11.8	4.3	28.0	6.8	46.0	46.0	3.1	100.0	
141.0	B212+319	70.5	2	12.8	5.0	29.8	7.8	42.6	42.6	2.1	100.0	
261.0	B213+214+320	87.0	3	9.8	4.6	23.6	6.3	53.4	53.4	2.3	100.0	
80.0	B215+322	40.0	2	8.8	8.8	20.0	10.0	47.5	47.5	5.0	100.0	
294.0	B316+317+423+424	73.5	4	11.6	4.8	27.9	7.5	44.9	44.9	3.4	100.0	
85.0	B321	85.0	1	10.0	4.7	24.1	6.5	52.4	52.4	2.4	100.0	
70.5	B426	70.5	1	12.1	5.0	28.4	7.8	44.0	44.0	2.8	100.0	
52.0	B427	52.0	1	12.5	7.7	18.3	9.6	48.5	48.5	3.5	100.0	
120.0	B528	120.0	1	13.8	5.4	25.8	7.5	22.1	21.7	43.8	3.8	100.0
124.5	B529	124.5	1	11.6	3.2	22.5	8.0	40.6	10.4	51.0	3.6	100.0
2041.0			29									
45.0	C201	45.0	1	8.9	6.7	21.1	8.9	50.0	50.0	4.4	100.0	
192.0	C202+309+413	64.0	3	6.3	6.3	27.3	7.8	47.7	47.7	4.7	100.0	
350.0	C203+204+205+206+207	70.0	5	8.6	5.7	25.7	9.3	47.9	47.9	2.9	100.0	
103.0	C308+412	51.5	2	6.8	5.8	18.4	8.7	56.3	56.3	3.9	100.0	
166.0	C310+311	83.0	2	10.8	6.0	21.7	8.4	50.0	50.0	3.0	100.0	
82.0	C414	82.0	1	4.3	7.3	24.4	7.3	53.7	53.7	3.0	100.0	
938.0			14									
	Hageby 4											
	A101+02+03+04+05+06+											
1188.0	07+08+09	132.0	9	16.6	5.0	21.5	7.6	30.0	9.9	39.9	9.5	100.0
558.0	B101+02+03+04+05+06	93.0	6	18.5	5.6	31.7	9.9	13.8	13.8	27.6	6.7	100.0
396.0	C101+102+103	132.0	3	16.6	5.0	21.5	7.6	30.0	9.9	39.9	9.5	100.0
172.0	C104+202+302+402	43.0	4	7.3	10.4	21.5	10.2	43.8	43.8	6.9	100.0	
260.0	C105+203+303+403	65.0	4	6.1	8.6	30.1	6.9	41.8	41.8	6.5	100.0	
162.0	C201+301+401	54.0	3	5.2	10.3	28.4	8.4	41.4	41.4	6.2	100.0	
2736.0			29									

Figure G.1 BRA and Percentage of BRA for Lervik Brygge

Total BRA	Tou Park	% of BRA										Total	Wall space	Total
		BRA	Flats	Hallway	Storage	Bed room	Bath room	Living space	Kitchen	LS+K				
125.4	A201+301+401	41.8	3	9.6	7.2	21.3	10.8	44.3	0	44.3	6.9	100.0		
278.8	A102+202+203+302	69.7	4	11.3	4.3	22.8	7.7	49.1	0	49.1	4.7	100.0		
344.0	A103+203+303+403+													
	110+210+310+401	43.0	8	9.3	7.0	21.9	10.5	45.3	0	45.3	6.0	100.0		
	A104+204+304+404+													
574.4	109+209+309+409	71.8	8	11.1	4.2	28.6	8.5	43.5	0	43.5	4.2	100.0		
	A105+205+305+405+													
496.8	107+207+307+407	62.1	8	14.7	4.8	31.4	8.4	35.7	0	35.7	5.0	100.0		
	A106+206+306+406+													
496.8	108+208+308+408	62.1	8	14.7	4.8	31.4	8.4	35.7	0	35.7	5.0	100.0		
364.4	A111+211+311+411	91.1	4	11.2	3.3	22.0	6.1	53.5	0	53.5	4.0	100.0		
2680.6			43											
320.8	B101+201+301+401	80.2	4	12.5	3.7	25.8	7.1	46.3	0	46.3	4.6	100.0		
	B202+203+302+													
249.0	205+305+405	41.5	6	10.1	7.2	19.5	11.3	45.3	0	45.3	6.5	100.0		
	B103+203+303+403+													
681.6	104+204+304+404	85.2	8	11.6	3.5	35.1	6.1	37.8	0	37.8	5.9	100.0		
280.8	B106+206+306+406	70.2	4	10.5	4.4	28.1	9.0	43.6	0	43.6	4.4	100.0		
1532.2			22											
322.4	C101+201+301+401	80.60	4	10.9	3.7	26.4	6.6	47.5	0	47.5	4.8	100.0		
242.0	C102+202+203+302	60.50	4	13.6	5.0	29.9	7.9	38.0	0	38.0	5.6	100.0		
280.0	C103+203+303+403	70.00	4	12.3	4.3	30.1	8.3	39.4	0	39.4	5.6	100.0		
280.0	C104+204+304+404	70.00	4	12.3	4.3	30.1	8.3	39.4	0	39.4	5.6	100.0		
	C105+205+305+405+													
496.8	107+207+307+407	62.10	8	14.7	4.8	30.9	8.4	35.7	0	35.7	5.5	100.0		
	C106+206+306+406+													
496.8	108+208+308+408	62.10	8	14.7	4.8	30.9	8.4	35.7	0	35.7	5.5	100.0		
67.8	CU01	67.8	1	5.2	0.0	28.6	7.1	55.2	0	55.2	4.0	100.0		
68.3	CU02	68.3	1	5.1	4.5	18.4	8.9	58.4	0	58.4	4.5	100.0		
120.1	CU03+CU04	60.1	2	5.8	5.2	21.0	10.2	53.6	0	53.6	4.3	100.0		
2374.2			36											

Figure G.2 BRA and Percentage of BRA for Tou Park

		% of BRA										
Total BRA	Haugesundsgate	BRA	Flats	Hallway	Storage	Bed room	Bath room	Living space	Kitchen	Total LS+K	Wall space	Total
64	A31	64.0	1	11.4	0	26.3	7.2	48.8	0	48.8	6.4	100.0
60.5	A32	60.5	1	6.9	0	26.3	6.6	56.6	0	56.6	3.6	100.0
74.8	A43	74.8	1	10.4	0	22.7	5.3	56.0	0	56.0	5.5	100.0
98.7	A54	98.7	1	10.3	0	18.8	8.9	56.1	0	56.1	5.8	100.0
60.2	A65	60.2	1	9.6	0	26.9	6.1	51.5	0	51.5	5.8	100.0
65.2	A66	65.2	1	7.7	0	26.1	10.2	51.7	0	51.7	4.4	100.0
423.4												
156.8	B11+12+13+14	39.2	4	10.7	0	18.4	10.2	56.6	0	56.6	4.1	100.0
78.4	B25+26	39.2	2	10.7	0	18.4	10.2	56.6	0	56.6	4.1	100.0
62.6	B27	62.6	1	6.5	0	31.6	8.0	50.3	0	50.3	3.5	100.0
54.2	B38	54.2	1	9.2	0	24.9	8.5	53.9	0	53.9	3.5	100.0
81.4	B39	81.4	1	10.1	5.2	23.7	8.5	47.2	0	47.2	5.3	100.0
60.7	B410	60.7	1	4.4	0	27.3	7.1	56.7	0	56.7	4.4	100.0
494.1												
88.2	C11+12	44.1	2	6.1	0	24.5	9.5	55.1	0	55.1	4.8	100.0
46	C13	46.0	1	7.2	0	23.5	8.9	57.4	0	57.4	3.0	100.0
46	C14	46.0	1	7.2	0	23.5	8.9	57.4	0	57.4	3.0	100.0
88.2	C25+26	44.1	2	6.1	0	24.5	9.5	55.1	0	55.1	4.8	100.0
78	C27	78.0	1	9.0	0	30.9	10.3	45.5	0	45.5	4.4	100.0
56.9	C38	56.9	1	13.2	0	34.3	8.1	41.1	0	41.1	3.3	100.0
403.3			8									
	Støperigaten											
453.6	101+102+103+104+105+ 106+107+108+109 212+213+214+215+216+ 217+218+219+220+325+ 326+327+328+329+330+	50.4	9	18.7	0.0	21.2	13.1	42.9	0	42.9	4.2	100.0
806.4	331	50.4	16	18.7	0.0	21.2	13.1	42.9	0	42.9	4.2	100.0
173.2	110+111+221+222	43.3	4	21.7	0.0	24.7	9.5	40.9	0	40.9	3.2	100.0
100.8	323+324	50.4	2	18.7	0.0	21.2	8.1	46.4	0	46.4	5.6	100.0
86.6	332	86.6	1	12.2	3.6	15.7	8.9	55.4	0	55.4	4.2	100.0
1620.6			32									

Figure G.3 BRA and Percentage of BRA for Haugesundsgate and Støperigaten

		% of BRA										
		Siriskjær 2										
Total BRA	101+201+202+211+312+ 412+504+603	BRA	Flats	Hallway	Storage	Bed room	Bath room	Living space	Kitchen	Total LS+K	Wall space	Total
351.0		43.87	8	5.5	0.0	20.1	11.4	59.0	0.0	59.0	4.0	100.0
	102+205+206+207+208+ 302+303+306+307+308+ 309+402+403+406+407+											
551.8	408+409	32.46	17	7.4	0.0	28.6	10.8	49.3	0.0	49.3	3.9	100.0
64.3	103+301+401	21.43	3	10.9	0.0	0.0	16.1	70.0	0.0	70.0	2.9	100.0
	104+105+209+210+310+											
352.8	311+410+411	44.1	8	5.0	0.0	34.0	11.8	44.2	0.0	44.2	5.0	100.0
43.2	106	43.2	1	5.8	0.0	23.5	11.6	56.5	0.0	56.5	2.6	100.0
	203+304+404+502							39.3				
	204+305+405+503											
89.2	501	89.24	1	9.7	3.5	28.3	7.4	48.7	0.0	48.7	2.4	100.0
88.8	505+604	44.38	2	4.3	6.2	42.1	8.3	34.8	0.0	34.8	4.2	100.0
68.6	601	68.62	1	5.1	4.6	22.1	7.7	54.3	0.0	54.3	6.2	100.0
105.2	602	105.2	1	2.0	2.7	28.3	7.0	57.5	0.0	57.5	2.6	100.0
1714.9			50									
		Siriskjær 4										
	101+102+104+201+201+ 204+301+302+304+401+											
386.4	402+404	32.2	12	7.1	0.0	24.1	12.8	49.3	0	49.3	6.7	100.0
89.0	103+106	44.48	2	5.7	0.0	19.9	10.1	59.4	0	59.4	4.9	100.0
	105+205+208+305+308+											
305.1	405+408	43.58	7	5.5	0.0	33.8	11.9	45.6	0	45.6	3.1	100.0
220.6	206+306+406	73.54	3	5.9	9.0	25.6	7.1	50.7	0	50.7	1.6	100.0
213.9	207+307+407	71.3	3	5.9	9.3	27.3	7.3	47.7	0	47.7	2.5	100.0
178.5	203+303+403	59.51	3	5.7	6.0	35.1	7.6	36.6	0	36.6	9.0	100.0
73.7	501	73.66	1	5.1	8.5	25.8	6.1	50.5	0	50.5	3.9	100.0
94.9	502	94.9	1	3.7	3.3	18.9	6.4	64.6	0	64.6	3.1	100.0
133.0	503+505	66.48	2	6.0	7.7	25.2	7.8	50.2	0	50.2	3.1	100.0
105.2	504	105.2	1	2.6	5.3	26.3	6.5	50.8	0	50.8	8.4	100.0
1800.2			35									
		Siriskjær 6										
	101+102+104+201+201+ 204+301+302+304+401+											
386.4	402+404	32.2	12	7.1	0.0	24.1	12.8	49.3	0	49.3	6.7	100.0
89.0	103+106	44.48	2	5.7	0.0	19.9	10.1	59.4	0	59.4	4.9	100.0
	105+205+208+305+308+											
305.1	405+408	43.58	7	5.5	0.0	33.8	11.9	45.6	0	45.6	3.1	100.0
220.6	206+306+406	73.54	3	5.9	9.0	25.6	7.1	50.7	0	50.7	1.6	100.0
213.9	207+307+407	71.3	3	5.9	9.3	27.3	7.3	47.7	0	47.7	2.5	100.0
178.5	203+303+403	59.51	3	5.7	6.0	35.1	7.6	36.6	0	36.6	9.0	100.0
73.7	501	73.66	1	5.1	8.5	25.8	6.1	50.5	0	50.5	3.9	100.0
94.9	502	94.9	1	3.7	3.3	18.9	6.4	64.6	0	64.6	3.1	100.0
133.0	503+505	66.48	2	6.0	7.7	25.2	7.8	50.2	0	50.2	3.1	100.0
105.2	504	105.2	1	2.6	5.3	26.3	6.5	50.8	0	50.8	8.4	100.0
1800.2			35									

Figure G.4 BRA and Percentage of BRA for Siriskjær 2, 4 and 6

APPENDIX H

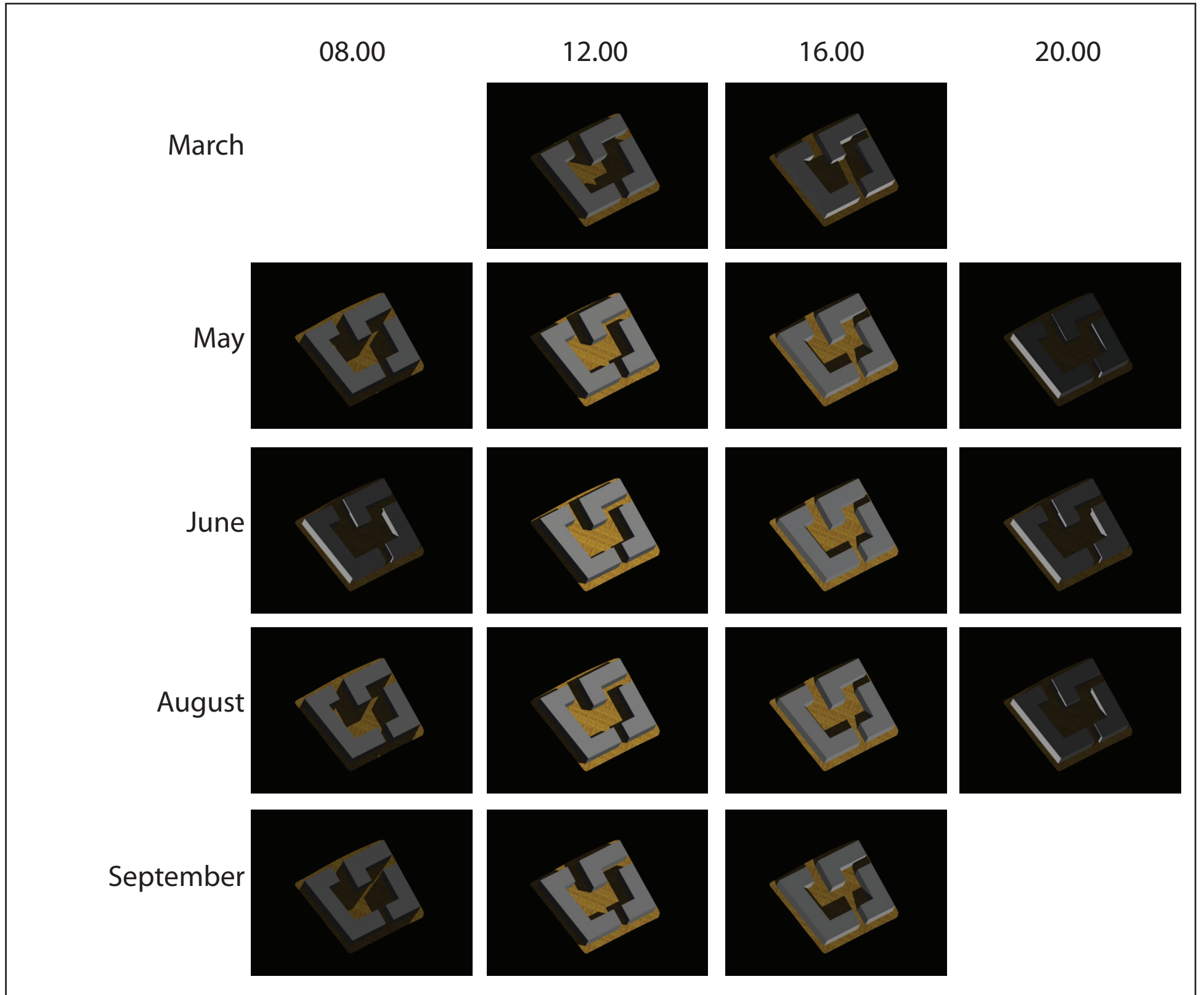
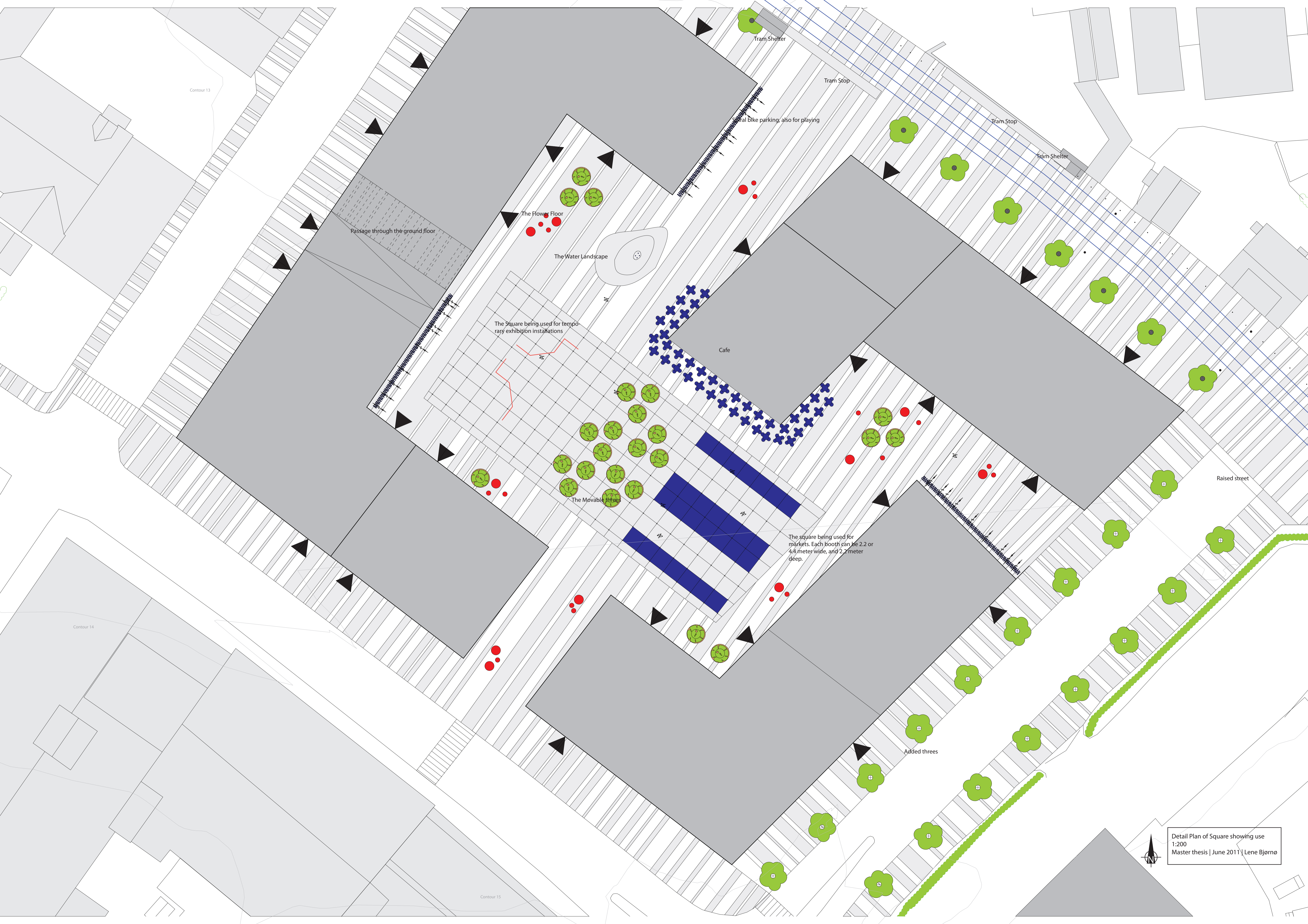


Illustration H.1 Sun diagram of the project buildings, showing the shade on the public square at different times of the day and year



Contour 13

Tram Shelter

Tram Stop

Tram Stop

Tram Shelter

Passage through the ground floor

The Flower Floor

The Water Landscape

The Square being used for temporary exhibition installations

Cafe

The Movable Tables

The square being used for markets. Each booth can be 2.2 or 4.4 meter wide, and 2.2 meter deep.

Raised street

Added threes

Contour 14

Contour 15



Detail Plan of Square showing use
1:200
Master thesis | June 2011 | Lene Bjørnø