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Sustainable Transitions at Home
– Insights by the HSB Living Lab Project Member Organizations

Master's Thesis in the Master's Programme Design for Sustainable Development

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CHALMERS UNIVERSITY OF TECHNOLOGY
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ABSTRACT

Presently, a large part of our daily resource consumption occurs at home. In order to finding ways to decrease resource consumption and harmful environmental impact, the research and student housing facility HSB Living Lab will be built by HSB and Chalmers in collaboration with several other partners from different industries. In the living lab, research projects will take place on different aspects such as washing, where a shared laundry room will also function as a social meeting space, as well as energy management and sensors inside apartments measuring thermal comfort. The advantage with testing and evaluating ideas and products at a living lab facility is to actually be able to examine how individuals, in their home environment, interact with and react on ideas and products. This enables academia and companies to evaluate which ideas are working and which are not, seen both from the perspective of the individual on terms of practicality, and from a sustainability perspective. The HSB Living Lab project was exhibited during Sweden's most important political event, Almedalsveckan in Visby, and the exhibition functioned as a case study for this thesis in terms of what and how the project ought to be communicated to the audience in Almedalen.

The aim for this thesis is to explore the relationship between innovations, transition theory and practice theory. In order to do that, in-depth interviews were held with representatives from Chalmers, HSB, Johanneberg Science Park and other partners involved in this project. This collected data was then used as a basis for a qualitative analysis, relating answers to transition theory and the multi-level perspective, practice theory and to a Living Lab-discourse jointly created between members in the Living Lab-project. Conclusions were that more links were found to a shared Living Lab-discourse within the group and links to a general sustainability-discourse than to transition theory and practice theory. Reasons for involvement in the project include moral obligations to do the right thing as well as strengthening the own brand, while market conditions and current socio-political and socio-technical systems function as barriers hindering new innovations to break through.

Key words: sustainability, living lab, resource consumption, lifestyle, transition, practice, routine

Contents

Preface

This master thesis report is produced by Sarah Franzén within the frame of the master programme Design for Sustainable Development. The study is based on in-depth interviews with participants in the HSB Living Lab- project presently taking place on campus Johanneberg at Chalmers University of Technology, in a joint effort with several prominent industry partners to come up with solutions intending to lead to the sustainable housing of the future.

Interviews were held with seven out of nine approached organizations involved in the HSB Living Lab project during the planning phase of this study in the spring 2015. The interviews were done either face-to-face, by phone or strictly per e-mail correspondence, before being transcribed and qualitatively analysed. Greg Morrison functioned as an examiner with Shea Hagy as the supervisor.

I am very grateful for all help and support provided to me during the work with this thesis, and I would especially like to thank all the persons willing to be interviewed by me. Thank you so much, it was all very informative and interesting! I'd also like to thank Frida Bard and Afra Noubarzadeh for letting me use their photographs in my thesis.

Finally, I'd also like to express my gratitude for being invited to attend the exhibition in Almedalen in June-July 2015. That was a lot of fun!

Göteborg, September 2015
Sarah Franzén

1 Introduction

The population of the world is rising, with an estimated population of 9.6 billion people in 2050. A vast majority of the population today live in developing countries with very varying standards of living. Since the Brundtland commission of 1987 and the emergence of the term 'sustainable development', people have been increasingly aware of the downsides of the Western world's more affluent lifestyles like resource depletion and climate change, not to mention the issues associated with global inequalities between the rich and the poor; the latter also being affected by climate change the most.

At the same time, countries like India and China experience rapid changes with a fast-growing middle class, meaning that people are better off in material terms but also put additional stress on the already strained capacity of the Earth. This of course raises ethical questions: levelling out global inequalities is something worth striving for, but the Earth simply cannot manage to provide the affluent lifestyle of the world's developed countries for all. Already, we have seen an increase of 0.9 degrees in global average temperatures in the 20th century, and the current CO_2-concentration of approximately 390 ppm in the atmosphere cannot be found during the last 800 000 years.

Thus, measures are urgent and major adaptations must be done. Overconsumption leading to resources ending up as waste must stop. On the positive side is the fact that consumption and material standards are only related to human well-being up to a certain threshold level, after which additional consumption doesn't really cause increased happiness levels; however, the downside is that the throw away-society during a relatively short time has managed to take deep roots causing profound changes to everyday lives. Moreover, things must be done, and it's time for the Western world to step back and decrease consumption, thus allowing people in the rest of the world to reach decent and dignified living standards. The adaptation to more sustainable lifestyles among the general public is an urgent issue.

1.1 Background

Individual involvement in practices, such as cooking, cleaning, and playing computer games, are increasingly seen as a possible point of departure for enhancing sustainability (e.g. Gram-Hanssen 2008, Hargreaves 2011, Ingram et al 2007, Reckwitz 2002). At the same time, sustainable technologies are seen as another aspect of sustainable lifestyles: resource and energy efficient technologies make it easier to lead a more sustainable life. Transitions towards sustainability are from a socio-technical point of view facilitating lifestyle changes, with technologies as the possible incubators and starting points for change (e.g. Geels 2002, Geels & Schot 2007, Rotmans et al 2001). One type of incubator is the living lab-approach: a co-development of concepts and products between academia, business and society, jointly defining problems and creating solutions (e.g. Ståhlbröst 2012, Bakker et al 2010, Hagy & Balay 2014).

At Chalmers University of Technology in Gothenburg, Sweden, a new living lab will be built during 2015, the HSB Living Lab. This is done by Chalmers in close cooperation with HSB, a large cooperative housing company in Sweden owned by its members, and Johanneberg Science Park, a local technology cluster at the Chalmers Johanneberg Campus partially owned by Chalmers and the city of Gothenburg, along with several other industrial partners. The HSB Living Lab will provide an arena for numerous projects on sustainability, with research being a joint effort between scientists and the inhabitants of the living lab (Hagy and Balay 2014 p.27 & 35). The HSB Living Lab was exhibited at the yearly event taking place in Almedalen in the main town Visby on Gotland, Sweden's largest island, located in the eastern parts of the country. There were at least 30 000 visitors attending the event in 2014 (Almedalsveckan 2014 p.1).

1.2 Objectives and focus areas

Today, resource consumption at home is a significant source of harmful environmental impact. This thesis aims at identifying habits, obstacles and innovations which are either enabling sustainable lifestyles or obstructing them in people's every-day life; a task which was carried out through in-depth interviews with representatives from several of the organizations which are partners in the HSB Living Lab project. This task was then complemented by a few interviews with individuals on matters related to sustainable lifestyles at home. In addition, issues of co-creation related to the exhibition in Almedalen are explored.

1.3 Formulated questions

1. What expectations do the HSB Living Lab partners have on the participation in the project, and which motives do they define as the most important to partake?

2. Which links to living lab methodology, transition theory and practice theory can be identified in data provided through interviews with HSB Living Lab partners?

3. What obstacles can be identified as hindering sustainable lifestyles at home, and which potential innovations could possibly foster transitions towards a more sustainable life at home?

4. Which communication criteria can be recommended in order to engage the public into co-creation activities with the aim to increase willingness to live more sustainably at home among the visitors during Almedalsveckan?

1.4 Limitations

The scope of this thesis is concerning individuals and their habits and lifestyles taking place in their home environment. Time is an important limiting factor since 20 weeks are the time frame for thesis work in general. Other limitations include both the amount and availability of information and statistics, and the willingness for individuals to partake in interviews and surveys. In addition, considering the width of the scope of the thesis, in depth-enquiries in each field remains limited.

1.5 Disposition

This thesis is structured as follows: the second chapter briefly defines the term sustainable development and how it is related to individuals' homes and home life, and describes some of the current resource flows taking place in this particular place. The third chapter provides a theoretical framework for work with sustainability at home, with three different points of departure: the multi-level perspective, with its aim of sustainability transitions; practice theory, putting practices rather than the individual in focus for changes towards more sustainable lifestyles at home; and thirdly the living lab methodology, which tries to develop innovations in collaboration between universities, enterprises and ordinary individuals in order to foster sustainability and avoid design mistakes.

In the following chapter, chapter four, the HSB Living Lab will be presented and some aspects of future research projects are described. The fifth chapter will concern methodological issues which have been dealt with during the work with this thesis. The sixth chapter will summarise the outcome of the field work that took place, and present criteria for communicating sustainable lifestyles at a place like Almedalsveckan. Chapter seven addresses the analysis and discussion of the work related to this thesis in terms of data analysis. In the eighth chapter, conclusions will be presented, and in the ninth and final chapter recommendations for further studies are proposed.

■

2 Sustainability and resource flows at home

In this chapter, a brief definition of sustainable development is given and how it is related to individual's lives and choices in their homes: in order to understand how to reach a more sustainable way of life, there is a need to have a clear picture of the current situation regarding resource consumption and the impact lifestyles have on the planet.

2.1 Sustainable development

Since the concept of sustainable development was made famous by the Brundtland Commission Report in 1987, many definitions of sustainable development have been created, one of which is:

> *The capacity to maintain a certain process or state for improving the quality of human life, while living within the carrying capacity of supporting ecosystems (IUCN et al 1991 p.10).*

The European Union has an ecological footprint of 4.7 global hectares per person, whilst the carrying capacity of the same region is equivalent of 2.3 global hectares. Hence, the ecological footprint per person is twice the size as the available biological capacity (Naturvårdsverket 2010 p.21).

Three out of nine planetary boundaries as identified by Rockström et al (2009 p.472) have been overshot globally: climate change (measured in CO2 rate in the atmosphere), nitrate cycles (amount of N2 removed from the atmosphere for human usage), and wildlife loss (extinction rate: number of species extinct per million species and year – more than 100 instead of the proposed 10).

The following sections will relate to sustainability in terms of awareness and action, resource consumption, and the concept of 'reduce, reuse, recycle'.

2.1.1 Awareness and action

Social compositions (such as demographic profile), structural characteristics (such as the provision of recycling) and situational factors (knowledge about environmental issues) can possibly be seen as significant in setting apart levels of environmental actions (Barr & Gilg 2006 p.908). However, research has shown that there is a paradox concerning knowledge, concern and action. People have knowledge about e.g. climate change which causes concern; however, action is not directly linked to that concern.

In the developed countries of the world today, 'even environmentally minded and environmentally active people often consume far beyond their fair share of global emissions' and a number of factors have been identified as the cause of this inconsequent behaviour, such as (Lenzen & Cummins 2011 p.650):

1. dominance of convenience and financial constraints over moral imperatives
2. peer and status pressure to consume resources

3. the perception that an individual cannot effectively instigate noticeable, lasting change
4. people's lack of agency and trust in authorities
5. general shortage of abatement opportunities, such as public transport

Thus, the question is how to transform concern into practical action?

2.1.2 Resource consumption

On average, Europeans consume 45 tons of non-renewable materials per year, plus 5 tons of biomass and more than 1000 tons of water (of which 1.5 ton is drinking water and additional 15 tons are necessary for hygiene care). In general, less than 5 % of the materials extracted from nature end up in products, while 95 % are turned into waste. Thus, the ecological rucksack of products is often not visible but has a large impact on the environment. In addition, services are utilizing goods and infrastructures, meaning that services have ecological rucksacks, too (Schmidt-Bleek 2008 p.6).

Achieving a more sustainable consumption pattern means a reduction of consumption of raw materials and resources, but also a reduction of consumed goods in absolute measurements (Akenji 2014 p.16). If the human environmental impact is to decrease, current resource-intensive systems must be replaced to other, less demanding forms (Shove 2010 p.281-282).

2.1.3 Reduce, reuse, recycle

In order to decrease environmental impact caused by resource consumption and waste, the following hierarchy of measures are important. First, the reduction of consumption is the most central response to minimise environmental damage; the product which isn't consumed is the most environmentally friendly. Secondly, reuse of existing objects is better than recycling. Reuse is less energy demanding in the sense that it doesn't require energy in order to be moulded and transformed into new products. Thus, it is better to hand in goods no longer needed to second hand retailers than it is to recycle them at a recycling station, but the most environmental benefitting action is to consider if the goods actually are needed before purchasing in the first place (Naturvårdsverket 2012 p.65).

2.2 Resource consumption at home in Sweden today

In Sweden, according to 2010 statistics, the consumption of resources was equivalent to 3.7 planet earths each year, resulting in a top 10 placement of the most resource demanding countries in the world. The global average corresponds to 1.5 planets per year, which means that by September the yearly quota of resources available to stay within the Earth's carrying capacity is already consumed (WWF 2014a p12). In this chapter, statistics for current resource consumption taking place in Sweden each year is presented, alongside with requirements of resource savings and potential measures on a household scale.

Consumption was the cause for 46.47 million tons CO_2 emitted within the borders of Sweden in 2001, and had decreased to 40.67 million tons CO_2 in 2011. However,

during the same period of time, CO_2 emissions caused by purchases in Sweden but emitted elsewhere rose from 49.21 million tons to 75.87 million tons. All in all, the Swedish CO_2-emissions thus increased with approximately 22 % (Naturvårdsverket 2014a).

Swedish households generated approximately 4.5 million tons of waste in 2013, circa 461 kg per person (Avfall Sverige 2013). In total in 2012, societal waste in Sweden corresponded to 156 million tons, with household waste contributing to 2.7 % of the total waste generation (Naturvårdsverket 2014b). 16 % of household waste was biologically treated, 33 % was recycled, 50.3 % was incinerated with heat recovery, and 0.7 ended up at landfills in 2013 (Sopor.nu 2015a).

Many items which could be reused are disposed in waste bins and incinerated. A reason for throwing away items that could be reused instead of incinerated include difficulties to find retailers who can take care of their goods no longer needed, and to find the time to do this. In addition, many people are aware of environmental benefits of recycling, but are not aware that it is more benefitting to leave objects for second hand retailers (Naturvårdsverket 2012 p.68). As a way to trace potential resource flows, income expenditures were distributed by Swedish households in 2009 can be seen in table 1 below.

Table 1. Costs for Swedish households, based on a survey with ca. 2000 households (SCB 2014 p.297).

Expenditure type	***[%]***
Housing, water, electricity, gas and other fuels	19.31
Recreation and culture	15.10
Food and non-alcoholic beverages	13.56
Transport	12.86
Other	9.61
Miscellaneous goods and services	6.53
Furnishings, household equipment and routine maintenance of the house	6.49
Clothing and footwear	4.96
Restaurants and hotels	4.06
Communications	3.10
Health	2.32
Alcoholic beverages, tobacco and narcotics	2.18
Education	0.02

The households are continuously spending less and less money on housing and food, the latter mainly due to decreased food costs and growing food import (Ekonomifakta 2015).

Waste resulting from consumption is collected in different ways. In many Swedish municipalities, biological waste is sorted out and collected in order to be turned into biogas (Göteborgs stad 2015a). Packages and newspapers are to be disposed at a recycling station, of which there are presently more than 300 in Gothenburg (Göteborgs stad 2015b). Hazardous waste on the other hand is supposed to be handed in at six recycling centrals in Gothenburg (Göteborgs stad 2015c) or at the 14 environmental stations (Göteborgs stad 2015d). At recycling centrals bulk waste can also be disposed, such as broken furniture or refrigerators (Göteborgs stad 2015e).

FNI (Fastighetsnära insamling) is a voluntarily, complementing system where landlords provide recycling stations in the immediate proximity to the property, or even indoors. This is done to increase service to tenants, making it easier to recycle, but also provides some cost benefits to the landlord due to decreasing costs of garbage handling and additional monetary compensation for the material provided for recycling (FTI 2015a). In an increasing number of municipalities, FNI for single-family housing is being implemented, with households sorting waste and leaving it for collection in a bin next to the garbage bin, resulting in large increase of recycled goods (Göteborgs stad Kretslopp 2012 p.4).

2.2.1 Water consumption

Sweden has a stable access to water, with a maximum of 500 people sharing one million cubic meters of crude water (drickkranvatten.se 2015a). However, some regions, especially during drier periods, do have water deficits. Especially the archipelagos are vulnerable (GP 2012a). In addition, climate change may cause more unstable precipitation, threatening or complicating surface water supplies (Miljö & Utveckling 2011).

The internal and external water footprints caused by Swedish consumption are roughly of the same size, which means that approximately the same amount of water is consumed in the country and outside the Swedish borders (Naturvårdsverket 2010 p.32).

21 % of the Swedish water consumption occurs in households, compared with 64 % for the industries and 4 % for agriculture, according to the latest available statistics from 2010 (SCB 2011a).

On average in Sweden, if all the drinking water produced in the municipal water treatment plants is distributed per capita, 280 litres of water are consumed per person and day. At home, on average 160 litres of water are consumed per person and day, meaning that 57 % of all water is consumed at home (Svenskt Vatten 2015a). The water is distributed as follows in table 2 below.

Table 2. Water consumption per person, activity and day (Svenskt Vatten 2015a).

Water consumption per activity and day		
Purpose	*[liters]*	*[%]*
Hygiene	60	37.5
Washing the dishes	30	18.8
Flushing toilet	30	18.8
Washing clothes	20	12.5
Drinking and cooking	10	6.3
Remaining needs	10	6.3

1750 Swedish water treatment facilities produces almost 1000 million cubic meters of water per year, for usage by 8.5 million people connected to municipal water supply networks. Approximately half of the Swedish drinking water produced stems from surface water, and half comes from ground water (Svenskt Vatten 2015b).

Necessary changes

In general, it is important to preserve ground water levels and not overuse them, causing sinking water levels or intrusion of saltwater. However, since water is not a scarce resource in Sweden as of now, it is more important to save hot water thus saving energy than it is to lessen water consumption. Taking into consideration such things as water quality, it might even be beneficial to use certain amounts of water and not save, in order to avoid stagnant water in the pipe system (Drickkranvatten.se 2015).

Moreover, the Swedish water footprint, taking into consideration water necessary for the production of the food and products we use, is equivalent to 1428 cubic meters per person and year (compared to the global average of 1385) or 6 000 litres per person and day (in contrast to 3550 litres which the UN has estimated as necessary for drinking water and food production) (SCB 2012, WWF 2008). Thus, even though there is no apparent water shortage here, water through goods and food purchased in Sweden may have been impacting restrained water resources elsewhere (WWF 2015a).

Potential household measures

Having low-flow toilets and faucets provide potential to save water. Showers should be shortened, and the water turned off during shampooing etc., and baths could be replaced by showers (Energirådgivarna Värmland 2015). Leaking taps should be fixed – a dripping faucet means waste of 25 l of water per 24 hours or over 9000 l per year (Vattenfall 2015) and costs 600-1200 SEK (if the water is cold, otherwise the cost will be higher) (Energirådgivarna Värmland 2015). Doing the dishes in the dishwasher or in a dishpan also have potential for saving water and/or energy. Faucets should be turned off during shaving and teeth brushing (Vattenfall 2015).

2.2.2 Electricity and energy consumption

In 2010, 34 % of the electricity was consumed in the industry; 24 % was used by society as a whole (hospitals, trains, street lights etc.); and 23 % was used by households.

The average electricity consumption varies depending on housing type; detached housing or multi-family housing. Households are accounting for circa one third of all energy consumption in the developed world (Gram-Hanssen 2010 p.151). In 2011, Sweden had the seventh highest per capita electricity consumption in the world with 14 360 kWh and year (Svensk energi 2015). The following statistics come from energy supplier Eon (Eon 2015).

Detached housing. Heating accounts for 15 000 kWh/year, hot water for 5 000 kWh/year, and direct household consumption for 5 000 kWh/year (all figures are approximate).

Multi-family housing. The equivalent numbers for apartment dwellers are 6 500 kWh/year for heating, hot water 2 500 kWh/year, and direct household consumption 3 000 kWh/year.

The total electricity consumption in Sweden in 2010 corresponded to 147 371 GHW (el.se 2011). Electricity consumption per housing type can be found in table 3 below.

Table 3. Electricity consumption per housing type: detached housing and multi-family housing.

Detached housing			***Multi-family housing***		
Activity type	*kWH*	*%*	*Activity type*	*kWh*	*%*
Washing and drying of clothes	1 000	20	*Food storage*	1 000	33
Lighting	1 000	20	*Washing and drying of clothes*	500	17
Food storage	1 000	20	*Lighting*	500	17
Electric appliances	850	17	*Electric appliances*	400	13
Cooking	800	16	*Cooking*	400	13
Doing the dishes	350	7	*Doing the dishes*	200	7

Necessary changes

By the year of 2020, the Swedish energy consumption should be reduced to 80 % of the energy consumed in the year 1990, according to the EU directive 20-20-20 (Sveriges Riksdag 2015). Energy usage in houses, which by technical standards are completely identical, can vary by 300-400 % due to individual behaviours and the practices of everyday life, thus making individual's actions and attitudes important (Gram-Hanssen 2010 p.151).

Potential household measures

Lower indoor temperature by one degree is one way of saving energy (Energimyndigheten 2014a), having proper light levels another. Lamps should be

placed where needed, e.g. at desks, and light sources should be switched off when they aren't used (Energimyndigheten 2014b). Fridges and freezers are to be set on proper temperatures (+5° and -18°, respectively), where each degree colder will cause an increase in energy consumption by approximately 5 %. Frying pans and sauce pans should have flat bases and be used on stove plates with matching size. Water should be heated in electric kettles before being poured into a pan, and boiling should be done with a lid on to save energy. Kitchen fans should not be used longer than possible, in order to prevent heat leakages. The microwave can also be less energy consuming when it comes to heating e.g. a cup of tea or one or two food portions, compared to heating in the oven (Energimyndigheten 2014c). Appliances should be turned off when not used, and not left in standby mode (Energimyndigheten 2011). It's more energy-efficient to do the dishes in a washing machine than by hand, and taking shorter showers is one way of decreasing energy consumption. Washing machines should be properly filled. Lots of savings can be done if wet textiles are dried in the air rather than in a tumbler (Energimyndigheten 2014d).

2.2.3 Food: consumption and waste

Food consumption and food waste are sources of environmental impact: the Swedish chain of food processing is estimated to be the cause of approximately 50 % of local eutrophication and 20-25 % of the total climatic impact (Naturvårdsverket 2014c); the latter is in accordance with international estimations of food consumption impacts (Beretta et al 2013 p.764).

Food consumption

In 2012, the food and non-alcoholic beverages sold in Sweden had a worth of 203.9 million SEK (SCB 2014 p.329). On average, every person in Sweden consumes 800 kg food and beverages each year, of which 40 % may be imported (Naturvårdsverket 2008a p.44).

During the time period 1980-2010 the average calorie consumption increased from 2 878 kcal to 3 179. The calories consumed in 2010 had their origin in bread- and grain products (29 %), dairy products and eggs (22 %) and meat products (13 %) (SCB 2013 p.291). Only 9 % of the population is eating the recommended amount of fruits and vegetables which is at least 500 grams per day (Statens Folkhälsoinstitut 2011 p.11). Changes in Swedish food consumption during the period 1980-2010 can be found in table 4 below.

The average Swedish diet demands 3700 m^2 agricultural land per person and year, which is approximately the same as a half soccer field. Two thirds represent farm land producing fodder to animals, and 23 % is permanent pasture land. Less than 10 % are used for production of vegetables for human consumption, corresponding to 65 % of our calorie intake. This average diet also results in the emissions of 1.8 ton CO_2 equivalents per year, which can be compared with the emissions of individual car transport of 1 ton CO_2 per person and year. 75 % of the emissions stem from meat- and dairy consumption (Naturvårdsverket 2015 p.26-27). The diet is not only the cause to CO_2- emissions but also to water consumption, as seen in table 5 below.

Thus, what we eat also impacts the global water consumption levels (Naturvårdsverket 2010 p.36-37).

Table 4. Swedish food consumption 1980-2010 (Jordbruksverket 2012, SCB 2013,).

Food type	***1980*** *[kg or l per person and year]*	***2010*** *[kg or l per person and year]*	***Change*** *[%]*
Beef	6.1	12.3	102
Pork	12.5	16.0	28
Poultry	4.3	16.7	288
Fish	2.4□	3.7□	54
Milk products	183.0	126	-31
Cream	7.7	11.0	43
Cheese	14.0	19.0	35
Butter	3.5	2.2	-38
Margarine	17.6	9.4	-46
*Eggs**	11.2	10.6	-5
Almonds & nuts	1.1	2.7	245
Vegetables (fresh)	21.7	44.3	104
Root vegetables	6.0	9.0	50
Fruits (fresh)	49.9	59.7	20
Berries (fresh)*	3.9	2.1	-46

* Data unsure. □ Filleted and frozen. – No data.

Table 5. CO_2-emissions and water consumption on average for several types of food stuff. Required water for production (on average). Numbers are rounded to the closest hundreds in terms of CO_2-emissions (Mekkonen & Hoekstra (2012 p.409), Mekkonen & Hoekstra (2010 p.17-20), Naturvårdsverket (2010 p.36-37), Naturvårdsverket 2015 p.26).

Food type	***CO_2-emissions*** *[kg CO_2-equivalents per kg]*	***Water consumption*** *[l per kg]*
Beef	43▪	15 400
Pork	61	6 000
Poultry	2.4	4 300
Fish	3-6	-
Milk products	1.4	1000•
Cream	–	-
Cheese	12	-

Butter	–	5600
Margarine	–	-
*Eggs**	–	3300
Almonds & nuts	–	9100
Vegetables (fresh)	0.7	300
Root vegetables	0.1	400
Fruits (fresh)	0.9 (imported) 0.2 (domestic)	1 000
Berries (fresh)*	–	-
Wheat	–	1 800
Rice	1.4	2 200
Pulses	0.2	4 000
Chocolate	–	17 200
Cotton	–	3600
Coffee	–	280
Tea	–	35

• Milk only. ▪ No milk cows, strict beef production. – No data.

Food waste

771.5 tons of biological waste was discarded for either composting or anaerobic digestion in Sweden 2013, of which 48.7 were composted at home by households, and the rest were taken care of elsewhere (Avfall Sverige 2014 p.4). Statistics from 2012 shows that approximately 81 kg of food is disposed per person and year, with additional 26 kg of food and beverages per person are being poured into the sewage system. 270 000 tons or 35 % of food being discarded is considered 'unnecessary waste' (Naturvårdsverket 2014e p.89). The wasted food in 2012 accounted for 2 million tons of CO_2-emissions, or approximately 3 % of the Swedish emissions of greenhouse gases (Naturvårdsverket 2014c).

Necessary changes

Eating more sustainably means following the seasons and eating more healthy foods (Naturvårdsverket 2013b), e.g. consumption of red meat leads to increased risks for colon cancer. Maximum intake of red meat and processed meat product should not exceed 500 grams per week (Naturvårdsverket 2015 p.32).

In order to decrease food waste in households, better planning and correct storage of food are necessary (Beretta et al 2013 p.772). There is also a need to change consumption patterns and attitudes (Naturvårdsverket 2014c). In addition, the contemporary society with time limitations and ever-increasing demands on material standards leads to households having lack of time in engaging in cooking, causing increased risks of waste through: lack of time to plan purchases; buying too much, leading to groceries getting old; misinterpretations of 'best before'-dates; waste of some parts of groceries or not taking care of leftovers; or failure in emptying packages properly (ibid).

Potential household measures

Meat consumption should be decreased by half (WWF 2014b). It is important not to replace meat with fish, but rather vary sources of protein and eat more beans or chickpea. When eating meat, the production of it is important to consider. Wild game has a lower climatic impact than bred animals. Locally produced meat often has lower environmental impact, due to shorter transports. It is also worth considering if the meat has been organically produced or not. Vegetable and wholegrain consumption should increase. Different certifications of food could also be looked into. 'Empty calories' such as crisps, sweets and sodas have a large environmental impact (WWF 2015b), e.g. sweets are equivalent to 2.2 CO_2-equivalents per kg (Naturvårdsverket 2015 p.27), which means that this type of consumption should be minimised (WWF 2015b).

Shopping and meals should be planned ahead. Fruits and vegetables could be bought loose instead of pre-packaged, in order to get exactly the amounts needed. All dates on groceries must be controlled, and 'best before' and 'use by' kept apart. Fridges and freezers should be set on proper temperatures. After purchasing groceries, the food in the fridge could be rotated to allow the oldest food to be clearly visible at the front. Meals can be served in small amounts on the plate and get seconds, instead of having too much food which isn't finished. Leftovers should be made use of, e.g. as lunch boxes the following day. Food which cannot be eaten should be composted or utilised in other ways (European Commission 2015).

2.2.4 Recycling

Responsible for recycling in Sweden are Förpacknings- och Tidningsinsamlingen, FTI, with responsibilities for recycling newspapers and glass-, paper-, plastic- and metal packages (FTI 2015b), and Returpack; addressing the recycling of metal cans and PET-bottles (Returpack 2015a). Households are required by law to sort their waste, and package- and newspaper producers are required to provide for recycling of their products in accordance with 'polluter pays principle' (FTI 2015c). Products which aren't packages or newspapers, e.g. frying pans made of cast iron or glass plates, should be left at municipal recycling centrals (Sopor.nu 2015b).

Metals can be recycled many times, saving lots of resources. Recycling of aluminium saves 95 % of energy compared to extraction of new resources; and steel saves 75 % when comparing to production from iron ore. All metals from nails to paper clips can be recycled. Glass can also be recycled many times, saving limited resources such as sand and lime; a process which is more resource efficient than making new glass. One ton of recycled packages of paper and cardboard are equivalent to saving 14 trees. Recycling of tree fibres can be made up to seven times, saving energy during the process. Plastic packages are usually based on petroleum products. Every kilo of recycled plastics saves approximately one litre of oil and two kilos of CO_2. In addition, it takes approximately 450 years for nature to decompose a plastic bottle (Sopor.nu 2015c).

Recycled materials per person in Sweden 2014 (FTI 2015d, Returpack 2015b) can be found in table 6 below, as can the directives from the Swedish government.

Table 6. Recycling directives from the Swedish government,' FTI and Returpack statistics, along with recycled materials (FTI 2014d , Returpack 2015b).

Package type	***Recycling goal*** *[%]*	***Reported statistics*** *[%]*	***Recycled material*** *[kg/person]*
Paper	65	77	12.8▪
Plastics	30	37	5.6▪
Metal	70	73	1.6▪
Glass	70	89	19.6▪
*Newspapers**	75	–	29.7▪
Package type	***Recycling goal*** *[%]*	***Reported statistics*** *[%]*	***Recycled cans/bottles*** *[nr/person]*
Aluminium cans	93	90	
Large PET	92	90	169•
Small PET	75	90	

*All newspapers are currently not being accounted for. ▪Collected by FTI, meaning recycled at a recycling station. • All three sorts in total, collected by Returpack, meaning returned at a store in return for money.

Necessary changes

In a study made by Tetra Pak and WWF, several aspects were identified as being obstacles hindering recycling. The most important ones included 'too much work needed in rinsing and folding packages', and 'difficulties in finding proper storage space in the home'. Others included too long distances to the recycling station and the perception that packages caused smell. In addition, some people in the study questioned the reliability of the recycling system: are packages really recycled and transformed into new products? Is recycling really benefitting the environment? Some participants also expressed that recycling containers often are full, and that recycling stations are littered (Tetra Pak & WWF 2012 p.12-13). Distances to recycling stations and weight-based charges for garbage have proven to be important factors for recycling, as have social norms: when others are perceived as partaking in recycling, the individual tends to recycle too (Naturvårdsverket 2008b p.45). Recycling rates for households must increase (SKL 2014 p.14).

Potential household measures

It is important not to create unnecessary amounts of waste (e.g. bottled water – one litre of water is equivalent to a little less than one kg of CO_2- emissions, 1000 times more than water from the tap) (Svenskt vatten 2015c). Products with excessive plastic packages could be avoided. Plastic bags should be reused, or replaced with textile shopping bags. Fruit bags could be either reused or substituted with paper bags (Sopor.nu 2015d).

2.2.5 Case study goods: clothes consumption, reuse and laundry

In 2012, according to the latest available statistics, Swedish households spent approximately 1.681 billion SEK. Out of this, 79.9 million or almost 5 % were spent on clothes and footwear (SCB 2014 p.329). As has been described above (section 2.2.1) an ordinary Swedish citizen spends on average 20 l water per day on laundry. Thus, clothing is an important economic sector which has consequences for the environment. In this section, the current status of consumption and reuse will be presented.

Consumption and reuse

Out of the 15 kg of clothes per person purchased in 2010, more than half ended up in the waste bin and approximately 3 kg were left in for second hand retail (IVL 2014). Out of these 3 kg, 0.3 were sold at second hand stores in Sweden and the rest was either exported or given to foreign charity organizations (Naturvårdsverket 2013a p.40). 20 % of the clothes are thus being handed in for reuse, in comparison with 80 % in Germany, e.g. (ibid).

An analysis made for the Swedish Environmental Protection Agency resulted in the conclusion that having producers/importers taking responsibility for clothes potentially is the most promising instrument for increasing reuse and recycling of textiles. Today, used textiles are collected by charity organizations such as the Red Cross and Myrorna (IVL 2014). The umbrella organization Ideell Second Hand collects 22 000 tons of clothes yearly, but estimates that out of the 70 000 tons which are thrown away each year, 35 000 tons of usable textiles ends up in the waste bin (Ideell second hand 2015). The analysis made for the Swedish Environmental Protection Agency suggested that charity organizations should be allowed to continue their work even with the proposed responsibility change, having the producer/importer choosing between having a collection system of their own or paying another organization to collect their used products (IVL 2014). As of today, very few municipalities are collecting textile waste (Naturvårdsverket 2013a p.43).

Households are responsible for the largest amount of clothes waste in absolute terms. In the first decade of 21th century, consumption of clothes and textiles for home use increased with 40 % (Naturvårdsverket 2013a p.41). Nevertheless, in the period 2011-2013, second hand-retailing of clothes increased with 16 % and the consumption of new clothes decreased with 9 % (Naturvårdsverket 2014d).

Laundry

Laundry (washing and drying) is estimated to account for 5 % of the electricity consumption in Swedish households, and 13 % of households' water consumption (Peters 2015 p.1), or equivalent to 20 litre of water per person and day (Svenskt Vatten 2015a). Recent studies in Gothenburg indicate that 13 % of households' phosphorous emissions into the wastewater systems originate from laundry. These numbers only account for the actions of households and don't take upstream processes such as production of clothes and detergents into consideration (Peters 2015 p.1).

Washing clothes causes them to degrade and removes functional chemicals, resulting in pollution of wastewater (Peters 2015 p.2). Washing a fleece shirt, for instance, causes the release of 1900 plastic particles into the sewage system before ending up in the ocean (SVT 2013). Thus, altering washing routines regarding both frequencies and ways of washing can make clothing and other textiles last longer. Textiles are most often based on either cotton or crude oil, making it important to minimise environmental effects such as irrigation and the use of fossil resources caused by too frequent washing, leading to a shortened life span of the clothes (Peters 2015 p.2).

Necessary changes

Two important reasons for the rapid turnover of clothes in Swedish households have been identified as individuals getting tired of garments, or that garments no longer can fit in the wardrobe. Also, on the producer's side, the production of cheap clothes with a short lifespan adds to the problem.

Since municipalities are generally not collecting textile waste, collection of clothes may not occur close to individuals' homes, increasing the risk of textiles ending up in the garbage bin. Other potential explanations include that it is possible that persons are unaware of the possibility of handing in clothes; there are uncertainties of whom to leave the clothes to and whom can be trusted; or an idea of clothes as very personal items which one doesn't want anybody else to use (Naturvårdsverket 2013a p.42-43).

In order to address these aspects, several necessary changes have been identified. The life length of textiles must increase and it should be easier to repair clothes, and, in addition, the clothes must be prepared for recycling and reuse of the material. There is also a need for a better infrastructure for collecting textiles, and households must be informed of existing systems for collection; where to find collection points; how to sort textiles; and educated in environmental benefits of recycling in comparison with incineration (Naturvårdsverket 2013a p.46-47). Today, it is easier to throw textiles away than to donate them to second hand retailers (IVL 2013 p.9).

Research has shown that households are washing clothes in ways which are harming the environment more than is necessary, even with today's standards. Foremost, this is related to the frequency of clothes-washing and to what extent the washing machine is properly filled; but also to the amount of detergents which are user per washing (Peters 2015 p.2).

Potential household measures

Consumption must be better planned in order to optimise resource consumption, but first and foremost, it must be decreased. Clothes should be kept longer by the first purchaser, before being handed in for recycling/reuse (Naturvårdsverket 2013a p.46-47); and stored and washed properly (GP 2015a). Throwaway mentalities must be challenged and changed. The quality and longevity of textiles should be considered before purchases (IVL 2013 p.11).

Clothes should be washed only when dirty, often it's enough to air garments instead of washing them. This is particular useful when it comes to textiles made of natural

fibres such as wool, cotton, and linen; and also viscose which is based on cellulose. Synthetic fibres on the other hand can be rinsed in water due to the fact that dirt doesn't enter the fibre the same way as with natural fibres; it forms a film over the surface. Single stains could be removed by hand instead of in the washing machine, but it should be done before the stain has dried. Tumble driers should be avoided since they destroy textiles and are very energy demanding. Ironing is positive for textiles since it forces fibres together and helps to preserve colours. Washing clothes should be done in as low a temperature as possible to save energy. Proper dosage of detergents is important; too much detergents tear on both fabric and the environment (GP 2015a).

■

In this chapter, statistics of resource flows in Swedish homes were presented, together with required changes and potential household measures. In the next chapter, the theoretical framework for this thesis will be presented, with links to how and why a reduction of resource consumption is essential for sustainable development. The concepts of the multi-level perspective and transition theory will be linked with practice theory and living labs, and how all of these research fields relate to sustainability.

3 Theoretical framework

Three different theoretical fields will be presented in this chapter, forming the framework for this master thesis. First, the multi-level perspective and its potential to bring around transitions for sustainable development will be described. Secondly, a section will follow on practice theory and the environmental consequences of individuals' actions in their daily life. Lastly, the concept of living labs and what they can mean in terms of sustainable development will briefly be addressed.

3.1 Transitions for sustainable development: the multi-level perspective

In order to foster transitions to a more sustainable society, the multi-level perspective (MLP) can be seen as a tool to understand possible outcome of events and to analyse and evaluate earlier transitions in society (e.g. the shift from horse-carried wagons as a main transportation mode to that of the car) (Elzen et al 2004 p.3).

The MLP provides a way of addressing the core analytical puzzle of transitions, namely stability and change. On the one hand, existing systems are characterised by stability, lock-in, and path dependence, which give rise to incremental change along predictable trajectories. The socio-technical approach to transitions instead highlights co-evolution and multi-dimensional interactions between industry, technology, markets, policy, culture and civil society (Geels 2012 p. 472).

The main point of the multi-level perspective is 'that system innovations come about through the interplay between processes at different levels in different phases' (Geels & Kemp 2007 p.443), thus potentially forming a basis for transitions towards a more sustainable development:

> *The challenge of sustainable development is increasingly understood in terms of 'transitions' to more sustainable socio-technical systems (Smith 2010 p.439).*

The multi-level perspective deals with events occurring at three different levels: the socio-technical regime or meso-level, the niche or micro-level, and the socio-technical landscape or the macro-level (Geels 2002 p.1260). One of its benefits is that it 'does away with simple causality in transitions' (Geels 2012 p.474), because:

> *There is no single 'cause' or driver. Instead, there are processes on multiple dimensions and at different levels which link up and reinforce each other …. Scholars who study transitions therefore emphasise lateral alignments, unexpected linkages, thresholds and tipping points (Geels 2012 p. 474).*

The multi-level perspective describes potential processes when trying to create new innovative technologies and its wider diffusion into actual usage in society. The success of a new technology is not only governed by events occurring inside the niche (micro level), but also by processes and developments happening at the landscape level (macro level) and the regime (meso level) (Geels 2002 p.1261). However, what appears to be a regime shift (a transition from one system to another) at a particular

level may be seen as 'merely an incremental change in inputs for a wider regime' – it's all a matter of where to look and set limitations (Berkhout et al 2004 p.55).

3.1.1 Different levels of analysis: niches, socio-technical regimes and landscapes

The three different levels of the multi-level perspective will briefly be presented in this section.

Niches

Niches can be defined as 'platforms for interaction' created out of processes by many types of actors and cannot be controlled (Kemp et al 1998 p.186). Niche-innovations ('radical novelties') are the basis for the micro-level in the MLP. Due to above-mentioned path dependencies and stability within a regime, there are difficulties to force the creation of radical innovations. However, protected niches can act as 'incubation rooms' for radical novelties before a 'window of opportunity' arises and the new technology can be implemented (Geels 2004 p. 912, Geels & Kemp 2007 p.446). In the niches, learning processes can take place, in matters such as technical specifications, public policies, symbolic meanings and user preferences. Niches are 'locations where it is possible to deviate from the existing regime' (Geels 2004 p. 912). However, the relationship between niches and regimes are nothing but simple, according to Smith:

> *Paradoxically, a niche in tune with the incumbent system will not demand very great changes in socio-technical practice; whilst radical niches … will not diffuse much at all since they demand too many (structural) changes. Highly divergent sustainable niches will have to offer considerable positive feedbacks, in terms of scope for profitable application, before 'mainstream' actors become enrolled (Smith 2007 p.430).*

Niches are thus ultimately depending on processes both within and outside the niche itself (Kemp et al 1998 p.184).

Socio-technical regimes

Smith (2007) recognises seven different dimensions which have been suggested for characterizing of the socio-technical regime:

> *1) guiding principles; 2) technologies and infrastructures; 3) industrial structure; 4) user relations and markets; 5) policy and regulations; 6) the knowledge base for the regime; and 7) cultural, symbolic meanings underpinning practices (Smith 2007 p.429).*

Socio-technical regimes can be defined as 'the whole complex of scientific knowledges, engineering practices, production process technologies, product characteristics, skills and procedures, and institutions and infrastructures that make up the totality of a technology' (Kemp et al 1998 p.182). The socio-technical regime accounts for the stability of existing socio-technical systems via trajectories (Geels &

Schot 2007 p.400), and Smith (2005) agrees: 'Regimes, by definition, have a tendency to exclude options and thereby introduce stability' (Smith et al 2005 p.1508).

A regime is stabilised by existing trajectories in several ways: it shapes the practices and cognitive routines of engineers and designers, making them look for solutions in certain directions and blinding them for potential solutions outside the regime (Geels & Kemp 2006 p.3); existing regulations and standards; sunk investments in machines, infrastructure and competencies; and adaptation of lifestyles to technical systems (Geels & Schot 2007 p.400).

Socio-technical landscapes

The socio-technical landscape forms the macro-level of the MLP. What differs between the regime and the landscape is that regimes concern rules restricting and enabling within communities, while landscapes refers to wider technology-external factors. Landscapes changes more slowly than regimes and are even harder to change (Geels 2002 p. 1260).

This landscape notation refers to 'aspects of the exogenous landscape that is beyond the direct influence of actors' (Geels & Kemp 2006 p.4). Socio-technical landscapes are made up by sets of 'deep structural trends' (Geels 2002 p.1260) and has a heterogeneous content, including aspects such as economic growth, environmental problems, resource scarcities, cultural and normative values, and broad political coalitions, etc. The allegory with a landscape is made to 'emphasise the large-scale material context of the society' such as material and spatial arrangements of cities and technologies affecting all of society (Geels & Kemp 2006 p.4). This means that the socio-technical landscape is an external context which actors interact within.

3.1.2 System change: reproduction, transformation and transition

In a 2006 article, Geels and Kemp identify three types of system change related to the MLP perspective, of which one is transition. The others are reproduction and transformation.

Reproduction

Reproduction refers to incremental change along the existing trajectories in a regime, elements in the socio-technical are refined rather than ground-breaking, and rules are reproduced by the actors involved. The dynamics occur only at the landscape and niche level (Geels & Kemp 2006 p.6).

Transformation

The second mode of system change, *transformation,* means an adjustment caused by pressures on the existing regime leading to a change in technical agendas, visions, incentive structures, perception of opportunities, etc. Interacting dynamics occur mainly at the regime and landscape level, with little influences from niches. Adjustments occur after negotiations and struggles. The 'survival of incumbent actors is not threatened' and these actors are the ones to change the development of the existing system, which may grow into a new system through cumulative adjustments (Geels & Kemp 2006 p.7).

Transition

The third and final system change is *transition*, a shift from one socio-technical system to another. Interaction occurs between all levels in the MLP. Landscape developments put pressure on the existing regime causing problems which the regime actors cannot resolve, creating above- mentioned 'windows of opportunities' for new innovations. If the new innovation manages to break through, it can replace the earlier system, causing the fall of some incumbent actors. Once the transition has taken place, a new, stable regime will form (Geels & Kemp 2006 p.7), see figure 1 below. Each transition 'displays unique characteristics, dynamics and history' (Berkhout et al 2004 p.53), meaning that no transition is identical with another. However, some argue that general characteristics can be found (e.g. Kemp et al 1998, Smith et al 2005, Berkhout et al 2004).

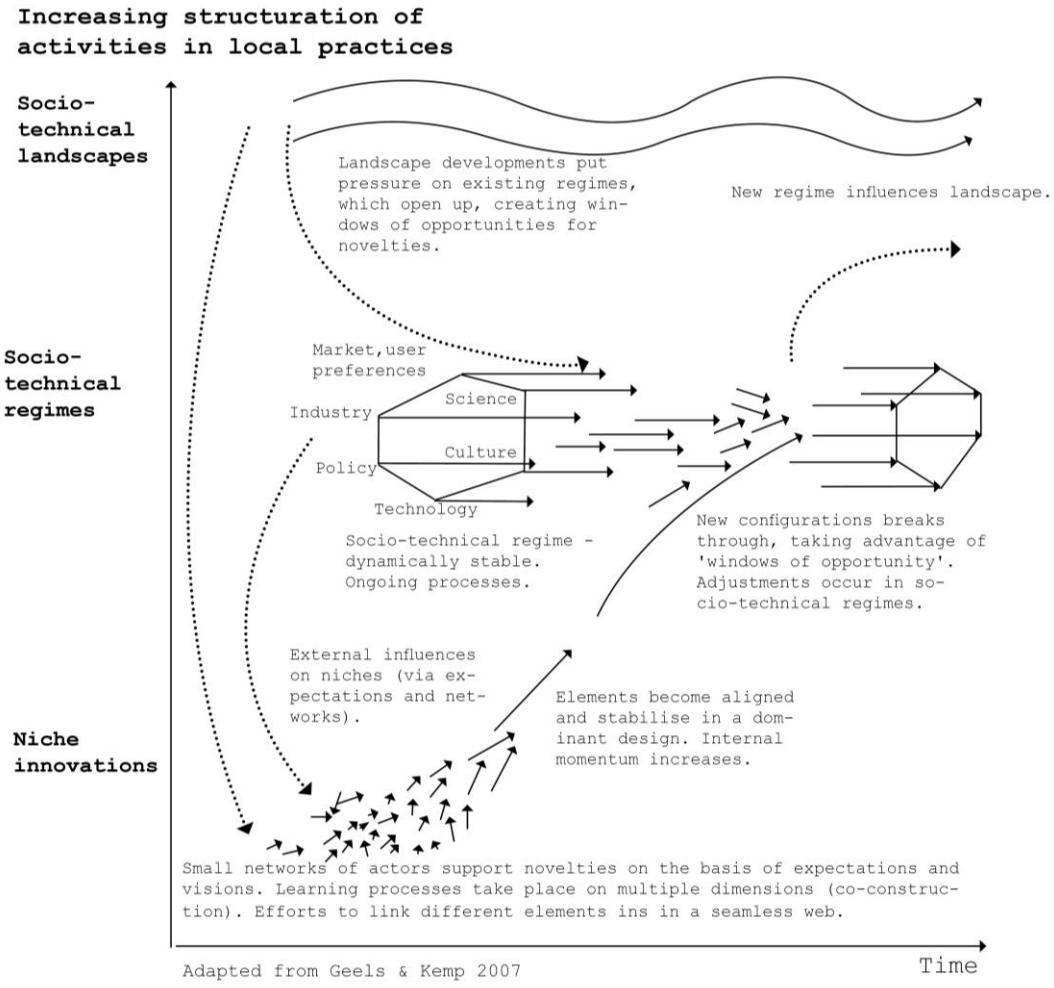

Figure 1. The multi-level perspective. Adapted from Geels & Kemp 2007

3.1.3 Radical change: Transitions in focus

Regimes can shift and cause transitions. However, 'transitions are not processes over which any one set of actors has control' (Shove 2010 p.282). The concept of transition has been defined by Rotmans et al (2001) as follows:

> *A transition can be defined as a gradual, continuous process of change where the structural character of a society (or a complex sub-system of society) transforms. Transitions are not uniform, and nor is the transition process deterministic: there are large differences in the scale of change and the period over which it occurs. Transitions involve a range of possible development paths, whose direction, scale and speed government policy can influence, but never entirely control (Rotmans et al 2001 p.16).*

A transition can be seen as 'a process of technological succession in which a superior system that is morphologically and institutionally distinct comes, over time, to replace an incumbent system' (Berkhout 2002 p.3). Berkers and Geels (2011) identify five different patterns of innovation leading to transitions: 1) scale intensive, 2) science-based, 3) government and utilities, 4) supplier-dominated and 5) specialised suppliers. In transition theory, most of the cases studied have been in the first three categories. Examples of scale intensive cases are that of the car and the automotive industry; science-based cases include the breakthrough of the turbojet; transitions caused by governments and utilities include the introduction of sewer systems in the Netherlands; and an example of the supplier-dominated case is the development of the Dutch greenhouse horticulture in 1930s-1980s. Each type of transition has its own characteristics (Berkers & Geels 2011 p.228).

General characteristics of transitions

There are some general characteristics of preconditions enhancing the possibilities of transitions, according from historical studies as identified by Kemp et al (1998):

Deep interrelations between technological progress and the social/managerial environment in which they are put to use. Radical innovations bring new managerial problems and user-supplier relationships, requiring or leading to changes in the social fabric, thus meeting resistance from vested interests, and may cause public debate about the new technology.

Importance of specialised applications in the early phase of technology development. In the beginning, there is often no or little economic advantage of the technology, while existing technologies often improve or become more efficient during the development phase of the new technology.

Systems of related techniques. Radical innovations tend to involve systems of related techniques, thus the economics of the process depends on costs of particular inputs and availability of existing technologies – 'Technical change in such related areas may be of central importance to the viability of the new regime' (Kemp et al 1998 p.183).

Social views of the new technology. Social views of the new technology, including engineering and management ideas, expectations on market potential, and perception of the new innovation by users, are all highly subjected and differing across communities. They are also in a constant flux, and the 'progression of the ideas may be either a barrier or a catalyst to the development of a particular technology' (Kemp et al 1998 p.183).

All these elements explain why fostering a transition is rather complicated – 'the task is no longer to control or promote a single technology but to change an integrated system of technologies and social practices' (Kemp et al 1998 p.184). Also, 'the core puzzle in transitions thus centres around (dynamic) stability and (radical) change, and how the interactions are played out on multiple dimensions' (Geels 2012 p. 472).

The fostering of transitions

To actively foster a transition towards sustainable development is very complicated, as seen in the eyes of Smith (2007):

> *Imposing a normative goal like sustainable development upon existing regimes implies connecting and synchronizing change processes at a bewildering variety of points within and beyond the regime (Smith 2007 p.429).*

Rotmans et al (2001) stresses the complexity of transitions in a similar way:

> *A transition is the result of developments in different domains. In other words, a transition can be described as a set of connected changes, which reinforce each other but take place in several different areas, such as technology, the economy, institutions, behaviour, culture, ecology and belief systems. A transition can be seen as a spiral that reinforces itself; there is multiple causality and co-evolution caused by independent developments (Rotmans et al 2001 p.16).*

In accordance with the MLP perspective, transitions advent through diverse interactions between processes at all three levels. The niches 'build up internal momentum through learning processes, price/performance improvements and support from powerful groups'; changes occurring at the landscape level causes pressure on the regime; and the destabilisation of the regime 'creates windows of opportunities' for niche innovations (Geels & Schot 2007 p.400). When aligned, these processes make it possible for niche innovations to enter and breakthrough in mainstream markets, where they then have to compete with the existing regime (Geels & Schot 2007 p.400), see figure 1 above.

Politics and transitions

Meadowcroft (2011) identifies three big problems for political involvement with sustainability: '(a) there are lots of other things to worry about; (b) uncertainties overwhelm action; and (c) change disturbs established interests … So a real (as opposed to a rhetorical) politics of sustainability implies hard choices: picking priorities (and setting aside other projects); making decisions that are almost guaranteed to be suboptimal and assuming current costs to hedge uncertain future risks; and cutting through distributional entanglements' (Meadowcroft 2011 p. 72).

Supporting transitions towards sustainable development thus is a risky task for policy-makers, who are constrained by two sets of dependencies. The first one of these dependencies is that to the public, whom policy-makers are (supposed to) represent. Policy-makers tend to follow rather than lead public opinion, due to the fact that if they introduce tough policies, they risk either public protest or electoral defeat in the future. The second dependency is to the industry, which provides jobs, taxes, new technologies, and growth (Geels 2012 p.480).

Regime stability: path-dependencies and lock-ins

Different types of mechanisms provide stability for regimes through rules, social groups and socio-technical systems, as identified by Geels (2004). Rules and regimes provide stability by their ability to guide both actions and perceptions. As rules tend to be reproduced, they can be characterised as 'the deep structure' of sociotechnical systems (2004 p.910). Among these rules four can be mentioned:

- cognitive routines (making designers and engineers look in certain directions and not in others, shared belief systems and expectations, or perceptions of user preferences)
- normative rules (mutual role expectations within social or organizational networks)
- regulative and formal roles (legally binding contracts stabilise established systems)
- the alignment of the three mentioned rule types: it is difficult to change one set of rule without changing the other

Actors and organizations are anchored in mutual dependencies and interdependent networks. Once formed, networks represent 'organizational capital' (trust). Organizations such as firms often resist major changes because interdependencies with buyers and suppliers have been established, and so have patterns of norms and culture. Other aspects framing path-dependencies are 'organizational commitments and vested interests of existing organizations in the continuation of systems' (Geels 2004 p.910-911).

Sociotechnical systems (in particular artefacts and material networks) have a type of 'hardness', making changing them difficult (Geels 2004 p.911). Once technical systems and material structures have been put in place, they will likely not be easily abandoned, 'almost [acquiring] a logic of their own' (Geels 2004 p.911). Also, '[c]omplementarities between components and sub-systems are an important source of inertia in complex technologies and systems', and components and subsystems are interdependent for functioning – a stark obstacle for the emergence and incorporation of new radical technologies (Geels 2004 p.911). Stability can often be found in compatibility standards. In addition, Geels argue:

> *Material artefacts are also stabilised because they are embedded in the society; hence the term socio-technical systems. People adapt their lifestyles to artefacts,*

new infrastructures are created, industrial supply chains emerge, making it part of the economic system dependent on the artefact (Geels 2004 p.911).

3.1.4 Niche-innovations as basis for sustainability transitions

Niches as basis for sustainability transitions can be seen as 'aimed at making institutional connections and adaptations, at stimulating learning processes necessary for further development and use of the new technology' (Kemp et al 1998 p.186). Development of radical new innovations potentially leading to a more sustainable development will 'have a hard time … bridging the "valley of death" between R&D and market introduction' (Schot & Geels 2008 p.538). Researchers believe that 'sustainable innovation journeys' can be enabled by creating conditions for protected spaces (niches) that 'allow nurturing and experimentation with the co-evolution of technology, user practices, and regulatory structures' (Schot & Geels 2008 p.538). The innovations are not seen as technological fixes ordered by a top-down approach by governments, but rather the need is identified that interrelated social and technological changes are necessary in the pursuit of a more sustainable society (Schot & Geels 2008 p.538). Niche developments occur at two levels at the same time: projects occurring at a local level with local practices, and at a global niche level: local projects will step by step create an emerging niche field at the global level. Thus, there is a need to distinguish between 'local socio-technical projects and the niche level which consists of an emerging community that shares cognitive, formal and normative rules' in order to separate processes of niche formations – too keep apart a local niche formation from a global (Schot & Geels 2008 p.543).

Niche-formations take place against 'the backdrop of existing regimes' (Kemp et al 1998 p.186). Actors in the incumbent regimes are often participating and trying to resolve problems that are identified but not solved from within the regime. Thus, the potential success of niche formations are linked to shifts, changes and structural problems within the present regime. This means that not only does the niche formation depend on processes *within* the niche, but also to a large degree depend on changes occurring *outside* the niche. The coincidence of both types of development creates different niche development patterns (Kemp et al 1998 p.184). Kemp et al continues to argue:

The creation of a protected space for a promising technology gives it a chance to develop from an idea or showpiece in an exhibition into a technology that is actually used. The actual use of a new technology is important for articulation processes to take place, learn about the viability of the new technology and build a network around the product.

The radical novel technology, which is expected to be the precondition of a transition, faces difficult obstacles. New technologies are proposed, developed and tried out by 'pioneers, entrepreneurs, social movements' and others outside the existing regimes, facing issues such as economy (not yet benefitting of economies of scale and learning curves), user preferences and practices (customers required to change practices),

mismatching with existing regulations, or lacking necessary infrastructure (Geels 2012 p.472).

In the field of strategic niche management, Schot & Geels (2008) argue that experiments in a real life context and the development of niches are closely linked.

> *[R]eal-world experimental projects [are seen] as important devices that precede market niche development. Such proto-markets can be exploited to explore possible alignments of technology, user demands and sustainability issues (Schot & Geels 2008 p.539).*

The links between the multi-level perspective and living labs (incubation niches) will be looked into in further detail in sections 3.3 and 4.

3.1.5 Knowing the future – transitions and the un-making of unsustainable paradigms

Each time a commitment to a new type of regime has been made, there is always a risk in the fact that the new technology gaining dominance may be sub-optimal, seen in hindsight. To evaluate what type of technological options which most likely will yield the best outcome a priori is extremely difficult, and the uncertainties will be larger the more novel and unknown a technology is. This might indicate that the rational behaviour under such circumstances would be to keep a multitude of options – but then again, the maintenance of options and preservation of option or reversibility or retreat, might actually undermine the establishment of a new trajectory (Berkhout 2002 p.3).

Shove (2012) argues that transitions don't necessarily need to mean clean cuts with earlier sociotechnical regimes and that remains of the old regimes can resist the incoming one, which can be useful in re-instating more sustainable habits like cycling instead of taking cars for short trips, e.g.:

> *'the dynamic relation between incoming, outgoing and returning systems deserves more explicit attention, and that processes of disappearance are especially important for those seeking to promote 'environmental efficiency' and a lower carbon way of life (Shove 2012 p.364).*

This is due to two main reasons. Firstly, any transition on a systemic level 'will almost certainly entail either the downfall or the substantial modification of contemporary sociotechnical regimes. Generally, studies of sociotechnical transitions frames erosions or losses of regimes as the 'flipside of innovation' but these processes of emergence and disappearance are not necessarily coincidental nor different sides of the same coin (Shove 2012 p.364). When conceptualising innovations and declines 'as equal parts of one story', sociotechnical transition theories identifies that both innovation and decline reconfigures landscapes and regimes, changing preconditions for future innovations. However, the relationships between old and new regimes as well as innovation and decline tend not to be analysed further once an incoming

regime appear to be stabilizing, thus potentially ignoring dynamic linkages between old and new regimes (Shove 2012 p.369).

Secondly, moving towards a more sustainable way of development might actually mean looking backwards towards earlier regimes that worked in the past but have been replaced by newer, more resource-intensive systems (such as car versus bike commuting). In reality, the promotion of reversing a transitional change and going backwards is not a goal which governments or environmental NGOs aspire to officially; 'yet many of the practical steps people are advised to take if they want to reduce the size of their carbon footprint entail some kind of return' (Shove 2012 p.364), leading to contradictive situations:

> *The result is a curious situation in which the substance of sustainable behaviour has this backward looking quality, meanwhile, intellectual priorities and policy agendas concentrate on introducing and promoting new, more efficient technologies capable of sustaining current standards of living but at lower environmental cost (Shove 2012 p.365).*

Looking backwards in order to proceed forward?

In order to be able to reinstate old, more sustainable regimes, it is important to understand the ongoing relationships between paths that have not and have been taken, or to prevent the loss of environmentally beneficial habits or structures (Shove 2012 p.369). When *not* studying the dynamics between the former and the present regimes, the (still) ongoing influence of previous regimes will typically be underestimated. Traces of existing regimes will not be perpetuated in an intact way nor unchanged by past events, but will still be relevant for future developments. Shove argues that this means that in attempts to bring back earlier more sustainable habits and regimes such as cycling, producing organic food, lower carbon diets etc. might mean that instead of looking for niches of innovation, one should look for pockets of persistence, finding ways to activate these pockets and incorporate them anew in the present regime (Shove 2012 p.372).

Revival of earlier regimes

However, a study of cycling commuting habits in the U.K and the Netherlands indicates that revival and reintroduction processes are not the same as the diffusion of the innovation when it was new. In situations of reinvention and revival, e.g. the know-how and the 'relevant forms of materiality' already exist, meaning that 'the challenge is one of rescuing, remembering and perhaps adapting but not generating competence from scratch' (Shove 2012 p.373). In that case, lead users 'might turn out to be those who are least experimental in orientation, and who are in fact laggards doggedly clinging to old ways', and 'if lower carbon ways of life depend on reinstating arrangements that have been displaced by new more resource intensive forms, a further strategy is to deliberately dislodge these incoming regimes' (Shove 2012 p.373). Shove continues arguing that this sort of framing may well mean that 'transitions towards sustainability might entail radical disruption' (Shove 2012 p.373). Lastly, Shove concludes that there are good reasons with projects of seeding and

promoting developments and diffusions of new sociotechnical systems benefitting the environment, but there are also good reasons to explore the other side of innovation and 'keeping track of the broken elements of configurations that no longer work but that might yet figure again in the future' (Shove 2012 p.373).

Seen in the eyes of Shove and others, socio-technical transitions are closely connected to the practices carried out in everyday life. The following section will describe practice theory and its implications for sustainability.

3.2 Practices and their relation to consumption

Practices form the basis of our everyday life which means that practices and routines determine our environmental impact caused by consumption of resources (Gram-Hanssen 2008 p.1181), and is linked to the MLP due to the fact that socio-technical transitions rely on transitions in practices (Scott et al 2011 p.282). Practice theories emerged as a response to move beyond the dualism of actor-structure opposition in sociology but the concept of it varies among different research fields (Røpke 2009 p.2490).

A practice 'is a routinized type of behaviour which consists of several elements, interconnected to one other: forms of bodily activities, forms of mental activities, "things" and their use, a background knowledge in the form of understanding, know-how, states of emotion and motivational knowledge' (Reckwitz 2002 p.249).

Practices such as consuming, working, or cooking,

> *forms so to speak a 'block' whose existence necessarily depends on the existence and specific interconnectedness of these elements, and which cannot be reduced to any one of these single elements. Likewise, a practice represents a pattern which can be filled out by a multitude of single and often unique actions reproducing the practice (a certain way of consuming goods can be filled out by plenty of actual acts of consumption) (Reckwitz 2002 p.249).*

According to Røpke, practices do not only form blocks but also identifiable entities which are relatively stable over time:

> *in the continual flow of activities it is possible to identify clusters or blocks of activities where coordination and interdependence make it meaningful for practitioners to conceive of them as entities … An organized set of activities is seen as a coordinated entity when it is recognizable across time and space: a practice is a relatively enduring, relatively recognizable entity (Røpke 2009 p.2491).*

In addition, these types of entities can only exist when their related activities are carried out by larger groups of people and not only a few individuals. In order to survive, practices must be enacted. However, these enactments will always differ among its practitioners, leading to a potential transformation of the practice over time (Røpke 2009 p.2491).

The individual, functioning as a bodily as well as the mental agent, acts as a 'carrier' of a certain practice (Reckwitz 2002 p.250). Both individuals and things can act as the

carriers of a practice or many different practices, which may or may not be coordinated with one another:

> *[Individuals are] therefore the carriers of certain routinized ways of doing, understanding, knowing, and desiring. These aspects are necessary attributes of practices in which individuals participate, and which in part are shaped by the material world — but they are not qualities of human or of nonhuman actors (Ingram et al 2007 p.14).*

In addition, the practice itself is understandable not only to the agents who carry it out, but also to potential observers with a similar cultural background. Hence, 'a practice is … a routinized way in which bodies are moved, objects are handled, subjects are treated, things are described and the world is understood' (Reckwitz 2002 p.250).

In the words of Gram-Hanssen, 'the actual practice – the doing – is an assemblage of what is easy and straightforward, what knowledge one has, and what engagements and meanings are associated with that knowledge' (Gram-Hanssen 2010 p 159).

Practices are social since they consist of a type of understanding and behaving 'that appears at different locales and at different points of time and is carried out by different body/minds' (Reckwitz 2002 p.250). Still, practices does not need to involve interactions nor 'does it remain on the extra-mental and extra-corporal level of discourses, texts and symbols' (ibid).

In the world, many different practices exist, and most individuals are involved in a considerable number of types of practices; a number that is increasing: 'the multiplication of enthusiasms and interests is one of the marvels of our era' (Warde 2005 p.142). In the striving for variety, the 'set of items conventionally defined as part of a decent and normal life' is continually increasing (ibid). Practices will also differ in accordance with the engagement of the involved individual, who can be said to have a 'career' with a practice 'as experience and learning-by-doing develop the skills, attach new meaning to the activity, and maybe call for more advanced or supplementary equipment … acknowledgement of the pleasure of being a skilful practitioner' must also be made (Røpke 2009 p.2494 & 2495).

Practices reproduce social pattern simply through the way they are carried out, or 'supposed' to be carried out according to societal norms. Examples include the unequal access to resources; gender relations; the division of labour; and political, legal, economic, and cultural institutions. At the same time, these reproductions serve as the context in which other practices exists (Røpke 2009 p.2493).

3.2.1 Characteristics of practices

Practices can emerge, changing individual's lives, or disappear, leaving nothing but fragments behind; individuals can impact practices, and vice versa; and practices can be restricted by time, money and space (e.g. Shove & Pantzar 2005, Røpke 2009). However, as yet, practice theory is still a forming field of research and no common

definitions yet exists (Gram-Hanssen 2010, Hargreaves 2011). In this section, these issues will be looked into briefly.

The life and death of practices

In order for a new practice to emerge, an innovation process is required where agents develop and configure sets of bodily-mental activities 'by integrating elements of meaning, material and competence' (Røpke 2009 p.2494). Should this new configuration be diffused in the society thus being taken up by additional individuals, a new stable practice can emerge as a recognizable entity.

On the other hand, practices can die out when people stop performing them or they no longer are able to recruit new performers. Even practices that seem stable require constant reproduction should they not disappear. One visible force of destabilisation is the process of technological substitution: the car taking over as the main way of person transport from horse and carriage, e.g.

When a practice dies out, it can leave fragments of the old practices in the shape of relict artefacts, which can be characterised as social fossils. In doing so, a process of breaking existing combinations of existing elements has taken place: 'artifacts, ideas and forms of competence only have meaning and effect (they only live) when integrated into practice', and when that no longer is the case, fossilisation of the practice starts (Shove & Pantzar 2005 p.59-60).

When a practice fades away, the 'soft' parts of it (symbolic meaning, knowledge, competence etc.) disappear and only the 'hard' parts (items) remains, just like fossils found in nature. Examples of fossils include derelict tools intended for farming or making of cookies, which no one any longer knows how to use (ibid).

Practice innovation could thus be complemented by the studies of the process of killing practices (i.e. breaking the links between the elements that hold the practice together) in order to decrease practitioners' environmental impact. This could be done by breaking the links which make it purposeful to use the car for commuting: to make it cheaper to use public transport or to change the status of car-using into something symbolising low-class (Røpke 2009 p.2495).

Practices and agency

In practice theory, individuals are seen as 'skilled agents who actively negotiate and perform a wide range of practices in the normal course of everyday life' (Hargreaves 2011 p.83). The agency of individuals is clearly visible in practice theory because 'human agents are carriers of practices who are seen as knowledgeable and competent practitioners, able to link and integrate the elements of meaning, material, and competence necessary to perform practices' (Røpke 2009 p.2493). The exposure of different practices are important factors which are partially determining what practices an individual will partake in, both in the sense of practices the individual encounters and has access to. Often, these circumstances are rather haphazard. Likewise, the experiences which an actor has with different practices are influencing which new practices s(he) can be recruited to. In daily life, people are managing their

situation as ‘a puzzle of many considerations emerging from practices and projects and influenced by their accumulated experiences and dispositions’ (Røpke 2009 p.2493). Agents thus ‘are knowledgeable about their day-to-day activities, and most routinized activities are carried out based on a practical consciousness that does not require conscious reflection’ (Røpke 2009 p.2491).

Practices and the limitations of time and money

When changing focus from the composition of consumption categories to the composition of practices, differences in dynamics can be identified, leading to a special focus of the environmental impact of time scarcity. Before the advent of the internet, both time and space limited an individual’s possible range of activities. Nowadays, it is time that sets the limits to what number of activities one can engage in, leading people in modern societies to having to cope with what can be conceived as a scarcity of time (Røpke 2009 p.2493 & 2496).

Individuals adapt to this time scarcity by various strategies. In one’s prioritizing among practices, there is a tendency to let go of time-consuming leisure activities which requires both coordination of schedules and much training, resulting in a ‘high activity-intensity per unit of time’ (Røpke 2009 p. 2496). Moreover, the materials-intensity of practices is limited by the income available to individuals, but relationships between income and consumption are also dialectical in the sense of when practices require additional consumption of materials or goods, a search for higher income is stimulated. In addition, as long as increases in real income is making it possible for actors to acquire the material they need to ‘improve the performances of valued practices’, the actors also tend to do so (Røpke 2009 p.2496).

3.2.2 The act of consumption

Almost all practices somehow involve the usage of material resources, no matter if the practices themselves can be classified as production or consumption. However, ‘people first of all think of themselves as being involved in meaningful practices rather than being involved in consumption’ (Røpke 2009 p.2495). Consumption has been defined by Warde (2005) as follows:

> *Consumption [is understood] as a process whereby agents engage in appropriation and appreciation, whether for utilitarian, expressive or contemplative purposes, of goods, services, performances, information or ambience, whether purchased or not, over which the agent has some degree of discretion. In this view, consumption is not itself a practice but is, rather, a moment in almost every practice (Warde 2005 p.137).*

The activities that we engage in can be seen as the cause of consumption. Practices entail certain aspects of consumption, which leads to a statement that it might be practices themselves, rather than the desires of individuals, that creates want (Warde 2005 p.137). In addition, the increasing range of practices which individuals are getting involved in, has ‘potentially enormous economic consequences; getting people to dabble in everything offers splendid commercial opportunities, particularly when it

is the affluent who are the most prone to dabble' (Warde 2005 p.142), thus leading to economic growth.

Consumption and well-being

After a certain threshold level is passed, increased consumption no longer has an impact of the individual's well-being (Pretty 2013 p.475). However, the paradox that still persists is that people continue to strive for further material improvements and purchases, even though those who are relatively unsuccessful in this pursuit in practicality show no loss of well-being (Warde 2005 p.148).

Invisible consequences – the impact of distancing

In many societies of today, the consequences of actions are not visible to the individuals carrying out the action. The waste generated by household is collected by private or public companies before being neatly disposed of, hence leading to little understanding amongst individuals of where their waste finally ends up (Clapp 2002 p.22).

Princen (2002 p.116) describes distance as the separation of primary resource extraction decisions and consumption decisions along four dimensions, namely geography (physical distance), culture, bargaining power (asymmetric power relations among stakeholders in where to dispose waste) and agency, forming what Clapp (2002 p.157-158) calls an 'understanding gap'. According to Akenji (2014), '[t]his leads to a growing mental, cultural and geographic distance between consumers and their waste. Whether from resource extraction or waste generation, the more people are isolated as final-end consumers … distancing causes ecological feedback to be severed, leading to decisions that perpetuate resource overuse and increased waste generation' (Akenji 2014 p. 16).

Green or sustainable consumption?

There is a difference between green consumption and sustainable consumption (Akenji 2014 p.13). Green consumption can be defined as 'the production, promotion, and preferential consumption of goods and services on the basis of their pro-environment claims' (Akenji 2014 p.13). Examples of ways to promote a green consumerism includes public campaigns, eco-labelling schemes for services and products, process certifications, eco-efficient standards, recycling of post-use products and green public procurement.

However, due to rebound effects, green consumerism in the form of eco-labelling, e.g., has not lead to decreases in resource consumption but rather to increases. As an example, a study of a Japanese program providing Eco-points to individuals upgrading to new energy-efficient TVs, refrigerators, air-conditioners etc. in order to boost consumer spending and economic growth lead to the spending of the acquired Eco-points to buy even more products. During the year the program was in effect, the sale of TV sets increased by 62 %, air conditioners with 21 %, and refrigerators with 9 % in comparison with the year before (Akenji 2014 p.16). According to Akenji,

> *It becomes evident that promoting green consumerism at once lays responsibility on consumers to undertake the function of maintaining economic growth while*

simultaneously, even if contradictorily, bearing the burden to drive the system towards sustainability (Akenji 2014 p.16).

Sustainable consumption means consuming less, not more (Akenji 2014 p.16). Green consumerism 'is at its best at the periphery' of sustainable consumption and 'provides an illusion of progress which distracts from the urgent structural changes needed in order to achieve sustainable development' (Akenji 2014 p.13).At the same time, the green consumer is lead to think that (s)he is consuming in a sustainable way – not from any realiztic understanding of the ecological consequences of accumulated consumption (Akenji 2014 p.16).

Motives for consumption

As described above, consumption of resources is a major cause of harmful environmental impact. Many different reasons exist to why an individual consumes a resource, and some will be presented in this section.

Consumption related to self-image of the individual

Ingram et al (2007 p.6-7) identify several reasons for individual's consumption related to the individual's self-image, such as social comparison and creation of self-identity, e.g. social comparison (lower social classes aim to imitate high-status groups through consumption, while the high-status groups try to separate themselves from the rest); creation of self-identity (you are what you buy); mental stimulation and novelty (avoiding boredom by testing new items and tastes in an everlasting spiral); matching (acquiring goods to match items already owned), and specialisation (engagement in an increasing number of activities means need for equipment) (ibid).

Diffusion of technologies in the society – normalisation

New technology gets integrated in the daily life by normalisation. First, it might be bought or used only be the individuals most interested in technology, before being accepted by the general public and lastly the most conservative individuals, thus making the once novel technology a standard feature in society. Examples include computers and smartphones (Ingram et al 2007 p.12).

Technology lock-ins

By designing products and technologies of different sorts to be compatible with other, systems of interdependencies are created. Examples include the interdependencies of computers, printers and digital cameras (Ingram et al 2007 p.12).

Societal structures

The activity of shopping can be seen as 'not only involv[ing] market exchange' (Akenji 2014 p.17) but is rather 'a way of procuring many of the goods and services consumed in the course of other practices' (Røpke 2009 p.2495), making 'resource consumption is … not premeditated but a consequence of the practice of partaking in everyday life' (Akenji 2014 p.17). From this perspective, it becomes clear why practices and not individuals should be the basic unit of analysis (Akenji 2014 p.17).

Though consumers do have a responsibility for their actions, individuals' decisions are neither necessarily individual nor rational but could be caused by other factors

outside their control (Akenji 2014 p.17). Both social and physical infrastructure is determining the behaviour of the consumer. Infrastructures such as electricity, district heating, water and electricity etc. may be 'the most important structures of sustainable lifestyles' (Gram-Hanssen 2012 p123). Thus, if effective facilitators and a proper infrastructure were already put into place, then the attitude of individuals would matter less because the easiest choice would be to choose the sustainable behaviour (Akenji 2014 p.17-19):

> *This is somewhat analogous, though in an opposite effect, to the market bypassing consumer needs to provide new products and then creating the 'need' for them among consumers. On the reverse side, where the facilitator is weak and infrastructure unsustainable, attitude becomes key to moving the system (Akenji 2014 p.19).*

Lifestyles are the result of options available to people, but also, 'final choices available to citizens and consumers are a reaction to government policy, manufacturers' and service providers' choices, and retailers' decisions on what to or not to shelf' which is not really in line with the idea of the consumer's freedom of choice (Akenji 2014 p.20). A more sustainable consumption pattern could thus be enabled by e.g. choice editing, which means taking out the bad options from the market or somehow make them less desirable.

Practices as the cause of consumption

Links between practices and the environment goes through its material component, meaning through the production and use as well as through the discarding of materials, equipment and infrastructure, which are necessary in order to carry out the practice. Having this view on consumption 'emphasizes that the transformation of material goods into waste, while obtaining services from the goods as an aspect of various practices, is a process which in most cases takes place over a longer period' (Røpke 2009 p.2496).

It can be stated that the consumption pattern of an individual 'is the sum of the moments of consumption which occur in the totality of his or her practices' (Warde 2005 p.144). When looking at the individual as an intersection point of his or her practices, and assuming that practices are the foundation of consumption, a new view on consumer behaviour can be identified. Patterns of consumption can thus be explained by the range of activities an individual is practicing, and also to his or hers commitment to these practices (Warde 2005 p.144).

It might be that consumption is not caused by the will of 'demonstrating one's economic capability by owning and showing off expensive consumer goods' but rather the fact that 'people are engaged in demonstrating their abilities as competent practitioners of various valued practices' (Røpke 2009 p.2496).

3.2.3 The issue of changing a practice

Practices are by their nature ever-evolving and when they diffuse in society, they can still be recognizable as entities, but 'they also change like chameleons according to

the context of the practitioners' (Røpke 2009 p.2494). Changing of practices is complex:

> *On the basis of a practice theory approach, one cannot expect simple correlations between knowledge and practice, between attitudes and practice, between economy and practice, or between technology and practice. We need to understand changes in practice as part of long-lasting and ongoing processes that incorporate all these elements (Gram-Hanssen 2010 p.163).*

Routine practices are interesting, seen from an environmental perspective, since they account for a great share of materials-, energy-, and water consumption (Røpke 2009 p.2496):

> *the lack of reflexivity in routine practices may constitute a barrier to the inclusion of environmental considerations. Consumers are often not aware of the environmental impact of routine practices, when the impact is not embedded as an aspect of meaning constituting the practice, and routines are not so easily called into question. Since environmental considerations tend to be included only in a limited number of actions, serving as symbolic indicators of environmental awareness and behaviour, it would be a formidable challenge to bring in the environment as an important aspect of meaning across most practices.*

In trying to foster more sustainable practices, it is agreed that making people change their routines are difficult (Gram-Hanssen 2008 p.1181). Still, history shows that routines constantly change – not due to public campaigns to save energy, e.g., or out of concerns for the status of the environment – but rather because of changes in the social organization of everyday life, often combined with the introduction of new technologies (ibid). In the words of Shove & Walker (2010 p.475): 'when practices change they do so as an emergent outcome of the actions and inactions of all (including materials and infrastructures, not only humans involved)'.

3.2.4 Enabling more sustainable practices

Due to the environmental impact of practices which individuals engage in and the tendency to diversify practices, it is increasingly becoming more important to investigate what types of practices that can be found in society and in which groups of individuals, as well as to look into typical patterns of combinations in practices (Warde 2005 p.149). In these different practices, lots of materials are needed, such as tools, equipment, toys and other resources in order 'to accomplish what people believe to be normal, ordinary, and acceptable ways of life' (Ingram 2007 p.14). Due to the impact of practitioners' habits and routines, it is important to study domestic practices since 'practitioners appropriate and transform resources' (Røpke 2009 p.2496). In order to generate more sustainable practices, links and elements of existing practices must be both challenged and broken before they could be replaced and remade in more sustainable types of ways (Hargreaves 2011 p.83). In particular, 'socio-technical transitions are reliant upon transitions in practice' (Scott et al 2011 p.282).

Practices and energy

On the matter of energy research, there is a tendency identified 'to take the societal "need" for energy for granted and to focus on methods of meeting demand more efficiently, or in a manner that reduces CO_2-emissions' rather than questioning the current practices and ways of life: the energy need in society is seen as constant and not problematized" (Shove & Walker 2014 p.41). The question of why we need energy is one not often asked. Also, people do not consume energy as such: 'patterns of energy consumption depend on a series of historically specific conjunctions of technologies (wiring, light bulbs, etc.) and practices (illuminating rooms, reading at night) and constellations of practice, many of which are now disconnected from seasonal variations in daylight' (Shove & Walker 2014 p.49).

Technology and changing of routines

Changes in technology are often central causes to the changing of practices over time and artefacts and practices, by their nature, coevolve (Røpke 2009 p.2494, Ingram 2007 p.14). Quite often, technologies can be found as the reason of the changing of routines, '[n]ot as technological determinism, as development of technology is in itself a social construction, but as the direct reason for the inertia of the routines being overcome' (Gram-Hanssen 2008 p.1187). Routines often mean the handling of materials and items around us, and as the materials change (e.g. by the introduction of a new technology), the daily routines also have to change. Thus, already in the design process, the routines of the future users should be considered. However, it can often be seen that users reshape and rethink new technologies in ways not foreseen by the designers, which leads to the conclusion that '[t]he social relations in which routines develop also have significance for the development of the routines' (Gram-Hanssen 2008 p.1187).

To be able to understand how practices, routines and technology relate to each other, a brief description of a case study on laundry will follow in the next section.

Case study: doing the laundry

As described earlier (see section 2.2.5), doing the laundry is an every-day activity impacting the environment in several ways. To enhance the understanding of what practice theory is, a short case study on laundry will be presented in this section.

The practice of washing clothes consists of different projects such as sorting of clothes, washing them and then drying them, in a way that most people in the Western world share (Gram-Hanssen 2008 p.1182).

Historical development in a northern-European context

When the appliance technology of washing machines were new, it was looked upon with some scepticism and it was questioned whether the machines really managed to get the clothes washed properly. In a northern European context, the washing machines made it easier for women to go from being housewives to enter the paid labour force. At the same time, the incorporation of washing machines in everyday life also changed the norms of how often clothes should be washed.

Gram-Hanssen (2008 p.1183) describes interviews with women born in the 1920 and 1930s and how the advent of the washing machine changed their washing routines, and how they experienced that their washing practices almost immediately changed: from monthly washes with a full day of hard work, to washing more frequently and also much more (Gram-Hanssen 2008 p.1183).

Washing clothes today

Today, washing is 'still primarily a female domain, not that women necessarily do all the laundry, but in the sense that their norms often rule the standards of how to launder' (Gram-Hanssen 2008 p.1186), who continues:

> *Women's washing practices may be influenced by norms inherited from their mothers on the importance of cleanliness, but the routines of how the laundering is actually done will often have changed, because of new technologies in washing machines, in washing powder and in types of fabric … However the washing machine might also be reinterpreted and used for other purposes than for cleaning dirty clothes.*

The practice of washing can be carried out as a means of simplifying the administration of everyday life. In a Danish study, the mother of three teenagers explained that she washed three to four loads a day, simply because it was easier to wash the clothes of her much active children and husband, than finding places to hang the towels in the bathroom to dry and to remember whom each towel belonged to. The purchase of an additional washing machine had been considered, in order to increase the washing capacity. Other families explained that once an item was taken out of the wardrobe, the only way back into it went through the washing machine, regardless if the item was dirty or not. As Gram-Hanssen puts it, these examples show 'how new routines emerge while reinterpreting technologies' (2008 p.1186). Very few of the mothers in the study really questioned neither the amount nor the necessity of washing, even though this frequent washing results in a lot of work. Also, very few considered the environmental impacts of their washing habits, 'even if the family in other domains reflects on their environmental performance' (Gram-Hanssen 2008 p.1186). In the cases where washing and the environment was connected, it was mainly along the lines of 'keeping a lower temperature' and 'filling the machine' in accordance with public campaigns. Gram-Hanssen then notes that 'no public campaign has ever focused on questioning how often clothes need to be washed' (2008 p.1186).

Going from practices and how they impact sustainability to a presentation of the living lab concept and its potential to change behaviour, the next section describe how living labs can assist in creating a more sustainable world. As been described above, socio-technical transitions are dependent on a change in practices; in this following section it is explained how living labs can be used in order to evaluate transitions in a real-life context.

3.3 Living labs: arenas for innovations

Living labs are multi-faceted research arenas which 'can support a co-creative process to facilitate innovation' (Hagy & Balay 2014 p.6), of which an agreed definition is lacking (Ståhlbröst 2012 p.62). Living labs have been described as 'a methodology, an organization, a system, an arena, an environment, and/or a systemic innovation approach', striving to support the innovation process for all involved stakeholders from manufacturers to the end user (Ståhlbröst 2012 p.62 & 61).

In general, the concept of living labs is becoming increasingly important regarding public-private partnerships in which public authorities, firms and citizens get together 'to create, prototype, validate and test new services, businesses, markets and technologies in real-life contexts, such as cities, city regions, rural areas and collaborative virtual networks between public and private players' (Dell'Era & Landoni 2014 p.139).

Among the existing definitions can the following be found:

- *bring[ing] together interdisciplinary experts to develop, deploy, and test – in actual living environments – new technologies and strategies for design that respond to this changing world (Massachusetts Institute of Technology 2015)*

- *a user-centric innovation milieu built on every-day practice and research, with an approach that facilitates user influence in open and distributed innovation processes engaging all relevant partners in real-life contexts, aiming to create sustainable values (Bergvall-Kåreborn et al 2009 p.3)*

- *as an innovation organization in which the whole value chain is involved in the development of innovative services in co-creation with users in a real world context … both as an environment (milieu, arena) and an approach (methodology, innovation approach) (Ståhlbröst 2012 p.61 & 62).*

- *design research methodology aimed at co-creating innovation through the involvement of aware users in a real-life setting (Dell'Era & Landoni 2014 p.139)*

- *aims to turn users into active co-creators of emerging ideas and innovative concepts. A living lab is an experiential environment, physical or virtual, where users are immersed in a creative social space for designing and experiencing their own future (Hagy & Balay 2014 p.8)*

However, most of the definitions have two things in common: 1) Living labs are real life experimentation environments with 2) individuals (users) who are aware of being co-involved in the innovation process (Dell'Era & Landoni 2014 p.139). Living labs are spreading as 'design research is evolving from a user-centred approach (with user as subject) to a participatory one (with user as partner)' (Dell'Era & Landoni 2014 p.137).

3.3.1 Stakeholder's motivation for involvement in living labs

In living lab constellations, each partner (be it universities, firms or municipal actors) 'bring their own specific wealth of knowledge and expertise to the collective, helping to achieve boundary spanning knowledge transfer' (Bergvall-Kåreborn et al 2009 p.4). When it comes to potential partnerships, it has been identified as beneficial to have a mixture of stable and flexible partnerships: the more flexible partners contribute with new ideas and perspectives whilst the stable provides continuity to the living lab (Bergvall-Kåreborn & Ståhlbröst 2009 p.4 & 13).

Academia

Academia's involvement in living labs stem from the need to be involved with innovations in order to help transform society, e.g. by trying to foster sustainable development. In doing this, stakeholder participation is crucial and all stakeholders must be involved on equal terms, albeit not equally during all steps in the innovation process (Spangenberg 2011 p.283). This is due to the fact that the 'effects of implementing science-based measures will frequently emerge outside the individual scientist's realm and field of competence, but will still be partly the responsibility of science' (ibid). Spangenberg continues to argue that the concept of scientific communication as one-way from experts to decision makers and to the general public is outdated, and thus must be substituted by

> *a notion of partnership through reciprocal learning by all those involved and affected. This implies involvement of both the public and decision makers in the quality assurance and assessment of scientific and technological innovation: every stakeholder becomes a peer (Spangenberg 2011 p.283).*

The act of opening up research can prove to be very rewarding if 'disciplines involved are ready to accept their limited competence and thus their role as contributors amongst equals', and not only may the outcomes be more diversified, but results may also have a 'higher degree of political relevance' (ibid).

Research question definitions should be done by all stakeholders together and the relevance of a task decided by stakeholders with scientists 'possibly participating in their capacity as citizens, rather than because of their scientific expertise' (Spangenberg 2011 p.283). In the matters of methodology and approval of scientific work, scientists must have the decision-making power since no method is neutral, and choices of methods must be explicit and justified in terms of appropriateness (ibid).

Firms

New products often fail in market launches, thus giving companies poor returns on their product innovation investments. Having a user-centred research approach can lead to commercial benefits for companies through the minimisation of risk when a new service, technology or product is launched on the market (Liedtke et al 2012 p.5). This has led many companies to open up their innovation processes 'since innovation stakeholders have become more mobile, venture capital more abundant, and knowledge more widely dispersed across different types of organizations' (Ståhlbröst

2012 p.65-66). Studies have indicated that approximately only 15 % of companies' time spent on development is invested in products that will actually reach the market (Bergvall-Kåreborn & Ståhlbröst 2009 p.10).

Individuals

To be part of a living lab can be emancipating to individuals since it allows them to leave their imprint on concepts, prototypes, and/or finished products (Bergvall-Kåreborn & Ståhlbröst 2009 p.11). In a Finnish living lab project, the volunteering individuals' expressed that they

> *Perceived that participation in a Living Labs (sic) initiative enabled them to influence companies' innovation development in a specific area of their personal interests. In other words, they could influence something that is meaningful and has an impact on their personal life and consumption habits (Leminen & Westerlund 2012 p.52).*

Outcomes for participants include learning experiences and accumulated knowledge, while some identified challenges consisted of keeping up motivation for their involvement in the living lab project and to have them express relevant experiences during the research (Leminen & Westerlund 2012 p.54). However, there is an acknowledged need to study interactions and the roles between users and other stakeholders in living lab projects (Leminen & Westerlund 2012 p.56).

Living labs and the construction industry

Living labs can provide an opportunity to deal with some of the concerns related to the slow pace of innovation and implementation in the building sector, such as high risk of failure of new technologies (such as individuals not knowing how to use the innovation properly). In order to avoid such a discrepancy between designer and user, testing and evaluation of technologies 'with, for and by users' can be done before potential market launch (Rosado et al 2015 p.178). Thus, with the future users engaged in the testing process, the feedback time to the industry will be shortened and the risk of failure minimised.

3.3.2 Traditional research methods compared to the living lab approach

Traditional methods of getting insights into consumer's preferences and needs include market research, focus groups, quantitative surveys, and lab-based or real-life observation. These tools are generally well known and in some cases often cost-efficient (e.g. focus groups). However, in predictions if and how households accurately will understand 'the technology that underpin truly innovative products', tools such as those mentioned above have a tendency to fail (Bakker et al 2010 p.1234). These methods also presuppose that the customer 'knows best the characteristics that he or she desires to implement in a product' (Dell'Era & Landoni 2014 p.141).

Several networks for living labs exist: SusLabs (sustainable living labs) including projects in the Netherlands, Germany, Great Britain, and Sweden (SusLab 2015a) and

ENoLL (European Network of Living Labs) with 20 effective members (ENoLL 2015).

Interviews and questionnaires

Interviews and questionnaires are established methods to try to find out customer's need(s), and made with the assumption that the customer knows what (s)he wants to get out of the product. However, unless the product satisfies explicit needs, this assumption is often not true – rather, the customer is unaware of her or his needs, and even more so of the need of others or future needs (Dell'Era & Landoni 2014 p.141).

Focus groups

Focus groups are a qualitatively oriented research method with more contemplative approach compared to questionnaires and interviews, which can be used by firms to explore what customers report to the firm and to other participants in the group. A limiting factor is that focus groups are subject to social norms in the group, leading the customer to omit needs that s(he) doesn't want to acknowledge or explain in the presence of the rest of the group. This means that the evaluations of certain subjects can be 'conditioned by other opinions and expected opinions' (Dell'Era & Landoni 2014 p.141).

Lead-users

Lead-users are customers standing out from the general crowd of customers in the sense that they have autonomously developed "ad hoc" solutions to better satisfy their needs stemming from a certain degree of dissatisfaction with a product', thus are able to suggest 'previously unknown market solutions' (Dell'Era & Landoni 2014 p.142). Lead users can also provide reliable information on consumer needs and about desired performances and characteristics during initial product development. However, finding these types of individuals are very difficult for companies.

Participatory design

Participatory design is a design method for actively involving as many stakeholders as possible (such as employees, partners, customers, citizens and end users) into the design process to try to create a product that is properly meeting all needs and is usable. In this particular method, the invited participants are co-operating with designers, developers and researchers during the process of innovation. The participants can be involved in one or several steps of the innovation process, e.g. they can help with problem definition and focus areas for solutions, and be part of the development by helping to evaluate proposed solutions. The method of participatory design, 'represents an example of a research method developed to support design work during concept generation and development phases' (Dell'Era & Landoni 2014 p. 143).

Living labs – similarities and differences

Living labs do have a lot in common with traditional types of research methods, but they also differ substantially:

> *On the one hand, the users are involved and aware of the process, as opposed to users studied by applied ethnography. On the other hand, the users are not special*

in terms of skills or knowledge of the technologies as during lead user innovation … (i) the context of use in the Living Lab methodology significantly affects the user's needs similar to applied ethnography, (ii) users in the Living Lab methodology actively contribute to the innovation process, like the users in the lead user methodology, and (iii) the co-creating activity of the Living Lab methodology usually supported by physical artefacts is aligned with participatory design approaches (Dell'Era & Landoni 2014 p.147).

Thus, there are similarities between the different methods, but also great differences (ibid), potentially leading to different research outcomes depending on used methods.

3.3.3 Different types of living labs

Living labs can come in many types of shapes and with different aims and objectives. During the development of the living lab concept, it has been defined as everything from an environment, to a methodology, and as a system (Bergvall-Kåreborn & Ståhlbröst 2009 p.4); whilst Bakker et al (2010 p.1235) chooses to call it a 'research infrastructure' where conceptual frameworks are provided for researchers as well as a physical infrastructure. The stakeholders involved vary from communities of expert users to whole bounded populations (Leminen & Westerlund 2012 p.46).

Living labs can either be classified as open (anybody who wants to can join a living lab – open for public participation) or closed (only invited individuals and actors are allowed to participate). There are also differences in the role of platform technology: either value appropriation (opportunity exploitation of existing technologies) or value creation (developing completely new technologies), which living labs can choose to work with (Dell'Era & Landoni 2014 p. 149-151).

Case study: Delft University of Technology

Delft University of Technology, the Netherlands, is the main actor in the living lab project called The Concept House Prototype 1, which was opened in October 2012 – a facility which will host tenants from different demographic backgrounds (SusLab 2015b). It is a prefabricated modular house which provides its own electricity (Concept House Village 2015).

Three general modes of procedure are guiding the work with living labs in the Delft University of Technology and the SusLab network: generating insights into people's behaviour and needs, developing and experiencing early prototypes, and evaluating prototypes in the field (Bakker et al 2010 p.1236-1237).

Generating insights into people's behaviour and needs

Explorations of individual's needs in their own personal context should be seen as an important point of departure for new ideas and opportunities. Ethnographic methods (e.g. observations, cultural probes and context mappings) can form the basis of 'people's context and needs' and should be carried out in real-life settings such as people's homes (Bakker 2010 p.1236). Additionally, data can be collected by means like user-reporting and 'non-obtrusive observational techniques' (ibid).

Developing and experiencing early prototypes
Findings from the first step should be interpreted in 'sustainable solutions by multi-disciplinary teams through open innovations sessions and co-creation workshops' and then tested by temporary residents at the living lab facility where volunteers will be chosen based in order to represent 'specific social and cultural segments' of the population (Bakker et al 2010 p.1236 & 1237). The living lab will complement existing research in 'non-controllable environments in existing homes' (ibid).

Evaluating prototypes in the field
In the third step of the living lab methodology from Delft University of Technology, the functional prototype should be installed in homes in order to let the inhabitants experience, experiment and evaluate potential future service- and product ideas at home, in order to be able to explore long-time impacts of the innovation (Bakker et al 2010 p.1237).

Case study: Botnia Living Lab: Luleå University of Technology
The Botnia Living Lab is a project taking place at Luleå University of Technology at the Center for distance-spanning technology. It is an 'open environment' for studies on 'human-centric research and development of new innovative ICT-based products and services' (Luleå University of Technology 2015). The Botnia Living Lab was started in 2000 and has 'matured from a test-bed to a real-life laboratory, powered by more than 6000 co-creative pilot users', with a focus on advanced IT products and services, forming a virtual platform with previous studies on subjects like mobile marketing and traffic information (Luleå University of Technology 2015) and is part of the ENoLL network (ENoLL 2015). It is guided by 5 general principles: value creation, sustainability, influence, realizm, and openness.

Value creation
The first goal is to create value for all stakeholders in two different ways: for the involved partners (typically small to medium size enterprises) and for presumptive customers/ developed innovation user in terms of user value (Ståhlbröst 2012 p.63).

Sustainability
The innovations should support the development of sustainable innovations. Likewise, '[s]ustainability refers both to the viability of a Living Lab and to its responsibility to the wider community in which it operates' (Bergvall-Kåreborn et al 2009 p.9). In addition, it is important to do research on how to design living lab processes in order to actually contribute to a more sustainable society (Ståhlbröst 2012 p.71).

Influence
Actors should be seen as competent and active partners with expertise within their domains and '[a]s such, their involvement and influence in innovation and development processes shaping society is essential' (Ståhlbröst 2012 p.64). Innovations must be based on the needs and desires of future users. The emphasis on decision-making powers of domain experts and future users make this principle differ from 'participation, involvement and engagement, which instead focus on the

activities carried out by users and on users' psychological state (Ståhlbröst 2012 p.64).

Realizm

Innovation processes must occur in 'a realiztic, natural, real-life setting' (Ståhlbröst 2012 p.65). This is done either by research environments, which imitate the real world, or by testing/evaluating services and products in user's real world environments – reflecting people's interpretations of their present situation (Bergvall-Kåreborn et al 2009 p.7). In addition, different stakeholders face different realities:

> *as a researcher, the reality can be focused on producing scientific results, while SMEs' reality can be to earn money by developing a new IT system. Different perspectives and views on the reality are also often mentioned reasons for why it is crucial to involve users as well as many different stakeholders in the development process (Bergvall-Kåreborn et al 2009 p.8).*

Openness

An innovation process should be as open as possible with regards to stakeholders, since the concept is 'that multiple perspectives bring power to the development process and contribute to the achievement of rapid progress' and in order to 'develop as attractive an innovation as possible' (Ståhlbröst 2012 p.66). The openness factors also provide opportunities to better utilise 'collective creativity' and the potential to decrease the time span of development before launching a product on the market (ibid). However, reputational effectiveness of a company could potentially be impaired by too much sharing of information, and open innovation can possibly lead to 'worse timing to market and slower, more costly processes' (ibid), thus making additional research on the field of openness is required.

3.3.4 Living labs and sustainability

A transition of the contemporary society towards sustainable ways of production and consumption can be seen as a key challenge, and transition processes are necessary in several areas, of which some of the most important are housing and food (Liedtke et al 2014 p.1). Sequences of local experiments should be performed before being replicated in different settings and places, in order to foster potential transitions (Liedtke et al 2014 p.10). Livings labs have the potential of assisting the understanding of what sustainable lifestyles and practices are, in order to enable sustainable development:

> *the future potential for resource efficiency, climate change, poverty reduction and broadening welfare lies in the fields of individual decision making and behavioural processes combined with organizational learning processes recognizing the social context situation Therefore, more information and research results about these processes are needed, more knowledge is necessary about what people want and how they use products and frameworks in their living environment (Liedtke et al 2012 p.107)*

There are several living labs with sustainability profiles. Liedtke et al (2014) defines a sustainable living lab as:

> *a locally based regional, national and international infrastructure set-up to enable innovation processes in which users and value chain-relevant actors actively participate in development, testing and marketing phases. Interactive innovation processes take place gradually in users' real life surroundings (user observation, field tests) and user interaction laboratories (e.g. for prototyping) (Liedtke et al 2014 p.2)*

The living lab approach has a strong potential in the fostering of diverse eco-innovations since it has a different perspective from the more common eco-feedback approaches (e.g. sensors and meters). The difference is that rather than to reduce users' behavioural options to what has been identified as more sustainable, or to create awareness of habits which by itself doesn't have to result in decrease of consumption, the living lab approach would ideally 'lead to long-term effective sustainable innovations in the home by engaging users rather than restricting them or designing around them' (Liedtke et al 2012 p.108). Thus, living labs can be of help by undertaking 'new methods of user-oriented research in order to foster innovation in sustainable lifestyles and products' (ibid). However, as Ståhlbröst (2014) points out, it is essential that the living labs themselves take the responsibility for their impacts on the environment around them, be they social, economic or ecologic; meaning that the right types of materials must be chosen, environmental friendly processes should be implemented, and social and economic impacts of innovations caused by their implementations must be considered (Ståhlbröst 2014 p.64).

The combination of laboratory and household system enables focus on the social needs of individuals and aims

> *at the development of integrated technical and social innovations – new product mixes, services and societal infrastructures – and simultaneously promot[es] the conditions of sustainable development (highest resource efficiency, highest user orientation, etc.) and respect the limited numbers of natural services that can be used without destroying the ecological system (Liedtke 2014 p.109)*

which makes the living lab approach appropriate for developing sustainable services and products. This is due to the fact that it puts the user (the home occupant) in focus while developing and testing potential sustainable domestic technologies (ibid). In many sustainable housing projects of today, homes are high-tech where '[h]eating, cooling, ventilation, lighting, communication and energy management systems are all connected and interact with each other and with the home occupants who need to monitor, manage, maintain and live with them' (Liedtke et al 2021 p.108). One prominent research goal for sustainable living labs is to evaluate whether individuals can interact with these systems successfully or not, and if this interaction in fact do lead to sustainable households over a longer period of time. In order to do this, the relationships between inhabitants' behaviour, consumption of resources at home and domestic systems such as technologies and products must be further explored, whilst

succeeding in optimizing user comfort and experience yet minimizing resource consumption and waste production (ibid). In addition, since practices rather than individual desires have been identified as the main driver of consumption, unanticipated user behaviour is important to identify in order to avoid potential rebound effects (Liedtke et al 2014 p.3). Thus, social practice theories are well suited for evaluating routine behaviour when it comes to specific case studies such as heating (ibid).

■

In this chapter, the theoretical framework forming the foundation for this master thesis was presented. In the following chapter, the HSB Living Lab project will be described: its purpose, goals, and what a project such as this intends to achieve in terms of testing out new and sustainable solutions intending to improve daily life, alongside with links to the theoretical framework.

4 HSB Living Lab: a new arena for co-creation and innovation

The HSB Living Lab will be a physical structure that aims to be a co-creative social space for experimenting with sustainable technology and lifestyle in order to develop innovative concepts and products (Rosado et al 2015 p.178-179).

The HSB Living Lab is a new modular and mobile living lab that will be situated at the Johanneberg Campus of Chalmers University of Technology, providing housing for students and researchers (see figure 2 below). The modules will be in place for ten years (Hagy & Balay 2014 p.33). Planned date for moving in is set to the spring of 2016 (Morrison 2015-04-28). The chosen definition forming the basis of the project is:

A Living Lab aims to turn users into active co-creators of emerging ideas and innovative concepts. A living lab is an experiential environment, physical or virtual, where users are immersed in a creative social space for designing and experiencing their own future (Hagy & Balay 2014 p.8).

Figure 2. HSB Living Lab illustration, Tengbom.

4.1 The building

The house is built in a factory as 44 prefabricated volume elements in steel, which are to be assembled on site on Chalmers Campus in December 2015/January 2016, before being finalised during the spring 2016 (Elfstrand 20151009). It will contain 29 apartments of which 20 are identical and static, with the intention of having similar preconditions for comparative studies. Five apartments are designed to be equivalent to the current production standards in Sweden, whereas 25 housing units are designed to have a smaller personal space and one larger, shared space. These 25 housing units are also organised into groups of four, in order to be able to make comparative studies of this type of housing, too. For illustrations on the interior of the building, see figures 3-6 below.

Figure 3. Apartment interior. Illustration by Tengbom.

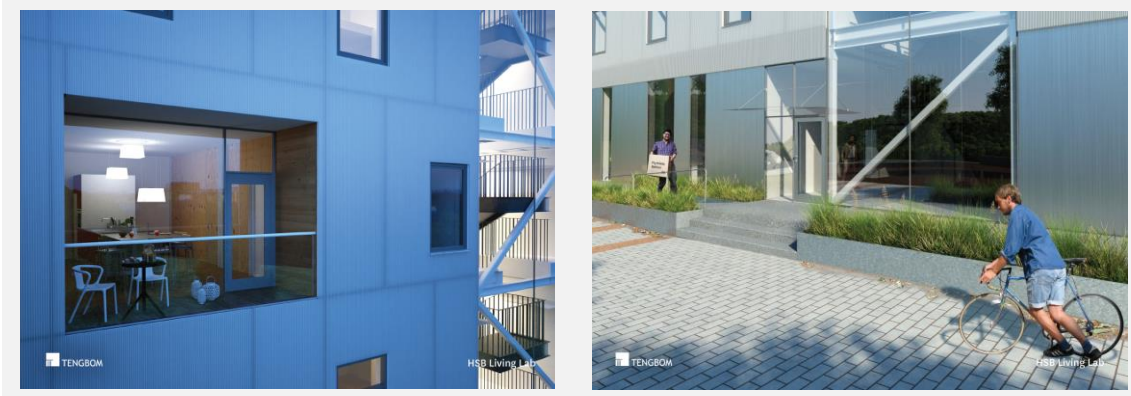

Figure 4. Façade of the building. Illustration by Tengbom.

Figure 5. A shared kitchen. Illustration by Tengbom.

Figure 6. Common spaces. Illustration by Tengbom.

4.2 Scientific basis

The HSB Living Lab is built on three equally important pillars, forming the basis of the project: systems and engineering; design and behavioural science; and sustainability science, of which the living lab is not placed at the intersection of the three subjects but rather includes elements from the different research fields (see figure 7 below).

Systems and engineering. Services, smart automation, simulations, and engineered systems for optimised performances can be integrated into home designs and also enables eco-visualisation.

Design and behavioural science. Lifestyle change can be assisted through a practice-oriented approach with the user in the centre, which will provide different sorts of potential design solutions.

Sustainability science. Sustainability science is 'increasingly being defined as an inclusive and ubiquitous super-discipline and with a clear foundation in the study of human, social and ecological systems' (Rosado et al 2015 p.178).

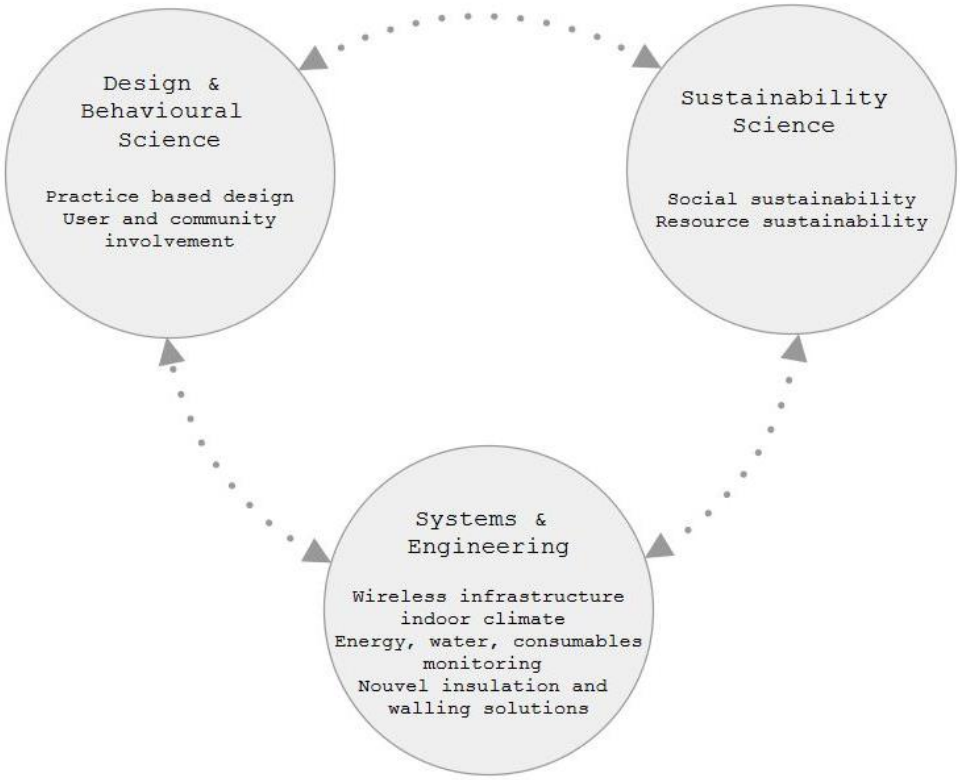

Figure 7. Model for enabling sustainability at home. From Rosado et al 2015.

4.3 Objectives

The set objective for the partners in the HSB Living Lab in order to enable a more sustainable home life is

to have a space for the co-creation, prototyping, and testing of sustainable living technologies and behavioural practices in order to develop innovative products and systems to reduce energy consumption in the home environment (Rosado et al 2014 p.178)

and this is why new types of home design, building materials and sustainable living will be tested and evaluated in the living lab (ibid).

4.3.1 Provide a research arena for sustainable lifestyles and technologies

In order to maximise the usage of the facilities, the HSB Living Lab is intended to be as flexible as possible. Thus;

The design of the HSB Living Lab should be adaptable to any and all current and future research and not only encourage co-creation, innovation, and participation but be created in a working environment where these elements are driving the design and management processes (HSB Living Lab 2014a p.iv).

In order to achieve this, some measurements must be taken, such as flexible and/or refitable spaces, accessible/refitable building services (electricity, water- and heat piping), and exchangeable wall elements (ibid).

Examples of potential research projects in the HSB Living Lab

Some of the potential research projects for the living lab are briefly presented in this section.

Passive regulation of comfort/temperature by phase change material (PCM). The aim of this research project is to develop and explore new applications for PCM wall boards in order to prevent moisture/condensation/freezing in walls, roofs or pavements around building, and to visualise the activity of phase changing materials. Prototypes will be fitted with sensors in a lab before being tested in the HSB Living Lab (HSB Living Lab 2014a p.4).

(TRC) Textile reinforced concrete ultra-thin envelopes. In order to reduce CO_2-emissions through the use of Portland cement, textile reinforcement of concrete have the potential of making thinner, lighter and more durable wall panels than exist on the market today. Prototypes will be tested in the HSB Living Lab in the shape of wall modules (HSB Living Lab 2014a p.7).

Home energy management (HEM). HEM is a project which aims to link energy consumption caused by housing services such as lighting, HVAC, appliances, heating, cooling, etc. used by tenants. The aim is to study user interaction with above mentioned services and to develop prediction models and interfaces allowing large scale energy contracting. Sensors in the HSB Living Lab will measure humidity, CO_2 rates, light, temperature, energy flow and more (HSB Living Lab 2014a p.10).

More by less – a shared greenhouse. The greenhouse, which will be a shared asset for the inhabitants in the HSB Living Lab, will be heated through district heating with the intention to contribute to more sustainable food production and consumption

practices. The production of vegetables in the greenhouse and the consumption of the edibles by the tenants will be monitored during one year. The greenhouse will be possible to move after the research project is finished (HSB Living Lab 2014a p.8).

Worm composter. A small research project within the Living Lab, 2-5 apartments will be equipped with worm composts for organic waste in order to study biodegradable processes within the context of an apartment. Measurements of how much and how often users feed and empty the composter will be made. User interviews will be performed after one month and one year after implementation (HSB Living Lab 2014a p.11).

Other projects include More by Less – User-centred District Heating (movable heating units); Dare2Build (joint student project Chalmers University of Technology and other universities); Zentigo 48 Volt Direct Current (DC) System (enabling monitoring of energy consumption etc.); and Passive Regulation of Floor Heating Systems (with/without PCM) (exploring self-regulating floors and to find new applications for PCM), etc. (HSB Living Lab 2014a p.5, 6, 11 & 12).

4.3.2 The social laundry area – the washing studio

Sometimes being perceived as a place where people feel unsafe, one purpose of the washing studio is to turn the act of washing into an activity with less negative associations and turn it into a both social and positive one (HSB 2015a).

In HSB Living Lab, a new way of doing laundry is explored. Appliances will be placed in an open environment where it will be mixed with tables and couches (see figure 8 below). This is done in order to make it more pleasant to do laundry work and to see if this particular household task can be made attractive enough to compete with the increasingly common action of providing new apartments with their own washing machine. From an environmental perspective, sharing washing machines, thus sharing resources, is the most favourable option (Johansson 2015-04-22, Morrison 2015-04-28).

Figure 8. The washing studio in the HSB Living Lab. Illustration by Tengboms.

In the washing studio, there will be opportunities to study the interaction between humans and washing machines, and to study how feedback given to users can help them to do their laundry in a more sustainable way (HSB 2015a).

4.3.3 Minimise environmental impact caused by the living lab

The objectives are to 1) examine ways of minimising climate impact during the lifespan of the building caused by energy- and water consumption/management and building materials; 2) examine ways of minimising climate impact during inhabitation of the building caused by the consumption of foods and goods (HSB Living Lab 2014b p.1).

Measures of minimizing impacts caused by the physical structure of the living lab include:

Energy consumption

- Resources and spaces will be shared to the largest possible extent (including a workshop, common kitchens, gyms and a café, etc.).
- Downshifting will be brought up and discussed
- Energy consumption will be visualised and measured per person – not per square meter, which is the most common measurement today
- Pilot project with emission allowances
- Temperature and ventilation adapted by usage and hours of the day
- Evaluation of perceived temperature and comfort among tenants (HSB Living Lab 2014b p.2)

Water consumption

- Visualise water consumption and the water's journey through the house
- Use rain water for irrigation and washing clothes
- Grey water for toilet flushing
- Storm water filtered through biofilters (HSB Living Lab 2014b p.3)

Building materials

- Demountable structure (including interior material such as floors)
- Minimise material usage
- Life-cycle assessment
- 'Clean' and environmental friendly materials to enable smooth dismantling/recycling
- Emission free materials to minimise ventilation need
- Document all building materials added or removed from the building (HSB Living Lab 2014b p.3)

Food consumption

- Measurements and visualisation of consumption and food waste
- Farming of vegetables in green house
- Common compost (HSB Living Lab 2014b p.4).

4.4 Partners

Main partners are Chalmers University of Technology, HSB and Johanneberg Science Park. Additional partners are Bengt Dahlgren, a technology consultant company; Electrolux, appliance manufacturer; Göteborg Energi, a municipality-owned energy company; Peab, one of the largest construction companies in Sweden; Tengbom, an architecture firm; Vedum, developer and manufacturer of kitchen, bathroom and laundry room interiors, and Tieto, provider of IT-solutions (HSB 2015b). There is also an ongoing cooperation with NASA, through a partnership with Chalmers Architecture Department, in their strivings towards sustainable habitats in space explorations (SusLab 2015c). The organizations which were interviewed during the scope of this study are presented below, see figure 9.

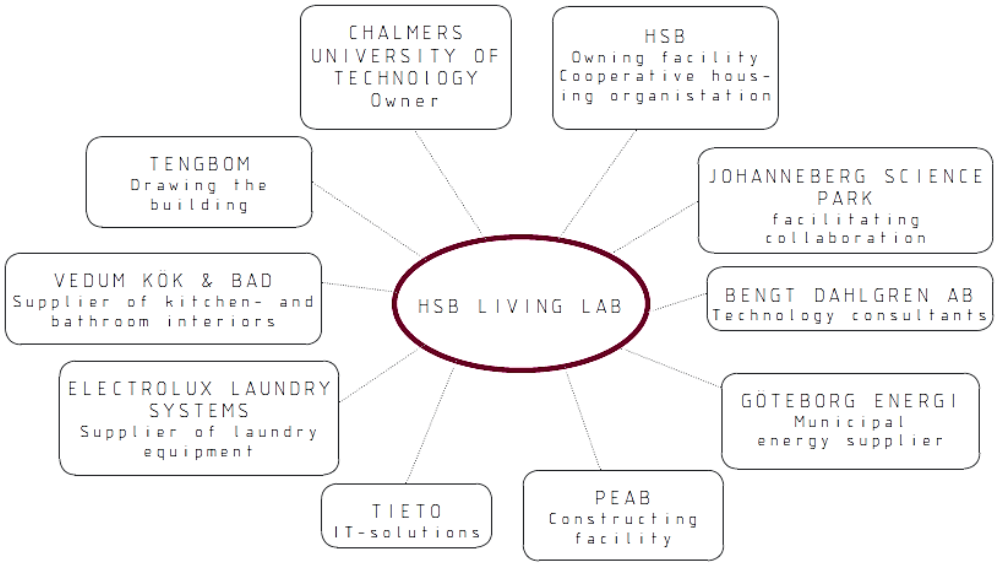

Figure 9. Members of the HSB Living Lab project as of May 2015, when the last interviews were made.

4.4.1 Chalmers University of Technology

Chalmers University of Technology was founded by William Chalmers in 1829 as a handicraft school helping poor students (Chalmers University of Technology 2015a). Today, it has approximately 10.000 engineering and architect students and 3000 employees (Chalmers University of Technology 2015b) at two different campuses centrally placed in Gothenburg, of which campus Johanneberg is one. Research is made within 18 departments of varying size and within eight areas of advance, ranging from Built Environment to Life Science and Transport (Chalmers University of Technology 2014c, d).

4.4.2 HSB

HSB (formerly known as Hyresgästernas sparkasse- och byggnadsförening, the National Association of Tenants' Savings and Building Society), is one of the largest housing companies in Sweden, a cooperation owned by its more than 550 000 members (HSB 2015c). Dating back to 1923, the company was formed as a means for individuals to improve living standards and to gain control over one's housing

situation in times when there was a large housing deficit and crowded housing conditions (HSB 2015d). Most of the housing stock is owned by tenants, but the company also has more than 27 000 traditional rental apartments, making HSB one of the largest landlords in Sweden (HSB 2015e).

4.4.3 Johanneberg Science Park

Johanneberg Science Park is co-founded by Chalmers University of Technology and the City of Gothenburg, with additional owners AB Volvo, Bengt Dahlgren Göteborg AB, HSB, Peab Sverige AB, Riksbyggen, Skanska AB and Tyréns AB (Johanneberg Science Park 2015a). The Science Park is to function as an environment which strives towards the stimulation of collaboration between academia, industry and complementing stakeholders in the society at Campus Johanneberg in central Gothenburg with focus on Urban Environment, Energy, and Material- and Nanotechnology. Johanneberg Science Park supports companies in their attempt to strengthen their competiveness by innovative projects in cooperation with other businesses, universities and institutes. The platform supplies contacts and competence and educates companies to lead development projects on their own (Johanneberg Science Park 2015b).

4.4.4 Tengbom

Tengbom is a supplier of architectural services, working with urban planning, architecture, interior design, landscape architecture and project leadership. The company has 550 employees and about 10 persons working with the HSB Living Lab since they first joined the project in 2013 (Stoll 2015-04-22 & 2015-04-29).

4.4.5 Bengt Dahlgren

Bengt Dahlgren AB is a technology consultant company working with HVAC, fire and risk assessment. The company has ca 400 employees (Bengt Dahlgren 2014). It was the fifth company joining the HSB Living Lab project (Jönsson 2015-05-19).

4.4.6 Electrolux

Electrolux Laundry Systems is a global appliance company with 1100 employees across the world. Professional textile care solutions are the area of interest for the part of Electrolux participating in the HSB Living Lab project, which was joined in 2014. At the moment, two persons are working with HSB Living Lab (Johansson 2015-04-21 & 2015-05-22).

4.4.7 Vedum

Vedum Kök & Bad AB is a material supplier of kitchen, bath and laundry room interiors with 330 employees of which three are working with HSB Living Lab. Vedum was signed for the project in 2015 and have a long tradition as a supplier for both HSB and Peab (Färlin 2015-04-30).

4.5 Tenants

Approximately 35 persons will live in the HSB Living Lab facility; students, doctoral students, and guest lecturers with their families. The Chalmers Student Union- owned real estate company Chalmers Studentbostäder will act as a landlord. Tenants will be chosen through interviews. In addition to considerations of time spent in the housing queue in Gothenburg, interviews with potential tenant candidates will also be held to enquire if they fulfil the requirements set by the partners in the project and to see if they fully understand what the HSB Living Lab is all about (Morrison 2015-04-28). The intention is to have a mix of tenants; single households and families, ages, sexes and countries of birth (GP 2014a).

4.6 Case Study: Exhibition at Almedalen June-July 2015

In late June each year, the week-long event called Almedalsveckan is taking place in Visby, the largest town on the island of Gotland in eastern Sweden. With a history stemming from a speech made by education minister Olof Palme in Visby in 1968, the Almedalen event is the biggest political meeting place in Sweden. Each party represented in the Swedish Parliament has their own day during the week, partaking in speeches, seminars, and press conferences. Openness and accessibility are seen as key words; all activities are free of charge and open for everybody in an environment, which is unique both in Sweden and in the world (Almedalsveckan 2015a). In addition to activities run by the political parties, additional actors are welcome to rent spaces to host their own events in the central parts of Visby (Almedalsveckan 2015b). The concept with a week dedicated to the interactions between politicians, companies and public has been replicated in other countries such as Norway, Denmark, Finland and Germany (Almedalsveckan 2015c). This year's event took place during the 28th of June to the 5th of July (Almedalsveckan 2015d).

HSB Living Lab was presented at a 100 m^2 exhibition space, with participants from Chalmers, HSB and other partners who represent the project. On Wednesday July 1st a workshop arranged was arranged, along with several other events taking place during the week. In addition, the aim was to have two Chalmers students and one or two students from the U.S partner university of Rice interviewing visitors on sustainability with randomly and/or consciously selected visitors in Almedalen. The data was then to be saved in a database and interpreted into art on site in Visby by an artist who creates digital art through programming.

The goal of the exhibition of HSB Living Lab was to draw attention to and create an interest in the project among the visitors in general and with politicians, potential partners and other influential individuals in particular. Interviews with visitors were made due to several reasons: creating engagement in sustainability issues, attracting visitors to the HSB Living Lab exhibition, and last but not least to collect data for further research.

■

This chapter contained descriptions of some aspects of the HSB Living Lab project. The next chapter will present the methodological choices made during the work with this master thesis.

5 Methodology

This study has been executed through interviews with representatives from the HSB Living Lab partnership firms in order to frame their view on sustainability and sustainable lifestyles at home. A literature study on transitions for sustainability, practice theory and living labs is forming the foundation of this report. Furthermore, the plans and intentions behind the HSB Living Lab have briefly been investigated and presented. In addition, a small sample of interviews with 'ordinary' persons who are seen as experts in their own life of how sustainable lifestyles are perceived, which obstacles are met and what adaptations is made to lessen environmental impact have been made, in order to create a reference material. As mentioned above, interviews were also made on site in Almedalen.

In this chapter, the methods used for the study are discussed along with the selection of interview informants and respondents. Moreover, the design of the interview guides can also be found as a topic for discussion. Validity, reliability and the issue of generalizing the outcome of the study are also debated. The chapter ends with a discussion of the chosen methods and encountered problems.

5.1 Choice of method

Research problems are either defined as stemming from an identified knowledge gap within a research field, or arousing from a societal problem (Esaiasson et al 2012 s.31). This study is a combination of both: clearly there is awareness about sustainability in the society today, yet not enough measures are made for us to live sustainably. At the same time, even though much research is made individually on living labs and transition- and practice theory, a combination of the three disciplines are not common. This study attempts to bridge these three disciplines, and can be described as abductive, which is a mix of inductive and hypothetico-deductive methods: a continuous interaction between the empirical findings and the theoretical framework (Hartman 2011 s.151, 158 & 163).

The approach in this study is qualitative rather than quantitative. Qualitative methods are exploring or understanding problems in depth, enabling the researcher to interpret the result (Esaiasson et al 2012 s.193, 210 & 224). Thus, to understand people's perceptions of sustainability at home, qualitative methods are well-suited.

5.1.1 Interviews with HSB Living Lab Partners

The idea of interviewing the partners involved in HSB Living Lab originated from needs to understand a) their perceptions and ideas of sustainability; b) to frame visions of future sustainable lifestyles at home; c) expectations on the participation in HSB Living Lab; and d) what the very different firms wished to communicate at the exhibition in Almedalen. All partners engaged in the project in April 2015 were approached for semi-structured interviews.

5.1.2 Interviews with respondents

In order to get an understanding on how different persons reflect upon and think of sustainability and sustainable lifestyles at home, a reference material with a small sample of persons was created through interviews. To be able to understand how individuals relate to sustainability, what kind of efforts they do to live in a sustainable way, and what obstacles they encounter in trying to do so, semi-structured interviews where held with three persons.

5.2 Samplings

Sampling of a population can be done according to three main principles: inquiries of all possible units, inquiries of randomly selected units of the population, or an inquiry of a strategic selection of the total population (Esaiasson et al 2012 s.158). From a sampling frame, where all potential units are included, the selection can be made (Esaiasson et al 2012 s.175).

Selections of all possible units in a population or randomly chosen units of the population have a high extern validity which means that it is possible to generalise empirical findings to a larger population outside the current selection. This is due to the fact that either all the units of the population is studied, or that a random selection of a large enough population are providing a result which can be said to be representative of the whole population (Esaiasson et al 2012 s.171). This is harder to achieve when it comes to strategic selection, since the selection itself is affected by the fact that someone made subjective decisions about it (Esaiasson et al 2012 s.158).

5.2.1 Choice of focus areas

Home life has great many aspects to it: cook, eat, wash, clean, sleep; all of which demand resources. Energy and water are required; consumption of food and other products result in waste. Some waste can be recycled, some can be reused, and some can be composted. The focus areas were chosen to show the breadth of home life, and also to enable a holistic view on what sustainable lifestyles at home can mean.

5.2.2 HSB Living Lab Partners sampling

Identifying the sample frame in the case of HSB Living Lab partners was rather self-evident: there were nine partners during the time this study was planned since Tieto joined the project in late spring, and it seemed natural to have all partners included in the study if they would want to participate. Thus, in this particular study with focus on HSB Living Lab partners, the first type of sampling was desired: enquiring all possible units in the selection frame.

5.2.3 Respondents samplings

In a more extensive study, the aim ought to be to have a sampling consisting of a random selection of a population, in order to achieve a high external validity. However, this was not possible within the framework of this master thesis. Instead, respondents were chosen on the basis of being friends with the author. Thus, there are little to none possibilities to generalise the material to larger population. However, the

intention with the interviews was simply to generate insight into individuals' views on sustainability. This made it possible to better understand how sustainability is percived by persons who don't possess academic knowledge in the field, not to be able to draw conclusions on sustainability regarding a wider population

5.3 Literature review

A literature review has the purpose of exploring recent research within the research field in question; to discover potential knowledge gaps; and to identify problems which can be expected to be encountered during research (Flowerdew 2005 s.48).

This literature review in particular has mainly been based on publicised scientific articles, of which some were provided by the examiner, and some were discovered as part of research. Moreover, in order to describe the situation regarding resource consumption in Swedish homes' today, reports by different state organizations have been complementing the articles, as has data and literature found elsewhere. The literature review was ongoing during the whole project, but with major emphasis during the first month of work.

5.4 Interview guide design

The interview guides (three different in total) were developed and redeveloped in parallel with the literature review, and then reviewed and updated before the actual interviews took place. All interview guides can be seen in appendixes 1, 2 and 3, respectively.

5.4.1 HSB Living Lab partners

The goal with the HSB Living Lab partners interview guide was to explore what the different companies had to say about sustainability and sustainability work at the firm itself; what they think of sustainability and home life in general; to find out what strengths and weaknesses they identify with the HSB Living Lab project and what they hope to gain from the project and last but not least to identify what they consider to be the most important aspects to take into account during the exhibition in Almedalen. This resulted in 60 questions in a structured interview guide.

5.4.2 Respondents

This interview guide was divided into two parts: one more survey-like, in which the respondents themselves could fill in and answer short questions, and one longer guide which was more traditionally conversation-based. The reason for this was to activate and engage the respondent, who got to answer short hands-on questions on sustainability. The second part of the interview guide was more in depth and gave the respondent the opportunity to elaborate more on sustainable lifestyles at home, including obstacles and adaptations made to foster a more sustainable development. This data functioned as a reference material in order to get some insight on individual's experiences and thoughts of sustainability in their everyday life.

5.4.3 Almedalen questionnaire

Designing the questionnaire for interviews taking place at Almedalen was a task formulated by Shea Hagy, with the intention of using knowledge generated during the design of the other two design guides and on experience gained during the interviews already held as basis for the interviews in Almedalen. The intention of the surveys made in Almedalen was to generate data for other research projects, but also to attract visitors to the HSB Living Lab exhibition area and to make people reflect on sustainability and issues related to it, which are why some of the questions formulated were rather thought provoking.

5.5 Interviewing sessions

Within the scope of this master thesis, interviews were held with a total of 17 persons during the period 16th of April – 19th of May 2015. The vast majority of interviewees where chosen because of their relevant positions within their company/organization and within the HSB Living Lab project. Attempts were made to contact all organizations involved in the HSB Living Lab partnership, of which 7 different organizations chose to be part of this interview study.

Numerous additional interviews where held in Visby by the author and three other students in Almedalen from June 29th to July 3rd, of which some were carried out in company with an artist creating digital art through interpretation of individual's replies.

5.5.1 HSB Living Lab partners

Starting from 17th of April and continuing to the 19th of May, interviews were held with 14 persons representing 7 different organizations (see table 7 below). Interviews were either held face to face (5 in total), by phone (5) and some entirely through e-mail correspondence (4). All interviews were complemented by additional questions per e-mail. The interviews were recorded, transcribed, compiled and summarised to function as a basis for analysis. Contact attempts were made with representatives from Peab and Göteborg Energi without any success. Tieto was not contacted since the company joined the project in late spring.

Table 7. Interviews: organizations and persons.

Organization	Person	Title
Chalmers University of Technology	Shea Hagy	Project Manager HSB Living Lab Civil and Environmental Engineering, Building Technology, Building Physics
	Christian Marx	Postdoc researcher, Civil and Environmental Engineering, Building Technology
	Ulrike Rahe	Professor, div. Design & Human Factors, Product and Production Development

Johanneberg Science Park	Maria Ådahl	Director Open Arena – Urban Development
HSB	Eva Hellberg	Communications Manager
	Sanna Edling	Project Manager and Business Developer, HSB Projektpartner
	Cecilia Lööf	Public Relations Manager, HSB Göteborg
	Anna Olofsson	Market Developer HSB Göteborg
	Hans Kruus	Controller HSB Göteborg
Tengbom	Thomas Stoll	Chief Sustainability Officer
Bengt Dahlgren AB	Henrik Jönsson	Head of department Energy & Environment
Electrolux Laundry Systems	Mattias Johansson	Mattias Johansson, I&T Technology Manager Electrolux Global R&D
	Christina Rosdahl	Marketing & Communication Manager Electrolux Professional Swedish Sales
Vedum Kök & Bad AB	Marianne Färlin	Marketing Manager

5.5.2 Respondents

In order to form an opinion of individual's thoughts about sustainability and everyday life at home, three interviews were held with persons living in Gothenburg. These interviews should be seen as a reference material and are not to be seen as generalizable for a larger population, especially since all three individual's come from a similar background in terms of socio-economic circumstances, age and geographic area.

Interviews were held during April 16th, April 22nd and April 25th.Two interviews took place in cafés/restaurants, whereas one was held in the home of the respondent. Interviewed were 'Marie', at the time working and owning/renovating a night club and with secondary level of education, living alone in a rented apartment; 'Lisa', packaging design specialist with an education as an engineer from Chalmers, living in an rented apartment with her fiancé, and 'Hilda', living in an apartment which she owns, working as a socionom with a bachelor's degree from the University of Gothenburg.

5.5.3 Almedalen

Short surveys were held with visitors either strolling around in the exhibition area or resting in the actual park called Almedalen or in the harbour near the HSB Living Lab exhibition space.

5.6 Interpretation and analysis

The interviews were analysed through a method originally developed for transcribing focus groups discussions (Massey 2011). Statements are classified into one out of three categories: articulated data, attributed data and emergent data. In doing this, replies generated in the interviews where then linked back to the theoretical framework described in chapter 4.

5.6.1 Articulated, attributional and emergent data

Articulated data which can be found the first level of this model are data which 'arises in direct response to the questions … provided in the discussion guide' (Massey 2011 p. 23) – basically answers to a given question. A question which will generate an articulated answer could be something like 'How long has your company been working with sustainability?'

Attributional data forms the second level of analysis and are 'comments and discussion that relate to a priori theories, operating hypotheses, or research questions that the evaluator brings to the study' (ibid). In the case of this study, attributional data will be related to either the multi-level perspective or practice theory.

The third and last level of analysis is emerging data, 'information that contributes to new insights and hypothesis formulation and is the unanticipated product of individual comments and exchanges among group members'. This will include data that touch on unspoken cultural perspectives and normative values that are presumed to contribute to the participants' beliefs, attitudes, and behaviors' (ibid). However, this study concerns interviews and not focus groups, meaning that the same type of dynamic achieved in a focus group discussion never can occur in an interview.

5.6.2 Classification

Classification of the material was made according to several different categories and levels. On the articulated data level, references to a general HSB Living lab-discourse in terms of a common story of the project; sustainability science; design & behavioural studies; and systems & engineering were made, with several sub-categories. Sorted into attributional data were links to the multi-level perspective, practice theory and living lab-methodology. Another category of replies was classified as 'comments', which means that they have been identified as extra important or interesting but perhaps not directly related to the theoretical framework. Generic replies, which were not really contributing to analysis or were too vague to be sorted as anything else, where classified as 'general answers'. The categories of classification of sustainability science were provided by thesis examiner Greg Morrison, while the others were developed during the work with this thesis. The classification was not mutually exclusive, i.e. one reply can be seen as belonging to several different categories. For a full review of the 48 different classification categories, see figure 10 and appendix 4.

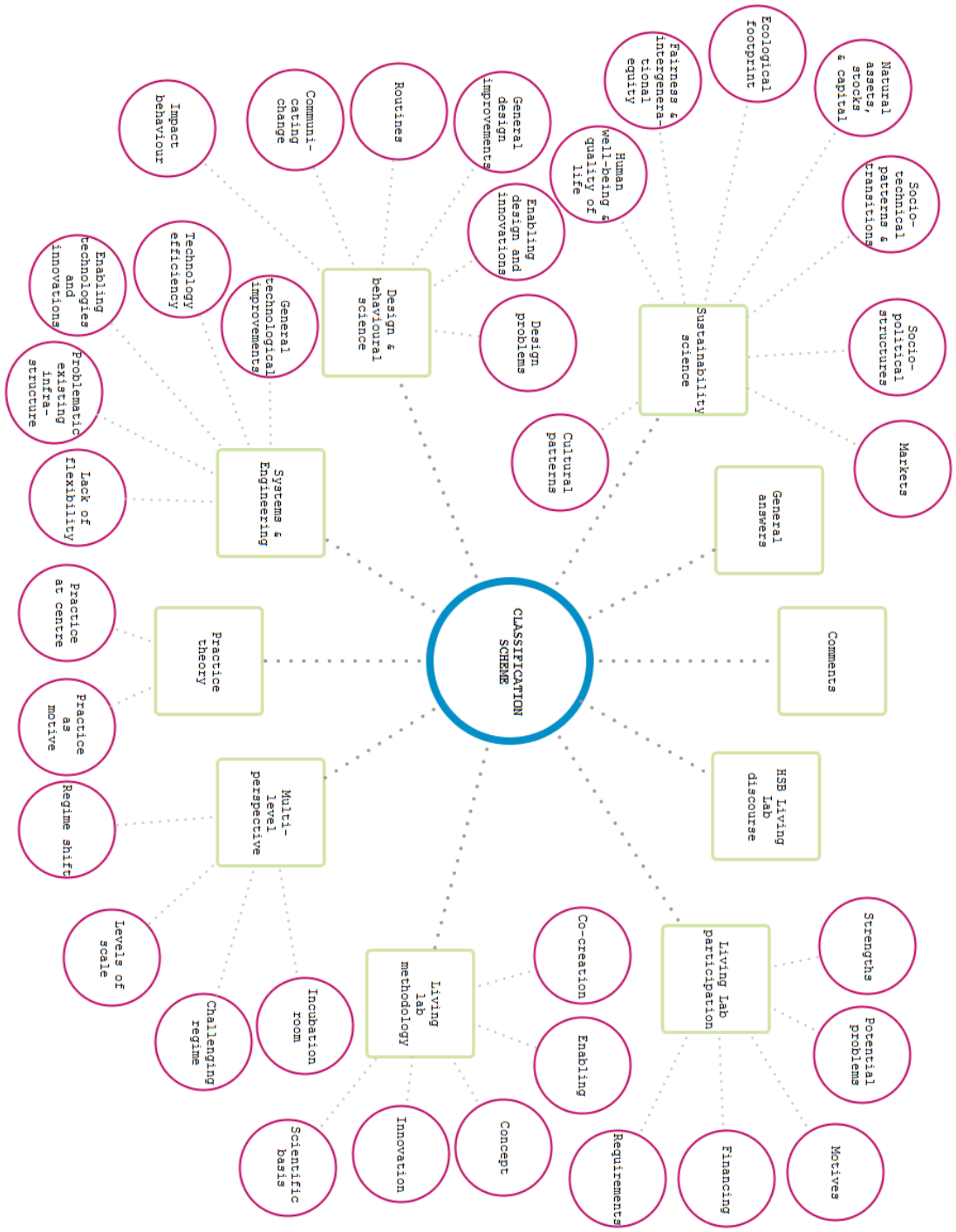

Figure 10. Classification scheme.

5.6.3 Encountered obstacles during thesis work

In this section, different obstacles which have been encountered during the course of this study will be discussed, as well as some thoughts of appropriateness for this type of qualitative study.

Literature review

During the first month of the work with the master thesis, a quite extensive literature review took place. Collecting and processing texts from three fields of theory (transition theory and the multilevel perspective, practice theory and living lab theory) meant a lot of work as well as a lot of decisions of what not to read, since there are extensive amounts of publications on all three matters.

Interviews

Problems and issues in interviews both with HSB Living Lab partners, respondents and visitors in Almedalen will presented below.

HSB Living Lab partners

During the data collecting phase, making interviews happen was the most critical step. In order to interview as many a representative as possible, the first inquiries of potential interest to participate was sent to potential interviewees during the first week of April with awareness of the fact that many of the interviewees in general are very busy and with fully booked schedules. However, the first interview took place the 17th of April and the last over a month later – booking interviews was even harder than expected. For a while, inability to book interviews with appropriate intervals in reality turned into a bottleneck making it difficult to proceed with thework. The intention was to complete all interviews by mid-May, but when a final opportunity arose to interview an important partner in the partnership structure, it had to be seized in order to benefit the project.

Transcribing interviews turned out to be a challenge, too. In general, transcribing itself wasn't a problem, but it took much longer time than anticipated and it also took quite a long time to figure out how to do it in the most efficient way. The last interview taking place took about 1 hour and 40 minutes, but about 20 hours to transcribe. The compiled material from the interviews resulted in 97 pages of text.

Technical problems were also minor obstacles during the interview phase. Especially one phone interview, which was made with a company representative traveling by car by car in an area with very mobile phone coverage, turned out to be a challenge. The conversation was disconnected three times, causing confusion and trouble. The recordings of that particular conversation were extra demanding to transcribe, with several parts being inaudible.

The amount of questions asked was troublesome too, there were many and at least one was forgotten during each interview, leading to the need to complement afterwards. Some questions were too similar and should have been rephrased or simply removed. Others were left out during interviews by purpose, in order to have the interviewee reply with written text later in order to speed up the interviews. A question of ranking

alternatives was also deemed more suitable to reply by mail than during a conversation, since it was thought to be easier to rank when the interviewee could read the alternatives rather than hearing them.

Making interviewees reply on e-mails sent with complementing questions in some cases turned out to be just as difficult as booking an interview, and was a cause of stress.

Respondents
There is a risk of biased answers from the respondents since they all are friends with the person who interviewed them, thus there is a risk that they answered questions in ways meant to please the interviewer. However, there is also a chance of them speaking more freely since they know the person to whom they are talking.

Almedalen
Since many attendees are on a rather tight schedule, only people who could find some time to spare were interviewed. Due to the fact that companies such as NCC and IKEA's concept BoKlok along with HSB Living Lab were in the very proximity of the harbour where many interviews took place, it can be argued that people in this particular area may have a great interest in issues of housing and sustainability, which may skew the result. It can also be argued that it is likely that individuals choosing to participate in the survey may have a deeper interest in sustainability issues than the ones who chose not to.

Data analysis
Approaching a dataset of 97 pages can be a bit troublesome, as it is difficult to know where to start. These 97 pages were then shortened to approximately 60 pages before analysis could begin. Summarising and translating somebody's statement will most likely always mean that some aspects of information get lost.

Using the three-levelled model developed by Massey (2011) proved to be difficult. Many questions where formulated in a way generating articulated answers, which can be useful in some cases but also means less connection to the theoretical framework relevant for this study. In general, even when there was potential of generating data of a more theoretical character or even beyond that (emerging data), most interviewees replied in ways which can be seen as a part of a general sustainability discourse in society – all knows what needs to be done but actual implementation is more difficult. There was not as much information available to be able to link to neither the multi-level perspective nor practice theory – this was partially dependent on how questions were phrased, but also due to a shared perspective on what sustainability is and how it should be dealt with.

5.6.4 Validity and reliability

The term 'validity' means the problematic situation of research simultaneously taken place at both a theoretical and an operational level – that one in a practical manner studies different theoretical problems or research questions (Esaiasson et al 2011 s.57).

A result of good validity is built upon avoidance of systematic errors (one measures what one claims to measure through ones' operationalisations) and a high reliability. If the studied indicators are wrong, one will end up measuring something else than intended, leading to a systematic error in the study. In general, validity issues will be worse the further the distance is between the theoretical problem and the operational indicator chosen for the study.

Reliability means the absence of random or non-systemic mistakes, e.g. mistakes during field studies or the analysis of data, such as misunderstandings and typing mistakes (Esaiasson et al 2011 s.63). Thus, in order to achieve a good validity, one needs a proper measuring instrument used as precise as possibly.

The theoretical framework for this study, especially the multi-level perspective and practice theory, is of a rather abstract nature, thus potentially creating issues of systematic errors should the measuring instrument not be precise enough. When trying to relate to both the multi-level perspective and practice theory, this is perceived by the author as a potential issue, especially since links were few and not always very strong. In terms of reliability, there are always possibilities of misunderstanding something or typing in data wrong in e.g. Excel files, but that is not seen as a risk with a potential high impact on the final result. This is especially true in this case were vast quantities of data were produced.

The intention of this study was not to have an external validity or to be able to generalise it to a larger population, but rather to represent the organizations and persons involved. Rather, the aim has been proper intern validity (Esaiasson et al 155 & 158).

5.7 Summarising reflections

The major issues with this study have been the amount of questions asked in the interviews and the method for analysing the results, as stated previously. The purpose of the study should have been formulated more clearly from the beginning, but instead it was too vaguely phrased which lead to the initial scope being too broad. Perhaps linking data back to three different fields of research, all very interesting but also very different, is something which either should be done during longer studies or through interviews with fewer but more precise questions.

The method developed by Massey (2011) for sorting out data generated in focus groups proved to be a useful tool in analysis of interviews, too. However, in order for achieving an optimised result, it would be strongly recommended to have the method in mind when actually forming the interview guide. This particular method was introduced in a rather late phase of work, and it would most likely be more useful and especially more efficient if it was taken into consideration already during the design of the study. As the situation was during the analysis of interviews, it was difficult to apply the method to some of the questions, and linking generated data back to theory was also a challenge.

In terms of in fact never being able to identify any data at the third level, there are several potential explanations. One is that, quite frankly, in a dataset as large as this one there weren't that many connections to the theoretical framework in the first place, meaning that replies given to a large extent can be seen as part of a general societal discourse on sustainability, as has been touched upon earlier. Another one is that this analysis tool was developed for use in focus groups, which are dynamic in a way an interview never could be. Thus, it isn't that strange that this desirable third level was never reached, since the synergies which can be generated in a focus group just weren't possible to achieve. It's among the comments, not all but some, where one can find the gems potentially closest to the third level. However, interesting research problems can be found at all three levels and in all research fields, which this thesis has touched upon.

All in all, working with this thesis has been challenging, but also very interesting. Living labs in general and how they can be related to sustainability is a fascinating subject, of which there is much more to be explored in the future.

■

Chapter 5 contained descriptions of methodological stances made during this study. The following chapter will present some of the results found within the frames of this master thesis in terms of interview replies, both among HSB Living Lab representatives and respondents. A more detailed description of the Almedalen events will also be provided.

6 Results: Summary of interviews

A short summary of the data generated in interviews with HSB Living Lab partners and with respondents will be presented in this section, alongside with a description of the event taking place in Almedalen.

6.1 Interviews with HSB Living Lab Partners

The responses given by the organizational representatives can mostly be seen as belonging to the first category of questions, articulated answers. In general, these types of answers can be classified as being part of two discourses – a larger, general sustainability discourse in the society today, and a living lab-discourse developed within the frames of the HSB Living Lab project.

In terms of sustainability and the HSB Living Lab, there is an approximate agreement of what and how to increase sustainability in society; the problem is to actually implement it. All interviewees see the HSB Living Lab as an opportunity to try to find new solutions through means of co-creation between the partner organizations and the future tenants of the facility; solutions which can be evaluated in real-life settings and then applied in the construction industry at large, increasing chances of successful implementation.

6.1.1 Sustainability

All organizations are working with sustainability in one way or another, and rely on the Brundtland Commission definition of sustainability with its three pillars ecologic, social and economic sustainability. There seems to have been a shift of focus from environmental to sustainability issues in the latter part of the first decade of the 21st century. Many representatives regard sustainability work as both a necessity to be able to remain leading actors in the industry, and also that the provision of sustainable solutions is a promising business potential. Most interviewees also express a moral obligation to work with issues of sustainability.

Identified problems include clients' willingness to pay for more sustainable options, both individuals and companies; and a feeling that products and/or buildings have become as resource efficient as they possibly can, and that it now is more important to change behaviour than to optimise products. There are also uncertainties to what extent companies, individuals or the society are responsible for actual achievement of sustainable development.

"...in order to have a longer, long-term growth, it will be necessary to achieve a sustainable development at market competitive... prices, so to say"

> *"... how much can be dealt with by construction technology and how much is behaviour related, and do we really want to deal with it by technology?"*

6.1.2 Sustainable lifestyles at home

In responses of questions related to sustainable lifestyles at home, several trends emerged. Consumption of energy and hot water are occurring unconsciously, and individuals do not really notice doing it. At the same time, the consequences of consumption are not visible. Furthermore, water and energy are too cheap which allows us to waste it. There are several structural problems which are hindering sustainable lifestyles at home, and our homes are also much standardised, meaning that possibilities are small for adaptions to individual needs.

There is potential in designing products and developing technologies which can enable us to change our behaviour, but these solutions must be much more intuitive and easy to understand and interact with than they are today. It is all a matter of making it easy to make the sustainable choice – to enable sustainability.

"… I think that we will live more compact, I think that we will share more, both things and surfaces"

> *"… yes, it even starts outside the home. Do we make it easy for people to take the car, if there are garages in the house or in the block, if is it easier to take the car than to use public transport, then you have made some aspects of actually changing people's habits impossible"*

"… and habits. As an example, we mentioned water recycling earlier. And that's typically an example that there isn't any technical obstacles, really, but it's related to behaviour, to wash in somebody else's used washing water, that is a bigger challenge than it is technically"

> *"… I think we should have a rather high degree of automatisation. So you don't have to know that much about things. But with options, so you don't limit the individual's … freedom of choice, so to say"*

6.1.3 HSB Living Lab participation

The organizations represented in the project are very positive about it and the potential research outcomes. The joint effort of the project is seen as an enormous strength, but not without difficulties. As the structure within the partnership constellation is supposed to be equal, decisions must be made in common agreement which is time consuming, and there are also issues of communication. All agree that openness between partners is extremely important; some recognise that in reality, this can become a challenge.

Several interviewees mention the opportunity to work with behaviour-related issues and the human-machine interface, and others express that this is a unique chance to actually evaluate a structure which their organization has been part of building.

The HSB Living Lab is a project which is easily communicated since all people can relate to it – housing is something which concerns us all. Still, it is important to send

out realiztic messages from the project to media and audience, in order to not create expectations which cannot be fulfilled.

"...we want to get lots of results and new knowledge to implement in our work … but also to build long-term relationships, to find new ways of collaboration with other companies … how can we work together in the future and integrate more functions and companies and develop [ourselves] together"

> *"… the interesting thing is that this isn't static. That there is an idea about openness in testing new ideas, new technical solutions and so forth"*

"… I never faced co-creation and open innovation before, but I'm loving it"

6.1.4 Almedalen exhibition

Among the organizations, some have previously been represented in Almedalen, and some have not. Almedalen is seen as an arena where attention can be generated, target groups can be reached, and contacts can be made. All representatives expressed that it is important to communicate that the HSB Living Lab is a partnership and that the project now is running. The message of the journey towards the sustainable housing of the future is the most prominent one, and was also mentioned as a key in communication by many of the interviewees. The most important target groups are decision makers, politicians and potential partners, although this varied among the different organizations. Some interviewees mentioned that it is more important to exhibit the living lab next year, when there are actual results to present.

> *"…expectations, it's about everything from telling … there is a lot of curiosity regarding HSB Living Lab, and considering the target group in Almedalen, that is, decision makers, politicians and business leaders; so everything from having new partners to the project, to increase opportunities for research funding"*

"… I think that we should try to create attention, perhaps by finding 'the spirit' of HSB Living Lab"

> *"… message … if we want to change the world and how we live and reach a more sustainable state, we have to work together and start co-create and re-create the world we live in"*

6.2 Classification results

The frequency of the classified data can be seen in table 8 below. All in all, general answers and comments are the most common; likely due to the fact that comments can be found in all other categories of data and that general replies are parts of a more general societal discourse. The most common reference to theory is to sustainability science.

Table 8. Classification results.

Category	***Subcategory***	***Frequency***
General answers		236
Living Lab-discourse		22
Comments		122
HSB Living Lab participation	Requirements	27
	Financing	5
	Motives	9
	Strengths	6
	Potential problems	22
Design & behavioural science	General design improvements	14
	Routines	6
	Impact behaviour	11
	Communicating change	3
	Design problems	3
	Enabling design	14
Systems & engineering	General technological improvements	18
	Technology efficiency	5
	Enabling technology and innovations	16
	Problematic existing infrastructures	8
	Lack of flexibility	7
Sustainability science	Socio-political structures	55
	Market	82
	Natural assets, stocks and capital	19
	Ecological footprint	9
	Fairness and intergenerational equity	11
	Socio-technical patterns and transitions	61
	Human well-being and quality of life	28

	Cultural patterns	37
Living Lab-methodology	Concept	10
	Scientific basis	2
	Innovation	4
	Co-creation	14
	Enabling	11
Multi-level perspective	Challenging regime	26
	Regime shift	3
	Levels of scale	1
	Incubation room	1
Practice theory	Practice as a motive	2
	Practice at centre	2

6.3 Interviews with respondents

All respondents mention that trying to live sustainably is difficult, mainly due to lack of time and space. Infrastructures are not supportive enough, e.g. recycling and collection of compostable waste, which often should be handed in at different places. Living sustainably is also difficult in that it requires either knowledge or making adequate choices. One respondent said that she tries to dry all her laundry in the drying cabinet since she believed it to be the least energy consuming, when in reality it is the opposite. A quick googling provides the right answer, but then an active measure of finding information is required. Another situation where it is difficult to make the right choice is in the grocery store, where decisions must be made between prices, organic production, or locally produced goods. The same respondent expressed that it is problematic to navigate between these three aspects and try to do the right thing. All respondents more or less agreed on that people really aren't making more efforts to live sustainably now than they did ten years ago, or that they do attempts on a very low level.

"...When I think about if I should buy something I think... do I really need this? No. And then I buy it anyway" (Marie)

> *"... [Consumption in society today] means high status. You are successful if you can consume. You are successful if you can afford unsustainable consumption. Many companies are built on this, technology, cars, it isn't important to last for long. It's status to have the newest" (Hilda)*

"... In order to live more sustainably, you actively have to choose not to do things that you're used to ... it's my needs and my safety versus living sustainably" (Hilda)

"...You get happy when you buy something, even if you shouldn't. It's satisfying, even though it's against your own moral values" (Lisa)

6.4 Almedalen 2015

The HSB Living Lab exhibition in Almedalen 2015 consisted of several different parts. There was an actual exhibition space near the harbour in Visby open for spontaneous visits; a seminar held by the project group; and also a workshop on co-creation in terms of sustainability and art, along with several other activities. Present were representatives from Chalmers, HSB, Johanneberg Science Park, Tengbom, Electrolux, Peab and Bengt Dahlgren, along with two students and guest lecturers from the US partnering university, Rice.

6.4.1 Exhibition space

The HSB Living Lab exhibition area was placed on a lot in the Visby harbour area, placed in a thematic cluster with NCC and IKEA as immediate neighbours, during June 29th-July 3rd. A wood cube with dimension 3*3*3 m^3s built on site symbolised the actual cubic meters of a single-room apartment in the HSB Living Lab-building, and also functioned as a hanging device for information on the project (see figure 11 below). A tent functioned as a meeting place and also hosted seminars and lectures. Deck chairs provided a resting space for visitors.

Figure 11. The HSB Living Lab exhibition space in Almedalen. Photo courtesy: F. Bard.

6.4.2 Co-creation workshop

On Wednesday July 1st, a hot summer day, the workshop on co-creation and sustainability was held in the tent at the HSB Living Lab exhibition area (see figure 12 below). During the workshop, the attendees were divided into smaller groups of which some were English-speaking but with a majority taking place in Swedish. One or two representatives from the project functioned as a leader for the exercise in each group.

The workshop consisted of several steps of which the first were joint, written exercise on different sustainability themes called 'brain writing'; the second included cutting and gluing coloured papers in one's own interpretation of the themes arisen in the

previous task; and the third was an attempt on creating digital art jointly through the use of tablets on the same theme. Between each exercise, each group summarised and presented their results for the larger group. Visitors ranged from politicians to officials to ordinary Almedalen attendees.

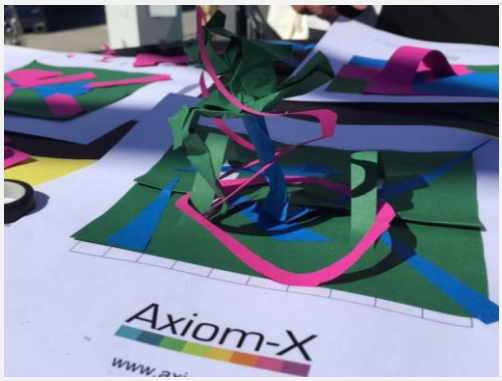

Figure 12. Workshop in progress.

Photo courtesy: A. Noubarzadeh

■

In this chapter, results from interviews with HSB Living Lab partners and others were described along with a summary of the events taking place at Almedalen. Next, analysis of and discussions on the gathered data will be presented in chapter 7.

7 Analysis and discussion

This chapter will present analysis and discussion of the various topics described within the frames of this master thesis, with focus on the links between the data generated in the interviews with HSB Living Lab partnership representatives and theory, especially the findings of eight different main classifications described in chapter 5.6.2 and 6.2.

7.1 HSB Living Lab partners

As can be seen in chapters 5 and 6 and appendix 5 below, the interview data generated was extensive. Also, there is a very fine line between many of the different subcategories – how sharp is the line between design and behavioral studies really, or ecological footprints and natural assets? How to classify a statement like this: 'How much can be dealt with by (new) technology and how much is related to behaviour and do we want to steer things with technology?'

All in all, this means that the actual frequency of a category as described in table 8 is not important, but should be seen as a guide line for a relative importance in the dataset. It is perhaps not that strange that the most common replies are sorted as 'general answers' since that term is so broad, as is the comment-subset which could be seen as interesting findings.

7.1.1 HSB Living Lab-discourse

In the dataset, there is evidence of a jointly created discourse which has been involved within the partnership structure. Examples of such is the motto 'start of the journey of the sustainable housing of the future' and terms of enabling sustainable lifestyles. In some cases the line between the project discourse and a general Living Lab-methodology is very thin, as in the case 'Companies working together means creation of synergy – easier to jointly work towards a shared goal'. Approximately 20 references to a project discourse have been identified.

7.1.2 HSB Living Lab participation

The data sorted under this label is of a rather general character. One subcategory contains descriptions of the partner organizations' views on requirements, such as being able to invest and be part of the projects over the ten year period; another one strengths and motives, of which keeping up or being ahead of market demands are one, as is the partnership structure as a whole. Potential weaknesses are another subcategory, with typical examples of communication between the partners and the time-consuming process of making decisions. Financing the membership and what that means is another reoccurring example.

7.1.3 Design & behavioural science

Replies related to design and behavioural studies are in some respect more or less general. General design improvements of products as a subcategory is approximately as common as ideas and products intended to impact behaviour and designs supposed

to enable a more sustainable behaviour. There are also several identified design problems in the dataset such as 'Products of today are so energy efficient that it is difficult to get any further without changing people's behaviours', and examples of how communicating change could make it easier to live sustainably.

7.1.4 Systems & engineering

The most common reference to systems & engineering were in terms of general technological improvements, which basically means incremental development of present technologies. However, of approximately the same frequency were references to new enabling technologies and innovations, potentially assisting sustainable lives and lifestyles, e.g. 'Energy patterns may be used for control systems to stabilize energy consumption, avoid peak loads, avoid 'punishing' tenants to decrease energy consumption'.

Technology efficiency was also mentioned several times, as were existing and built-in problems in society today in terms of problematic existing infrastructures (e.g. heating systems which cannot be customised) and the closely-related subcategory of lack of flexibility.

7.1.5 Sustainability science

This dataset was by far the most extensive, with the most frequent subcategory being market. As most partners are companies who are depending on growth for their survival, this is not a very surprising result. All depend on market demands. In order to stay ahead of competitors, sustainability is seen as a key element, but also an extra cost for clients. Thus, a balance between cost and benefits are crucial.

Other common labels were socio-technical patterns and transitions and socio-political structures – not very surprising either, since these are the structures in which the organizations must navigate, paradigms which must be changed in order to facilitate and enable sustainable development. Cultural patterns and human well-being and quality of life are also relatively often touched upon, explaining (un-)sustainable behaviours. Natural assets, stocks and capital (and especially human capital) and ecological footprint were also mentioned.

Examples of data sorted under this label is 'Energy efficiency is a win-win-win opportunity – increase competence, savings for clients and decreased emissions' and 'Market economy means companies dictate conditions on market in many ways, thus have a responsibility for sustainability'.

7.1.6 Living Lab-methodology

The most frequent references to a general living-lab methodology were in terms of co-creation and enabling such as 'Having homes where generated knowledge within the fields of technology and architecture are actually implemented – making it easier for individuals to make the right choices', but several replies were also related to the living lab-concept itself. Once again, there was a fine line between what could be classified as a HSB Living Lab-discourse and living lab-methodology, since the

former can be seen as a part of the latter. However, classifications into the methodology-subset were made on account of being either more abstract or more theoretical. Noteworthy is that many of these replies came from Chalmers employees, who most likely are accustomed to work on a more theoretical level. A few replies were related to the need of a scientific basis to be able to impact industries in general, like 'Need to prove scientifically the pros of shared equipment and spaces', and some replies were especially related to innovations.

7.1.7 Multi-level perspective

Being on a more abstract and theoretical level, the distance between the given reply and theory was greater than the previous' categories. Thus, the links between data and theory is somewhat weaker, and perhaps the questions for the interviews should have been rephrased in order to get more spot on-observations. Most links are in terms of challenging regimes, which have been expressed in terms of changing mindsets, and transforming society, such as 'we used to live more sustainably less than a century ago, living in smaller dwellings and with more careful resource use like making sure to finish leftovers the following day – more recent development to demand larger living space and generate much more waste – one way forward could be to look backwards to be able to develop concept for multi-purpose use of space'. This particular reply is also a theme which has showed up in the literature review (see chapter 3), where looking backwards were mentioned as one way to un-make unsustainable paradigms.

Just a few references were made to regime shifts; references to levels of scale; and one reference to an incubation room, which was very applied in terms of the Almedalen exhibition; means that these links are not very strong. All in all, some links to the multi-level perspective exist, but are not very prevalent.

7.1.8 Practice theory

The links to practice theory were almost non-existent. However, this is not that surprising since practice theory is a) rather abstract and not very applied; b) a sociological research field and most interviewees come from either a technical background or a background in management or communication; and lastly c) not very practical to study since it is the practice itself which is the focus of research and not the individual. 'Persons can have ethical goals to behave sustainably – sometimes daily routines hinder those goals, or hedonistic goals such as wanting to take a long hot bath' is one of those replies on the borderline between practice theory and design- and behavioural studies.

As seen in the theoretical framework, putting the individual at center instead of habits are something which has been criticised especially by Elizabeth Shove, but in an applied science as engineering, the most practical thing to do is actually put the individual at the centre (like Kirsten Gram-Hanssen has been doing, see chapter 3 and the case study of doing the laundry). With these aspects in mind, it is not that strange

that the informants being interviewed in this study have replied in terms more related to design- and behavioural studies than to practice theory.

7.2 Respondents

Since the interviews with respondents were made only to create a reference material for this study, the discussion of data generated in these interviews will be brief. In this particular sample of three persons, there seems to be a clear connection between education and knowledge and concern about sustainability – the longer the education on university level, the more interest in sustainability issues. Whether main focus were on environmental sustainability or social sustainability also depend on which type of studies individuals were involved in – humanities or technology. Both these observations seem rather natural. It is also clear, just from these short interviews, how complex each individual's agency is.

Marie

Sustainability issues don't really concern Marie, it's nothing she thinks of on a day-to-day- basis and she thinks that she has too little knowledge in the matter to be able to do something about it. She doesn't recycle because she finds it to be a hassle, she doesn't buy things second hand and sees it as a status symbol to be able to buy things brand new. It was clear that Marie found answering the interview questions difficult at times, and sometimes she was a bit embarrassed about knowing too little about things she felt she was supposed to know.

Marie has a driver's license but no car and use public transport. She stated that it is important for her to try to have a more sustainable lifestyle (3 out of 4 on a scale, see appendix 6), and it's equally important for the society to become more sustainable. At the same time, Marie believes that is more an issue for the individual than the state to initiate more sustainable lifestyles at home; and likewise that it is completely up to the individual to implement a sustainable behaviour at home – perhaps a little bit contradicting since Marie herself doesn't really make an effort to change her lifestyle. Marie believes that is not so difficult to live sustainably at home every day – 2 out of 4 on a scale.

It is noteworthy to see that the societal change Marie believes is the most important to make is to increase recycling, and that decreasing goods consumption is the least important. This signals that she doesn't really see the resource flows in society or the fact that the more we consume, the more waste is generated. All in all, it is clear that it is individuals like Marie that the society should build sustainable development for – an individual who has good intentions but doesn't really do anything about it.

Lisa

Lisa has a master from Chalmers University of Technology with education partially concerning issues of sustainability. She has a great interest in food and cooking; is concerned about healthy foodstuff and environmental footprint of food and goods, and she eats mostly vegetarian food due to ethical reasons related to animal well-being. Lisa also grows some vegetables in her garden. She thinks that changing our food

patterns are the most important measure to make in order to achieve a sustainable development, followed by reducing goods consumption.

At the same time, Lisa doesn't often reflect on her electricity- and energy consumption, and believes that there's only so much effort you should make before you can be entitled to feel satisfied with what you have achieved. She takes one of the household's two cars to work every day because public transport is too time-consuming, but living closer to work is something she would consider in the future.

Lisa stated that, just like Marie, it is important to live a more sustainable lifestyle (3 out of 4 on a scale), and that it is equally important to achieve a more sustainable society. In the same way (3 out of 4), she thinks it is more up to the state than to the individual to induce change regarding sustainable lifestyles at home, and that the individual have a responsibility to implement sustainable behaviour at home (3 out of 4).

All in all, Lisa is interested in sustainability but time restrictions and an opinion that one has the right to feel content at some point leads her to say 'enough is enough', thus justifying behaviour and practices which are less sustainable such as taking the car to work. Lisa estimates it to be not too difficult to live sustainably at home (2 out of 4 on a scale), which likely can be related to her way of putting the individual at center, together with the philosophy of having the right to feel content.

Hilda

Hilda studied humanities at university and is now employed by Försäkringskassan, the Swedish Social Insurance Agency, thus has a great interest in issues related to social equality. She doesn't often reflect on her electricity- or water consumption, or the environmental impact caused by food and goods consumption, but at the same time she feels guilt about her environmental impact. She believe that decreasing goods consumption is the single most important change to make in order to achieve a more sustainable societal development, and she is aware of the consequences of consumption of goods and resources. Hilda eats mostly vegetarian and often vegan. She doesn't have a driver's license and use public transport.

Hilda states that she has to justify activities for herself the whole time and for all activities. She believes that at its current design, the society makes her choose between living sustainably or forsaking her own needs, which have been formed by societal norms, such as having a certain image or standard of living. Norms related to consumption and wealth are among the most important things to change in society today, and politicians have a great responsibility for initiating change.

Hilda states that is very important for her to have a more sustainable lifestyle (4 out of 4), with equal importance to steering the society into a sustainable direction. She thinks that it is a societal responsibility to initiate change towards more sustainable behaviours in individual's homes (4 out of 4), and that the individual have an important responsibility to implement sustainable behaviour at home (3 out of 4). Hilda estimates that it is very difficult to live in a sustainable way in her home,

indicating that she has a more systemic view on sustainability than Lisa has. Overall, Hilda is concerned about the current situation in society today and would like to live more sustainably, but feels trapped by societal norms to continue to live as usual.

7.3 Almedalen events

This section will contain a discussion on the co-creation workshop held in Almedalen on Wednesday 1st of July 2015 and the interviews taking place during that same week. These reflections are based on the author's own experiences as one of the group leaders during the workshop, and as an interviewer on site in Almedalen.

7.3.1 Co-creation workshop evaluation

The workshop, with its three different phases, proceeded smoothly. The first step, where one was to reason on issues on sustainability in the 'brain writing' activity, was supposed to make people write intuitively and avoid overthinking. This task was both stressful and challenging but also fun and inclusive by nature – all visitors in each group could participate, no other skills than reading and writing were required. Even though there were no new world-changing revelations made, this activity was useful in making individuals understanding how other persons relate to and think of sustainability. Three themes were concluded as being the most important then founded the basis for the next phase of the workshop, where each theme where represented by a designated colour.

The next task was to relate the themes to each other and then interpret these connections into art were an activity which seemed to be perceived as more fun and easy-going than the previous task. It's not very often that most adults sit down with coloured papers, glue and a pair of scissors and randomly start to create art. Adding the mental stimulation of trying to connect the three themes and turning them into filters for art creation, the activity seemed to be rewarding and pleasing to the visitors, and some art pieces created were truly extra-ordinary and imaginative (see figure 12 above).

The final step of the workshop, turning the analogue art into digital, had potential of being the most visionary but also the most difficult, in some aspects. Going from individual art creation with paper and glue to a shared virtual art piece through use of tablets proved to be a bit intimidating for the visitors which were not very comfortable with new technology, typically older visitors. In retrospect, it would perhaps have been wise to restrict the number of colours available to use digitally to those which had been selected to represent the themes in the previous' task, to make the link between the activities stronger. As this was the most daring activity and also the last, at a point where visitors might have begun to feel a bit tired, it is not strange that the digital art creation wasn't as big a success as the two earlier tasks. However, those who truly participated in the last activity seemed to have a lot of fun.

Overall, the workshop was an amusing event which gave the impression of pleasing the visitors. It was considerably different from many of the other presentations and lectures taking place during Almedalsveckan. Some aspects like the hot temperature

and a somewhat lacking of shade were a bit troublesome and something to keep in mind for the future, but all in all, it was a happening attracting lots of individuals from different backgrounds with interests in sustainability issues.

7.3.2 Interviews

Making interviews as a means to make people reflect on sustainability issues was an interesting approach, and a lot of people appeared to be surprised by the questions or by their own replies. One statement that the respondents had to relate to was 'I am entitled to the living standards currently found in homes today in the Western world', a statement which many found very provoking and some even wanted to refuse to reply on at first. Only a few agreed to this statement, but most people disagreed. This particular statement appeared to be food for thought among those who chose to be interviewed.

Another statement generating some buzz were 'It is more important for me to have a high income than it is to work less and have a somewhat lower living standard', of which surprisingly many said no but added 'though that is actually how I live'. It seemed like at least some individuals were curious on their own reply on this matter, and questioned themselves as to why they choose to live in that way.

Thirdly, the statement 'The current level of consumption in today's society is a precondition for human well-being' were generally not agreed on, which is a bit surprising considering the status consumption has in society today – or perhaps more symptomatic than surprising; people are aware that consumption doesn't necessary lead to happiness but are caught in the economic systems and practices which make up daily life. Thus, on the data generated in interviews in Almedalen, some statements seemed to fulfill the purpose of raising interest and question modern lifestyles among the interviewed individuals.

Since there were only one artist and two pair of students making interviews, at least half of the interviews took place without the artist present, which was a major drawback in terms of co-creation. It was very clear that having an artist interpreting the visitor's replies both fascinating and fun for those who were interviewed, and had it been possible to have all answers being interpreted in this manner, it is very likely that more people would have appreciated being interviewed in a totally different way. This issue was discussed on site and it might have been the second best alternative to generate art out of replies in an automatised way, but during that time the issue was impossible to resolve. However, for the future, mixing art with science is probably an excellent way to make scientific studies fun and entertaining yet useful, in a fashion true to the sense of co-creation.

■

This chapter concerned discussion and analysis of data and events taken place during the work with this master thesis. The following chapter will contain the conclusions inferred from discussion and analysis.

8 Conclusions

8.1 What expectations do the HSB Living Lab partners have on the participation in the project, and which motives do they define as the most important to partake?

The reasons are likely as many as there are individuals involved in the project, but the two most prominent ones are a moral obligation to do the right thing and to try to strengthen their own brand by being at the front of excellent research.

8.2 Which links to living lab methodology can be identified in data provided through interviews with HSB Living Lab partners?

A discourse has been formed within the project, with the importance of co-creation as a tool and with the goal enabling sustainable lifestyles as the main features; this discourse is to some extent firmly founded in the living lab- methodology and to some extent built on a more general sustainability-discourse in society.

8.3 What obstacles can be identified as hindering sustainable lifestyles at home, and which potential innovations could possible foster transitions towards a more sustainable life at home?

As expected, there are a multitude of explanations related to this question, but in general market conditions hinder and socio-political and socio-technical systems are not flexible enough to allow new innovations to break through.

8.4 Which communication criteria can be recommended in order to engage the public into co-creation activities with the aim of promoting transitions towards sustainable living at home during Almedalsveckan?

Fun, engaging and thought- provoking activities which can encourage participation in co-creation, with the intention of making people rethink their own lives and to highlight aspects of sustainable lifestyles at home.

■

9 Recommendations for further research

This thesis can be seen as a snapshot of the HSB Living Lab project in the spring-early summer of 2015. As this project will be ongoing for the next decade, there are almost infinitely many aspects to look into. This study had a very wide scope and it would definitely be interesting to explore more of the multi-level perspective and practice theory and/or in combination with design and behavioural studies. To put just one or two practices into focus would be a very intriguing subject, most likely also a rewarding task. Issues raised by one informant were also very interesting and important, such as: How efficient should we build? What kind of material do we build into our homes in order to save energy? How shall we do in order to not sub-optimise for the future? These are just a few of the many important questions we need to ask ourselves. The HSB Living Lab might just be the place to find out.

■

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Appendix 1. Interview Guide HSB Living Lab partners

0. Introduction

0.1 *Name of company/organization*

0.2 *Business idea*

0.3 *Business area*

0.4 *Number of employees*

0.5 *Participating in HSB Living Lab since*

0.6 *Number of employees working with HSB Living Lab*

0.7 *Type of involvement in HSB Living Lab (construction of physical structure, prototype testing, etc.)*

1. Sustainability

1.1 *Which definition of sustainability is used at the company?*

1.2 *For how long has the company been working with the sustainability concept, approximately?*

1.3 *Does the company have a sustainability policy? If yes, could you describe it shortly? If no, what principles are guiding the company's work with sustainability?*

1.4 *Which goal(s) does the company have with its striving towards sustainability?*

1.5 *In which ways is the company currently working with sustainability?*

1.6 *How does the company look on combining growth and sustainable development?*

1.7 *1.7 How important is it to associate the company brand with sustainable development? Why?*

1.8 *What types of responsibility do firms generally have to contribute towards sustainable development?*

1.9 *Which responsibilities does the company have to contribute to a more sustainable society?*

1.10 *Which obstacles do the company face in it strivings for sustainable development?*

1.11 *How are future prognoses looking within the company's line of business, seen from a sustainability perspective?*

1.12 *What types of visions does the company hold for the future, seen from a sustainability perspective?*

2. Sustainability at home

2.1 *In which areas can the company/your research contribute to more sustainable*

homes?

2.2 *In which areas can the company/your research contribute to more sustainable lifestyles/habits at home?*

2.3 *What obstacles can the company/you identify as hindering sustainable lifestyles at home?*

2.4 *What types of ongoing projects are relevant to increase the degree of sustainability at home?*

2.5 *What kind of research potentials regarding sustainable homes does exist in the company's line of business, according to the company?*

2.6 *Is there any research projects regarding sustainable homes done by competitors or in other lines of businesses which the company find extra promising?*

2.7 *How do the company/you think that our future homes will look?*

2.8 *Which obstacles must be overcome before that point can be reached?*

3. HSB Living Lab

3.1 *What strengths do the company/you generally identify with the Living Lab-approach?*

3.2 *Can the company /you identify any disadvantages with the concept?*

3.3 *How did the company/your organization/your research become involved in HSB Living Lab?*

3.4 *How did the company/you first hear of the idea?*

3.5 *Which sorts of discussions did the company /organization have internally before joining the project?*

3.6 *What types of discussions did the company have externally?*

3.7 *Which motives do the company/you see as the strongest to be part of the HSB Living Lab?*

3.8 *What hopes do the company/you have for participating in the project?*

3.9 *What strength in particular do the company/your organization add to the project?*

3.10 *Do the company/you identify any disadvantages with being part of this type of open knowledge-generating research which is embedded in the living lab-approach?*

3.11 *Which expectations do the company/you hold on Chalmers?*

3.12 *Which expectations do the company/you have on the other partners?*

3.13 *Which part of the HSB Living Lab are the company/you most interested in? (testing products, try out an open research structure, etc.)*

3.14 *How does the involvement in HSB Living Lab look, in concrete?*

3.15 *Is there a planned research project that the company is involved in which the*

(partner) *company perceive as extra interesting?*

3.15 *What type of research projects are you involved in?*
(researcher)

3.16 *Is there a planned research project that a partner is involved in which the*
(partner) *company/you perceive as extra interesting?*

3.16 *Is there a planned research project except the one/ones you are involved in that*
(researcher) *you find extra interesting, seen from a sustainability perspective?*

3.17 *Is there a planned research project that a partner is involved in, which can benefit the company/your organization too?*

3.18 *Which are the most important channels of communication for HSB Living Lab, according to the company/you? Why?*

3.19 *What do the company/you find the most important thing(s) to do to be present in the media?*

3.20 *How dependent on communication outwards is the HSB Living Lab, according to the company/you?*

3.21 *Which is the company's/ your organization's greatest strength when it comes to communication?*

4. Almedalen exhibition

4.1 *What expectations do the company/you have on HSB Living Labs participation during the Almedalen week?*

4.2 *How important do the company/you find the HSB Living Lab exhibition in Almedalen? In which ways?*

4.3 *Has the company/your organization been exhibiting in Almedalen during previous exhibitions?*
If yes, what experiences were made that can strengthen this year's exhibition in Almedalen on the behalf of HSB Living Lab (shortly)?

4.4 *Will the company/your organization be in Visby during the Almedalen event on its own behalf?*
If yes, how could the company/your organization contribute to strengthen the HSB Living Lab exhibition if the opportunity arises?

4.5 *Which target group does the company/you identify as the most important to reach in Almedalen? Why?*

4.6 *What types of connections does the company/you identify as the most important to make in Almedalen on the behalf of HSB Living Lab and why?*

4.7 *Please rank the following target groups from the most important to the least important:*
Everyday visitors, politicians, competitors, potential partners, other businesses, media, associations

What shall be done in order to make HSB Living Lab stand out in Visby, according to the company/you?

Is there something that absolutely must be done on order to stand out in Almedalen?

What would the company/you like to be communicated on the behalf of HSB Living Lab during the Almedalen exhibition? Why?

Is there something which absolutely must be included in the communication, according to the company/you?

Which are the most important channels of communication in Almedalen?

Appendix 2. Interview Guide Reference Material

1. What appliances can you/can you not be without in your own home?

Please mark your reply and add (a) suggestion(s) if you like to.

a)	*stationary computer(s)*	*x*	*b)*	*laptop(s)*	*x*	*c)*	*TV(s)*	*x*
d)	*Ipad etc.*	*x*	*e)*	*printer(s)*	*x*	*f)*	*dishwasher*	*x*
g)	*washing machine*	*x*	*h)*	*microwave oven*	*x*	*i)*	*stereo*	*x*
k)	*vacuum cleaner*	*x*	*l)*	*hobby equipment (sewing machines etc.).*	*x*	*m)*	*power tools*	*x*
n)	*car(s)*	*x*	*o)*	*fridge*	*x*	*p)*	*freezer*	*x*
q)		*x*	*r)*		*x*	*s)*		*x*

2. What appliances could you consider share with others?

Please mark your reply and add (a) suggestion(s) if you like to.

a)	*stationary computer(s)*	*x*	*b)*	*laptop(s)*	*x*	*c)*	*TV(s)*	*x*
d)	*Ipad etc.*	*x*	*e)*	*printer(s)*	*x*	*f)*	*dishwasher*	*x*
g)	*washing machine*	*x*	*h)*	*microwave oven*	*x*	*i)*	*stereo*	*x*
k)	*vacuum cleaner*	*x*	*l)*	*hobby equipment (sewing machines etc.).*	*x*	*m)*	*power tools*	*x*
n)	*car(s)*	*x*	*o)*	*fridge*	*x*	*p)*	*freezer*	*x*
q)		*x*	*r)*		*x*	*s)*		*x*

3. Which aspects do you consider the most important to change in order to make your lifestyle more sustainable?

Please rank from 1 to 8, where 1 is the most important and 8 is the least important: decrease water consumption, decrease electricity consumption, decrease goods consumption, change food consumption, reduce food waste, increase composting, increase recycling, increase reuse

1		*5*	
2		*6*	
3		*7*	
4		*8*	

4. Which aspects do you consider the most important to change in order to create a more sustainable society in general?

Please rank from 1 to 8, where 1 is the most important and 8 is the least important: decrease water consumption, decrease electricity consumption, decrease goods consumption, change food consumption, reduce food waste, increase composting, increase recycling, increase reuse

1		*5*	
2		*6*	
3		*7*	
4		*8*	

5. How often do you reflect on your water consumption?

Please mark your reply (4 = very often, 1 = not very often)

1	2	3	4

6. How often do you reflect on your electricity consumption?

Please mark your reply (4 = very often, 1 = not very often)

1	2	3	4

7. How often do you reflect on the ecologic footprint caused by the food that you consume?

Please mark your reply (4 = very often, 1 = not very often)

1	2	3	4

8. How often do you reflect on the ecologic footprint caused by the goods and products that you consume?

Please mark your reply (4 = very often, 1 = not very often)

1	2	3	4

9. How often do you reflect on the amount of food you throw away at home?

Please mark your reply (4 = very often, 1 = not very often)

1	2	3	4

10. How often do you compost your food waste?

Please mark your reply (4 = very often, 1 = not very often)

1	2	3	4

11. How often do you recycle?

Please mark your reply (4 = very often, 1 = not very often)

1	2	3	4

12. How often do you reuse? (Swap items with a friend/hand in for second hand retail etc.)

*Please mark your reply (4 = very often, 1 = not very often**)***

1	2	3	4

13. How often do you consider purchasing an item that you need on second hand, instead of new?

Please mark your reply (4 = very often, 1 = not very often)

1	2	3	4

14. Do you tend to wash items because they are dirty or more on a routine basis?

Please mark your reply (4 = garment dirty, 1 = routine)

1	2	3	4

15. Do you tend to buy new things because you need them (don't have it before or it has broken down) or because you want them?

Please mark your reply. (4 = item needed, 1= item wanted)

1	2	3	4

16. Do you tend to get rid of things you no longer need, or do you tend to store them?

Please mark your reply. (4 = get rid of things, 1= keep things)

1	2	3	4

17. In the future, would you consider eating less meat in order to reduce your environmental impact?

Please mark your reply. (4 = very likely, 1= not very likely)

1	2	3	4

18. In the future, could you consider lease or rent a function (e.g. a cell phone) instead of actually buying it?

Please mark your reply. (4 = very likely, 1= not very likely)

1	2	3	4

19. In the future, could you picture yourself growing parts of your own diet yourself?

Please mark your reply. (4 = very likely, 1= not very likely)

1	2	3	4

20. What is most important to you: to work eight hours a day and have more money, or to work less and have more spare time?

Please mark your reply. (4 = work 8 hours with less spare time, 1= work less than eight hours with more spare time)

1	2	3	4

21. How important is it for you to try to have a more sustainable lifestyle?

Please mark your reply. (4 = very important, 1 = not very important)

1	2	3	4

22. How important is it for you that the society should become more sustainable?

Please mark your reply. (4 = very important, 1 = not very important)

1	2	3	4

23. Do you think it's up to individuals or up to the society to initiate change towards more sustainable behaviours in individual's homes?

Please mark your reply. (4 = societal responsibility, 1 = individual responsibility)

1	2	3	4

24. How important is the individual's responsibility to implement a sustainable behaviour at home?

Please mark your reply. (4 = very important, 1 = not very important)

1	2	3	4

25. How difficult do you think it is for you to live sustainably at home right now?

Please mark your reply. (4 = very difficult, 1 = not very difficult)

1	2	3	4

26. Mention at least one thing you do well at home regarding sustainable habits, in your opinion.

1	
2	
3	

27. Mention at least one obstacle in your home environment that makes it more difficult for you to live a sustainable life at home. (design of the home/distance to recycling centre/etc.)

1	
2	
3	

28. Mention at least one thing in the society that should change in order for you and others to live a more sustainable life.
(the design of the recycling system/long distances to centrals for hazardous waste/insufficient food labelling/long distances for handing in clothes and goods to second hand/etc.).

1	
2	
3	

29. Which habit that you have do you consider to be the most unsustainable, regarding your everyday life at home?

30. What is the most important thing to change about our current 'unsustainable' society, in your opinion?

0. General background

0	1	Age	0	7	Type of living
0	2	Level/type of education	0	8	Number of inhabitants
0	3	Type of work	0	9	Living space indoor [m^2]
0	4	Working hours/week [h/w]	0	10	Living space outdoor in immediate proximity [m^2]
0	5	Spare time/ day [h]	0	11	Access to recycling point [m]
0	6	Household work/day [h]	0	12	Access to compost point [m]

1. Introduction

1 *What does the term 'sustainable' mean to you?*

2 *What do you think of the sustainability discussion in society today?*

3 *What does the term 'consumption' mean to you?*

4 *What do you think of the status of consumption in the contemporary society?*

5 *Do you try to live sustainable?*
If yes, in what way(s)?
If no, why?

6 *Do you have to justify activities for yourself?*
If yes, how?
If no, are you conscious about these activities and potential consequences of them?

7 *Do you ever think of changing activities due to them being not sustainable?*
What could motivate you to change?

2. Water and electricity consumption

8 *Do you know how much water you use every month?*
If not, do you know how to find out?

9 *Are you aware of your water consumption while you are doing daily activities?*

10 *Are you attempting to decrease your water consumption?*
If yes, in what way(s)?

11 *Is there a way to decrease your daily basis water consumption?*
If yes, how? What could motivate you to do this change?
If no, why not?

12 *How could it be easier for you and/or others to consume less water?*

13 *Do you know how much electricity you use each month?*
If not, do you know how to find out?

14 *Are you aware of all appliances that you use and when you use them?*

15 *Are you attempting to decrease your electricity consumption?*
If yes, in what ways?

16 *Is there a way to decrease your average-day electricity consumption?*
If yes, how? What could motivate you to do this change?
If no, why not?

17 *How could it be easier for you and/or others to consume less electricity?*

3. Goods and food consumption

18 *What do you think of the relationship between consumption and well-being?*

19 *Do you mostly plan what to purchase, or do you buy on impulse?*

20 *What do you take into consideration before purchasing an object?*
(organic/Fair Trade/grown nearby/price etc.)

21 *Do you consider the ecological footprint of an item before purchasing it?*

22 *Do you deliberately try to decrease the ecological footprint caused by your consumption?*
If yes, in what way(s)?

23 *Do you buy objects on second hand?*
Why/why not?
What types of objects?

24 *Do you do any attempts of consuming less?*
If yes, in what way(s)?

25 *How could it be made easier for you and others to consume more sustainably?*

26 *What do you consider when you buy food at the store?*
(organic/Fair Trade/grown nearby/price etc.)

27 *Do you consider the ecological footprint of a food product before you purchase it?*

28 *Do you deliberately try to decrease the ecological footprint of your food?*
If yes, in what way(s)?

29 *What could motivate you to eat more:*

a) vegetarian *b) locally produced*

c) organic *d) Fair Trade*

30 *Do you grow any food yourself?*
Why/why not?

31 *Do you pick any wild-growing food in nature or make use of e.g. apple trees in parks?*
If yes, which types?
If no, why?

32 *How could it be made easier for you to consume food in a more sustainable way?*

4. Food waste, composting, recycle and reuse

33 *Do you deliberately try to avoid throwing food away?*

34 *How much food do you estimate that you throw away on an average week?*

35 *Do you ever plan what to eat based on groceries turning old in your fridge/pantry?*

36 *Is there any way to decrease your food waste rate?*
If yes, what could motivate you to actually decrease your food waste rate?

37 *Are you composting on a regular basis?*
If yes, how often?
If no, what could motivate you to compost regularly?

38 *How could it be made easier for you and/or others to compost?*

39 *Do you recycle on a regular basis?*
If yes, which types of products do you recycle?
If no, what could motivate you to recycle?

40 *How could it be easier for you and others to recycle?*

41 *Do you reuse?*
If yes, what type of objects? What motivates you to reuse?
If no, what could motivate you to reuse?

42 *How could it be made easier for you and/or others to reuse?*

5. Clothes washing

43 *How often do you wash?*

44 *How much do you wash at a time?*

45 *Do clothes and textiles have to be dirty (e.g. stained) in order for you to wash them, or do you occasionally wash them anyway?*
Why?

46 *How do you generally dry your clothes?*

47 *Are you doing aware measures to lessen your environmental impacts caused by your washing?*
If yes, how?

48 *How could it be made easier for you and others to lessen your environmental impact caused by washing and drying?*

6. Conclusion

49 *Do you think that a point can be reached when one could/should feel satisfied with one's efforts to live sustainably?*

50 *In your opinion, do people try to live more sustainably today and in what way(s)?*

Appendix 3. Almedalen interview guide

Questions

1. *What 3 aspects would you say are the most important in a sustainable society?*
2. *What 3 features do you think our future, sustainable homes should have?*

Statements

1. *It is important for me to contribute to a more sustainable society.*
2. *I'm concerned about the environmental impact caused by my lifestyle.*
3. *A sustainable lifestyle at home is the responsibility of the individual, not the state.*
4. *It is easy for me to have a sustainable lifestyle at home.*
5. *The existing design of infrastructures such as public transport and recycling systems are enabling me to live as sustainably as possible.*
6. *The current level of consumption in today's society is a precondition for human well-being.*
7. *Problems with resource scarcity, waste and emissions can be solved exclusively with increased technology efficiency.*
8. *Behaviour change is not required in order to achieve a more sustainable life at home.*
9. *I am entitled to the living standards currently found in homes today in the Western world.*
10. *It is more important for me to have a high income than it is to work less and have a somewhat lower living standard.*

Appendix 4. Classification scheme

General answers

Data sorted under this label is so generic and vague that it's not really contributing to the analysis, or may be part of a generally accepted sustainability discourse in society, or may not have strong enough links to the theoretical framework.

Living Lab discourse

Data classified as being part of a general project discourse within HSB Living Lab are statements like 'the start of the journey of the sustainable housing of the future', meaning a language and point of view which has been embraced by the different partnership organizations. Statements like these belong to level 1, articulated data, as described in an earlier chapter.

Comments

Comments are replies which perhaps don't have apparent links to the theoretical framework but are interesting and noteworthy in their own right. Often the most thoughtful or new-thinking replies are to be found as a comment.

Living Lab participation

This dataset concerns some rather general aspects of being part of the HSB Living Lab project, such as financing (e.g. how to finance partaking in the project), requirements (what do each partner need to do?), potential problems (e.g. communication issues), strengths (e.g. assets and knowledge within the partnership structure) and motives (rewards, financial gains etc.).

Design & behavioural studies

Data related to either design or human behaviour in relation to sustainability but without proper connections to secondary level theories have been sorted as belonging to this category. Within this category, several different subsets have been identified.

General design improvements
General development within the research field along existing trajectories.

Routines
Sustainability challenges caused by individuals' routines in their daily life, but where the habit itself is not pinpointed as the unit of enquiry, thus not being equal to practice theory. However, it is closely related to the latter field of research through the similarities in-between.

Impact behaviour
Try to change 'incorrect' behaviour.

Communicating change
Visualise and communicate how and why a change in behaviour is necessary.

Design problems
Identified problems caused by poor design, or people not understanding how to use in a proper way.

Enabling design and innovations
A design which is supposed to facilitate a more sustainable behaviour.

Systems & Engineering

Data related to technical systems and issues of engineering, such as infrastructure or the heating of a home. This dataset has been found consisting of five different themes.

General technological improvements
General development within the field of research along existing trajectories.

Technology efficiency
Solutions related to increased efficiency of resources and products.

Enabling technologies and innovations
Technologies meant to facilitate a more sustainable behaviour.

Problematic existing infrastructure
Infrastructure which isn't benefitting sustainable development, such as roads meant to facilitate the current car regime.

Lack of flexibility
Data related to issues of lack of flexibility, e.g. dimensioning of apartments to a nuclear family with a man, woman and two kids; or heating systems which allows no personalisation whatsoever.

Sustainability science

Issues related to the sustainability sciences, either related to politico-economic or socio-cultural systems, have been sorted into this category. Many different themes can be found within this dataset.

Socio-political structures
Data related to socio-political structures in the society, such as legislation or the political structure.

Market
Issues related to the market or the conditions related to the market.

Fairness and intergenerational equity
Aspects related to what can be seen as the ethically correct thing to do.

Socio-technical patterns and transitions
Issues related to how technology impacts society, and vice versa. Related to Systems & Engineering.

Ecological footprint
Data related to environmental impact caused by products and lifestyles

Natural assets, stocks and capital
Data which can be seen as linked to usage of natural assets, stocks and different sorts of capital. Human capital can be seen as part of this category.

Human well-being and quality of life
Perceptions of what a good life is and what is needed to make individuals feel good.

Cultural patterns
Behaviours which can be seen as part of a culture, such as going abroad for holidays or norms of cleanliness.

Living Lab methodology

This category contains links to the living lab-methodology in terms of being more scientific than the Living Lab-discourse, and have includes five identified themes.

Concept
Data and subjects which is directly linked to the Living Lab-methodology.

Scientific basis
Statements related to the importance of anchoring projects within the Living Lab-project scientifically.

Innovation
Replies on innovation related to the Living Lab-methodology are classified under this label.

Co-creation
Being the core of the Living Lab-methodology, all replies related to co-creations are sorted into this category.

Enabling
Enabling as a means for facilitating a sustainable development, with statements more theoretical than 'enabling design' and 'enabling technologies' found in Design & behavioural studies and Systems & engineering above.

Multi-level perspective

All replies which can be seen as linked to the multi-level perspective are sorted under this label. Four different themes have been identified within the category. Linked to socio-technical patterns and transitions.

Challenging regime
Statements which can be seen as challenging or questioning a current socio-technical regime can be found here.

Regime shift
Mindset change, paradigm shift and the like are sorted under this label.

Levels of scale
Data addressing different levels of scale and the relation in-between those different levels.

Incubation room
Replies related to protected spaces which can function as an incubation room for new technologies.

Practice theory

Data which can be related to practice theory is to be found in this category. Two different themes have been discovered: practices themselves as a motive for doing actions with negative environmental impact, and statements which put practices themselves at centre and not the individual. Related to Design & behavioural studies: routines above.

Practice as a motive
Practices as the cause of negative environmental impact, e.g. commuting to work by car.

Practice at centre
Putting the practice at centre of attention and not the individual, such as choosing to study the practice of cooking and not studying individual electricity consumption, e.g.

Appendix 5. Analysis matrixes

1. Sustainability view

1.1 Which definition of sustainability is used at the company/your organization?

In total, there is a clear discourse on sustainability according to the Brundtland Commission, which seems to be very accepted and implemented in the organizations. The answers are an articulated character and can be related to sustainability science and design- and behavioural science (see table 1 below).

> *"We usually tend to rely on the Brundtland Commission. And I find it important and correct."*

> *"…focused on development on energy-efficient products and it has gotten so far that it is difficult to get further… [in the future,] how you use the product is making the biggest difference."*

Table 1. Sustainability definitions used by partnership organizations.

Level	Replies	Related to
1	*The Brundtland Commission definition is a very common answer, with its three pillars of sustainability: economic, ecologic and social*	*General answer*
	Some companies tend to work more with economic and ecologic sustainability than others	*General answer*
	Importance of economic sustainability in order to be able to carry out project since economy is the driving force	*Sustainability science: socio-political structures*
	Products of today are so energy efficient that it is difficult to get any further without changing people's behaviours	*Design & behavioural science: impact behaviour*
	One representative mention green wash as potential hazard, making the term sustainability more weak	*Comment (also related to Sustainability science: market/ socio-political structures)*

1.2 For how long has the company been working with the sustainability concept, approximately?

This question is clearly of an articulated character, thus getting articulated answers. A shift seems to have occurred sometime in the later part of the first decade of the 21st century, from work with environmental issues to sustainability (see table 2 below).

> *"I'm not completely sure... and when was sustainability started to be used as a buzz word, anyway? … [but] at least five years ago."*

Table 2. Sustainability work by each organization from a contemporary historical perspective.

Level	Replies	Related to
1	*Some companies claim that it's part of their business model or has always been part of their line of work*	*General answer*
	Most started to work actively with sustainability instead of environmental issues during the first decade of the 21st century	*General answer*

1.3 Does the company have a sustainability policy?

If yes, could you describe it shortly? If no, what principles are guiding the company's work with sustainability?

This question is also of a relatively obvious articulated character (see table 3 below). Most of the partners have sustainability policies guiding their work, while others have environmental policies. There are discussions of a sustainability policy at one of those companies.

> *"The key to remain a sustainable and successful [company name] is to fully integrate our sustainability work in our strategy ant the way we are doing business. "*

Table 3. Existence of sustainability policies among the partner organizations.

Level	Replies	Related to
1	*Several partners have a sustainability policy while others either have environmental policies or are discussing a sustainability policy*	*General answer*
	Some have quite extensive policies	*General answer*
	Some see the full integration of sustainability into all aspects as a prerequisite to remain an important actor on the housing market and strengthen company brand	*Sustainability science: market*
	Need to fulfil demands from society on economic, ecologic and social sustainability	*Sustainability science: market*
	Decreasing harmful environmental impact	*Sustainability science: ecological footprint, natural assets*

1.4 Which goal(s) does the company have with its striving towards sustainability?

This question generated responses which where a bit more varied than the previous questions, but all still can be found within the articulated category (see table 4 below). Several partners mention reduction of CO_2-emisisons, caused either by products or behaviour by the company's employees. One company mentions that working with sustainability is a necessity to develop the company itself. There are two representatives mentioning the importance to offer sustainable services to the clients, where one stresses that the company itself isn't really in the decision-making position. Most answers can either be categorised as belonging either to ecologic sustainability (decrease harmful environmental impact) and economic sustainability (create successful business models and values which last over time).

> *"For example, reduce CO_2-emissions is a goal which is easy to set but more difficult to achieve, but that really means that we need to decrease the emissions of the product… Recycle more materials, which is already going on. "*

Table 4. Sustainability goals.

Level	Replies	Related to
1	*Sustainability necessary develop the company and create long-lasting values for the future*	*Sustainability science: market*
	Sustainability a very important competence and responsibility to offer clients – but clients have the power to decide, not the service supplier	*Sustainability science: market*
	One representative mention that they want to global leaders on the matter and have projects attracting attention from all over the world	*Sustainability science: market*
	Decrease CO_2-emissions are mentioned by several representatives along with other harmful environmental impacts	*Sustainability science: ecological footprint*
	Several representatives also mention strategies for decreasing harmful environmental impact caused by their daily work at the office or cutting down on flying, etc.	*Sustainability science: ecological footprint*
	A diversity goal is mentioned by one organization, both regarding employees and customers	*Sustainability science: Fairness and inter-generational equity*
	Sustainability is guiding all work on two companies	*General answer*

1.5 In which ways is the company currently working with sustainability?

Data generated by this question are of an articulated character, being general descriptions of work with sustainability issues. Several organizations claim to take sustainability into consideration in all their work. Ethical codes of conduct and purchasing policies are also mentioned, as is the importance of spreading knowledge and competence both internally in the company and externally in the society. There is also a link to a living lab-discourse through a referring of a goal to enable sustainable lifestyles, see table 5 below.

> *"All we do have to be permeated by sustainability. Or that you can develop… enabling of sustainable lifestyles and sustainable behaviour."*

Table 5. Ways in which partners work with sustainability.

Level	Replies	Related to
1	*Sustainability impact all levels of work/all projects/is part of the central work in product development , according several companies*	*General answer*
	Matter of balancing economic aspects with social and ecological dittos	*General answer*
	Developing new solutions to live sustainably – e.g. reduce car dependency; adding 4000 new work places on campus without adding any new car parks	*General answer*
	Sustainability director in the board of the company	*General answer*
	Purchase philosophy on ethics and moral	*Sustainability science: fairness and intergenerational equity*
	ISO-verifications: ISO 9001, ISO 14000, Svanen, Sunda hus, etc.	*Sustainability science: market*
	Sustainability network within the company with the task to identify expertise in aspects from noise to energy calculations, etc.	*Sustainability science: human capital*
	Spread knowledge and awareness both internally in the company and externally in the society	*Sustainability science: human capital*
	Regular internal environmental education	*Sustainability science: human capital*
	Partners and suppliers need to take part of code of conduct + certifications in order to make sure they live up to standards	*Sustainability science: human capital*
	Have to enable sustainable lifestyles	*Living Lab discourse*

1.6 How do the company/you look on combining growth and sustainable development?

There is a shared opinion that growth is a necessity for sustainability – without growth, there are no opportunities to work with social or ecologic sustainability. It seems also to be a general agreement that the market potential for providing sustainable solutions is huge. All answers can be classified as articulated, as seen in table 6 below.

> *"We can see that there is an enormous growth. On the one hand one can think that this is a fundamental… it should be a fundamental competence in the whole construction- and real estate industry and the basis for all projects, but that's not the case today unfortunately. However, we do see that the demands from clients and customers are getting bigger and bigger. The interest… and competence and knowledge are increasing. And then we see a … business opportunity to actually… be able to help our customers by offering a competence in these issues."*

Table 6. Combining growth and sustainability.

Level	Replies	Related to
1	*Growth as a precondition for sustainability a common theme*	*Sustainability science: socio-political structures/markets*
	Growth and sustainability demand from society and clients	*Sustainability science: market/ socio-technical patterns and transitions*
	Still market segments which aren't working with these types of issues – lots of market potential	*Sustainability science: socio-political structures/markets*
	Generation of jobs	*Sustainability science: market*
	Interest, competence and knowledge is growing	*Sustainability science: socio-technical patterns and transitions/ market*
	Energy efficiency a win-win-win opportunity – increase competence, savings for clients and decreased emissions	*Sustainability science: ecological footprint/ market*

1.7 How important is it to associate the company brand with sustainable development? Why?

Many of the replies concern market-related issues, but also fairness and intergenerational equity. Sustainability is seen as an important service to offer clients, and as has been seen in earlier replies, it is also a condition for being able to have a leading position in the industry. Many representatives also express moral obligations to push societal development into a more sustainable direction. Once again, all questions can be sorted as articulated (see table 7 below).

> *"One can say that today, it is vital. If we are to remain … [a] leading actor on the housing market, there is no other way to proceed."*

Table 7. Importance of associating brand with sustainable development.

Level	Replies	Related to
1	*Necessity a common reply – to be able to remain a leading actor in the market, to strengthen brand*	*Sustainability science: market*
	A matter of being an attractive employer	*Sustainability science: market*
	Important from a business perspective – demands from market, extreme market potential	*Sustainability science: market*
	Associate brand with sustainability	*Sustainability science: market*
	Markets demands exist for a reason – want to have a habitable world in the future	*Sustainability science: market/ fairness and intergenerational equity*
	A matter of being part of the future/ trying to be part of creating a sustainable society for the future	*Sustainability science: market/ fairness and intergenerational equity*
	Ethical responsibilities	*Sustainability science: fairness and intergenerational equity*
	Due to aspect of green-washing – perhaps the word sustainability itself isn't necessary, but the values embedded in it	*Comment (also related to Sustainability science: socio-political structures/ market)*
	The term sustainability is vague, maybe due to the way it is presently being (over)used	*Comment (also related to Sustainability science: socio-political structures/ market)*

1.8 What types of responsibility do firms generally have to contribute towards sustainable development?

With a wide range of replies, this question generated lots of perspectives which mainly can be found belonging to socio-political structures, socio-technical system patterns and transitions, markets and fairness and intergenerational equity. Interesting comments include that it is a responsibility for larger firms to lead R&D in order to help smaller companies to become more sustainable, and that companies should work more openly in order to better integrate feedback loops and sustainability into internal structures (see table 8 below). All replies can be sorted as articulated.

> *"You'll always get to situations where you have to choose … between growth and sustainability, where you will end up in a conflict. And I think that it is more difficult for smaller companies, to have the option of prioritizing sustainability over growth. And I don't think you should count on that either. I think it's important that larger companies … invest and take the lead in this, vis-à-vis smaller companies."*

> *"Firms have a… great responsibility, who else would have it? We live in a market economy where companies in many ways dictate the terms on the market, and then they also have a responsibility to do it in a sustainable way."*

> *"…who's to push this development, it is clients, citizens and the society as such, or is it political development?"*

Table 8. Corporate responsibility to contribute to sustainable development.

Level	Replies	Related to
1	*Great responsibility a common theme*	*General answer*
	Important that sustainability work is anchored throughout the whole company	*General answer*
	Increasingly common for companies to take responsibility	*Sustainability science: market*
	Important to gain and collect knowledge	*Sustainability science: human capital/ market*
	Companies should offer solutions to customers that promote sustainable actions in order to overcome the challenges we face today with climate change and resource scarcity	*Sustainability science: Socio-technical system patterns and transitions/ natural assets & ecologic footprint*
	Improve resource/energy efficiency and take care of by-products and waste, facilitate recycling	*Sustainability science: Socio-technical system patterns and transitions / Systems & Engineering: technology efficiency*
	Have open work structures as to integrate sustainable development-thinking and feedback	*Sustainability science: Socio-technical system patterns and*

	loops	*transitions*
	Set quality over price arguments and communicate this to customers	*Sustainability science: market/fairness and intergenerational equity*
	If business is to be made – it needs to be done in a sustainable way	*Sustainability science: market/fairness and intergenerational equity*
	Firms have a responsibility to increase their minimum standards in all fields in order to have a sustainable business model, and to take actions to contribute to increased awareness and competence	*Sustainability science: fairness and intergenerational equity*
	If you're not into sustainability issues you're out of the game	*Sustainability science: market*
	Who's responsible for pushing development in a sustainable way? Clients, citizens, the society or politicians?	*Comment (also related to Sustainability science: socio-political structures)*
	Living in a democracy – have to follow regulations and goals and decisions made by politicians	*Comment (also related to Sustainability science: socio-political structures)*
	Firms have a great responsibility – who else would have it?	*Comment (also related to Sustainability science: socio-political structures)*
	Market economy – companies dictate conditions on market in many ways, thus have a responsibility for sustainability	*Comment (also related to Sustainability science: socio-political structures/ market)*
	Each individual have their own opinion – a political standpoint	*Comment (also related to Sustainability science: socio-political structures)*
	Sustainability is a priority when there are opportunities to make it one – there are situation where choices have to be made between sustainability and growth, but customers also have a responsibility to show that there's a demand for sustainable products	*Comment (also related to Sustainability science: socio-political structures/market)*
	More difficult for small companies – larger companies have a responsibility to lead development	*Comment (also related to Sustainability science: socio-political structures/market)*

1.9 Which responsibilities does your company have to contribute to a more sustainable society?

Another question generating a wide range of replies which are presented in clusters depending on what company the informant represented, since answers are similar yet differing due to what type of company the interviewee work for (see table 9 below). There are several aspects of moral obligations mentioned (fairness and intergenerational equity, as in what companies ought to do) but also of patterns regarding socio-technical systems, such as an opinion that a lot of research results are actually not being implemented into society. Once again, all replies can be categorised as articulated.

> *"And we have … opportunities, thus also a responsibility to contribute to a sustainable [society]."*

Table 9. Each organization's own responsibility to contribute to a more sustainable society.

Level	Replies	Related to
1	*Representing members of a cooperation – responsibility to represent them properly*	*General answer*
	Dwellings are places where one should be and feel safe, a place to recharge batteries – the node where all activities are based	*General answer*
	All individuals must have somewhere to live – old and young, rich and poor – aspects touching all individuals' lives	*General answer*
	Main goal of one company, and also to highlight the sustainability work done by said company's owners, and also to push their development forward and guide them to necessary contacts to get even further in their strivings	*General answer*
	Size of the company – 500 persons in 12 offices around the country	*General answer*
	Projects from product design till city planning	*General answer*
	Research is a key issue – lots of knowledge aren't implemented in society	*Socio-cultural systems: socio-technical system patterns and transitions*
	Companies in general have a great responsibility (related to previous question) and there are lots to do within the construction industry and real estate sector	*Sustainability science: socio-technical system patterns and transitions/ market*
	Both opportunities and obligations to contribute to a more sustainable society	*Sustainability science: fairness and inter-generational equity*
	Existing experiences and competences also means a	*Sustainability science:*

	responsibility to communicate with clients – help them make the right decisions	*fairness and inter-generational equity*
	Not making decisions of implementation, merely suggestions – obligations to provide clients with pros and cons	*Sustainability science: fairness and inter-generational equity/ socio-political structures/ markets*
	The size of the company brings a responsibility to have an ongoing dialogue, both with clients and in the societal debate	*Sustainability science: fairness and inter-generational equity / socio-political structures*
	Sustainability needs to be part of all innovation work	*Sustainability science: fairness and inter-generational equity*
	In general matters, sustainability should be taken responsible for and promoted whenever an opportunity arises	*Sustainability science: fairness and inter-generational equity*
	Take responsibility of educating co-workers and make sure they understand the importance of a sustainable society	*Sustainability science: fairness and inter-generational equity/ human capital*
	Choosing to take responsibility of which resources are being used and in which ways, through constant improvements and by being part of different development areas in a close cooperation with customers, suppliers and other stakeholders	*Sustainability science: fairness and inter-generational equity / ecological footprint*
	Largest environmental impact by the company's products caused by energy consumption of appliances – try to develop more efficient products	*Sustainability science: ecological footprint /natural assets, stocks and capital*
	Opportunity to both work with something you love, provide for your family, generate jobs and to contribute to a sustainable development – a chance to fulfil idealistic commitment through work and to be able to make a difference	*Sustainability science: Human well-being and quality of life*

1.10 Which obstacles do the company face in it strivings for sustainable development?

There are several themes, all articulated, to be found in the type of replies: the first is related to economy, where financing sustainable solutions are difficult and there's an apparent short-term economic focus; and the second is related to the current societal structure where it is difficult to make sustainable choices and where socio-political and socio-technical structures are working against sustainability. For more information, see table 10 below.

> *"I find that the difficulty is that we in Sweden haven't started to work with economic sustainability principles. We haven't fully succeeded in addressing economic issues in a long term perspective. And that… can usually be seen in the fact that we in projects encounter a short-sighted financial reality which perhaps isn't always optimal from a long-term perspective."*

Table 10. Faced obstacles hindering sustainability within organizations.

Level	Replies	Related to
1	*Several interviewees mention economic sustainability principles are not properly addressed in Sweden today – short term economic thinking dominating, as well as adapting projects to a financial reality and willingness to pay among customers*	*Sustainability science: market/ socio-political structures/ cultural patterns*
	To prioritise and deal with time constrains – a constant need to prioritise sustainability issues which otherwise will be neglected	*Sustainability science: market/ cultural patterns*
	All suppliers don't work with sustainability which means that demands have to be put on them, while at the same time suppliers must have the opportunity to develop their work and make their own mistakes	*Sustainability science: socio-political structures/ market/ cultural patterns*
	All levels and aspects – from challenging yourself to make sustainable choices at all time to pick the right type of coffee; a challenge to practice what you preach	*Sustainability science: socio-political structures/ socio-technical patterns and transitions*
	One thing to be visionary and have projects regarding sustainability, another thing to turn it into reality – challenge for everyone	*Sustainability science: socio-political structures/ socio-technical patterns and transitions*
	Time-consuming to develop and evaluate new solutions when trying to phase out harmful substances	*Sustainability science: socio-political structures/ socio-technical patterns and transitions*
	A company working mostly with economic and ecologic sustainability mention that social sustainability is something they'd like to look into	*Sustainability science: socio-political structures/ socio-technical patterns and*

	more, but e.g. ecologic sustainability is often valued (quantified in terms of kwh, -emissions etc.) – not the case with social sustainability *What is the most sustainable, really – finding the best alternative in each individual project according to the existing preconditions is not always easy*	*transitions* *Comment (also related to Sustainability science: market/ socio-political structures/ cultural patterns)*

1.11 How are future prognoses looking within the company's line of business, seen from a sustainability perspective?

Replies to this question were of both articulated and attributional character, see table 11 below. The articulated questions were generally related to the market and how sustainability is valued. Interface between technology and behaviour was also a frequently mentioned aspect. Attributional replies included challenging regimes (is the energy-saving discourse really the right way to go?) and links to the living lab-methodology (a need to prove scientifically the pros of shared equipment and spaces in order to be able to compete on the market – the living lab as an incubator).

> *"…there are indications that it is the most sustainable you can do … using something together where you really can enable sustainable behaviour … that's something we believe in and parts of the research we are going to do is, in an objective way, to find what strengths there are in using shared spaces and laundry rooms, and what is it that is perceived as good to have it in one's own apartment, which we can try to … compete with."*

> *"I can see that that's what it's starting to come down to, how energy-efficient should we build? Is it right to build zero- and plus energy houses? … what kind of materials do we build in instead?"*

Table 11. Potential for sustainability within each company's line of business.

Level	Replies	Related to
1	*Lots of potential, according to several representatives*	*General answer*
	Sustainability will be increasingly important	*Sustainability science: market*
	Increasing knowledge means increasing demands – market needs to adapt	*Sustainability science: market*
	Demands from clients increase, as does the awareness among individuals, thus creating a hope that sustainable alternatives will be more valued in the purchasing situation	*Sustainability science: market*
	More and more actors recognise the need to work with sustainability	*Sustainability science: market*
	Opportunity to strengthen company brand and reputation by having sustainability competence/focus	*Sustainability science: market*
	Project prognoses looks good since the society must become more sustainable	*Sustainability science: ecologic footprint / natural assets, stocks and capital*
	How much can be dealt with by (new) technology and how much is related to behaviour and do we want to steer things with technology?	*Design & behavioural science: design improvements/ Systems & Engineering:*

		technology efficiency
	Technology improvement vs behaviour change – probably a combination of both needed	*Design & behavioural science: design improvements/ Systems & Engineering: technology efficiency*
	E.g. low-flushing shower heads are fine as long as the same level of comfort is proficient, but not if one experience that there's no water coming out of it, then there's something wrong – maybe it's better to impact people to shower less in general? How to do that – measurements? Measurements are already done but usage of water isn't decreasing – measurements are made to bill use, but water is so cheap that billing don't really matter	*Design & behavioural science: design improvements/impact behaviour / Sustainability science: human well-being and quality of life/ socio-political structures/ socio-technical system patterns and transitions*
	Uncertainty if climate change issues are successively addressed	*Sustainability science: socio-political structures/ socio-technical system patterns and transitions*
	A matter of constantly evaluating what's important right now in order not to sub-optimise – and are we there or not yet is unsure, different from case to case	*Comment (also related to Sustainability science: socio-technical systems patterns and transitions)*
	Companies working together means creation of synergy – easier to jointly work towards a shared goal	*Comment (also related to Living Lab discourse)*
	Sharing of resources (equipment, space) is mentioned by two representatives	*Living Lab discourse*
	One company face an internal competitive situation – shared equipment is competing with equipment for personal use	*General answer*
2	*Before the energy during operating time used to be the dominating factor, but we're starting to reach a point when one has to ask 'how energy-efficient should we build? What types of materials do we build into our homes in order to save energy?'*	*Multi-level perspective: challenging regime*
	If energy becomes cleaner or completely clean, should we then save energy at all?	*Multi-level perspective: challenging regime*
	Need to prove scientifically the pros of shared equipment and spaces	*Living Lab methodology: scientific basis*
	Identify the pros of individual washing machines at home, to try to bridge the gap and understand what can be done to benefit shared equipment	*Living Lab methodology: scientific basis*

1.12 What types of visions does the company hold for the future, seen from a sustainability perspective?

Data from this set is mostly articulated (see table 12 below) with some very general replies and some which are related to design and behavioural science (enabling designs) and some related to sustainability sciences in the shape of politico-economic systems (market). Changing of praxis, how and why we do things, can be linked to challenging regimes.

> *"... HSB Living Lab. This is where we are going to test everything. Both products and services... and how do we function together, what is it that makes us feel good, what it is that make us not feel good, how is ... the sustainable, everyday life going to look like. "*

Table 12. Sustainability visions.

Level	Replies	Related to
1	*Impact global debate on sustainability and make a difference*	*General answer*
	A production which is sustainable throughout the whole life cycle	*General answer*
	Invest even more on R & D and spread engagement and knowledge	*General answer*
	Related to general vision for the company – to be the obvious choice for clients and co-workers, including sustainability issues, especially in energy-or environmental issues	*General answer*
	Listening to and participating in societal discussions to be part of the development	*General answer*
	Vision to be an active partner in discussions of the need for change	*General answer*
	Develop knowledge about sustainability in order to be able to address climate challenges, urbanisation, segregation etc.	*Sustainability science: socio-political structures, socio-technical system patterns and transitions, ecologic footprint*
	Changes necessary often related to rethinking current praxis	*Design & behavioural science: enabling design*
	Important to make it easy to live sustainably – e.g. sorting waste	*Design & behavioural science: enabling design*
	HSB Living Lab sustainability symbol – testing everything: products and services, what makes one feel good and what not, how do we function together Be a world-leading supplier with the most environmental friendly and sustainable alternatives	*Design & behavioural science: enabling design*

	Impossible to be a world-leading supplier of you don't provide sustainable products, in addition to have high quality products – necessary precondition	*Sustainability science: market*
2	*Important to keep question why we do stuff – why do we wash with water, for example? Is it reasonable to waste so much water when flushing toilets?*	*Multi-level perspective: challenging regime*

2. Sustainable lifestyles at home

2.1 In which areas can the company/your research contribute to more sustainable homes?

A wide range of answers were generated by this question, from technological innovations to change of mindsets (see table 13 below). Several representatives mention increased resource efficiency, which belongs to the category of systems and engineering. Once again, there is a link to the multi-level perspective through questionings of norms and existing regimes. Several areas are also touching upon innovations, which can be linked to the general living lab- approach and to the multi-level perspective.

> *"...sensors know that you cook and will open the fridge several times; now it is better to shut it down and wait until you finished the cooking in order to save the extra energy needed due to the frequent openings/closings."*

Table 13. Potential contribution to sustainable homes by each organization, respectively.

Level	Replies	Related to
1	*Whole concept – help out in starting out projects and finding the right researcher to connect with it, not doing actual research*	*General answer*
	More effective resource use common answer	*General answer (also related to Sustainability science: ecologic footprint/ natural assets, stocks and capital)*
	Social issues related to housing (how to make people feel well at home)	*Socio-cultural systems: human well-being and quality of life*
	Certifications	*Sustainability science: markets*
	Optimisation of buildings and technological systems	*Systems & engineering: technology efficiency*
	Product and material development	*Systems & engineering: general technological improvements*
	Collaboration with suppliers on product development	*Systems & engineering general technological improvements*
	Kitchen: sensors know that you cook and will take measurements to save energy	*Systems & engineering: enabling technologies and innovations*
	Work space: sensors know the best indoor conditions favouring your work performance – control lights, ventilation, temperature, etc.	*Systems & engineering: enabling technologies and innovations*

	Waste management: optimise trash collection and predict heating value for waste incineration plants	*Systems & engineering: enabling technologies and innovations*
	De-centralised renewable energy generation: control through energy demand prediction on a house- or district level	*Systems & engineering: enabling technologies and innovations*
	Much of energy consumption at home are caused by daily activities and behaviours – potential of energy savings of 20-30 or even 50 %	*Design & behavioural science: routines/ design problems*
	Try to develop product solutions to decrease resource consumption	*Design & behavioural science: enabling design and innovations/ Sustainability science natural assets, stocks and capital*
	Increased functionalities in things	*Design & behavioural science: general design improvements*
	Start do decrease living areas – less m²s per person	*Design & behavioural science: design problems/ Sustainability science: ecologic footprint*
2	*Innovation and new mindsets regarding surface usage*	*Multi-level perspective: challenging regime (also related to Design & behavioural science: enabling design and innovations)*
	Dare to challenge norms – must a kitchen be a kitchen?	*Multi-level perspective: challenging regime (also related to Design & behavioural science: design problems)*

2.2 In which areas can the company/your research contribute to more sustainable lifestyles/habits at home?

This question generated a very rich material in terms of different aspects of sustainability research (see table 14 below). As far as articulated questions go, there is an agreement of technology as an enabling factor of some sort. There are also suggestions of how to make home life easier in terms of mobility, and also suggestions of sharing of space. Behaviour and enabling a sustainable behaviour is also a reoccurring topic. Attributional data include links to the multi-level perspective in terms of challenging of existing regimes, and to practice theory in terms of practices as motives and causes for action and consumption.

> *"Individuals have special goals all the time steering their daily activities, and sometimes... you could have an etic goal to behave more sustainably in your everyday life, but sometimes it is simply daily routines standing in the way."*

Table 14. Potential contribution to sustainable lifestyles at home by each organization, respectively.

Level	Replies	Related to
1	*Housing issues – focus on the research in the living lab*	*General answer*
	Hopefully solutions will be found during the ten year the project is running; as a technology consultant firm – create or improve conditions for sustainable habits at home, by using technology	*General answer*
	Design of products and their application areas	*General answer*
	Collaboration of actors	*General answer*
	Energy-efficient products	*Systems & engineering: enabling technologies and innovations*
	Energy patterns may be used for control systems to stabilise energy consumption, avoid peak loads, avoid 'punishing' tenants to decrease energy consumption	*Systems & engineering: enabling technologies and innovations/ problematic existing infrastructures/ lack of flexibility*
	Work with mobility management, e.g. have spacious bicycle garages	*Systems & engineering: enabling technologies and innovations/ Design & behavioural science: enabling design and innovations*
	Information can be used for feedback to tenants – opportunity to adapt behaviour through awareness of energy impacts caused by actual behaviour	*Systems & engineering: enabling technologies and innovations/ Design & behavioural science: communicating change*

	Technology can either be fully automatised or supporting – no obvious choice, e.g. visualising the impact of energy consumption – a dead penguin on a display in the shower or whatever	*Systems & engineering: problematic existing infrastructures/ enabling technologies and innovations /Design & behavioural science: general design improvements /enabling design and innovations /communicating change*
	Really starts outside the home – if it is easier to take the car (e.g. there is a garage in the house) than the bus, then you have made some aspects of changing people's habits impossible	*Systems & engineering: problematic existing infrastructures/ Design & behavioural science: general design improvements / enabling design and innovations / communicating change*
	Can common spaces be offered, making it more attractive to live more compact?	*Design & behavioural science: general design improvements*
	Research focus on energy demand prediction based on behaviour patterns	*Design & behavioural science: enabling design and innovations / Systems & Engineering: enabling technologies and innovations*
	Necessary to develop many ways of impacting in parallel – not enough to just show energy consumption at a certain time of the day	*Design & behavioural science: impact behaviour*
	Complementing actions such as providing information needed	*Design & behavioural science: impact behaviour*
	Enable communication with products and adaptations for individual needs, as simple as possible	*Design & behavioural science: enabling design and innovations/ Systems & Engineering: enabling technologies and innovations*
	Make measurement- and steering technologies more visual to make it easier to understand one's environmental impact – if one knows how much emissions showering cause, it's easier to change behaviour	*Systems & engineering: enabling technologies and innovations*
	Energy consumption is neither aware nor visible – troublesome	*Systems & engineering: problematic existing infrastructures/ Sustainability science: socio-technical system patterns and transitions/ socio-political structures*
	Sorting waste another example – must be easy and	*Systems & engineering:*

	convenient, which isn't the case today	*problematic existing infrastructures/ Sustainability science: socio-technical system patterns and transitions /*
	Necessary to take cultural values or specific personal situation into consideration	*Sustainability science: cultural patterns/ human well-being and quality of life*
	Finding new concepts for business models	*Sustainability science: markets*
	Can assist in creating new companies who can develop services for a more circular economy and sharing of items	*Sustainability science: markets*
	People are especially willing to alter behaviours when there are big changes going on in their life – moving to one's first own flat, e. g.	*Comment (also related to Design & behavioural studies: impact behaviour)*
2	*Rethink the zonings of our dwellings*	*Multi-level perspective: challenging regime (also related to Design & behavioural science: general design improvements)*
	Rethink heating – must all parts of a dwelling have the same temperature, can there be different temperatures in different zones and depending on the current activities taking place	*Multi-level perspective: challenging regime (also related to Systems & engineering: enabling technologies and innovations)*
	All people have goals steering their daily activities	*Practice theory: practices as motive (also related to Design & behavioural science: routines)*
	Persons can have ethical goals to behave sustainably – sometimes daily routines hinders those goals, or hedonistic goals such as wanting to take a long hot bath	*Practice theory: practices as motive (also related to Design & behavioural science: routines/ Sustainability science: cultural patterns/ human well-being and quality of life)*

2.3 What obstacles can the company/you identify as hindering sustainable lifestyles at home?

Being a very broadly formulated question, a very rich data material was the outcome. Replies can both be classified into articulated and attributional answers, of which many concern the same themes but on different theoretical levels:

Not many opportunities to change lifestyle and other aspects of home life – not possible or difficult to impact aspects such as lighting, heating (articulated data) can be compared to *Obstacles on both structural and individual levels* which touches upon the multi-level perspective (attributional data).

Existing structures in the society, both socio-political and socio-technical, can be seen as obvious obstacles for sustainable lifestyles at home. Natural assets are not valued highly enough, and distance to harmful environmental impact is another factor to take into consideration. Information overflow can also be seen as troublesome. In terms of attributional answers, they are related to either the multi-level perspective; living lab methodology (enabling sustainability at home such as *Too much knowledge required from individuals – one shouldn't have to be an energy engineer in order to know how to behave)* and practice theory (*Not really aware of consuming energy – just part of everyday habits, same things go for heat).* See table 15 below for more details.

> *"I think that you get overflowed by information … and you feel that you ought to do something, but then you lose it along the way."*
>
> *"I would say that too much knowledge is required … and we don't think that should be necessary. … it should be intuitive to easily understand if we do things in the right way. You shouldn't have to be an energy engineer to understand how to behave."*

Table 15. Identified obstacles hindering sustainable lifestyles at home.

Level	Replies	Related to
1	*Costs – if it should cost more to live sustainably than not*	*Sustainability science: socio-political structures/ market*
	Lack of awareness and knowledge	*Sustainability science: socio-political structures/ cultural patterns*
	Not many opportunities to change lifestyle and other aspects of home life – not possible or difficult to impact aspects such as lighting, heating	*Systems & engineering: problematic existing infrastructures/ Sustainability science: socio-technical system patterns and transitions*
	Ignorance about the energetic, environmental, and social impacts of appliances/food/furniture/tools/etc. in order to choose the most sustainable option available	*Sustainability science: socio-technical system patterns and transitions/ socio-political structures*

	Influences from society and businesses proposing that you 'have to have' comfort through gadgets/appliances/home equipment etc.	*Sustainability science: socio-political structures/ cultural patterns*
	Energy, electricity, heat, garbage, warm water just exist – no questioning of the matters	*Systems & engineering: problematic existing infrastructures/ Sustainability science: socio-technical system patterns and transitions/ socio-political structures*
	No active measure to consume energy – energy is necessary for satisfying needs, and energy exist simply to satisfy needs	*Sustainability science: socio-technical system patterns and transitions/ socio-political structures*
	People really not aware – sometimes don't know that there are thermostats on radiators	*Sustainability science: socio-political structures/ cultural patterns*
	Housing construction strictly controlled through regulations such as PBL and BBR	*Sustainability science: socio-technical system patterns and transitions/ socio-political structures*
	Political decisions e.g. ROT, less illegal work but increased renovation rate – people exchange kitchens which could easily have been functional for another 10-20 years	*Sustainability science: socio-political structures*
	Important to try to give energy sources an identity to be able to raise awareness of them, via appliances or lifestyle habits	*Design & behaviour science: general design improvements/ Systems & Engineering: general technological improvements*
	Challenge to make people feel like they experience the same level of comfort but with less resource consumption	*Design & behaviour science: enabling technology*
	Looking concretely, there are smaller problems such as smell from sorted out waste, but nothing that can't be resolved	*Design & behaviour science: general design improvements*
	Recycling of washing water an example – there are no technical hinders, but behavioural – to wash in somebody else's used water	*Comment (also related to Sustainability science: socio-technical systems and transitions/ cultural patterns)*
	People want to have a sustainable lifestyle but do like they always have done – same level of comfort	*Comment (also related to Sustainability science: cultural patterns)*
	Need to combine incitement, will, ethical attitudes,	*Comment (also related to*

	and knowledge – then it is possible to create more sustainable lifestyles	*Sustainability science: cultural patterns)*
	What is a sustainable lifestyle, really – a way to live with awareness of energetic, environmental and social impacts, but at the same time achieve an adequate comfort	*Comment (also related to Sustainability science: ecologic footprint/ well-being and quality of life)*
	Energy is too cheap; water is abundant and too cheap	*Comment (also related to Systems & engineering: problematic existing infrastructures)*
	We live in a surplus of information which makes it difficult to absorb all information – how to resolve?	*Comment (also related to Sustainability science: cultural patterns)*
	Generation shift – children of today knows to recycle, wasn't the case 35 years ago	*Comment (also related to Sustainability science: socio-technical systems and transitions*
	What do we need to do now to change the behaviour of the children being born today, in 40 years' time?	*Comment (also related to Sustainability science: socio-technical systems and transitions*
	Push the development in the right direction – how to do that an important question	*Comment (also related to Sustainability science: socio-political structures)*
	Technology can be part of it, as could economy, and general education	*Comment (also related to Sustainability science: market/ cultural patterns)*
2	*Obstacles on both structural and individual levels*	*Multi-level perspective: levels of scale*
	Transition phase in society – changing habits	*Multi-level perspective: regime change*
	No real products and services offer sustainable lifestyles – a lot of knowledge, but no productification or servification of sustainability	*Living lab methodology: enabling*
	Must be new offers of products and service to enable consumers to have sustainable lifestyles, often that opportunity doesn't exist	*Living lab methodology: enabling*
	Too much knowledge required from individuals – one shouldn't have to be an energy engineer in order to know how to behave	*Living lab methodology: enabling*
	Should be intuitive to know how to do things in the most sustainable way	*Living lab methodology: enabling*
	Technologies for living sustainably should become	*Living lab methodology:*

	more interactive and intuitive *Most people feel like they ought to do something, but still they don't manage to change: perhaps supporting technology is necessary – e.g. should we have smart fridges telling us that there are two onions about to get spoilt in the fridge?* *A matter of enabling – habits important factors* *Not really aware of consuming energy – just part of everyday habits, same things go for heat*	*enabling* *Living lab methodology: enabling* *Living lab methodology: enabling/Practice theory: practice at center* *Practice theory: practice at center*

2.4 What types of ongoing projects are relevant to increase the degree of sustainability at home?

The data generated by this question was quite clearly of an articulated character. Some organizations have several projects with focus on either ecologic or social sustainability, while others only are involved in the HSB Living Lab project (see table 16 below).

> *"We're involved in several housing projects which I consider to be sustainable … we draw housing for HSB and Riksbyggen en masse where energy use is between 50-60 kw per m² and year … and we have customers asking us of we can draw a passive house, and if we can join an architectural competition and present a plus energy house, so I mean… the projects are already happening in the industry today. I think the important thing is, once again, how far shall we go? What's the right level and so forth? We are doing… several normal projects which from an energy point of view are just as efficient as HSB Living Lab."*

Table 16. Ongoing projects with focus on sustainability.

Level	Replies	Related to
1	*General development of more energy-efficient, less water-demanding products*	*General answer (also related to Systems & Engineering: general technological development)*
	Other student housing projects	*General answer*
	Projects in Norra Djurgårdsstaden with sustainability focus – solar cells, sustainable heating systems, green space factors etc.	*General answer*
	Riksbyggens Positive Footprint Housing – BRF Vivan	*General answer*
	Projects related to the outcome of political decisions	*General answer*
	Projects related to behaviour or how to make people feel satisfied with lower standards of living	*Sustainability science: human well-being and quality of life /Design & behavioural science: impact behaviour*
	Service related to social issues of housing – open phone line to educated social workers	*Sustainability science: human well-being and quality of life*
	Dialogue group with youths – similar to focus groups but more structured and with persons replying on the computer, in order to make everybody heard	*Sustainability science: human well-being and quality of life / fairness and intergenerational equity*
	Shared meeting places for all tenants – from swimming pools in some developments to spaces where the housing associations can arrange board meetings or parties	*Sustainability science: human well-being and quality of life*

	ElectriCity – mobility and public transport	*Sustainability science: socio-technical system patterns and transitions*
	Involved in several housing projects which can be considered sustainable – low energy consumption buildings (50-60 kwh per m² and year), environmental certifications, passive houses, plus energy houses – the projects are already happening in the housing market today	*Sustainability science: ecologic footprint / Systems & engineering: general technological development*
	Important to ask 'how far shall we go'? 'What is the right level of effort'?	*Comment (also related to Sustainability science: socio-technical systems patterns and transitions)*
	Several 'normal' projects which are as energy efficient as the HSB Living Lab	*Comment (also related to Sustainability science: market)*

2.5 What kind of research potentials regarding sustainable homes does exist in the company's line of business, according to the company?

All replies except one can be classified as articulated (see table 17 below). Many representatives agree on a potential which can be found in the construction industry and real estate sector. One representative mentions the importance of identifying target groups and lifestyle perspectives along with personal preferences. Another representative provide several interesting ethical comments on energy, such as 'what should we heat our passive houses with if appliances become more efficient?' and 'maybe we should use more energy at certain times to create a better indoor climate and let is cost more in terms of energy , if "clean" energy is available'. One question is of an attributional character and is related to a challenging regime in terms of how the built environment possibly could be used.

> *"Office buildings could be something else on weekends and… during night time, it could be housing for students, they are already working and living elsewhere during day time and… and I think sometimes that your detached house or semi-detached house is empty during day time. It could be a conference room for a small business owner … I think the built environment could be developed infinitely in order to be more sustainable. And we used to live more sustainably previously. Then there were many more sharing the same space and kind of had to use resources more economically. It's much more recently that we have started to kind of expand enormously and generate a lot more waste than we used to."*

Table 17. Research potential related to sustainable homes along the partners' lines of business.

Level	Replies	Related to
1	*Infinite potential – but more companies needs to test and develop solutions*	*General answer*
	Enormous potential in developing the built environment in a more sustainable way	*General answer*
	Extensive Swedish research on behavioural aspects on housing – lessons to be learned from HSB's studies in the 1930s and 1940s	*General answer*
	Water recycling systems	*Sustainability science: ecologic footprint*
	Energy one defining issue	*Sustainability science: ecologic footprint*
	Potential to deepen research regarding to target groups and lifestyle perspectives	*Sustainability science: cultural patterns*
	Identify preferences and needs – different people, different needs	*Sustainability science: cultural patterns*
	Research to find solutions which adapt products to individual's behaviours and loads	*Design & behavioural science: enabling design and*

		innovations
	One third of non-household electricity in housing is used for heating water ▪ *How to decrease consumption of hot water?* ▪ *What type of energy should we use to heat our water?* ▪ *How can we best recycle heat?* ▪ *Can we use the sun?* ▪ *What types of energy should Göteborg Energi produce?*	*Comment (also related to Sustainability science: ecologic footprint/ socio-technical system patterns and transitions)*
	Is it OK to combust garbage instead of using solar cells – the garbage needs to be dealt with?	*Comment (also related to Sustainability science: ecologic footprint)*
	Transmission losses through building envelope more related to what is a reasonable level in comparison with a life cycle analysis perspective – building a wall with U-value 0.1 instead of 0.14 doesn't save that much energy but is very costly, both in terms of money and space	*Comment (also related to Sustainability science: ecologic footprint/ natural assets, stocks and capital)*
	Interesting to adapt functions to users ▪ *Maybe we should use more energy at certain times to create a better indoor climate and let is cost more in terms of energy – if the right sort of energy is available* ▪ *At other times, perhaps less energy should be used – how to steer?*	*Comment (also related to Sustainability science: ecologic footprint/ socio-technical system patterns and transitions)*
	Adaptations to demands have a longer history in office premises – but how about housing? What can/can't we steer? What risks are there?	*Comment (also related to Sustainability science: socio-technical system patterns and transitions/ cultural patterns)*
	Electricity consumption always interesting – more energy efficient products and time of purchasing energy important ▪ *Household energy consumption – how big is it, and how will it change in the future?* ▪ *Average 30 kwh hours per m^2 and year* ▪ *Remain stable over time – appliances are increasingly getting more energy-efficient but number of appliances in homes are increasing too* ▪ *When this consumption goes down – time to re-evaluate building envelopes in terms of energy-efficiency again*	*Comment (also related to Sustainability Science: socio-technical system patterns and transitions/ cultural patterns/ Design & behavioural studies: impact behaviour)*
	Household appliances heating passive houses – how to heat them if appliances wasn't a source of heat any longer?	*Comment (also related to Sustainability Science: socio-technical system patterns and transitions)*

	Household electricity and heated water very interesting aspects – but not so easy to impact for a technology consultant firm	*Comment (also related to Sustainability science: market)*
2	*Maximise use of existing buildings – office houses could function as student housing at night with students working elsewhere on daytime, single family housing units are empty during day time – could function as conference rooms for small enterprises*	*Multi-level perspective: challenging regime*

2.6 Is there any research projects regarding sustainable homes done by competitors or in other lines of businesses which the company find extra promising?

This question easily had the lowest answering frequency due to several reasons, one being that it was once forgotten and a complementing e-mail never was replied. There was not much information to get from this particular question. For further detail, see table 18 below.

> *"Like I said, in some projects there are several eyes observing what's going on, not only competitors but also in adjacent technologies or similar, even if it isn't true competitors. So… in all sustainable projects going on, there are several eyes watching who can tie that together and that information. But nothing that I know of right now."*

Table 18. Other promising ongoing research projects with sustainability as a theme.

Level	Replies	Related to
1	*A lot of interesting research going on*	*General answer*
	One Ton Life (Vattenfall)	*General answer*
	Not at the moment	*General answer*
	Keeping an eye on the development among both competitors and adjacent sectors	*General answer*
	No	*General answer*

2.7 How do the company/you think that our future homes will look?

There is a clear agreement among the interviewees on the need for us to have smaller housing units in the future. Several also mention that we have to share more, both spaces and items. Modularity and flexibility is also a theme occurring several times. All in all, this can be seen as part of a general societal discourse on sustainability.

There is also a need to question why and how we do things, is it because of old habits or is it because it's the optimal way of doing something? Some other interesting findings include the indication of a paradigm shift in how we want to live, in the statement that younger persons want to live with access to nature and public transport, and not necessarily in the city; and the comment that housing hasn't really changed since the human species first started to live in houses is one worth keeping in mind. Another noteworthy statement was that the adaptation of a building for several functions will lead to more job to look after and maintain buildings, but that this at the same time creates job opportunities – a change which might be beneficial in times of high unemployment rates. The replies can be sorted into articulated (the majority) and attributional, linked to either the multi-level perspective through challenging regimes, and to living lab-methodology through enabling, see table 19 below.

> *"Young people, basically, they all want to live near public transport, it is very important that you quickly can transport yourself between different places, to be able to transport yourself is very important. And proximity to nature. That you like to live near nature and at the same time live near the city too. But it isn't that important to live in the city today, especially if you have good [public transport] connections. And being part of a community is also important, especially in the younger generation."*

> *"[I] sometimes hear the comment … that it will be much more work to look after and to entertain. Well, perhaps it's good to arrive at that point. Perhaps we need… To build a sustainable society concerns a lot, as I see it … about the consumption society, what is it we consume, to buy appliances and stuff. We do need to shift from that. In that case, to have an increased number of persons working with service and maintenance, in terms of buildings too, I can see that as something sustainable itself. "*

Table 19. Visions of the future sustainable home.

Organization	Replies	Related to	Level
Chalmers researchers	*Small and smart – today it's status to have a big living space, in the future that will be considered dumb*	*Comment (also related to Sustainability science: socio-technical systems patterns and transitions/ ecologic footprint)*	*1*
	Status will be small, smart houses and apartments	*Comment (also related to Sustainability science: socio-technical systems patterns and*	*1*

		transitions/ ecologic footprint)	
	Modular and flexible in order to adapt size to actual needs – not providing unused capacities at all times	*Comment (also related to Systems & engineering: lack of flexibility)*	*1*
	Urbanisation means that solutions must be available due to less space per person	*Sustainability science: natural assets, stocks and capital/ ecologic footprint*	*1*
	Higher degree of automatisation, but at the same time preserve individual's opportunities to control their environment (e.g. turn on some more lights in a dark corner of the room where sensors don't indicate it is too dark, open a window if one would like to get some fresh air into the room)	*Systems & engineering: general design improvements/ lack of flexibility*	*1*
	More automatisation makes life easier – less need for individual technical knowledge/competence	*Comment (also related to Sustainability science: ecologic footprint/ socio-technical systems patterns and transitions/ Design & behavioural studies: impact behaviour)*	*1*
	Working on a new scientific term on the subject – perhaps 'comfort automatisation' or 'interactive automatisation'	*Comment*	*1*
	Avoid putting responsibility on the user – but also not interfere with personal integrity	*Comment (also related to Sustainability science: ecologic footprint/ socio-technical systems patterns and transitions/ Design & behavioural studies: impact behaviour)*	*1*
	Personify the automatisation – people have very different needs and preferences	*Comment (also related to Systems & engineering: lack of flexibility)*	*1*
	Preserve individual freedom of choice	*Comment*	*1*
	Sustainable, biodegradable building materials	*Comment (also related to Sustainability science: human well-*	*1*

		being & quality of life	
	Energy from renewable sources – producing energy only when it's needed	*Sustainability science: ecologic footprint/ Systems & Engineering: lack of flexibility*	*1*
	Well-insulated	*Sustainability science: ecologic footprint*	*1*
	Zero-emission	*Systems & engineering: general technological improvements*	*1*
	Possibilities to work from home to a large extent, avoiding commuting back and forth	*Sustainability science: ecologic footprint / socio-technical system patterns and transitions*	*1*
	Beautiful and cosy	*Socio-cultural systems: human well-being and quality of life*	*1*
	Place for happiness and joy – shouldn't be just a housing machine	*Socio-cultural systems: human well-being and quality of life*	*1*
	Smaller – there are more and more single households, but we're constantly increasing average m^2/capita – a trend which must be stopped	*Comment (also related to Sustainability science: ecologic footprint/ cultural patterns)*	*1*
	Avoiding sprawl	*Sustainability science: ecologic footprint*	*1*
HSB	*Goal of the project to find out*	*General answer*	*1*
	Lots of thoughts already	*General answer*	*1*
	Young people want to live near public transport stops and functioning connections, more important than living in the city	*Socio-cultural systems: cultural patterns*	*1*
	Living close to nature a deciding factor	*Sustainability science: cultural patterns*	*1*
	Adapting to new family constellations – three persons in the household one week, eight the following – how to resolve without needing to have vast spaces?	*Comment (also related to Sustainability science: cultural patterns/ ecologic footprint)*	*1*
	Dialogue groups outcome – people can imagine share bathroom and toilet if it is a	*Socio-cultural systems: cultural patterns /*	*1*

	bit more luxurious and similar to a spa, even sharing kitchen	*Sustainability science: ecological footprint*	
	Questioning is important once again – why do we wash out clothes in water, why do we have to have our own fridges and kitchens, why does it look the way it does – due to lack of questioning or due to real needs?	*Multi-level perspective: challenging regime*	*2*
	Living more compact	*Comment (also related to Sustainability science: cultural patterns/ ecologic footprint)*	*1*
	Sharing more – things and areas	*Comment (also related to Sustainability science: cultural patterns/ ecologic footprint)*	*1*
	Home will be the hub in life in a completely different way – big data etc. supporting all activities	*Comment*	*1*
Johanneberg Science Park	*Vision that solutions will have been developed, making it easier to live more sustainably and save resources*	*General answer*	*1*
	Solutions enabling sustainable behaviours	*Living lab methodology: enabling*	*2*
	Structural engineering solutions – more energy efficient and smartly designed, making them flexible enough to use them for many different purposes	*Systems & engineering: technology efficiency/ general technological improvements/ lack of flexibility*	*1*
Tengbom	*Trying to ask this question to children and youth in as many projects as possible*	*Comment*	*1*
	'The only thing we know is that we don't know anything'	*Comment*	*1*
	In some ways, housing hasn't really changed since man first started to live in houses and cities – there's a certain elementary-DNA in the way we organise us	*Comment*	*1*
	The challenge is to be open for a user perspective, which isn't the case today – we don't build homes that the customers want, we build the homes that we think that the average, white, Swedish, middle class wants – a nuclear family which doesn't exist	*Multi-level perspective: challenging regime*	*2*

Bengt Dahlgren	*Supporting technology allowing the individual to make aware choices and to use buildings in an efficient way – based on the current technology status and with a positive mindset of how the future society will look, provided that no major wars will take place nearby – a precondition to keep living like we do today*	*Systems & engineering: general design improvements*	*1*
	Having homes where generated knowledge within the fields of technology and architecture actually are implemented – making it easier for individuals to make the right choices	*Living lab methodology: enabling*	*2*
	Sometimes the comment is heard that if you adapt a building for different functions it will be more to look after and maintain, but perhaps that is necessary – create new jobs which aren't directly related to consumption and the consumer society	*Comment (also related to Sustainability science: socio-technical system patterns and transitions)*	*1*
	Transition within the construction industry perhaps needed – once a building is completed you can't just leave it there for 50 years with the exception of cleaning the windows occasionally	*Multi-level perspective: transition / challenging regime*	*2*
Electrolux	*More compact*	*Comment (also related to Sustainability science: ecologic footprint)*	*1*
	More space efficient	*Comment (also related to Sustainability science: ecologic footprint)*	*1*
	More adopted to personal needs	*Comment (also related to Sustainability science: cultural patterns/socio-technical systems patterns and transitions/ Systems & Engineering: lack of flexibility)*	*1*
	More adopted to social networks	*Comment (also related to Sustainability science: cultural patterns/socio-technical systems patterns and transitions)*	*1*
Vedum	*Smaller*	*Comment (also related to Sustainability*	*1*

		science: ecologic footprint)	
	More shared spaces	*Comment (also related to Sustainability science: ecologic footprint)*	*1*
	More sharing of resources	*Comment (also related to Sustainability science: ecologic footprint/ natural assets, stocks and capital)*	*1*
	Increased flexibility	*Comment (also related to Sustainability science: /socio-technical systems patterns and transitions)*	*1*

2.8 Which obstacles must be overcome before that point can be reached?

Structural obstacles such as socio-political structures and socio-technical system patterns can be identified as the most important obstacles along with human behaviour. Examples of structural issues include the housing market of today and regulations related to housing and construction. Individuals are seen as being too busy and too comfortable to really make an effort to live sustainably. Difficulties in financing more sustainable solutions were mentioned by the representatives of two organizations: customers are not willing to pay for the more sustainable options, and as in the example provided by the respondent from Bengt Dahlgren, there is a need to come up with solutions which add value to a function in order to make clients find it worthy to spend some extra money for the more sustainable option. Replies can be seen as articulated, with the exception of three of an attributional character: changing the world economy (a rather extensive paradigm shift indeed); 'stop using traditions and what's convenient from an industrial engineering point of view as a starting point and instead put humans and individual's need at the centre'; and 'one way forward could be to look backwards to be able to develop concept for multi-purpose use of space' are the other two. For further details, see table 20 below.

> *"Well, that we don't put the human and human needs at centre [presently], instead we set what's convenient from an industrial engineering point of view at centre, or how we formed traditions, or letting technology steer too much."*

> *"… kind of the usual; persons like to live convenient and want to have a higher standard than they already have. And I also think that we live in a world full of pressure, we have high demands on ourselves and then there's no time … to figure what kind of risotto you can do with your leftovers the following day… I think perhaps time – that we live a bit too fast. "*

Table 20. Important obstacles to overcome before a more sustainable home-life are possible.

Organization	Replies	Related to	Level
Chalmers researchers	*Change the world economy*	*Multi-level perspective: challenging regime*	*2*
	Changes are starting to occur in the Western World	*General answer*	*1*
	Dynamic home in terms of size and modularity challenging– people do not want standardised homes; dynamic homes would enable them to easily move from time to time when needs change	*Sustainability science: socio-political structures / Socio-cultural systems: socio-technical systems patterns / cultural patterns / Design & behaviour science: design problem/ Systems & Engineering: lack of flexibility*	*1*
	Housing market (both rental and buying)	*Sustainability science:*	*1*

	is strict and with high prices, thus requiring long-term investments – less flexibility to change housing when needs change	*socio-political structures / Socio-cultural systems: socio-technical systems patterns*	
	A multi-sensored and multi-controlled home enabling resource consumption awareness while ensuring preserved comfort means additional investment plus minimum knowledge about frame conditions and control adaptation – education will take some time, changes will first reach only a share of the built environment	*Sustainability science: socio-political structures / Socio-cultural systems: socio-technical systems patterns*	*1*
	Regulations are presently limiting possibilities to explore and experiment with housing	*Sustainability science: socio-political structures / Socio-cultural systems: socio-technical systems patterns*	*1*
	Regulations are at the same time lacking incentives for sustainable development – no proper goals/guide lines like 'by 2040 all types of housing must be zero-emission'	*Sustainability science: socio-political structures / Socio-cultural systems: socio-technical systems patterns*	*1*
	The industry must become more flexible and less afraid of alternative ways of developing products and services	*Multi-level perspective: challenging regime*	*2*
	Industry must also become less prone to only by steered by the market, enabling developers to spend more time to explore research results and innovations, not just tcarrying out daily routines	*Multi-level perspective: challenging regime*	*2*
HSB	*Stop using traditions and what's convenient from an industrial engineering point of view as a starting point and instead put humans and individual's need at the centre*	*Multi-level perspective: challenging regime*	*2*
	Necessary to change what is unsustainable, e.g. replacing fossil fuels with less harmful ones – the train as a concept wasn't abandoned because coal as a fuel was environmentally harmful, there was just a change of fuel	*Comment*	*1*
	Today, many rental apartments are transformed to housing associations and then everything is done to increase the	*Sustainability science: socio-political structures / fairness*	*1*

	value of the property as fast as possible in order to sell at maximum profit – not necessarily sound for the associations	*and intergenerational equity/ Socio-cultural systems: socio-technical systems patterns*	
	Humans are wary against changes and lazy due to evolution – necessary to overcome through communication and highlighting of positive aspects with new innovations	*Socio-cultural systems: cultural patterns*	*1*
Johanneberg Science Park	*Construction industry conservative and not very driven by innovation – in addition, projects are very complex*	*Sustainability science: socio-political structures / Socio-cultural systems: socio-technical systems patterns*	*1*
	Cars can be built over and over again – buildings are unique with their own preconditions: weather conditions, ground conditions etc. with new constellations of constructors and suppliers each time	*Comment*	*1*
	Regulations surrounding construction – difficult to change	*Sustainability science: socio-political structures / Socio-cultural systems: socio-technical systems patterns*	*1*
	Regulations there for a reason – housing areas shouldn't look like a funfair, should be safe to use, withstand moist and fire, functional demands	*General answer*	*1*
	Difficult to use buildings for multi-purposes – either housing or office, not both – too many regulations to consider	*Sustainability science: socio-political structures / Socio-cultural systems: socio-technical systems patterns*	*1*
	People want to be comfortable and they constantly want to increase their living standards	*Socio-cultural systems: cultural patterns*	*1*
	Individuals' lives are too stressful – there is no time to think about what you can do with food leftovers the following day, it's easier to throw them away	*Socio-cultural systems: cultural patterns*	*1*
	Used to live more sustainably less than a century ago, living in smaller dwellings and with more careful resource use like make sure to finish leftovers the following	*Multi-level perspective: challenging regime*	*2*

	day – more recent development to demand larger living space and generate much more waste – one way forward could be to look backwards to be able to develop concept for multi-purpose use of space		
Tengbom	*Laziness and habits*	*Sustainability science: cultural patterns*	*1*
	Must be willing to challenge ourselves to a much bigger degree than today – difficult	*Sustainability science: cultural patterns*	*1*
	The construction industry and real-estate industry are conservative – probably the biggest obstacle	*Sustainability science: socio-political structures/ socio-technical systems patterns/ cultural patterns*	*1*
Bengt Dahlgren	*If changes are to break through in the society in general, they have to be easy to do and easy to do properly*	*Comment (also related to Sustainability science: cultural patterns)*	*1*
	Innovations can't be neither a pure research product nor a technological amusement park	*General answer*	*1*
	Perhaps contradicting statement to the previous question, but it's all a matter of finding the right level – solution should be easy to implement and handle, plus economically sustainable	*Comment (also related to Sustainability science: cultural patterns/market)*	*1*
	No point in finding solutions which are great but so expensive that no one can afford it	*Sustainability science: market*	*1*
	Find simple solutions	*General answer*	*1*
	Find solutions which bring added values e.g. bore holes preheating air – ▪ *Drill a hole, pump up water, and preheat air for ventilation* ▪ *Poor economy in it – expensive and don't really save a lot* ▪ *Saving the environment because you save energy when it is at its most dirtiest – either when it's really cold or really hot outside* ▪ *Selling argument to cool the apartment in the summer by pumping up water, cooling the air and heating the ground – added life quality* ▪ *Can make a buyer pay 1000 SEK more and suddenly the bore holes are economically viable – and at the*	*Comment (also related to Sustainability science: market/ cultural patterns/ ecologic footprint/ human well-being & quality of life)*	*1*

	same time saving more energy than if a solar cell were installed somewhere which only generates a kwh in the middle of the summer *Thus, important to find the things which can add value and make ideas economically sustainable*	*General answer*	*1*
Electrolux	*Find functions in areas and spaces* *Standardise yet personalise, preserve individual freedom of choice* *Functional and flexible adaptations after individual preferences – not standardised boxes*	*Living Lab discourse* *Design & behavior science: general design improvements* *Design & behavior science: general design improvements*	*1* *1* *1*
Vedum	*New mindsets ** *More conceptual thinking* *The willingness to pay among customers in order to increase sustainability*	*Comment* *Comment* *Comment*	*1* *1* *1*

* Had this reply been more detailed, it may have been sorted as attributional related to the multi-level perspective.

3. HSB Living Lab participation

3.1 What strengths do the company/you generally identify with the Living Lab-approach?

Replies can be sorted into either articulated data: general answers such *as learning and creating contacts* or comments *Product development for final user, can draw parallels with car industry – you don't just develop a car and sell it without testing it, but that's how it works in the construction industry*; or in to attributional data: *The concept of cooperating partners in an open and innovative environments creates potential for completely new ideas*, which can be classified as living lab-methodology related to co-creation. For more details, see table 21 below.

> *"…there are several, but the interesting thing is that this isn't static. That there's an openness in testing of new ideas, new technical solutions etc."*

Table 21. Identified strengths with the Living Lab concept.

Level	Replies	Related to
1	*Potential of testing out everything – e.g. windows with algae generating energy*	*Living Lab participation: strengths*
	Long-term project	*Living Lab participation: strengths*
	Strength to be on campus – immediate proximity to research and students	*Living Lab participation: strengths*
	Learning and creating contacts	*Living Lab participation: strengths*
	Opportunity to develop the products and solutions for the future	*Living Lab participation: strengths*
	At NASA 'failure is not an option' – in HSB Living Lab 'failure is an option'; collaboration with NASA – travelling to Mars means that e.g. washing must be done without water, at ISS today waste is executed from the station and burnt in the atmosphere, a circular way of resource use necessary	*Living Lab participation: strengths*
	Cooperation a strength in general – sharing is benefitting to all	*Living Lab discourse*
	The partner structure – HSB, Chalmers, Johanneberg Science Park and all other companies	*Comment*
	In a normal project Bengt Dahlgren encounters HSB, Peab, Göteborg Energi or Tengbom, but HSB Living Lab is a platform for conceptual dialogue – opportunity to learn from each other	*Comment*
	Construction industry today – drawing a building, constructing it, and then it's done – no evaluation	*Comment (also related to Sustainability science: socio-*

		technical system patterns and transitions/ market)
	Product development for final user, can draw parallels with car industry – you don't just develop a car and sell it without testing it, but that's how it works in the construction industry	*Comment (also related to Sustainability science: socio-technical system patterns and transitions/ market)*
2	*Aspects of co-creation and innovation*	*Living Lab methodology: co-creation*
	Product development in a public space – not in a hidden, company-owned lab	*Living Lab methodology: innovation*
	Living Lab promises exciting dynamics/changes contrary to actual static-like dwellings	*Living lab methodology: innovation*
	Most interesting is the dynamic of the project/research, related to the openness in testing new ideas, technical solutions, etc.	*Living lab methodology: co-creation*
	Include inhabitants in a new way	*Living lab methodology: innovation*
	Strength to have actual persons living in the house – not only a test	*Living lab methodology: concept*
	Bringing people and ideas together	*Living lab methodology: concept*
	Possibility to try a concept out before launching it into the market in general	*Living lab methodology: concept*
	First and foremost: an arena to try out things in reality	*Living lab methodology: concept*
	Living labs provide platforms and opportunities to actually test and evaluate ideas before they can be turned into a final solution or a solution which can be diffused in the industry	*Living lab methodology: concept*
	Learning to cooperate interdisciplinary across organizations' competences and breadths	*Living lab methodology: innovation*
	The concept of cooperating partners in an open and innovative environments creates potential for completely new ideas	*Living lab methodology: co-creation*
	Having users participated in the research at home provides an unique opportunity for research	*Living Lab methodology: co-creation*

3.2 Can the company /you identify any disadvantages with the concept?

Data generated by this question can mainly be classified as articulated, in the form of general descriptions of identified challenges related to communication and openness between the different organizations, see table 22 below.

> *"Absolutely, there are lots of challenges, and that will continue… there have been already and it will continue, so that's something… which we will have to get used to. The whole plan and structure of the project makes it a challenge in its own, there are several partners involved. It's all about dialogue, one giant team building exercise. "*

Table 22. Potential problems identified with the living lab project.

Level	Replies	Related to
1	*Tenants could be the first customers in contact with materials/technologies, which may never have been tested on mid or long-term*	*Living Lab participation: potential problems*
	Ensuring a minimum of continuity (which is needed for significant statistics) is maybe hard to achieve – people may move in and out rather frequently	*Living Lab participation: potential problems*
	Concept itself set to be unique – many facilities are already calling themselves living labs, could lead to confusion among the public in terms of what a living lab really is	*Living Lab participation: potential problems*
	Takes time to through development via living lab – not always necessary in product development	*Living Lab participation: potential problems*
	Testing or not in the lab very dependent on type of project/product to evaluate	*Living Lab participation: potential problems*
	More useful when it comes to broader studies concerning behaviours – living lab provides good access into people's homes	*Living Lab participation: potential problems*
	Difficulties are something to get used to	*Living Lab participation: potential problems*
	Concept and structure of the project make it a challenge – many partners involved	*Living Lab participation: potential problems*
	Pay to be part of the project means that all engaged and opinionated – both a strength and a weakness	*Living Lab participation: potential problems*
	Dialogue the key – one big collaboration exercise	*Living Lab participation: potential problems*
	Communication, dialogue, economy, focus on collaboration and responsiveness necessities throughout the project	*Living Lab participation: potential problems*
	Should look on issues as challenges and not	*Living Lab participation:*

	difficulties	*potential problems*
	Sharing is good but not painless	*Living Lab participation: potential problems*
	A lot of work in reconciling different ideas – but also generating new solutions	*Living Lab participation: potential problems*
	All actors have agendas which may not entirely be identical with other actors	*Living Lab participation: potential problems*
	Exchanging of persons – someone new entering the project without understanding the concept in a holistic way may cause problems	*Living Lab participation: potential problems*
	Challenge in the fact that the building is just a building envelope for a lab – not a spectacular, finalised building in itself	*Living Lab participation: potential problems*
	Challenge to communicate what the lab actually is – concept is much more than what meets the eye	*Living Lab participation: potential problems*
	HSB might have a special status – may need to take a leading role in decision making	*Living Lab participation: potential problems*
	Friction or delay due to the fact that everyone wants to be involved – all wants to add their point of view to the initial idea which is both strength and a weakness	*Living Lab participation: potential problems*
	New type of research – potentially completely new challenges	*Living Lab participation: potential problems*
	Outcome of the project depend on individual participators who might or might not be dedicated or have the same view of the concept	*Living Lab participation: potential problems*
2	*Difficulties in changing mindset and ways of thinking*	*Multi-level perspective: regime shift*
	Difficulties in changing/developing building processes for the future	*Multi-level perspective: regime shift*

3.3 How did the company/your organization/your research become involved in HSB Living Lab?

The project was initiated after discussions between HSB and Chalmers. Johanneberg Science Park is partially owned by HSB, and has a tradition of initiating projects with their owners. Tengbom and Bengt Dahlgren were involved due to previous work on matters related to sustainability, and Bengt Dahlgren is also an owner to the science park. Electrolux chose to join the project in according with a strategy to more closely connect research to universities, and Vedum has a long relationship with HSB. For further details, see table 23 below.

Table 23. Each organization's initial involvement in the project.

Organization	Replies
Chalmers	*Through the EU SusLab project*
Chalmers researchers	*Employed at the Building Technology Division at Civil and Environmental Engineering – support the Home Energy Management project (HEM)* *Research into behaviour dependent energy prediction* *HSB Living Lab the main application site for the sensors and data processing algorithms of HEM* *Work so far include sensor network layout, sensor specifications, sensor tender and purchase procedure* *Almost involved in Homes for Tomorrow (too late)* *Became involved when HSB Living Lab became a Climate-KIC project* *Research of products for sustainable behaviours generally lacking in engineering sciences – demand for this type of expertise*
HSB	*After initial discussions between Anna Olofsson & Greg Morrison, the project idea was formulated together with a first plan of action* *At HSB, anchoring started with personnel being informed of the project unit by unit before being invited to discussions regarding ideas, of which many contributed to the development of the project* *After the idea was formulated and anchored in the different organizations, project idea development started – collecting ideas, finding a proper organizational structure, find limitations, resolve costs and financing, ideas of potential partners, plan of development* *Work shops were later held, with a broad participation from HSB, Chalmers and other organizations*
Johanneberg Science Park	*HSB owner of Johanneberg Science Park – a guiding vision to start a development project with all owners* *Project idea in line with what Johanneberg Science Park wanted to do – also in line with main goal of the park and the wishers of the owners* *Involved in EU-project*

Tengbom	*Randomness a small part of it, but probably due to earlier work with '10 smarta kvadrat' (10 smart m²) – student housing experiment of only 10 m² where praxis and norms where tested and challenged, e.g. area demands in bathrooms, etc.* *That project generated a large interest – may have been the reason why HSB wanted to know if Tengbom wanted to be part of the living lab and change and challenge norms*
Bengt Dahlgren	*Related to the vision of being the obvious consultant choice – HSB, Riksbyggen, Peab, Veidekke should see Bengt Dahlgren as the obvious choice when planning new constructions projects* *Bengt Dahlgren in Gothenburg has been working a lot with housing – a region which is constructing lots of new dwellings* *Housing has become an increasingly important market due to the higher technical demands* *Ten years ago – a radiator system, electricity installations and a fan on the roof where all that was necessary in terms of standards: new standards a couple of years ago with demands on energy efficiency – housing of today have no exhaust air ventilation, either FTX or heat pump solutions which is equivalent with the technical demands on office premises 10 years ago* *Housing has become an increasingly important market due to the higher technical demands* *Higher demands from BBR means increase energy efficiency and necessary proofs of it – a market for environmental certifications* *Installation meters, energy efficiency and environmental certifications is a significant market* *Several loyal clients in Gothenburg – HSB one of them* *Bengt Dahlgren at the frontier of technology and in order to say there, it's necessary to be part of projects like this – to see what type of input Chalmers can generate and the research done there, and what can Bengt Dahlgren contribute in terms of own ideas and development in order to push the industry forward*
Electrolux	*Strategic decision to expand networks with universities and research arenas* *The guiding principle of sustainable lifestyles also an import factor*
Vedum	*HSB is an important client for Vedum and Vedum is a supplier to HSB since several years* *Also supplier of kitchen- and bathroom interiors for Peab* *Quite natural to ask Vedum to join the project since strong connections existed with two other partners*

3.4 How did the company/you first hear of the idea?

Discussions between Anna Olofsson, Greg Morrisson and Irene Svensson on a potential next step of the research program 'Homes for tomorrow' alongside with the wish from HSB on a lab infra-structure resulted in the idea of HSB Living Lab. Further details on each' organizations involvement can be seen in table 24 below.

Table 24. First contacts with the Living Lab project idea.

Organization	Replies
Chalmers researchers	*Through master thesis* *Project brought up during the hiring process* *Very early, when it still was just an idea*
HSB	*HSB got engaged as an owner in Johanneberg Science Park in 2011* *In order to concretise the engagement, discussions of what HSB wanted to achieve with being an owner took place, resulting in the theme better housing for the future* *Several aspects were starting points – sustainability, quality, etc.* *One idea was to try to create housing on vacant land plots during long administrative processes – housing which could be moved between different plots and have connections to different aspects within HSB and Chalmers, such as architecture and sustainability, through research and master theses* *Johanneberg Science Park brought HSB together with Chalmers research project 'Homes for Tomorrow' and Greg Morrison – many similarities between what Chalmers wanted to achieve (reach out with research to a larger extent than before) and what HSB intended to do (develop housing of the future in collaboration with research)* *Discussions resulted in the idea of a pavilion for demonstration and research with permanent inhabitants, a living lab with constantly ongoing research in collaboration with the tenants* *Precondition that the facility was localised on campus, thus inhabitants should be students on Chalmers or visiting guest lecturers* *Permanent building not an option – temporarily building permit for 10 years* *HSB owns the building – will be moved elsewhere afterwards* *Early on a decision was made to run the project not only with Chalmers and Johanneberg Science Park but with many different partners – a win-win potential for many*
Johanneberg Science Park	*Greg Morrison, Irene Svensson, Anna Olofsson – initial discussions* *Similar ideas – Chalmers project 'Homes for Tomorrow' and HSB wanted to make a lab infrastructure to develop housing of the future* *Role of the science park is to connect actors and make ideas turn into reality*

	Started with simple sketches, before bringing in Chalmers Teknologkonsulter and collecting research ideas *Connect with SusLabs to see which other projects were going on and what synergies might be gained*
Tengbom	*Through HSB – presented the idea early on and asked if Tengbom wanted to be part of the project*
Bengt Dahlgren	*Not really sure – Henrik (informant) first came in touch with the idea at a conference in Stockholm through a colleague in a conversation about the fact that Henrik was doing a lot of work for HSB – he was then told about a new interesting project called HSB Living Lab with Sanna Edling as project manager* *Another colleague was first involved at Bengt Dahlgren in Göteborg* *Possibility that ideas first came to Bengt Dahlgren from Johanneberg Science Park – Bengt Dahlgren is an owner of the science park and will have parts of their office in the new buildings presently being constructed there*
Electrolux	*Discussions between Electrolux Professional Global R&D, Electrolux* *Professional Svensk Försäljning and HSB was the cause of the interest*
Vedum	*Vedum has a long relationship with HSB*

3.5 Which sorts of discussions did the company /organization have internally before joining the project?

Replies mainly concerned the different motives for being part of the project, such as research on issues which impact daily work with sustainability and possibilities to strengthen company brand. It was also a matter of presenting the idea for the employees of each organization, respectively. Financing participation was also a significant factor for deciding whether to participate or not; one representative mentioned that the question of participation was decided not by the company board but by the owners of the company. In general, participation can be considered as an investment by the different organizations involved in the project. All data can be considered as articulated, see table 25 below.

> *"A question of usefulness. Usefulness for us, internally. Usefulness of being part of a network or partnership with these actors. The chance of… strengthening the brand."*

Table 25. Internal organizational discussions before joining the project.

Level	Replies	Related to
1	*Be clear on research and how to develop it/integrate it into a building*	*Living Lab participation: requirements*
	Importance of communication	*Living Lab participation: requirements*
	Large investment, not least financially, meaning that the benefit for the organization must be obvious – results from the project and research outcomes could/should be used in both current and future housing projects	*Living Lab participation: financing/ Sustainability science: markets*
	Potential was obvious from the beginning and many saw opportunities from the start	*Living Lab participation: motive*
	Discussion of usefulness – being part of the project and the partnership network	*Living Lab participation: motive*
	Possibilities to strengthen the brand	*Living Lab participation: motive / Sustainability science: markets*
	'This is the HSB Living Lab-thought, this is what we see, this could it mean for us in terms of annual costs, this could it give us in terms of the contract, this could it give us in terms of market gains'	*Living Lab participation: motive / Sustainability science: markets*
	Decision basis – decision was made not by the company board but by the company owners to join the project and pay this amount of money annually	*Living Lab participation: financing*
	Make sure that resources were available to ensure an active participation in the project running several years	*Living Lab participation: financing*

	Decision to participate was made since it was in line with ambitions to strengthen networks with universities in combination with the unique opportunity to study textile care in a research environment	*Sustainability science: human capital / Living Lab discourse*
	Discussions of how important it is to show that the organization is willing to be a part of this types of project and want to be a driving force in sustainability issues	*Sustainability science: markets / fairness and intergenerational equity*
	Considerations of what possible extra values the participation could bring in terms of other projects	*Sustainability science: markets*
	Possibility to build an internal knowledge base surrounding the project – long term, 10 years	*Living Lab participation: motive/ Sustainability science: human capital*
	Possibility to bring own research issues into the facility in order to try to resolve challenges and issues the organization daily face	*Living Lab participation: motive / Sustainability science: markets*

3.6 What types of discussions did the company/ organization have externally?

Matters discussed include goals of the project, discussions of financing, combining areas and interest and general discussions with suppliers and project partners. All data is to be considered as articulated (see table 26 below).

> *"'Homes of tomorrow' [earlier Chalmers research project] was going on and I know that HSB had… some thoughts on developing a test infra structures, because HSB has traditionally been a pioneer in developing housing … so it is a bit exciting to make that connection."*

Table 26. External organizational discussions before joining the project.

Level	Replies	Related to
1	*HSB's goal and program for the building*	*Living Lab participation: motive*
	Discussions with Chalmers and Johanneberg Science Park on purpose with and strategies for the project development	*Living Lab participation: motive*
	'Homes of Tomorrow' ongoing Chalmers project, HSB wanted to develop test infra-structure (HSB has traditionally been at the research frontier regarding housing e.g. measurement projects in kitchens and bathrooms) – interesting to combine areas of interest	*Living Lab participation: motive*
	Close dialogue with HSB especially about the terms of participation – what it would mean, what it could bring to the company, and what the company could contribute with	*Living Lab participation: requirements*
	Matters of investment size required for participation	*Living Lab participation: requirements*
	Discussions with suppliers and project partners	*Living Lab participation: requirements*

3.7 Which motives do the company/you see as the strongest to be part of the HSB Living Lab?

In general, sustainability is a crucial element for all partners and one of the strongest motives for being a part of the HSB Living Lab project (see table 27 below). Additional motives include development of organizations or the competence of their employees; continuing a tradition of being an explorative actor in the housing sector; a will to strengthen collaboration with other organizations; and an opportunity to be part of a unique research project. All but one replies were classified as articulated; there was one reference to Living Lab methodology which was sorted as attributional.

Table 27. Strongest motive to be part of the HSB Living Lab.

Organization	Replies	Related to	Level
Chalmers	*To research and innovate in a new way in collaboration with other industry partners in order to accelerate innovation in the building industry that will foster sustainable technology and living*	*Living Lab methodology: concept*	*2*
	HSB Living Lab a research paper producing factory – has to become from a researcher perspective (and all involved researchers are happy about that)	*General answer*	*1*
	Potential of enormous PR in raising issues concerning today's and future challenges	*General answer*	*1*
HSB	*Develop construction of new housing*	*General answer*	*1*
	Develop management of existing housing stock	*General answer*	*1*
	Way of making new history and take new steps forward	*General answer*	*1*
	Important with result outcomes which can be implemented both in management of the existing housing stock and into construction and renovation	*General answer*	*1*
	Sustainability crucial for the future – not being part is not an option	*General answer*	*1*
	Want to invest in research	*General answer*	*1*
	To keep developing as a company – HSB has traditionally been an innovator in the construction industry since the foundation of the company in the 1920s, and HSB Living Lab means a way of consolidating this role as a leader	*General answer*	*1*
	Used to build houses but now building homes – putting the individual at center, how we feel depending on how we live	*Sustainability science: human well-being and quality of life*	*1*

Johanneberg Science Park	*No choice – Johanneberg Science Park has to be part of the project, initiated by an owner*	*General answer*	*1*
	Flagship development	*Sustainability science: markets*	*1*
	Creating added values	*General answer*	*1*
	Interesting for small and middle-size enterprises	*General answer*	*1*
	Generating a lot of interest	*General answer*	*1*
Tengbom	*Show Tengbom's will to participate in a process of change in the society – signaling that Tengbom is an actor to take into consideration in sustainability issues*	*Sustainability science: markets*	*1*
	Strengthen the Tengbom brand is a natural consequence	*Sustainability science: markets*	*1*
Bengt Dahlgren	*As a company – can explore and develop technologies or areas together with a client like HSB – not something that happens in a normal project*	*General answer*	*1*
	Once again – to be the obvious choice when it comes to installation technology and energy- and environmental issues (could be related to many things – clients and coworkers)	*Sustainability science: markets*	*1*
	Coworkers will have the opportunity to develop their competence	*Sustainability science: markets*	*1*
Electrolux	*New type of research platform*	*General answer*	*1*
	Platform for research in peoples' homes	*General answer*	*1*
	Collaboration with HSB	*General answer*	*1*
	Collaboration with partners in shared areas of interests	*General answer*	*1*
Vedum	*An opportunity to be part of a research project, test and use the result in actual production – make sure that all customers and project partners are being benefitted too*	*General answer*	*1*

3.8 What hopes do the company/you have for participating in the project?

Replies are generally related to several motivational themes for the involvement in the HSB Living Lab project. Implementing research outcome into reality is one motive phrased by several participants, as is the collaboration with other partners. Developing the individual company is also considered an important motive for participation. These themes can be found both in the articulated data and in the attributional data category; the latter also have links to the multi-level perspective in terms of challenging regimes, and in terms of general living lab-methodology (see table 28 below).

> *"…perhaps to be considered as being one of those who know these [sustainability] issues, is prepared to make investments of this type. Of course we also hope to have an exchange in the form of us internally strengthening competences."*

> *"…how can we work together in this way in the future and integrate several functions and several companies and develop [ourselves] together."*

Table 28. Hopes on HSB Living Lab participation.

Level	Replies	Related to
1	*Find out how to lead sustainable lives at home in the future – now*	*Living Lab discourse*
	Develop something new and useful	*Living Lab discourse*
	Develop the construction industry	*Living Lab discourse*
	Build long-term relationship with other companies	*Living Lab discourse*
	Benefit all customers and partners in the project	*Living Lab discourse*
	Expect: Learn the Living Lab creation process within multi-layered frame conditions	*General answer*
	Hope: enable the Living Lab to be a nice research place for the next 10 years or more	*General answer*
	Hope: acceptance of tenants for the researches point of view to really have close metering – feedback better than total rejection	*General answer*
	Research outcomes to implement in new construction processes and renovations of existing housing stock	*General answer*
	Want to reverse the question – generate attention for owners and give them opportunities to develop their expertise	*General answer*
	Turn research outcome into something which can be implemented for daily use – research from Living Lab may be applied in housing	*General answer*

	Collaboration can result in very existing ideas when companies like Electrolux and Bengt Dahlgren together work on energy solutions in a laundry room, e.g.	*General answer*
	To be known as a company taking issues of sustainability seriously	*Sustainability science: markets*
	Building up internal competence and develop as a company	*Sustainability science: human capital*
	Strengthen relationships with the academic world – especially in the future, after the construction phase – how do things work on Chalmers, what kind of exchange can we have	*Sustainability science: human capital*
	Important that the employees consider their employer as an architecture firm taking sustainability issues seriously and find projects like this exciting and fun	*Sustainability science: markets*
	Identify new ideas and trends	*Sustainability science: markets*
	Develop smart solutions for kitchen and bathrooms relevant for future needs	*Systems & engineering: general technological improvements*
	Prove that habits can be changed, and demonstrate that to the production industry	*Comment (also related to Sustainability science: socio-technical system patterns and transitions/ Design & behavioural studies: impact behaviour)*
	Today there is constant reinforcement of existing patterns in the production industry – incentives to change if hard data proves that habits and behaviours can be changed	*Comment (also related to Sustainability science: markets/ socio-technical system patterns and transitions/ Design & behavioural studies: impact behaviour)*
2	*Change mindsets*	*Multi-level perspective: question regime*
	Rethink materials and inhabitants and collaborations and the links in between	*Living Lab methodology: co-creation/ innovation*
	Find new ways of collaborating with other companies, find out how to work in this type of way in the future – integrating several functions and companies and develop together – very exciting	*Living Lab methodology: co-creation*
	Identify ideas to help improve sustainability of products and the usability of products	*Living Lab methodology: concept*

	Important with real-world projects	*Living Lab methodology: concept*
	Important to speed up knowledge transfers from academia to enterprises	*Living Lab methodology: concept*
	Be part of a research project which enables testing and evaluation	*Living Lab methodology: enabling*
	Research being more closely tied to businesses and implementation	*Living Lab methodology: concept*

3.9 What strength in particular do the company/your organization add to the project?

All data in the dataset can be considered as articulated. Each organization brings their own competences into the project (see table 29 below).

Table 29. Strengths brought into the project from each organization, respectively.

Organization	Replies
Chalmers	*Origin in BTA, Building Technology Accelerator* *Chalmers central organization enters the project now* *Important for Chalmers to cooperate internally (faculties) and externally (other universities)* *Without Chalmers no HSB Living Lab – such structures cannot exist on the market but needs academic basis, governmental support and municipality infrastructure* *Chalmers have diversified research and ongoing projects which can meet in the living lab structure to create innovations in many fields* *Chalmers brings funding to support the planning and construction phase – bring funding from Climate-KIC* *Chalmers will make sure that HSB Living Lab will be visible in the research community and among the public*
HSB	*HSB building and owning the house – precondition for the project* *All existing knowledge and competence within the company – 90 year old history of housing construction and innovations* *Chalmers know technical and research aspects, HSB know the reality of working with humans – interdisciplinary projects more successful than others*
Johanneberg Science Park	*Highlighting the ongoing project* *Help out with collaboration* *Presence on campus* *Close links to Chalmers and to the City of Gothenburg (e.g. if trouble arises with the local urban planning office, Johanneberg Science Park has lots of connections to use)*
Tengbom	*The many competencies in the company – from landscape architects to product designers* *Good at making use of competencies and to utilise those in projects like this*
Bengt Dahlgren	*Holistic perspective* *Excellence competence in housing construction* *Engagement in the whole construction and real estate industry – be part of*

	the dialogue in matters not immediately related to energy or VVS *Engaged staff willing to work with this type of projects – especially the young* *Excellence competence within the company – also younger employees without lots of experience but a great engagement in this type of projects, making a good mix*
Electrolux	*Global manufacturer of textile care appliances* *Shared laundry facilities only common in Sweden, Denmark, and to some extent Switzerland and Austria – many other parts of the world laundromats are common* *If incitements can be found, it could be possible to spread shared laundry rooms to other parts of Europe, leading to environmental gains – important to take cultural aspects into considerations, behaviour is linked to housing type*
Vedum	*Furnishings for kitchens and bathrooms* *Material development* *Surface finishing*

3.10 Do the company/you identify any disadvantages with being part of this type of open knowledge-generating research which is embedded in the living lab-approach?

Several interviewees don't identify any disadvantages with an open research process, while others mention a few different aspects which can be hindering the research (see table 30 below). Communication is one; a vague organizational structure another. One representative commented that as a service provider, it might be easier to be part of this type of project than it is for a product developer, since a product developer might identify potential business ideas to develop or protect.

> *"Not suitable for all types of research, soft research (behavioural studies, generic studies) are more suited for this open environment."*

Table 30. Potential disadvantages of an open knowledge-generating research.

Level	Replies	Related to
1	*'No' the most common reply – 'no, not really', 'no, goal of the whole project'*	*General answer*
	Communication issues	*General answer*
	As a technology consultant company providing services – more pros than cons	*General answer*
	Company selling services and competence – HSB Living Lab participation a chance to learn and increase competence, making the company even more attractive as a service supplier in the future	*Sustainability science: markets*
	The more sharing of competences, the more people and firms aware of skill, are increasing attractiveness of the brand – work together to achieve solutions which works across the whole industry, which is implementable in the normal multi-family housing project	*Sustainability science: markets*
	Research model not suitable for all types of research – soft research such as behavioural studies more suitable for this type of environment	*Comment*
	Input from common research must be regulated and applied before use in the living	*Comment*
	Never been involved in co-creation and innovation before – love it	*Comment*
	A more clearly defined organizational structure is needed at times	*Comment*
	Don't see potential business opportunities which the company may want to protect – maybe it's different for a product provider like Vedum or Göteborg Energi	*Comment*

2	*Necessary to change mindset – a new way of thinking necessary and inherent in the living lab idea* *Struggle to get all partners on board with new/different way of working*	*Living lab methodology: / Multi-level perspective: challenging regime* *Multi-level perspective: challenging regime*

3.11 Which expectations do the company/you hold on Chalmers?

All data in this set can be characterised as articulated. In general, there is an agreement that openness and engagement in the living lab are key issues. Transparency and ongoing dialogue are also seen as vital. It is also stressed that Chalmers must take the lead in the process of identifying research projects and guiding work on research. All replies are of an articulated character. For further details, see table 31 below.

"And that there is an openness and a willingness to share what you do and what research is going on, that there is an openness… when ideas are suggested by… either us or another research partner, 'this is something we would like to study and look into'. That you accept ideas which are maybe… if you use the term research and design, which perhaps isn't… it is perhaps more in the field of develop than research, if you understand, more hands on, that the small and simple studies are accepted, if I can say 'small and simple studies' with quotation marks."

"Chalmers should be engaged and share its research to the companies and kind of be open with it, and be interested in being part of it because if Chalmers isn't, the whole concept will fall. It all depends on that all parts are willing to share, the companies too."

Table 31.Expectations on Chalmers.

Level	Replies	Related to
1	*Openness the most frequently mentioned answer – 'sharing what is being done and what type of research is going on', 'Openness for ideas from partners', 'Openness for ideas which are more close to development in R & D – encourage 'small and simple studies' too', 'if Chalmers isn't open and interested, the whole concept will fail (foundation for the project that all partners are willing to share)'*	*Living Lab participation: requirements*
	Be engaged and share research outcomes with partners	*Living Lab participation: requirements*
	To guide and lead framework of research activities; make it easy for all partners to find the right connections on Chalmers needed for research; contribute in identifying and suggesting research projects for the living lab	*Living Lab participation: requirements*
	Keep an ongoing dialogue regarding research ideas development – ideas developed jointly within the partnership structure, with outcomes benefitting all partners as soon as possible	*Living Lab participation: requirements*
	Transparent research structure from idea generation to implementation in the living lab and into the partners' production	*Living Lab participation: requirements*
	Comprehensive exchange of research – closely	*Living Lab participation:*

	related to actual implementation in real projects *Shortening gaps – how to take research and implement it into daily work solutions*	*requirements* *Living Lab participation: requirements*
	Industrial partners can show how it looks in the construction industry of today – academic word very theoretic – possible exchanges of experiences	*Living Lab participation: requirements*
	Chalmers shouldn't claim to own the living lab – 'we' instead of 'mine'	*Living Lab participation: requirements*
	Chalmers should be a communicator enabling work for both own and foreign researchers in the living lab project	*Living Lab participation: requirements*
	Chalmers should enable open lectures and practical exercises to take place at the living lab	*Living Lab participation: requirements*
	Financial support – HSB pays only for the building, unsure to what extent industrial partners will pay for research, researchers salary goes to the project – uncertain economic situation	*Living Lab participation: requirements*
	High expectations – Chalmers one of the main partners	*Living Lab participation: requirements*

3.12 Which expectations do the company/you have on the other partners?

In general, the same type of answers can be recognised in this data set too, compared with the previous question: openness, engagement, willingness to share competence and knowledge, dialogue and transparency (see table 32 below). It is also important to be straight with existing preconditions: if transparency is impossible at a given moment due to e.g. product development, this must be explained to the other partners. Two informants mention the matter of making decisions; vagueness must be avoided and there is a need for some sort of decision making structure in order to avoid delays due to slow process of making decisions. Most replies can be sorted as articulated, with two replies sorted as attributional related to the multi-level perspective and challenging of regimes.

> *"It's the same thing really, to share, to have an ongoing dialogue. And to be clear with existing preconditions, I fully understand that it could be a certain product being developed or something, but I mean, then it has to be stressed, 'now we're doing this', that it's very clear for everyone. So a transparency as possible and otherwise openness about what it is and motive, why you can't have this transparency."*

Table 32. Expectations on partners in the partnership.

Level	Replies	Related to
1	*Join the project with an open mind, being responsive and willing to share*	*Living Lab participation: requirements*
	Long-term engagement in HSB Living Lab, not only during the development phase but throughout the whole research phase	*Living Lab participation: requirements*
	Assist with competence and knowledge	*Living Lab participation: requirements*
	Transparency a key	*Living Lab participation: requirements*
	Important not to lose sight of the holistic concept	*Living Lab participation: requirements*
	To teach and share in order for organistations to be able to learn different aspects from the different partners	*Living Lab participation: requirements*
	Keeping an open dialogue and be clear with existing preconditions – e.g. development of a specific product which can mean temporary restrictions of openness	*Living Lab participation: requirements*
	Everybody should say 'we all' – not 'this is our part'	*Living Lab participation: requirements*
	All HSB Living Lab partners should fund a council (including tenant representatives) – meet frequently and decide about research applications, building	*Living Lab participation: requirements*

	technology changes, improvement suggestions, maintenance, well-being feedback, joint publications in any form (newspaper, press release, webpage update) *Everybody should clearly support/not support specific ideas – avoid vagueness* *If openness cannot be the case at a specific moment in time due to product development – motivate why transparency is not possible at that particular moment* *Pay interest in and join in on incoming research suggestions* *Decisions must be made fast – partners can't blame on their large organizations and slow down decision processes* *An overarching decision strategy is necessary, to make processes transparent for all involved*	 *Comment* *Comment* *Comment* *Comment* *Comment*
2	*Ready to develop their mindset and improve on processes* *Want to develop/change the industry*	*Multi-level perspective: challenging regime* *Multi-level perspective: challenging regime*

3.13 Which part of the HSB Living Lab are the company/you most interested in?

(testing products, try out an open research structure, etc.)

Replies strongly depend on which organization the interviewee represents, which perhaps only is to be expected. Mainly being of an articulated character, the data generated by this question can be sorted into several themes. The project as a whole is the most relevant for representatives from Johanneberg Science Park and Chalmers, while HSB is interested in implementing possible outcome from the project into their housing stock. Tengbom is interested in matters related to behaviour, which also is a main focus for Electrolux. Bengt Dahlgren has an interest in the building as a system, with projects regarding energy as the main priority. How to use energy in the future is of a particular focus: how do we value energy, how will we look upon energy in the future, how do we look on generating own energy and how can we store it. Vedum wants to test products and materials and link it to evaluation of lifestyles and resource consumption. For further details, see table 33 below.

> *"I think that what we want to know more about in the long term, that's the user perspective. The technology research is really interesting, but what I would like to know more about are aspects regarding user behaviour related also to technology but also to floor plans, how is it used, how does it work in this type of social context in this type of housing and so forth. That… that I think we would benefit a lot from. Of course technology too, with evaluations and measurability and so forth, but what I would like to get from this project is perhaps the difficult… aspects which are difficult to measure in architecture."*

Table 33. Most interesting aspects of HSB Living Lab according to informants.

Organization	Replies	Related to	Level
Chalmers	*Interest in the project as whole – from design to the installation* *Processes needed to create a new paradigm towards sustainable living in the home environment*	*General answer* *Multi-level perspective: challenging regime*	*1* *2*
HSB	*Implement research results into products and housing stock*	*General answer*	*1*
Johanneberg Science Park	*Holistic concept most important – the project as a whole* *Sustainable urban development related to behaviour, sustainable lifestyles and energy issues, how to make more energy efficient dwellings*	*General answer* *Sustainability science: socio-political structures, socio-technical systems patterns*	*1* *1*
Tengbom	*In a long term perspective – user perspective related to technology, floor plans, how things are used, how the social context works in this type of housing*	*Design & behavioural science: general design improvements / enabling design and innovations*	*1*

	Technology research also important, but to a lesser extent	*General answer*	*1*
	Most interested in aspects which are difficult to measure	*Design & behavioural science: general*	*1*
Bengt Dahlgren	*The building as a system and a product*	*Systems & engineering: general*	*1*
	Lessons learned from feasibility study and planning – modularity meant less flexibility than first expected	*General answer*	*1*
	Future dialogues with Göteborg Energi very interesting, project discussed with Göteborg Energi – future energy use and steering related to efficiency more than energy	*General answer*	*1*
	A lot of other minor technical details/products to study for the future by implementing it in the building once it is constructed, which Bengt Dahlgren can assist in evaluating	*Systems & engineering: general technological improvements / enabling technologies and innovations*	*1*
	Goal of saving energy when it is as most dirty – possibility to save 10 kwh sometimes which in turn will mean significant savings of emissions, while saving 200 kwh some other time doesn't have the same type of impact at all	*Comment*	*1*
	Discussion of energy in the future most interesting – how do we value energy, how will we look upon energy in the future, how do we look on generating own energy and how can we store it	*Comment*	*1*
Electrolux	*Test usability and interaction with products*	*Living Lab methodology: enabling*	*2*
	Study behavioural effects in textile care areas	*Design & behavioural science: routines*	*1*
	Use common spaces in a more efficient way	*General answer*	*1*
Vedum	*Sustainability aspects*	*General answer*	*1*
	Evaluate lifestyles	*General answer*	*1*
	Housing of the future	*General answer*	*1*
	Test products and materials	*Systems & engineering: general technological improvements*	*1*
	Test surface finishing	*Systems & engineering: general technological improvements*	*1*

	Evaluate resource consumption	*Sustainability science: ecological footprint / stocks and capitals*	*1*

3.14 How does the involvement in HSB Living Lab look, in concrete?

Once again, involvement varies depending on which organization the interviewee represents. All replies can be considered as articulated (see table 34 below).

Table 34. Concrete involvement in HSB Living Lab.

Organization	Replies
Chalmers	*Work with the design team and relate the research with the design* *Try to make the building adaptable –mixed success* *Provide research ideas* *Help partners understand what can be done within the frames of the project and what possibilities there are* *Facilitate processes regarding the building and the research* *Support the planning and construction phase which enables research through sensor network* *Research project HEM* *Research what happens inside the apartment regarding resource consumption (electricity, heat, garbage)* *How to achieve a zero-emission society* *Interface human/behaviour via artefacts* *What's needed to feel comfort and well-being at home*
HSB	*One of three owners – HSB, Chalmers and Johanneberg Science Park* *HSB owns the property* *Project leaders of the construction – Chalmers responsible for research* *HSB develops and carry out the project*
Johanneberg Science Park	*Eva Hellberg– communication issues* *Maria Ådahl– project council* *Mats Bergh – strategic planning*
Tengbom	*Project team in Gothenburg with Peter Elfstrand as main architect, assisted by several architects and projectors* *Drawn the whole building* *Drawn interior design concepts with Electrolux regarding the laundry room* *Sketched the outside landscape design* *Peter part of the planning group – part in deciding economy, time plan, construction, material choices etc.*

	Thomas Stoll part of the project council – making decisions on the future management of the building, start of construction *Thomas part of the reference group regarding potential research ideas*
Bengt Dahlgren	*A year ago – involvement as a partner* *Early dialogue with Tengbom* *Different workshops were held – Bengt Dahlgren provided ideas for discussions* *Since last autumn feasibility studies and planning – many hours spent on the project* *Resulting in a product which haven't quite found a suitable financial suit – taken time and engagement, been frustrating for some colleagues at Bengt Dahlgren* *Some aspects have had to be sacrificed due to financial circumstances* *Most important things it to construct the building so that Chalmers can feel that their studies can get started* *Find additional projects to continue working on within the project group* *Development of the building were the main focus last year – especially if compared with Göteborg Energi or Vedum, which entered the project in a later phase* *To Bengt Dahlgren, Tengbom and Peab shaping the building were the main task the last year*
Electrolux	*Participating in the project council* *Preparation all collaboration for research in HSB Living Lab regarding the laundry room* *Many other partners such as Tengbom are more involved right now, in both design and construction – Electrolux will step in at a later phase* *Preparing research – ideas come from Chalmers but Electrolux is a link in enabling the research and providing access to products*
Vedum	*Material supplier*

3.15 a) Is there a planned research project that the company is involved in which the company perceive as extra interesting? (partner)
b) What type of research projects are you involved in in HSB Living Lab? (Chalmers researchers only)

Most likely due to the way the question was phrased; answers were mostly of an articulated character: each interviewee has described planned research projects, not so much why the projects will be taking place. One representative mentions the need to challenge existing behaviours, which can be applied to the multi-level perspective and challenging regimes, thus being of an attributional character (see table 35 below).

Table 35. Planned research project with special potential.

Organization	Replies	Related to	Level
Chalmers	*Next Generation Building Envelopes – appears to be completely unique, haven't seen anything similar elsewhere, first time it's tried out*	*Systems & engineering: general technological improvements*	*1*
	Home Energy Management – interesting to have so many sensors in a home/apartment	*Systems & engineering: general technological improvements*	*1*
	Research project on Home Energy Management with focus on behaviour pattern recognition – enable energy demand prediction with high temporal and spatial resolution	*Systems & engineering: general technological improvements / Design & behaviour science: general design improvements*	*1*
	More by less: A shared greenhouse	*General answer*	*1*
	More by less: User centred district heating	*General answer*	*1*
	Worm composter	*General answer*	*1*
	Small scale biogas generator	*General answer*	*1*
	Reusable goods exchange	*General answer*	*1*
	CleanTech Kitchenaire	*General answer*	*1*
	Home Energy Management	*General answer*	*1*
	Zentigo 48 Volt Direct Current System	*General answer*	*1*
HSB	*Not relevant – HSB involved in the project as a whole*		
Johanneberg Science Park	*Not relevant – not directly involved in research*		
Tengbom	*User-orientated research, behavioural aspects on living sustainable*	*Systems & engineering: general technological*	*1*

		improvements / Design & behaviour science: general design improvements	
	E2B2 – Architecture, material flows and related energy usage in housing	*General answer*	*1*
Bengt Dahlgren	*What is research and what is development in R & D?*	*Comment*	*1*
	Making an LCA-study for the HSB Living Lab structure – not research but development	*Comment*	*1*
	LCA not something done in the average project – hands-on opportunity to develop methods – to what extent can this tool be used in ordinary projects?	*Comment*	*1*
	Project together with Göteborg Energi – application for funding via the E2B2 program at the Swedish Energy Agency, looking into power-efficient buildings and what they can be	*Systems & engineering: general technological improvements*	*1*
	Also interested in research either run by Chalmers or by the company itself, such as using bore holes for passive heating of air – not really research since it is already done, but the outcome still interesting	*Systems & engineering: general technological improvements*	*1*
	Potential study of VOC [volatile organic compound] decay interesting – possibility to decrease air flows in some apartments, will a difference be identified?	*Systems & engineering: general technological improvements*	*1*
	So far, the actual design of the building has been the focus – not so much writing application for research projects to Chalmers	*Comment*	*1*
	Defining what is research and what is development matters for financing projects, either by the partnership fund, external funds, or hands-on support Chalmers in research	*Comment*	*1*
Electrolux	*Project regarding the study of 'Information and influence in the sustainable laundry'*	*General answer*	*1*
	Make the procedure of washing clothes a more pleasant experience – make life a little easier, save time by doing something else while washing	*Design & behaviour science: Enabling design*	*1*

	Decrease environmental impact by sharing	*Sustainability science: ecological footprint*	*1*
	A need to challenge existing behaviours	*Multi-level perspective: challenging regime*	*2*
	Inhabitants in HSB Living Lab provide unique and close contact opportunity for Electrolux	*Comment*	*1*
	Inhabitants will most likely think twice of what they think of the laundry room and specify aspects that bother them	*Comment*	*1*
	Problems may include noise, integrity issues	*Comment*	*1*
	Exciting preconditions in the project, but no ideas what it will bring – necessity to be adaptive and adjust to the development of the project once inhabitants have acclimatised	*Comment*	*1*
	Not the only research project going on – participation in research mustn't be too burdensome for inhabit	*Comment*	*1*
Vedum	*No – all chosen focus areas: test products, materials, surface finishings; evaluate lifestyles and resource consumption, sustainability aspects of future housing*	*General answer*	*1*

3.16 a) Is there a planned research project that a partner is involved in which the company/you perceive as extra interesting?
b) Is there a planned research project except the one/ones you are involved in that you find extra interesting, seen from a sustainability perspective? (Chalmers' researchers only)

Perhaps only to be expected, once again the opinions of the representatives vary with the background they have. All replies can be classified as articulated (see table 36 below).

> *"Oh, I don't know if I want to highlight anything specifically, but... and then I think that it's interesting, the boundaries between research and development, we really want... want it to be research and development closely linked to reality, something that we can make use of soon. This... excellent research, it doesn't really belong in HSB Living Lab, it should be more of an applied research, and development."*

Table 36. Projects initiated by another partner which potentially can benefit the informant's own organization.

Organization	Replies	Related to	Level
Chalmers	*Definition: sustainability is a process that decouples economic growth from resource use and from environmental impact; in this understanding: testing new building insulation/envelop materials (thinner but same performance) are interesting*	*Systems & engineering: general technology improvements*	1
	Home energy management, predictive models on how to deal with peak energy consumption and enabling more sustainable energy supplies – achieve reductions in energy consumption and CO_2-emissions while not decreasing perceived comfort at home	*Systems & engineering: general technology improvements / Design & behaviour science: impact behaviour*	1
HSB	*Don't want to highlight a certain project*	*General answer*	*1*
	Interesting with the distinction between research and development – interested in the development part of R&D, not in excellent research	*General answer*	*1*
	Many interesting aspects in the building – from laundry solutions of the future to energy systems to floor plans	*General answer*	*1*
	Application important – the sooner the results can be implemented, the better	*Comment (also related to Sustainability science: market/ ecologic footprint/ fairness and intergenerational equity)*	*1*

Johanneberg Science Park	*Not really – not really informed of the chosen research projects*	*General answer*	*1*
	Interesting to see how to make the inhabitants share their experiences of the different research projects	*General answer*	*1*
	Challenge to keep interest up among inhabitants for several years – easy in the beginning, but in the long run it'll probably be more difficult	*Comment*	*1*
	Qualitative measurements interesting	*Comment*	*1*
	Ethical issues relevant – how to deal with enquired outcomes	*Comment*	*1*
Tengbom	*LCA/Anavitor by Bengt Dahlgren AB*	*General answer*	*1*
	So far, most of the focus has been on the building – research planning not really clearly defined yet	*General answer*	*1*
Bengt Dahlgren	*Many – see previous question*	*General answer*	*1*
	Project with Göteborg Energi in particular	*General answer*	*1*
	Chalmers research in general: e.g. exchangeable facades and stuff might not be so important to be part of, but the result is – competence the basis for Bengt Dahlgren's services	*General answer*	*1*
	Collecting great amounts of data related to people's behaviour not that interesting, but the outcome on the contrary is very interesting – what types of impact does it have, what could it mean for how to change or build supply systems in the future	*Systems & engineering: general technology improvements*	*1*
	Floor heating more in line with what the company normally does – opportunity to contribute to a larger extent, more direct payback	*Systems & engineering: general technology improvements*	*1*
	General interest in most things taking place in the facility but perhaps not when there's discussions of clever storage – more interesting when Chalmers wants to discuss steering of floor heating	*General answer*	*1*
Electrolux	*Not at the moment*	*General answer*	*1*
Vedum	*HSB, Peab, Electrolux – all project which can impact the design and use of kitchen- and bathroom interiors*	*General answer*	*1*

3.17 Is there a planned research project that a partner is involved in, which can benefit the company/your organization too?

The view interviewees had in this matter was a bit of a dichotomy: either they saw that all type of knowledge is benefitting them, or they couldn't see any ideas benefitting them right now. Two replied along the lines 'time will tell'. This question had a generally low frequency of answers. All replies were articulated (see table 37 below).

> *"All knowledge can benefit a knowledge-based company. Then it is [a matter of], how do we use thus knowledge, and I mean the knowledge we gain in this project, I think that… If we go back to the very first questions, how we could impact the society and do we as a company have a responsibility, well if we build up a competence somewhere, then it's a matter for us to 'how can we translate it and have it implemented in as many other projects as possible'. If we see that we have a technical solution which can contribute to a more sustainable world, how do we handle it in the best way in order to implement it on as many… in as many projects as possible in the future?"*

Table 37. Planned research project which another partner is involved in, potentially benefitting the informant's own organization.

Level	Replies	Related to
1	*Foundation of the project to be able to gain from other partners' research ideas – from the kitchen floor plans of the future to Electrolux's work with refreshing cabinets*	*Living lab discourse*
	All aspects are related to housing – all successful project outcomes can be of use to HSB, to varying extent	*General answer*
	All research projects will be benefitting in the long run – not one in particular	*General answer*
	Collaboration and new knowledge will be profiting to both Johanneberg Science Park and partners	*General answer*
	Of course – all knowledge can benefit a knowledge-based service company, a matter of how to implement gained knowledge in other projects in such an extensive way as possible	*General answer*
	Hopefully – time will tell	*General answer*
	Not at the moment	*General answer*

3.18 Which are the most important channels of communication for HSB Living Lab, according to the company/you? Why?

Another question of a clearly articulated character, the data set was generally of a quite coherent type (table 38 below). Most agree that communication is a matter of adapting to the target group one wants to reach, and that the more channels used the better. Internet and social media was mentioned by most. Some stress the importance of future tenants as communication channels of the future, while one representative thought movies will be very significant.

> *"Perhaps we should make an inventory of what channels… you know, this is about the sustainable housing of the future, and where is that knowledge needed? Perhaps we need a more strategic planning to see… where the project would benefit of being shown, and where that knowledge is missing. That type of inventory I don't really think that we've done, instead we're using all partners' channels and… maybe it isn't that much thought behind it."*

Table 38. The most important channels of communication for the project.

Level	Replies	Related to
1	*Most representatives are agreeing that it depends on who you want to communicate with*	*General answer*
	Consensus that the more channels the better	*General answer*
	Web page	*General answer*
	Actors and their own channels of communication	*General answer*
	Facility itself when it is put in place	*General answer*
	Future tenants	*General answer*
	Social media: Facebook, Twitter, Instagram, Linked in	*General answer*
	Movies	*General answer*
	Make the project transparent and generate insight in the process	*Comment*
	Important co communicate what we do, how we do it and why we do it	*Comment*
	Necessary to make an inventory of communication channels – where is the knowledge of the sustainable housing of the future needed?	*Comment*
	A more strategic planning of communication would be good in order to benefit the project and to realize where knowledge is actually missing	*Comment*

3.19 What do the company/you find the most important thing(s) to do in order for HSB Living Lab to be visible in media?

All replies can be classified as articulated (see table 39 below). However, some interesting and contradicting elements can be discovered in the data. One standpoint is that this is a project which basically is self-communicating due to its relative uniqueness and to the fact that housing is something which we all can relate to. Another standpoint was expressed by an interviewee, who was concerned that the media representation so far could potentially create a hype which the representative feared that the project won't be able to live up to; in the long run, this could potentially damage the project. Yet another interviewee stated that the media representation of HSB Living Lab so far has been a bit haphazard, and that there is a need for a strategy plan for communication. Lastly, one representative expressed that there is a communicative issue in explaining that there's more to the project than the actual building envelope.

> *"This project is communicating itself. Because it's been written incredible much about this project already, before we even started to build it. So there's… we don't really have to do that much to make it visible in media. It is… perhaps it is more that we… if we, if we decide to steer it, which media we want it to be visible in. "*

> *"Make it happen and… make it live up to the expectations which already have been expressed in media. Because I see that as one of the largest risks … And it has been presented in media with… descriptions which makes it… if I hadn't been involved in the project, it would have given me certain expectations or thought that… Generated some interests. And the most important now, is to make the project happen and that it somewhat corresponds, or live up to the expectations which we ourselves have created through media."*

Table 39. The most important things to do to make HSB Living Lab visible in media.

Level	Replies	Related to
1	*Most important to communicate with persons related to the construction industry from all over the world, so maybe the website is most important – type of media don't really matter otherwise*	*General answer*
	Up till now, news articles have been written about the project without active efforts from people involved in the project other than sending PMs to the press	*General answer*
	Important to create relationships with journalists	*General answer*
	Highlight interesting aspects of the project – not difficult, since housing issues are relevant for all, not a project which is difficult to sell to the press or create attention about	*General answer*
	Uniqueness – adding additional attractiveness	*General answer*

	Highlight strategic events related to the essence of the project – sustainable housing of the future	*General answer*
	Finding angles of the projects interesting for media – right type of media	*General answer*
	Research potentially interesting for media – in concrete ways, e.g. measure equipment, laundry rooms, the planned meeting place in the ground floor of the building	*General answer*
	Also show how the compact living flats are planned/designed – can be of interest	*General answer*
	Interviews with inhabitants	*General answer*
	Communicating research outcomes	*General answer*
	Digital media important –Instagram, Facebook, Twitter, Linked in , web site	*General answer*
	Each partner's own channels	*General answer*
	Project which communicates itself – many articles written even before on-site construction has started	*Comment*
	A matter of deciding what type of media the project should be visible in – in the long term, debate articles related to the research will be important	*Comment*
	Necessary to make a definition of the types of media HSB Living Lab should be shown in	*Comment*
	Be clear with motives of participation in the project and expectations of outcomes – something which will be given back to the final consumer, not participation as a showcase	*Comment*
	The visual is important – communicative challenge in explaining that there is more to the project than just the building	*Comment*
	Make it happen and make it fulfil the expectations already being painted up in the media – there's a risk in not be able to live up to the high-set goals which has been widely distributed in the media, meaning negative publicity which some persons can take advantage of	*Comment*

3.20 How dependent on communication outwards is the HSB Living Lab, according to the company/you?

The interpretations of this question among the persons being interviewed vary, mainly due to their own opinion of what 'dependent' mean. Participation in the HSB Living Lab project is a large financial investment, and if words of being partner in the project aren't spread, then the investment won't pay off. This is one theme discovered in the replies, which can be linked to sustainability science and politico-economic systems in general and to markets in particular. *Communicating results can lead to a multiplier effect* is another point of view, stressing the importance of communication. Communication is also a basis for finding both new, potential partners and funders. Communication will also vary in importance during different stages of the project. For more details, see table 40 below.

> *"But sure, it's incredibly important with communication outwards. Because it's a matter of creating… preconditions in order to have… a good platform to work with. To generate a great interest for this project, to make… companies and organizations want to join this project and be part of development, for example."*

Table 40. Dependence of the project on communication outwards.

Level	Replies	Related to
1	*Important to spread knowledge internally in each company, seen from a branding perspective – this is a large investment for the involved partners*	*Sustainability science: markets*
	A way of shaping the brand – the network surrounding a company defines it	*Sustainability science: markets*
	If something isn't visible it doesn't exist, thus a waste of money– very important	*Sustainability science: markets*
	Important to communicate with HSB's members, Chalmers employees/students/faculties, employees of all partners	*General answer*
	Spreading knowledge through BTA and Climate-KIC	*General answer*
	Communication will cause a multiplier effect by presenting research outcomes/solution to others – very important to get things right	*General answer*
	Spreading examples of what is possible to achieve in housing and for which costs – potentially an issue for the audience	*General answer*
	The more persons reached the better the outcome	*General answer*
	Communication essential aspect of the project	*General answer*
	Depends – 'what does' dependent' mean?', 'the research itself is not depending on communication'	*General answer*

	Communication creates conditions needed for having a functional platform as a basis for the project	*General answer*
	Communication can create interest so that other companies and organizations want to join the project	*General answer*
	Create interest for potential financiers	*General answer*
	Many similar projects going on around the world – communication is an enabling factor for getting the latest research news from other places and compare project outcomes	*General answer*
	At the moment – HSB Living Lab a self-propelling project	*General answer*
	A project which is easily communicated due to its uniqueness – unique both nationally and internationally	*General answer*
	Not sure that communication will be as smooth and obvious ahead, a strategic plan for stressing project outcomes will be needed – what are the results and how can results wisely be explained?	*General answer*
	Results are important to communicate, not only in the academic world but also to all partners – outcomes must reach a broad audience	*General answers*
	Varying during different stages of the project	*General answer*
	People won't be impressed just by participation in the project – the important thing is to communicate once there is a result (e.g. how people have used water, detergents etc.)	*General answer*
	Communicate participation a matter of PR status	*General answer*
	Important – this is an interesting project	*General answer*
	Impacting more actors than the ones included in the partnership	*General answer*
	The outcome of the project will impact housing in general and therefore an open dialogue will be valuable	*General answer*

3.21 Which is the company's/ your organization's greatest strength when it comes to communication?

The different organizations work with communication in different ways. Most have appointed communicators, while at least one organization haven't; the latter is seen both as a weakness and as an asset (communication only occurs when it is necessary and when there is a point with it). Due to their varying organizational type, communication channels and networks are also described differently by the interviewees (see table 41 below).

Table 41. Strengths in matters of communication among the different organizations.

Organization	Replies
Chalmers	*Difficulties to speak of Chalmers in general* *Greatest strength at Chalmers is to communicate complex ideas and research in an understandable way to partners and stakeholders in order to make knowledge accessible to those involved in innovative co-creative processes* *Short-term: Chalmers webpage may have many visitors every day. Thus, any publication there has the chance to highlight recent results etc.* *Mid-term: Chalmers campus is a district itself that has its own communication culture. Information on topics and activities easily spread through different channels* *Long-term: Chalmers education attracts many students. Through integrating recent research questions and outcomes into lectures it is possible to embed several themes*
HSB	*Long-time strategic and structural work with communication* *Communication often led from HSB Riksförbund and the communication board there* *Taking place in channels from own newspapers to web page and social medias* *Extensive contact network* *Strength to have a clear and strategic work with sustainability issues* *Stakeholder dialogue outcome always considered*
Johanneberg Science Park	*To be visible at many different places and being very active* *Compared to the other partners – a broader network spanning over many sectors* *Owned by the City of Gothenburg – connections to the different administrative departments of the city* *Unique within the partnership group*
Tengbom	*See things from another perspective – are able to talk from a user point of view*

	Can talk about architecture, experiences, processes – create an interest in ways different from only the technology point of view
Bengt Dahlgren	*Communication only occurs when it is necessary and when there is a point with it – not just a glossy façade* *No appointed communicator at the company*
Electrolux	*Simplicity – always thinking of keeping it straight forward* *Having in mind who the receiver is at all times* *Long experience of dialogue with customers*
Vedum	*Established supplier of both kitchen- and bathroom interiors with many contacts within the housing sector*

4. Almedalen exhibition

4.1 What expectations do the company/you have on HSB Living Labs participation in the week in Almedalen?

Expectations regarding the Almedalen exhibition were relatively similar, even though some representatives have more hopes than others. The most important theme is to spread information about the project and that it has started. To be honest and transparent were two key findings, as was the highlighting of the partnership, in the articulated answer category. In the attributional category, there were obvious links to the living lab- methodology and also statements which can be interpreted as links to the multi-level perspective, either through regime shifts or through the use of the exhibition itself as an incubation room for new technologies. For more information, see table 42 below.

> *"To create new mindsets or processes or… engaging the public in Almedalen. To have a new mindset and create a future together, regarding future housing."*

Table 42. Expectations on the Almedalen exhibition.

Level	Replies	Related to
1	*Spread information about the project and that it has started – show the project, show possibilities, show exciting research projects which can be taking place in the facility*	*General answer*
	Several partners have never been in Almedalen and some will be there for the first time – opportunity to watch and learn	*General answer*
	Good arena to be visible in	*General answer*
	Create media interest – highlight all the good aspects of the project	*General answer*
	Clear expression that the project is a partnership	*General answer*
	Presentation of the project in an honest and authentic way – what we're doing, why we're doing it and what things are the most important	*General answer*
	Opportunity to tell the story of HSB Living Lab – a lot of curiosity already exists	*General answer*
	Engage the public	*General answer*
	Attract potential target groups: decision makers, politicians and business leaders; attract potential partners and funding	*Sustainability science: socio-political structures/markets*
	Create a future together, relating to future housing	*Comment*

2	*Spread the HSB Living Lab is a co-creative place – every idea is welcome to be realized within the available frame conditions* *Create new mindsets and thoughts concerning processes* *Try the exhibition site as an application area to test sensor setup and see how people react on it*	*Living Lab methodology: co-creation* *Multi-level perspective: regime shift* *Multi-level perspective: incubation room*

4.2 How important do the company/you find the HSB Living Lab exhibition in Almedalen, and in which ways?

Interviewees were generally not agreeing on this matter. Some, especially the major stakeholders, found it very important, while others found it more relevant to exhibit the project once there were results to be presented (see table 43 below). Representatives who had never been to Almedalen or were working for firms not previously attending the event were more uncertain of the importance of the exhibition. Target groups, potential partners and funding were common replies. As far as attributional answers go, there were links to both the multi-level perspective through the challenging of regimes, and to the living lab methodology through the highlighting of co-creation.

> *"From our perspective it is important to show that collaboration in this wide sense can generate completely new ideas, which may not be possible [to do] if you're a single actor. And to show… the target group in Almedalen that you should be part of and supporting this type of activities. "*

Table 43. The importance of the Almedalen exhibition.

Level	Replies	Related to
1	*Very important – Almedalen the biggest political event in Sweden*	*General answer*
	More important next year when there are results to present	*General answer*
	Important but not crucial	*General answer*
	Not sure how important it is – have realized that it depends on whom to target and what the expectations are	*General answer*
	Access to key target groups	*General answer*
	HSB Living Lab seminar very popular last year	*General answer*
	Show that the project has started	*General answer*
	Good platform for communication – increase awareness in general and among decision makers in particular	*Sustainability science: socio-political structures*
	Communicate the project: what it is; that this will be the future of housing – being part of a living lab means that you will immediately find partners and customers	*Sustainability science: socio-political structures / market/ socio-technical system patterns and transitions*
	Try to create attention by presenting the 'essence' in HSB Living Lab, that it is a laboratory intended for housing aspects – if visitors were able to feel, experience and understand what this project is	*Sustainability science: socio-political structures / socio-technical system patterns and transitions*

	supposed to be would be enormously valuable *A chance to stress the importance of companies taking responsibility in societal debates* *Show the target group in Almedalen the significance of supporting this type of project – and to invest in it in the way it is presently done, otherwise the outcome will be less rewarding*	 *Sustainability science: socio-political structures* *Sustainability science: socio-political structures/markets*
2	*Good place to get new ideas and start a process of changing mindsets concerning future housing* *Collaboration in this type of partnership can generate completely new ideas, which a single actor cannot do on its own – important message*	*Multi-level perspective: challenging regime* *Living lab methodology: co-creation*

4.3 Has the company/your organization been exhibiting in Almedalen during previous exhibitions?

If yes, what experiences were made that can strengthen this year's exhibition in Almedalen on the behalf of HSB Living Lab (shortly)?

Some partners have been present in Almedalen before, and some have not. Among those previously visiting Visby, the value of informal meetings was highlighted. According to the interviewees, it's important not to try to present all aspects of the HSB Living Lab project; to frame communication to target groups, and to work with exhibition in terms of tactility or concreteness. An attributional answer was linked to the living lab-methodology (see table 44 below).

> *"Try to make the presence concrete and interesting. Try to stand out … by working with things which are tactile and concrete. But perhaps also to think about the debates and seminars… to make them pleasurable, finding the right persons, right themes for discussions."*

Previously attending Almedalen: Chalmers, HSB, Johanneberg Science Park, Tengbom – arranged table talks, seminars and mingles but not had an actual exhibition area.

Table 44. Experiences made which can strengthen the exhibition.

Level	Replies	Related to
1	*Can't just present – everybody do that, not very exciting*	*General answer*
	Slim the exhibition – not try to get every aspect of the project on display	*General answer*
	Significant to frame target group – exhibition cannot be too academic	*General answer*
	Often having a meeting place where visitors can come and have a chat or a discussion works the best – unofficial meetings and conversations more rewarding	*General answer*
	Try to make the presence concrete and interesting	*General answer*
	Try to stand out from the mass of seminars, pavilions and booths, by working with things which are tactile or concrete	*General answer*
	The mindset regarding the debates, panels and seminars – to make them pleasurable, find the right persons, right themes for discussions	*General answer*
2	*Exciting project – need exciting ideas to catalyze co-creation*	*Living lab methodology: co-creation*

4.4 Will the company/your organization be in Visby during the Almedalen event?

If yes, how could the company/your organization contribute to strengthen the HSB Living Lab exhibition if the opportunity arises?

Clearly of an articulated character, this question generated hands-on tips on what the different organizations could do in order to make the basis for the exhibition stronger (see table 45 below). Book in meetings in advance, hold lectures about the HSB Living Lab facility and arrange table talks are some of the suggestions.

> *"[T]able talks where we invite… interesting persons from the housing sectors and politicians and researchers … and then they'll have dinner and different topics to discuss, and the topics themselves don't have to be so advanced … how can we do in order to not throw away food, what would you need to have at home, what would you need to do, and then we'll also have an audience which can listen and ask questions."*

Attending Almedalen: Chalmers, HSB, Johanneberg Science Park, Tengbom, Bengt Dahlgren, and Electrolux.

Table 45. How to strengthen the HSB Living Lab exhibition in Almedalen?

Level	Replies	Related to
1	*Invite important persons/ book meetings with central decision makers in advance to the event and explain what a demo-arena like HSB Living Lab is and what use it can have for academia, enterprises and society – what values it will create*	*General answer*
	Help out with personnel in the display area	*General answer*
	Lead or moderate seminars and debates	*General answer*
	Give advice on the design of the display area	*General answer*
	Participate in the main seminar on the HSB day	*General answer*
	Hold lectures about HSB Living Lab from an architectural point of view	*General answer*
	Arrange table talks with experts in different types of fields – sustainability, energy, environment, laundry and bring this new knowledge in to the project	*General answer*

4.5 Which target group do the company/you identify as the most important to reach in Almedalen? Why?

The replies generated by this question was once again of a mostly articulated character and there was a somewhat general agreement of which targets group can be considered the most prominent, however, in which order they can be ranked in terms of importance varied a lot (see table 46 below).

"Well, it is decision makers. And it can be within all different fields really. "

"I think that on HSB Living Labs behalf it's really about showing societal... actors, in a broader sense, that this partnership group want to be part of developing the society in a sustainable direction."

Table 46. The most important target groups in Almedalen.

Level	Replies	Related to
1	*Authorities – show that project funding was properly spent*	*Sustainability science: socio-political structures*
	Politicians – impacting companies, impacting regulations, how to plan housing in order to build more energy efficient, modular and moveable, deciding what will be built, how, and when ; change political mindsets	*Sustainability science: socio-political structures/ markets/ socio-technical systems patterns and transitions*
	Decision makers – raise awareness and highlight sustainability issues, dare to invest	*Sustainability science: socio-political structures/ markets/ socio-technical systems patterns and transitions*
	Possible target groups include environment directors, energy advisors, other persons who influence decision makers	*Sustainability science: socio-political structures/ socio-technical systems patterns and transitions*
	Companies/potential partners/business community/construction and real estate sector – be part of the project, invest, develop	*Sustainability science: markets*
	Other stakeholders working with sustainability and housing	*General answer*
	Media	*General answer*
	On behalf of HSB Living Lab, it is important to show for all types of societal actors that this partnership group want to be part of developing the society in a sustainable way	*Living Lab discourse*

4.6 What types of connections does the company/you identify as the most important to make in Almedalen on the behalf of HSB Living Lab, and why?

With strong links to the previous question, the answers are quite similar (cf. table 47 below and 46 above). Politicians, potential funders such as Vinnnova and Formas, and business contacts can be found in the replies to both questions. One representative commented that it is the person-to-person contacts which are the most important.

> *"You see which others are being present, where they are and what seminars our partners arrange or potential future partners."*

Table 47. Most important type of connections to make in Almedalen on behalf of HSB Living Lab.

Level	Replies	Related to
1	*Politicians*	*Sustainability science: socio-political structures*
	Authorities and research funders like the Swedish Energy Agency, the National Board of Housing, Building and Planning; Vinnova and Formas – make them understand the opportunities with HSB Living Lab and try to find funding suitable for the HSB Living Lab structure; the seriousness of the HSB Living Lab project can be acknowledged in order to easier having funding in the future	*Sustainability science: socio-political structures*
	Actors from Gothenburg like the head of the Urban Planning Office which may be difficult to come in contact with 'at home'	*Sustainability science: socio-political structures*
	Decision-makers in municipalities with a large demand for housing	*Sustainability science: socio-political structures*
	Opinion formers and media	*Sustainability science: socio-political structures*
	Persons working with issues of sustainability and the environment	*Sustainability science: socio-political structures*
	Business contacts – potential partners like the construction and real-estate sector	*Sustainability science: markets*
	Also scouting who are present, where they are and what seminars partners or potential partners are arranging	*Comment*
	Person-to-person contacts most important type	*Comment*
	Interaction/doing things together	*Comment*

4.7 Please rank the following target groups from the most important to the least important:

Everyday visitors, politicians, competitors, potential partners, other businesses, media, associations

This particular question was the only one which involved ranking. Some individuals didn't like the formulated categories and chose to rephrase them. Both the representatives working in academia had the opinion that potential partners were the most important to attract in Almedalen. Politicians and other businesses/business leaders were generally important in the data set, along with potential partners. The question itself clearly belongs to the first level of analysis, articulated questions (see table 48 below).

> *"I think that this one is a bit difficult, I don't understand, I don't get why this is important? … I don't want to do this one. Focus is decision makers and then there are others… which can be interesting. But I say decision makers both in politics and in the business community."*

Table 48. Ranking of the most important target groups in Almedalen.

Individual	Ranking
1	*1. Potential partners* *2. Associations* *3. Everyday visitors* *4. Other businesses* *5. Media* *6. Politicians* *7. Competitors*
2	*1. Potential partners (a.k.a. researchers)* *2. Competitors (giving critical feedback)* *3. Associations (showing interest for transferring ideas to multi-housing)* *4. Other businesses (as business development partners, maybe as technology supplier)* *5. Everyday visitors (start discussion on future living: static vs. dynamic housing)* *6. Media (multiplication)* *7. Politicians (already aware of it, pushing research on future living)*
3	*1. Politicians* *2. Other businesses* *3. Media* *4. Potential partners* *5. Competitors* *6. Associations* *7. Everyday visitors*

4	1. *Politicians* 2. *Media* 3. *Other businesses* 4. *Potential partners* 5. *Individuals* 6. *Associations* 7. *Competitors*
5	1. *Decision makers* 2. *Potential partners and business community* 3. *Fund raisers and authorities* 4. *Media a channel – if breakthroughs are made in media, target groups are reached*
6	1. *Decision makers in both politics and in companies*

4.8 What shall be done in order to make HSB Living Lab standing out in Visby, according to the company/you?

Most answers can be classified into the articulated data category (see table 49 below). Two representatives mention how valuable it would have been to have an actual module on the site. A general agreement can be seen, in which thinking outside the box, engaging visitors, and have simple but interesting activities which visitors can participate in can be seen as themes. It's also seen as important to have a physical presence in the display area, and try to interact with people outside it. One interviewee mention that it is more important to be visible next year, when there are results to present.

> *"You need to have something which is surprising... and entertaining. ... it can be quite simple, I think. Something that makes you turn around or some sorts of activity which make people interact with each other."*

Table 49. How to stand out in Visby.

Level	Replies	Related to
1	*Important to interact with people outside the display area to make them want to come in*	*General answer*
	Being on site with physical presence	*General answer*
	Try to create a hype	*General answer*
	Just to generate a general attention for the project this year – more interesting next year when the housing units are completed and tenants have moved in	*General answer*
	Important to consider how to raise an interest with the exhibition	*General answer*
	Arrange surprising and entertaining activities – can be simple but preferably should make people turn around and look and interact with each other	*General answer*
	Have the right persons at the event – attracting people and media	*General answer*
	Important that partners agree on activities, highlight them, communicate and invite persons that they want to be present at the event	*General answer*
	Communicate via social media	*General answer*
	Think outside the box – not only present the project but rather present the challenges addressed	*General answer*
	Optimal would have been if there had been a housing module on site – perhaps a cross section, to make people see how it will look	*General answer*

	Try to build something high to be clearly visible *It will stand out through the booth display area* *Ordered banner to the Almedalen mobile app – slogan 'The journey towards housing of the future starts at the harbour' will be visible and guiding visitors to the booth* *Electrolux, Johanneberg Science Park, Chalmers, Tengbom, and representatives being in different places will all refer visitor to the exhibition area – the project will communicate itself even in Almedalen, without much extra effort* *Just to generate a general attention for the project this year – more interesting next year when the housing units are completed and tenants have moved in*	*General answer* *General answer* *General answer* *General answer* *General answer*
2	*Have something people can participate in and cause them to interact* *Engage the public, visitors can't just hear or read information*	*Living lab methodology: co-creation* *Living lab methodology: co-creation*

4.9 Is there something that absolutely must be done on order to stand out in Almedalen?

Answers are related to general aspects of communication and in some respect to co-creation, though not very explicit, which is why that particular statement along with the rest is classified as articulated (see table 50 below).

> *"[It is] vital with the content in the display area … that the content is consistent with what we say, i.e. we refer to it, we want all to come and visit, well then we must have some things to show. So I would say that at this point, the content of the booth and how we together ensure that it turns out really well, that's … main focus."*

Table 50. Must be done to stand out from the crowd in Almedalen.

Level	Replies	Related to
1	*Need to be different from the rest of the booths*	*General answer*
	Make visiting the booth a memorable experience	*General answer*
	Overall concept what matters – good premises, suitable times and interesting participants in the event, functional communication	*General answer*
	Step away from traditions – think outside the box	*General answer*
	Dare to be different	*General answer*
	Presence – there are not always persons in the display areas, there must be a physical presence and by the right type of persons	*General answer*
	Have simple but interesting activities which can engage people and make them want to enter the display area	*General answer*
	Try to attract interesting people	*General answer*
	Content inside the booth significant – it must correspond to the sent message	*General answer*
	If people are directed to the exhibition space, there must be interesting things to see and experience there	*General answer*
	At this point in time, joint efforts to make sure the HSB Living Lab booth is up to the task are the most important aspects	*General answer*
	Must have schedule in the Almedalen mobile app	*General answer*
	Engaging visitors, make them interact	*General answer*

4.10 What would the company/you like to be communicated on the behalf of HSB Living Lab during the Almedalen exhibition? Why?

Replies can be sorted into categories of articulated and attributional data (see table 51 below). In the case of the articulated data, most can be sorted into a Living Lab-discourse, while the rest can be classified as belonging to design & behavioural science through either impacting behaviour or through enabling design. Attributional data are of two types: either linked to the multi-level perspective through challenge of regimes or innovations, and through living-lab through co-creation.

> *"Well, what we want to show in Almedalen, it is… the collaboration. I.e. the partnership for the sustainable housing of the future. Because it is an unique collaboration structure and an unique joint effort, and that's why we would like… we would like to have a representation in the exhibition area of different companies, like… come and talk to Peab and come and talk to HSB, come and talk to Chalmers or Electrolux."*

Table 51. Communication on behalf of the project in Almedalen.

Level	Replies	Related to
1	*The collaboration between several partners in the striving of creating the sustainable housing of the future – unique project to find out how to live sustainably in everyday life situations in the future; want to have representatives from as many partners, as possible on site in Almedalen; show the joint effort, new partners are welcome; to dare –this is a project performed by actors who dare to invest, even though the outcome of the project is unclear*	*Living Lab discourse*
	Sustainability a crucial issue, this project means action instead of conversation – being part of this project is a way of trying to contribute to a sustainable world	*Living Lab discourse*
	Highlight that the project starts and that there is an opportunity to follow it; create an interest which is big enough to make people want to follow the project as a continually evolving story – in the long term the story should evolve – what results are achieved, how far has the research gotten (next step)	*Living Lab discourse*
	Building this platform for 9 years of research regarding the sustainable housing of the future	*Living Lab discourse*
	Making a global difference	*General answer*
	Challenge is a chance	*General answer*
	Changes are possible	*General answer*
	Stress that it is a research platform – not that it is 'now we're building the most sustainable housing	*Comment*

	solution that we can find' – because that's not true	
	Saving energy and carbon dioxide emissions doesn't mean that lives will be more boring	*Comment (also related to Design & behavioural science: impact behaviour)*
	Big market potential in sustainable products and services – not many available today	*Comment (also related to Design & behavioural science: enabling design and innovations)*
2	*Start collaborating better and change the way we work*	*Multi-level perspective: challenging regimes*
	'We have to live smarter now' – sustainable living approach means knowing the energy demand one day ahead, making energy re-direction and the integration of renewables more effective	*Multi-level perspective: challenging regimes (also related to Systems & engineering: enabling technologies)*
	'Do not be afraid of sensors; they help you every day' – data integrity discussions useful but never-ending	*Multi-level perspective: challenging regimes (also related to Systems & engineering: enabling technologies)*
	If we want to change the world and how we life and reach a more sustainable state, we have to work together and start co-create and re-create the world we live in	*Living lab methodology: co-creation*
	Co-creation the key	*Living lab methodology: co-creation*

4.11 Is there something which absolutely must be included in the communication, according to the company/you?

Most replies can be classified as articulated and belonging to an established Living lab-discourse. Two attributional answers are related to living lab-methodology and co-creation (see table 52 below).

> *"I would say collaboration and that it is... we're talking of the journey towards the sustainable housing of the future, that's kind of the essence of it."*

Table 52. Must be included in Almedalen communication.

Level	Replies	Related to
1	*Starting point of the journey towards the sustainable housing of the future*	*Living lab discourse*
	Sustainability and housing key terms	*Living lab discourse*
	To dare to take action	*Living lab discourse*
	All partners must be represented	*Living lab discourse*
	Actual research with actual persons, results will be proven scientifically and not just something presumed	*Living lab discourse*
	Saving resources	*Sustainability science: natural assets, stocks & capital*
2	*We all need to come up with ideas and work together to change the world – there are many ways to go, HSB Living Lab is one of them*	*Living lab-methodology: co-creation*
	Collaboration for sustainable development	*Living lab-methodology: co-creation*

4.12 Which are the most important channels of communication in Almedalen?

All answers can be found in the articulated category (see table 53 below). Many interviewees have commented on the enormous flows of tweets during the Almedalen event, but twitter still is important. Comments include that attempts ought to be made to step in on discussions on the current housing situation, and that it in general is very different to tell in advance which ways of communication that will work the best on site.

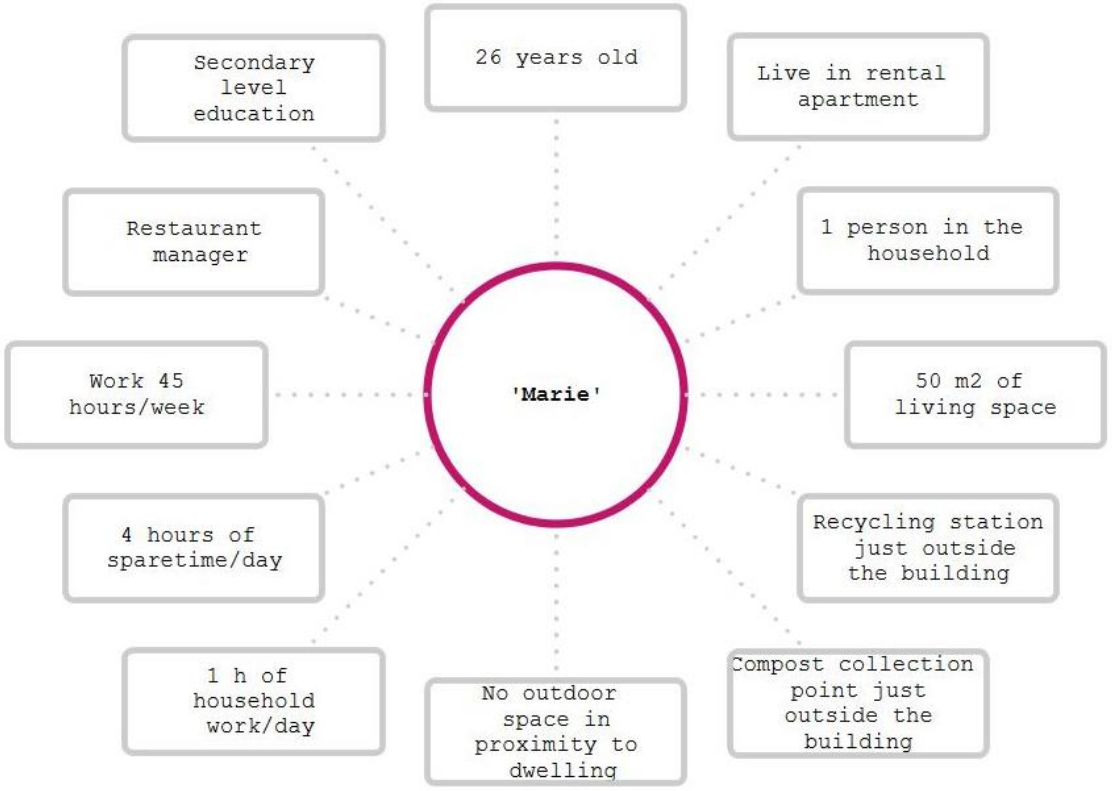
> *"To actually take part in seminars and panel discussions with a completely different… which isn't arranged by HSB but by others. Try to step in on discussions with politicians on the housing deficit and so forth."*

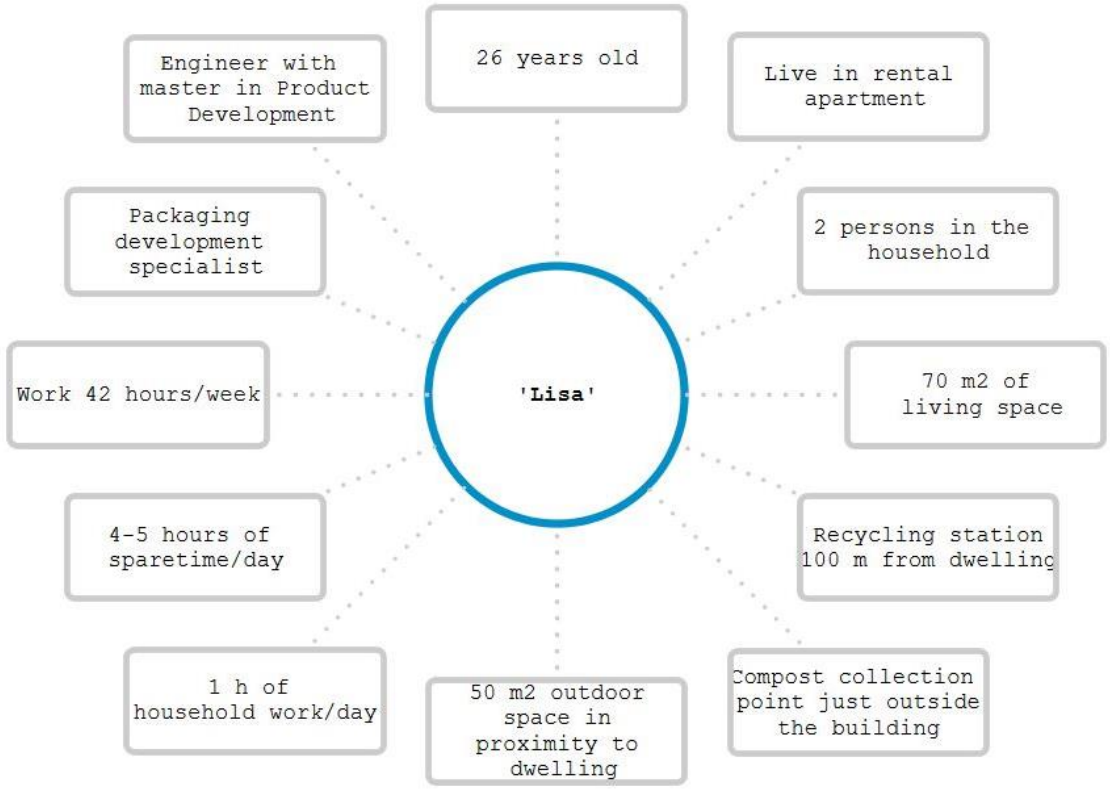
Table 53. The perceived most important channels of communication in Almedalen.

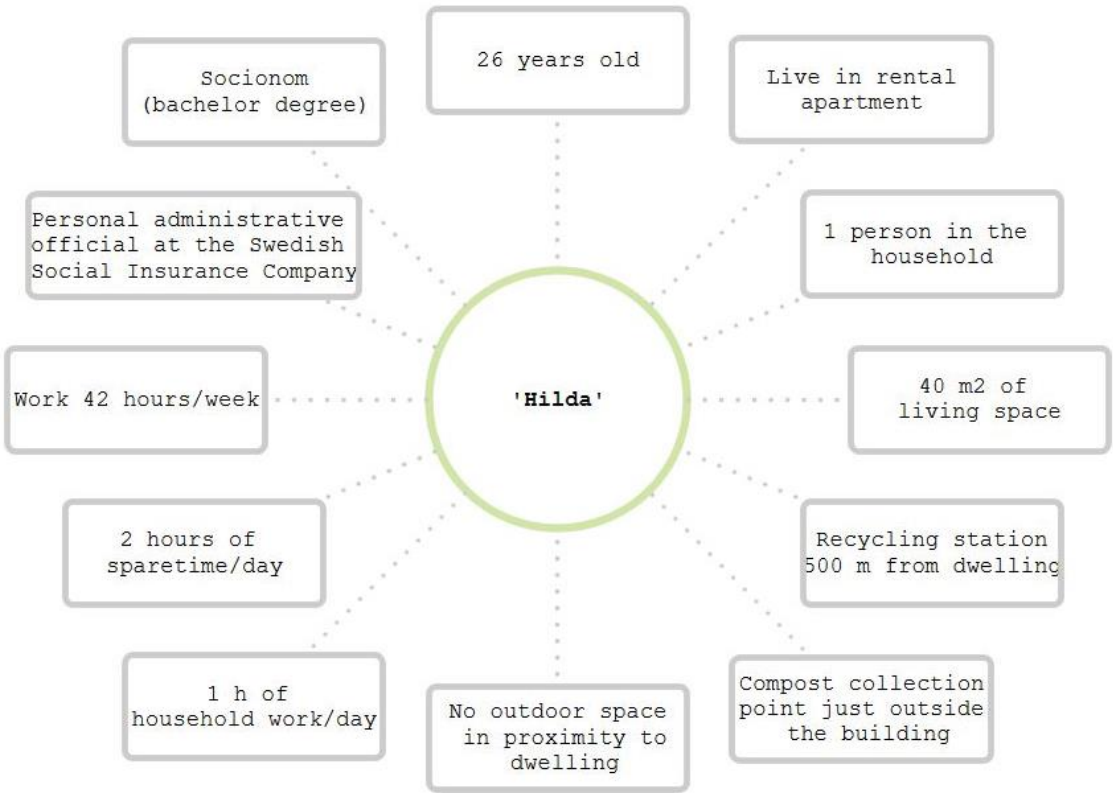
Level	Replies	Related to
1	*Social media in general*	*General answer*
	Try to reach outside the actual HSB Living Lab display area – e.g. handing out brochures, have a bike that says HSB Living Lab on which representatives of the project can use in Visby	*General answer*
	Instagram	*General answer*
	Twitter works well in Almedalen – #hsblivinglab, can also connect activities to tweets in order to attract people to the twitter flow, everybody will hashtag #Almedalen2015 so there will be nothing unique about it, but it is still important	*General answer*
	Almedalen mobile app	*General answer*
	Each company's/organization's own network	*General answer*
	Ideally during this type of circumstances would be broadcasting on TV news	*General answer*
	Participate in seminars and panel debates arranged by other than HSB	*Comment*
	Try to step in on discussions with politicians about the housing deficit etc.	*Comment*
	Necessary with strategic planning of communication before the event – maybe get expert advice	*Comment*
	Challenge – difficult to know	*Comment*

Appendix 6. Reference material

1. Mapping of respondents






'Hilda'
26 years old
Socionom (bachelor degree)
Live in rental apartment
Personal administrative official at the Swedish Social Insurance Company
1 person in the household
Work 42 hours/week
40 m2 of living space
2 hours of sparetime/day
Recycling station 500 m from dwelling
1 h of household work/day
No outdoor space in proximity to dwelling
Compost collection point just outside the building

2. Survey

1. What appliances can you not be without in your own home?

	Item type	M	L	H		Item type	M	L	H		Item type	M	L	H
a)	*stationary computer(s)*				*b)*	*laptop(s)*		**X**		*c)*	*TV(s)*	**X**	**X**	
d)	*Ipad etc.*	**X**			*e)*	*printer(s)*				*f)*	*dishwasher*		**X**	
g)	*washing machine*				*h)*	*microwave oven*				*i)*	*stereo*		**X**	
k)	*vacuum cleaner*	**X**	**X**		*l)*	*hobby equipment*				*m)*	*power tools*			
n)	*car(s)*				*o)*	*fridge*	**X**	**X**	**X**	*p)*	*freezer*	**X**	**X**	**X**

2. What appliances could you consider share with others?

	Item type	M	L	H		Item type	M	L	H		Item type	M	L	H
a)	*stationary computer(s)*				*b)*	*laptop(s)*				*c)*	*TV(s)*			
d)	*Ipad etc.*				*e)*	*printer(s)*		**X**	**X**	*f)*	*dishwasher*			
g)	*washing machine*	**X**	**X**	**X**	*h)*	*microwave oven*				*i)*	*stereo*			
k)	*vacuum cleaner*			**X**	*l)*	*hobby equipment*		**X**	**X**	*m)*	*power tools*	**X**	**X**	**X**
n)	*car(s)*		**X**		*o)*	*fridge*				*p)*	*freezer*			

3. Which aspects do you consider the most important to change in order to make your lifestyle more sustainable?

Please rank from 1 to 8, where 1 is the most important and 8 is the least important: decrease water consumption, decrease electricity consumption, decrease goods consumption, change food consumption, reduce food waste, increase composting, increase recycling, increase reuse

	Marie
1	*Increase recycling*
2	*Increase reuse*
3	*Increase composting*
4	*Change food consumption*
5	*Reduce food waste*
6	*Decrease electricity consumption*
7	*Decrease water consumption*
8	*Decrease goods consumption*
	Lisa
1	*Decrease goods consumption*
2	*Increase composting*
3	*Increase recycling*
4	*Change food consumption*
5	*Increase reuse*
6	*Reduce food waste*
7	*Decrease water consumption*
8	*Decrease electricity consumption*
	Hilda
1	*Decrease goods consumption*
2	*Increase reuse*
3	*Decrease water consumption*
4	*Reduce food waste*
5	*Change food consumption*
6	*Decrease electricity consumption*
7	*Increase composting*
8	*Increase recycling*

4. Which aspects do you consider the most important to change in order to create a more sustainable society in general?

Please rank from 1 to 8, where 1 is the most important and 8 is the least important: decrease water consumption, decrease electricity consumption, decrease goods consumption, change food consumption, reduce food waste, increase composting, increase recycling, increase reuse

	Marie
1	*Increase recycling*
2	*Decrease electricity consumption*
3	*Decrease water consumption*
4	*Increase reuse*
5	*Increase composting*
6	*Reduce food waste*
7	*Change food consumption*
8	*Decrease goods consumption*
	Lisa
1	*Change food consumption*
2	*Decrease goods consumption*
3	*Increase recycling*
4	*Increase reuse*
5	*Increase composting*
6	*Reduce food waste*
7	*Decrease water consumption*
8	*Decrease electricity consumption*
	Hilda
1	*Decrease goods consumption*
2	*Increase reuse*
3	*Increase recycling*
4	*Change food consumption*
5	*Decrease water consumption*
6	*Decrease electricity consumption*
7	*Reduce food waste*
8	*Increase composting*

5. How often do you reflect on your water consumption?

(4 = very often, 1 = not very often)

Marie	1	***2***	3	4
Lisa	***1***	2	3	4
Hilda	***1***	2	3	4

6. How often do you reflect on your electricity consumption?

(4 = very often, 1 = not very often)

Marie	1	***2***	3	4
Lisa	***1***	2	3	4
Hilda	***1***	2	3	4

7. How often do you reflect on the ecologic footprint caused by the food that you consume?

(4 = very often, 1 = not very often)

Marie	1	2	3	4
Lisa	1	2	3	***4***
Hilda	***1***	2	3	4

8. How often do you reflect on the ecologic footprint caused by the goods and products that you consume?

(4 = very often, 1 = not very often)

Marie	1	***2***	3	4
Lisa	1	2	***3***	4
Hilda	1	***2***	3	4

9. How often do you reflect on the amount of food you throw away at home?

(4 = very often, 1 = not very often)

Marie	1	***2***	3	4
Lisa	1	2	***3***	4
Hilda	1	***2***	3	4

10. How often do you compost your food waste?

(4 = very often, 1 = not very often)

Marie	1	***2***	3	4
Lisa	1	***2***	3	4
Hilda	***1***	2	3	4

11. How often do you recycle?

(*4 = very often, 1 = not very often)*

Marie	1	***2***	3	4
Lisa	1	2	***3***	4
Hilda	1	2	***3***	4

12. How often do you reuse? (Swap items with a friend/hand in for second hand retail etc.)

(4 = very often, 1 = not very often)

Marie	1	***2***	3	4
Lisa	1	2	***3***	4
Hilda	***1***	2	3	4

13. How often do you consider purchasing an item that you need on second hand, instead of new?

(4 = very often, 1 = not very often)

Marie	***1***	2	3	4
Lisa	1	2	***3***	4
Hilda	***1***	2	3	4

14. Do you tend to wash items because they are dirty or more on a routine basis?

(4 = garment dirty, 1 = routine)

Marie	1	2	***3***	4
Lisa	1	***2***	3	4
Hilda	1	2	***3***	4

15. Do you tend to buy new things because you need them (don't have it before or it has broken down) or because you want them?

(4 = item wanted, 1= item needed)

Marie	1	2	3	***4***
Lisa	1	2	***3***	4
Hilda	1	2	3	***4***

16. Do you tend to get rid of things you no longer need, or do you tend to store them?

(4 = get rid of things, 1= keep things)

Marie	1	***2***	3	4
Lisa	1	2	***3***	4
Hilda	1	***2***	3	4

17. In the future, would you consider eating less meat in order to reduce your environmental impact?

(4 = very likely, 1= not very likely)

Marie	1	2	***3***	4
Lisa	1	2	3	***4***
Hilda	1	2	3	***4***

18. In the future, could you consider lease or rent a function (e.g. a cell phone) instead of actually buying it?

(4 = very likely, 1= not very likely)

Marie	1	***2***	3	4
Lisa	1	2	***3***	4
Hilda	***1***	2	3	4

19. In the future, could you picture yourself growing parts of your own diet yourself?

(4 = very likely, 1= not very likely)

Marie	1	***2***	3	4
Lisa	1	2	3	***4***
Hilda	1	***2***	3	4

20. What is most important to you: to work eight hours a day and have more money, or to work less and have more spare time?

(4 = work 8 hours with less spare time, 1= work less than eight hours with more spare time)

Marie	1	2	***3***	4
Lisa	***1***	2	3	4
Hilda	***1***	2	3	4

21. How important is it for you to try to lead a more sustainable lifestyle?

(4 = very important, 1 = not very important)

Marie	1	2	***3***	4
Lisa	1	2	***3***	4
Hilda	1	2	3	***4***

22. How important is it for you that the society should become more sustainable?

(4 = very important, 1 = not very important)

Marie	1	2	***3***	4
Lisa	1	2	***3***	4
Hilda	1	2	3	***4***

23. Do you think it's up to individuals or up to the society to initiate change towards more sustainable behaviours in individual's homes?

(4 = societal responsibility, 1 = individual responsibility)

Marie	1	***2***	3	4
Lisa	1	2	***3***	4
Hilda	1	2	3	***4***

24. How important is the individual's responsibility to implement a sustainable behaviour at home?

(4 = very important, 1 = not very important)

Marie	1	2	3	***4***
Lisa	1	2	***3***	4

Hilda	1	2	***3***	4

25. How difficult do you think it is for you to live sustainably at home right now?

(4 = very difficult, 1 = not very difficult)

Marie	1	***2***	3	4
Lisa	1	***2***	3	4
Hilda	1	2	3	***4***

26. Mention at least one thing you do well at home regarding sustainable habits, in your opinion.

	Marie
1	*Turn off the lights when I leave a room*
2	
3	
	Lisa
1	*Eat mostly vegetarian*
2	*Recycle*
3	*Donate to and buy from second hand-stores*
	Hilda
1	*Eat very little meat*
2	*Don't consume much electricity*
3	*Recycling*

27. Mention at least one obstacle in your home environment that makes it more difficult for you to live a sustainable life at home.

	Marie
1	*Not enough space for recycling in the apartment*
2	*Time-consuming process to recycle*
3	
	Lisa
1	*Not enough space for compost and recycling*
2	*Takes a lot of time to go with public transport to work (so I take the car)*
3	
	Hilda
1	*Consumption norm*
2	*Lack of time*
3	*Lack of alternatives – would have been easier if there was access to locally produced foods and goods, freeshops etc.*

28. Mention at least one thing in the society that should change in order for you and others to live a more sustainable life.

(the design of the recycling system/long distances to centrals for hazardous waste/insufficient food labelling/long distances for handing in clothes and goods to second hand/etc.).

	Marie
1	*Too complicated to get rid of hazardous waste such as batteries, light bulbs, etc.*
2	
3	
	Lisa
1	*Easier to make the right choice at the grocery store*
2	*Better public transport*
3	
	Hilda
1	*Norms related to consumption*
2	*Societal values (e.g. definition of a 'good life', a 'developed society', etc.)*
3	*Politics – political interventions necessary*

29. Which habit that you have do you consider to be the most unsustainable, regarding your everyday life at home?

Marie	*Don't sort and recycle waste, throw it all into the waste bin*
Lisa	*Taking the car to work*
Hilda	*Consumption*

30. What is the most important thing to change about our current 'unsustainable' society, in your opinion?

Marie	*To provide people with more information related to sustainability*
Lisa	*Our consumption of food and goods. It is often difficult for the consumer to know which the good alternatives are and how your choices impact the society at large. But also to create better habits among individuals in terms of waste, recycling and composting.*
Hilda	*Norms related to consumption and wealth*

3. Interviews: Introduction

1. What does the term 'sustainable' mean to you?

Marie
- *'Something that doesn't break'*
- *Try to save resources*

Lisa
- *Sustainability and environment*
- *Can mean many things – associate foremost with environment*

Hilda
- *To do as little destructive impact as possible in relation to outcome*
- *Currently – big failure seen from this perspective*

2. What do you think of the sustainability discussion in society today?

Marie
- *Don't really hear so much about it – not so many discussions around*

Lisa
- *Discussions are held on a level which don't necessarily is related to you as an individual*
- *Either black or white*

Hilda
- *Too much focus on individuals – all responsibility is placed on individuals*
- *Happens more on a basis of personal interest than on a holistic, political level*
- *Important to have personal responsibility too, but it also explains why the society looks the way it does, in spite of all existing knowledge*

3. What does the term 'consumption' mean to you?

Marie
- *What you use or spend*

Lisa
- *Purchase products*
- *Consume items and services*
- *The way or society is structured – consumption often described as necessary, constant growth etc.*
- *A wheel which is supposed to spin faster and faster all the time*

Hilda
- *Use of resources – goes hand in hand with purchasing of items in society today (few things that you buy and keep for the rest of your life and then pass on to your kids)*

4. What do you think of the status of consumption in the contemporary society?

Marie
- *People throw away a lot of stuff and don't really care about is*
- *Get rid of things and buy new instead (e.g. cell phones)*

Lisa
- *Dichotomy really*
- *Sustainability is an important topic of discussion, with reuse and second hand, individual's habits – trendy to be aware*
- *At the same time, there is a constant encouragement to buy new products, focus on having the latest appliances, clothes, fashion – a short term buy- and then throw away- mentality*

Hilda
- *High status to consume – 'you are successful if you can consume and you are successful if you can afford unsustainable consumption'*
- *Many companies rely on products meant to be exchanged after short life spans – appliances, cars – a need to develop new products at high pace, more important than to sell durable products*
- *Status in having the newest products on the market*

5. Do you try to live sustainable?

If yes, in what way(s)? If no, why?

Marie
- *Not really*
- *Takes a lot of time*
- *Knowledge is also required*

Lisa
- *Yes, to a certain extent*
- *Know what you ought to do better*
- *Think about living sustainable*
- *Related to consumption – try to ask myself what I really need*
- *Don't buy things 'just because', don't have that as an habit – satisfied with that*
- *Food – try to buy organic*
- *Eat less meat*
- *Try to consider where production has taken place – very complex matter which is difficult to grasp as a consumer*
- *Something I have in mind – should I buy this, is there a better alternative, but you don't really know it – stand in the grocery store and reason with yourself but you don't really come to a conclusion, you just have to choose*

Hilda
- *Yes, on a very lazy level – through recycling, eat as little meat as possible, being a decent person in order to live socially sustainable – social aspects are often neglected*

6. Do you have to justify activities for yourself?

If yes, how? If no, are you conscious about these activities and potential consequences of them?

Marie
- *Yes: taking long showers, not turning of water while brushing teeth – think that soon I'll have to wash my hands, so the water needs to be running anyway*
- *Don't really think of the consequences of not doing what you 'ought to do'*

Lisa
- *Yes, human thing to do*
- *I take the car to work – I feel bad about that, especially when hearing others who take their bike or the bus, I have to reason about it even though I know why I have made the choice to take the car – it saves a lot of time*
- *Food – want to buy organic to a greater extent, it's a matter of cost – how much it is worth to spend*

Hilda
- *Yes, the whole time and related to all activities – I see that I could live much more sustainably if I moved into the forest and started to grow my own food and stop consume and stop travelling to work, BUT I would have to get rid of so many things that I'm used to and comfortable with*
- *More difficult to break these norms which are related to social security than you'd like to admit*
- *Conflict really is about the needs I feel versus a more sustainable lifestyle*
- *Also, efforts made if I sacrifice my needs won't make the difference of even one per mille – making sacrifices only on a principle level , thus making it only for your own conscience – a very high price to pay – have to live with your guilt instead*
- *Difficult to impact politically – a poorly functioning democracy which appears to be democratic can be more difficult to change than a dictatorship, where a clear structure of power exists and which you can oppose; in our society today, the power is so vague that you can't really protest or impact – stuck in momentum*

7. Do you ever think of changing activities due to them being not sustainable? What could motivate you to change?

Marie
- *Yes – not to throw things away that quickly, to recycle, to donate clothes for second hand*
- *Creature of habit – used to have recycling station quite far away, now it's really close, but still don't recycle – just haven't started*

Lisa
- *Perhaps not in an active way right now – in picking future housing or work place it is, it would have been really convenient if it was possible to take the bike to work or take an express bus*

Hilda
- *Very seldom*
- *Greater motivation needed*

4. Water and electricity consumption

1. Do you know how much water you use every month?

If not, do you know how to find out?

Marie
- *No and no*

Lisa
- *No – would call the housing host working for my landlord*

Hilda
- *No idea – perhaps by contacting the tenants-owner association, so I think that maybe I know how to find out*

2. Are you aware of your water consumption while you are doing daily activities?

Marie
- *Yes, I'm aware of the fact that I'm using water*

Lisa
- *No, I don't really think about it – the amount of water I use in the garden in the summer is insane, to grow vegetables*
- *Don't think that we use that much water*
- *Don't know much of the impact of using water, if it's worth rinsing packages in order to recycle – other than cleaning and transporting water, what impacts does it have?*

Hilda
- *Yes, I think so – I always have a bad conscience when I do the dishes*

3. Are you attempting to decrease your water consumption?

If yes, in what way(s)?

Marie
- *Yes – when I brush my teeth I realize that the water is on, and then I turn it off*

Lisa
- *No*

Hilda
- *No [laughter] – not motivated enough*

4. Is there a way to decrease your daily basis water consumption?

If yes, how? What could motivate you to do this change?

If no, why not?

Marie
- *Yes, but you need feedback on how much you consume, because it's difficult to know how much it really is*
- *To see how much is used on paper – in that case you know that you have to do something about it*

Lisa
- *Yes, I can take shorter showers – not stand in there to get warm*
- *Other than that, I don't really think that I waste water – I use it for cooking, washing, doing the dishes (dish washer)*
- *To know more of the consequences of using the water – it's not that fun to take showers*

Hilda
- *Yes, there are – doing the dishes in a more reasonable way (not under running water), taking shorter showers*
- *To be better on it – I feel that I'm bad on doing the dishes without running water, could need a course on the subject or something*
- *Think of hurrying while you shower*

5. How could it be easier for you and/or others to consume less water?

Marie
- *A clearly visible meter on the wall*

Lisa
- *More knowledge – not really something that I'd need assistance with otherwise*
- *Efficient dishwashers*

Hilda
- *Products which are using less water*
- *Consumption of products which demand less water during production – avoid meat, e.g.*

6. Do you know how much electricity you use each month?

If not, do you know how to find out?

Marie
- *No*
- *Yes, in the electrical bill and all you have to do is look – but I haven't done that*

Lisa
- *No*
- *Check the electricity bill – and if I don't understand it, I'd call my energy supplier*

Hilda
- *No, no idea*
- *Contact my supplier of electricity*

7. Are you aware of all appliances that you use and when you use them?

Marie
- *Yes*

Lisa
- *To a certain extent – don't really think about it*
- *Don't make aware decisions but know of consequences*
- *Habits which have been taught – I'd never boil water in a pot without a lid on, but I blow-dry my hair when it perhaps isn't necessary*

Hilda
- *No, I don't think of that – I know it, but I don't reflect on it*

8. Are you attempting to decrease your electricity consumption?

If yes, in what ways?

Marie
- *Yes, in a way – by turning lights off and pull out plugs*

Lisa
- *No*

Hilda
- *No*

9. Is there a way to decrease your average-day electricity consumption?

If yes, how? What could motivate you to do this change?

If no, why not?

Marie
- *Yes, I put on the TV for company when I get home, not really necessary*
- *You don't have to turn on the lights in a room every time you enter it*

Lisa
- *Yes, use less appliances – the computer for example, less lamps lit*
- *Perhaps if my bill could be much smaller or if I found it unjustifiable to use as much electricity as I do*

Hilda
- *It always does… but not that much*

10. How could it be easier for you and/or others to consume less electricity?

Marie
- *Could be timers in apartments which turns appliances of – often computers and TVs are on all night long*

Lisa
- *Technology – look what can be done with LED for example*
- *Live in an apartment, but perhaps if you live in a detached house it would be easy to measure in order to impact, and also to see what impacts the most*

Hilda
- *More energy-efficient appliances, perhaps*

5. Goods and food consumption

1. What do you think of the relationship between consumption and well-being?

Marie
- *Status proving that you're doing good when you can afford to buy stuff*

Lisa
- *You are happy after purchasing something, even though you don't should be or want to [laughter]*
- *It's a certain feeling when you buy a pair of new shoes, e.g. – the package, the experience of something new*
- *Satisfying but perhaps not in accordance to one's moral guidelines*

Hilda
- *Societal construction*
- *Self-enforcing idea caused by norms*

2. Do you mostly plan what to purchase, or do you buy on impulse?

Marie
- *Mostly buy on impulse – you see something that you want, and then you buy it*

Lisa
- *Plan most of purchases, not so much spontaneous shopping*
- *Use to live more central, now further away – planning more necessary than before*

Hilda
- *Buy on impulse – at all almost all times*

3. What do you take into consideration before purchasing an object?

(organic/Fair Trade/grown nearby/price etc.)

Marie
- *'Do I need this? No, but I'll buy it anyway' – a matter of rewarding yourself*
- *Organic and Fair Trade sometimes*
- *Quality and price*

Lisa
- *Depends on the type of product*
- *Sweater – is it that type of sweater that I want? What are the options? Do I need a new sweater? How much do I want to spend on it?*
- *Quality*
- *Organic – bonus (especially on basic garments – can consider to spend some more on organic alternatives)*
- *Don't really consider if it's produced nearby, but choose garments from brands known to be Swedish, with good quality and sound methods of production*
- *Fair Trade a bonus*

Hilda
- *If it is well-fitting and if I like it when I wear it*
- *Evaluate if I want to buy it or not*
- *Don't really consider if it's ecologic, produced nearby etc. – just a bonus if it is*
- *Also animal testing*

4. Do you consider the ecological footprint of the item before purchasing it?

Marie
- *No (hadn't hear the term before)*

Lisa
- *Yes – Product origin*
- *Type of materials used – brief analysis, but perhaps not a LCA*

Hilda
- *No, not really*

5. Do you deliberately try to decrease the ecological footprint caused by your consumption?

If yes, in what way(s)?

Marie
- *No*

Lisa
- *In terms of food, yes – other products are more difficult*

Hilda
- *No*

6. Do you buy objects on second hand?

Why/why not? What types of objects?

Marie
- *No*
- *Status thing to buy items new and not used*
- *Also related to habits*

Lisa
- *Yes – fun and sound*
- *Furniture, china, lamps, table cloths, purses – not so much clothes, even though I'd like to buy more clothes on second hand*

Hilda
- *Sometimes, yes – mostly because things look good*
- *Items for the home*

7. Do you do any attempts of consuming less?

If yes, in what way(s)?

Marie
- *No*

Lisa
- *Perhaps not in a radical way – but I do question if I should by something or not*
- *Don't see myself as somebody who's consuming lots of products – and that feels good, because once you've started it's easy to just continue buying*

Hilda
- *No, I don't*

8. How could it be made easier for you and others to consume more sustainably?

Marie
- *To have more knowledge about the consequences of consumption*

Lisa
- *To dare to talk about consumption, to discuss how it could be possible to have a society different from today, without consumerism*
- *Matters which aren't really discussed because or society is built on constant growth*

Hilda
- *Political interventions – laws and regulations on a product level, regulations related to consumption, laws changing societal norms – many persons don't wish to do illegal acts, so if laws are changed, it's likely that behaviour will change too, and new norms will be accepted*

9. What do you consider when you buy food at the store?

(organic/Fair Trade/grown nearby/price etc.)

Marie
- *Quality and price*
- *Buy organic sometimes, but often it's more costly, the range of products are smaller, and the food looks less good*
- *Buy Fair Trade sometimes – more that I happen to choose that type of products*
- *Don't really look for products produced nearby*

Lisa
- *Taste*
- *Be able to feel full*
- *Make lunch boxes*
- *Buy fresh or frozen, now or another day*
- *Brands*
- *Organic*
- *Grown nearby – mostly related to vegetables*
- *Seasons – what's suitable to buy right now*
- *Fair Trade a bonus*

Hilda
- *If it contains meat or other animal products – sometimes I do buy that, but mostly not, buy vegan or vegetarian alternatives instead*
- *Sometimes I buy organic too – if I get a feeling*
- *Fair Trade and food grown nearby also if I get a feeling, but more seldom – especially where an item is produced is something I rarely consider*

10. Do you consider the ecological footprint of a food product before you purchase it?

Marie
- *No*

Lisa
- *Yes, to a certain extent – no thorough analysis*
- *You make a statement when you make a choice*

Hilda
- *Only marginally*

11. Do you deliberately try to decrease the ecological footprint of your food?

If yes, in what way(s)?

Marie
- *No*

Lisa
- *Yes – try to buy more and more organic food, great to see that both the range of products and the price are getting better and better, making it easier to choose organic products*
- *Important to use consumer power and support alternatives that you like*
- *Don't eat meat during weekdays, mostly due to ethical issues but also because of environmental aspects*

Hilda
- *Only marginally*

12. What could motivate you to eat more:

a) vegetarian b) locally produced c) organic d) Fair Trade

Marie
- *Already eat vegetarian sometimes – more knowledge of the impact of eating meat*
- *Better labelling – how do you know if something is produced nearby*
- *Knowledge – what is organic really? It can't be twice as expensive, and there must be a wide range of goods*
- *Price*

Lisa
- *Eat vegetarian five days a week already – if meat was even more expensive than it is today we'd consume even less*
- *More clear labelling*
- *Information on when it is the best choice – not always the case*
- *Prices*
- *Information – sometimes when you hear information on how conventional food is produced (pesticides and what impact it has on workers on the field), you feel like you have to choose organic alternatives*
- *Some products I'd never buy unless they were organic – orange juice*
- *Must be many products with the same kind of problems that you just don't know of – wonder how you'd buy if you knew about it*
- *Don't know – feels as if that labels isn't used as much*
- *Not always a choice between Fair Trade or not Fair Trade but other aspects*

Hilda
- *Eat mostly vegetarian already – 95 % of all dinners for example (with a great percentages being vegan too – you can change your diet a lot by having vegans as friends)*
- *A greater variety of vegetarian food on restaurants – often there I eat meat*
- *A wider range of locally produced, organic and Fair Trade products in stores and restaurants*

13. Do you grow any food yourself?

Why/why not?

Marie
- *No – not enough space (live in apartment), not enough time, interest*

Lisa
- *Yes, during summertime – different each year, but I grow lettuce, beans, tomatoes, herbs, chili, and perhaps some things which are more for fun such as beetroot and onions*

Hilda
- *No – not good enough preconditions (access to space), though some access exist, lack of time and low motivation*

14. Do you pick any wild-growing food in nature or make use of e.g. apple trees in parks?

If yes, which types? If no, why?

Marie
- *No, but I pick apples in my parents yard when the threes there have apples*

Lisa
- *Pick berries spontaneously occasionally, elder flowers, mushrooms*

Hilda
- *Very seldom – sometimes berries and mushrooms*

15. How could it be made easier for you to consume food in a more sustainable way?

Marie
- *Plan meals better*
- *Don't really cook a lot at home – throw away spoilt vegetables*
- *Less spontaneous purchase of food*

Lisa
- *More knowledge about what's sustainable, both in the store but also in composing a meal*
- *To get assistance to know what's in season*
- *Labelling – easy to understand and visible – but not too much information (difficult to balance those aspects)*

Hilda
- *Political interventions*

6. Food waste, composting, recycle and reuse

1. Do you deliberately try to avoid throwing food away?

Marie
- *Yes, try to cook based on leftovers*

Lisa
- *Yes, try to use what I have bought, save leftovers for use in another dish, plan meals so the right amount of food is bought*

Hilda
- *Yes*

2. How much food do you estimate that you throw away on an average week?

Marie
- *Not so much – don't eat that much at home*
- *Buy just before eating – not getting spoilt*

Lisa
- *Don't really know – difficult question to answer*

Hilda
- *Some vegetables that have been spoilt, canned products turned bad, or dairy products that have become too old*
- *I usually finish what I cook – mostly groceries in the fridge which I don't have time to do something with that I have to toss away*

3. Do you ever plan what to eat based on groceries turning old in your fridge/pantry?

Marie
- *Yes*

Lisa
- *Yes, if it's something which can be used as a basis for a meal – perhaps not if it is half an onion*

Hilda
- *Very seldom*

4. Is there any way to decrease your food waste rate?

If yes, what could motivate you to actually decrease your food waste rate?

Marie
- *Plan more, but don't really throw that much away*

Lisa
- *Try to plan meals to an even greater extent*
- *Shop food on a weekly basis – not as flexible but enables planning*
- *Usually know how much to buy and how much gets eaten – not that much waste*
- *Don't really know what could motivate a change – up to me to take care of (perhaps by seeing horrible numbers of the amount of food people throw away each year)*

Hilda
- *Buy even more frozen products and dry goods – but I already do that*
- *Difficult question – don't really know*

5. Are you composting on a regular basis?

If yes, how often? If no, what could motivate you to compost regularly?

Marie
- *No – not enough space in the apartment*
- *Don't generate that much compostable waste*

Lisa
- *If we have large amounts of compostable waste at once*
- *Don't always have a bag for compost*
- *If I had more space – the space is very limited and now I have to choose between recycling or compost*
- *Would have been great to compost – easy to access compost bags, good container, short distance to compost collection point*

Hilda
- *No – have too little compostable waste to make it worth the effort, it just starts to rotten*
- *If I had more compostable waste*

6. How could it be made easier for you and/or others to compost?

Marie
- *Currently lack of space in apartment*
- *Better access to composting station*
- *Perhaps a design solution for compost and recycling, to make it fit*

Lisa
- *Maybe if the kitchen containers were better designed, more information was available*
- *If composting was more of an command – it's very easy to just continue doing things the way you've always done*

Hilda
- *More convenient ways of composting – if I could have just thrown the compostable material into a pipe and that pipe would have led to a compost, I would do that*

7. Do you recycle on a regular basis?

If yes, which types of products do you recycle? If no, what could motivate you to recycle?

Marie
- *No*
- *Have to take care of hazardous waste*
- *Recycling complicated and time-consuming*

Lisa
- *Yes – always glass and metal*
- *Most often plastic packages, unless they are too greasy*
- *Cardboard packages and newspapers*

Hilda
- *Yes, I do – plastic, cardboard, metal, glass, paper, batteries*

8. How could it be easier for you and others to recycle?

Marie
- *Better access to recycling points*
- *Less complicated*

Lisa
- *I think the problem is that people are lazy – recycling stations often good and nearby*
- *Maybe if there were better space in apartments, with containers of better design, making it very easy to recycle and you don't have to do that much yourself*

Hilda
- *If it was closer to a recycling facility, like in the courtyard outside my house*

9. Do you reuse?

If yes, what type of objects? What motivates you to reuse? If no, what could motivate you to reuse?

Marie
- *Not really*
- *Put used clothes in bags and my mother donates it to second hand*
- *Otherwise I'd have to have a car – difficult to drag things around on the bus*

Lisa
- *Varies*
- *Like to go to flea markets, especially in the summer*
- *Don't donate items very often, store them before giving it to Emmaus or Myrorna perhaps twice a year*
- *Fun*
- *Make bargains in another way*
- *Feel satisfied in another way than when you buy something completely new – bought in a sustainable way, more unique items, value of the item will sometimes be the same for a longer period of time in comparison with a brand new product, if you buy something of a good quality which was produced in the 1950s it feels good*

Hilda
- *Not that often, but sometimes I reuse clothes, glass jars, and tin cans*
- *Inspiration, time and know-how – could be fun to adapt items for new usage*

10. How could it be made easier for you and/or others to reuse?

Marie
- *If somebody could come and pick it up*
- *Don't have to do things yourself*

Lisa
- *Perhaps not for me as for others, but I feel like many people don't really know that it is possible to donate things for charity, for example at the recycling central*

- *Many items which people just dump at the recycling station they could donate at the recycling central*
- *Hype events such as flea markets*

Hilda
- *More know-how and inspiration*

7. Clothes washing

1. How often do you wash?

Marie
- *Once a month*

Lisa
- *Once a week*

Hilda
- *Every to every second week*

2. How much do you wash at a time?

Marie
- *4 full loads*

Lisa
- *3 full loads and one half-full, the latter is washed on a program for small loads*

Hilda
- *Between 3-5 loads*
- *Mostly the machine is full, but one load is often equivalent to half of the capacity or less – use washing program adapted for smaller loads*

3. Do clothes and textiles have to be dirty (e.g. stained) in order for you to wash them, or do you occasionally wash them anyway? Why?

Marie
- *Most often dirty, but if there is room left in the washing machine, then I fill it with clothes which may be not as dirty*

Lisa
- *Wash on routine many times*
- *Try to smell on garments such as cardigans to see if they smell like sweat or wardrobe*
- *Garments worn close to the body such as sleeveless shirts more washed on routine*

Hilda
- *Always dirty – smelly*

4. How do you generally dry your clothes?

Marie
- *Tumble drier/ drying cabinet*
- *Small drying rack in the apartment*

Lisa
- *Tumble drier and drying cabinet*

Hilda
- *Dry tumbler and drying room*

5. Are you doing aware measures to lessen your environmental impacts caused by your washing?

If yes, how?

Marie
- *Wash only full loads and when there's a need*

Lisa
- *Dose detergent properly*
- *Try to use the drying cabinet as much as possible – believe that it's more energy efficient than the tumble drier*

Hilda
- *No*

6. How could it be made easier for you and others to lessen your environmental impact caused by washing and drying?

Marie
- *Don't know really – could be built-in drying racks in all apartments*

Lisa
- *Dosing of detergents should be better and easier – either that the package was assisting you more or something else*
- *It is too easy to just pour detergent into the washing machine without actually knowing how much you need for the current wash load*
- *Inform about proper detergents for different types of water*

Hilda
- *Longer time for drying clothes in the laundry room*
- *Less harmful laundry detergent*

8. Conclusions

1. Do you think that a point can be reached when one could/should feel satisfied with one's efforts to live sustainably?

Marie
- *Yes, there should be a limit – the whole life can't revolve around sustainability*
- *Can't be the main focus in life*

Lisa
- *Yes, must feel satisfied with what you do yourself in order to continue to try to live sustainably*
- *Should also try to do your best to do even more*
- *Perhaps not with the society at large*

Hilda
- *Only in a theoretical way*
- *To live in the forest and not consume anything – well, doesn't really matter where it is but it's a mental image*
- *Even if you'd only buy organic products, eat vegan, use measuring cups for detergents or wash as seldom as possible , even if you maximise all those aspect while at the same time living a normal life – it wouldn't make a difference*
- *It would me a matter of principles, to manifest your opinions through actions – more of a statement than anything else*
- *At the same time, things you do have an impact through influencing the people around you*
- *If all would live this way, it would make a difference*
- *If you actually feel satisfied with your efforts to live sustainably, you in several ways are denying some of your responsibilities of impacting the environment in a harmful way, but at the same time, you have to realize that if you were to live sustainably you'd have to pay a very very high price which may not be reasonable to pay on an individual level*

- *On a philosophical level of thought: The ultimate responsible behaviour would be to become extremely politically active (lobbyism) or an activist performing sabotages – than you can feel satisfied*

2. In your opinion, do people try to live more sustainably today and in what way(s)?

Marie
- *No – most people probably don't think on what you could/should do*

Lisa
- *Depends on which period of time you compare with*
- *I think so, but I also think it's not happening that much anymore – there are discussions but not much more than that*
- *Many live isolated from the societal debate – easy to prioritise themselves and their time without recycling or putting any thoughts on sustainability*

Hilda
- *Yes, on a semi-lazy level – people talk about sustainability, spread knowledge about it, try to make some efforts on an individual level*