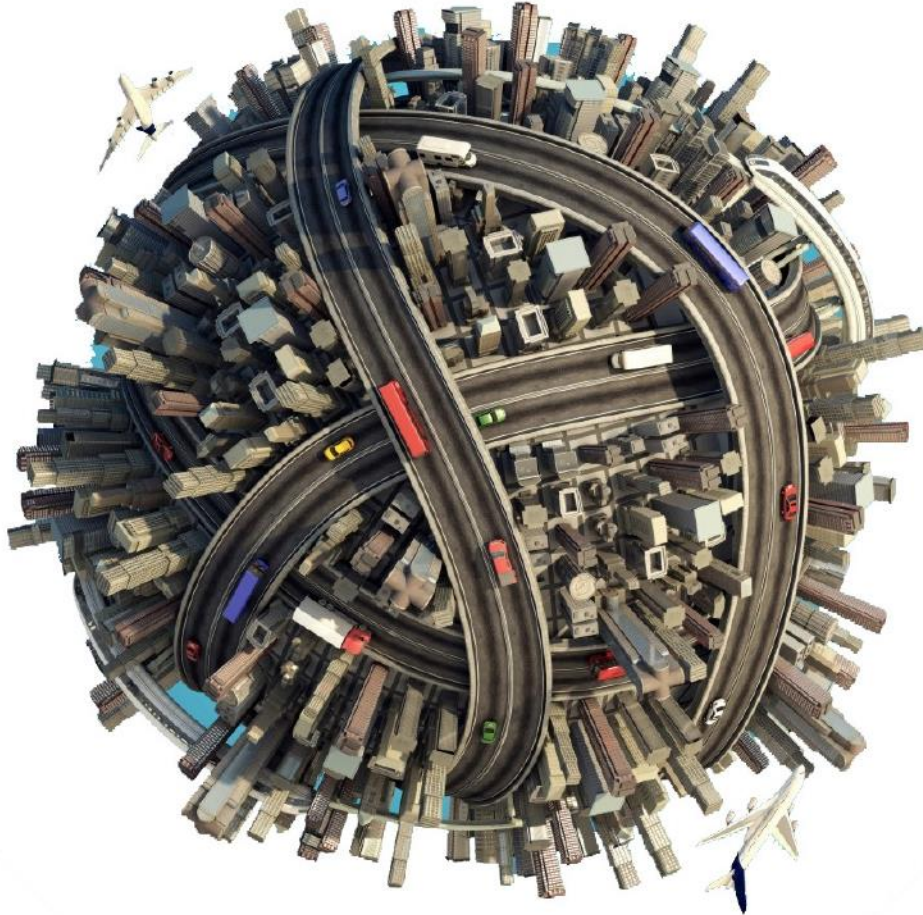


ICT's Role in Promoting Sustainable Urban Lifestyles

- The case of Stockholm Royal Seaport



**Tanmoy Bari,
Mohammed Al Abassi**

25/02/2014

KTH, Department of Urban Planning and Environment
Division of Urban and Regional Studies
Kungliga Tekniska Högskolan

Supervisors: Tigran Haas, KTH; Agneta Persson, WSP

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Acknowledgement

We would first and foremost like to thank our supervisors without whom this research could not have been carried out. Our supervisor at WSP, Agneta Persson, offered endless support and guidance throughout the process for which we are very grateful. We also greatly value the feedback and guidance from Tigran Hass, our supervisor at KTH, who from the start offered his help and knowledge.

We would also like to thank our colleagues and classmates at WSP and KTH as well as our friends and family for their support.

Lastly we wish to thank everybody who offered their time and knowledge, particularly the interviewees, and whose input has been invaluable.

Abstract

The starting point for this report has been to study the potential benefits ICT technology can have in promoting sustainable lifestyles and a special focus has been put on the new eco-district the Stockholm Royal Seaport. We have studied the work being done at the Stockholm Royal Seaport and especially the ICT research projects. We have further studied what sustainable lifestyles entail and also how technology can be used in a persuasive manner to change attitudes and behaviour. Based on all this we have compiled the ICT solutions most suitable for promoting sustainable lifestyles and incorporated these into a new Smart City SRS Concept. In the Smart City SRS Concept we discuss what actions need to be taken to implement the suggested ICT solutions into the Stockholm Royal Seaport and also what actors would need to be involved.

I. Introduction

Introduction

For the first time in human history, urban areas now house a majority of the earth's population (World Health Organization, UN-Habitat, 2010). This is a rather new phenomenon as up to the beginning of the previous century only 2 out of 10 people lived in cities throughout the world. This explosion in cities' populations have undoubtedly brought with them certain challenges but the concentration of people living and working in close proximity to each other also entail some widely acknowledged potential benefits, especially pertaining to the pressing global environmental issues. To achieve increased environmental sustainability it is therefore urban areas that should, and indeed do, draw the most attention.

Stockholm has gained a reputation internationally as being in the forefront for sustainable urban development and is being visited and studied by decision makers from all over the world. This reputation started growing with the new Hammarby Sjöstad eco-district, where construction began in the 1990s, and has deliberately and continuously been nurtured to promote both the city and a wide array of Swedish clean-technology products (Olsson & Metzger, 2013). The city has recently begun construction of the new vast eco-district Stockholm Royal Seaport (SRS), planned to have an even greater environmental sustainability profile than Hammarby Sjöstad and thus becoming the new showcase district in the export of the Swedish Sustainable City model. To reach the ambitious environmental goals set for the city district, ICT has been highlighted as one of the potential solutions and will therefore be installed in buildings to offer residents and businesses a number of advanced ICT services (City of Stockholm, 2010).

This report studies the ICT services that can be offered in Stockholm Royal Seaport as a tool for residents to use for decreasing their environmental impact. We also analyse how these can be developed or designed to promote their continuous use as a natural part of the residents' everyday lives.

Aim and objectives

Aim

The overall aim with this paper is to study the possible benefits ICT-technologies can bring in promoting a sustainable lifestyle to achieve ecological sustainability. The focus will lie in finding ICT-technologies suitable for the Stockholm Royal Seaport and give recommendations on how these can be implemented. The main objectives will be to compile ICT-solutions facilitating sustainable lifestyles that are currently being developed in Stockholm Royal Seaport as well as in other parts of Sweden and internationally. We will also analyse what a future sustainable lifestyle would look like. Based on this we will create an ICT concept for the SRS with the most suitable solutions and analyse what actors would be involved and their respective roles. Finally we will also study potential business opportunities for consultancy firms in implementing the presented ICT solutions in the SRS.

Problem formulation

It is widely accepted that the way we live in the richer parts of the world is unsustainable as we consume too much of non-renewable resources and release too many harmful substances into the nature. We are consuming resources in a too fast rate for ecosystems to regenerate themselves and we are releasing more CO₂ than the ecosystems can absorb (WWF, Zoological Society of London, Global Footprint Network, 2010). Cities are vital components when wanting to combat these negative trends as they are already the source for 80 % of CO₂ release, a figure that will grow if nothing is done considering the expected rapid increase of cities' populations. Cities however also present unique potential benefits, especially originating in the comparatively dense concentration of people enabling for more efficient use of resources and requiring a decreased need for travel.

Europe is very much affected by negative unsustainable trends such as a reduction in the size of the average household¹, increased meat import, increased car ownership and high energy use etc. (Backhaus, et al., 2011). A major contributor to energy use is housing where for example 67 % of households' energy consumption in the 27 European Union members goes to heating.

Regardless of what measures are being taken to increase environmental sustainability these most often hinge on the ability to achieve a change in peoples' behaviours and attitudes. This is a very complex task requiring extensive research but is vital for achieving the environmental issues. What needs to be solved is how to enable and persuade people to adopt more sustainable lifestyles without infringing too much on their freedom of choice or their quality of life.

Sweden is, for all its promotion of sustainable development and ecological sustainability, still not exempt from these negative trends. Even though the work done by policy makers and decision makers in Sweden, in regards to raising climate and environmental public awareness and implementing solutions combating the negative trends, is commendable there always needs to be a critical analysis of the virtues of these actions. Hammarby Sjöstad was for example hailed as a great solution to many of the environmental issues and it was believed that the residents in the area would lead more sustainable lifestyles with a low environmental impact. This aim has however yet to be fulfilled, as the average energy impact of households in Hammarby Sjöstad does not differ greatly from the Stockholm average and even, in some cases, exceeding it (Wangel, 2013).

¹ Smaller households means less efficient use of resources and energy, and thus greater environmental impact

The environmental issues are addressed in the ambitious Stockholm Royal Seaport in a different way where the need for an ICT infrastructure in the neighbourhood is an especially visible difference that gives the project some conditions that did not widely exist in Hammarby Sjöstad. ICT measures have a great potential for acting as solutions to environmental issues but they will only be effective if they are widely accepted by the intended users. That showcases the need for the measures to be non-obtrusive and easy to use.

Based on the great potential for ICT-solutions to contribute to environmental sustainability and the dedication of decision makers to use these in the Stockholm Royal Seaport district we have looked into greater detail about how these can be implemented. Our starting point was the following main research questions;

- What are the probable future sustainable lifestyle scenarios for the Stockholm Royal Seaport?
- In what way can ICT be incorporated throughout the Stockholm Royal Seaport to promote environmentally sustainable lifestyles?
- What are the main stakeholders that will need to be involved in implementing ICT in SRS and how do these cooperate?

Methodology

This section contains a brief discussion of the chosen methodology and the reasons for this choice to answer our research questions. This gives the reader a clear understanding of the reasoning behind the chosen methods and their feasibility for this study. To increase the reliability of the results a number of methods were chosen to give a more nuanced image. The chosen research method has been qualitative to better understand the dynamic between different actors and the issue at large.

Firstly we describe the kind of literature chosen for the study. A literature review was made on relevant topics of sustainable lifestyles, persuasive technologies and smart cities. A description is then given regarding the choice of interviews as a research method and the chosen interview persons. Interviews were made mainly with stakeholders in Stockholm Royal Seaport and researchers connected to the research projects in SRS. The section continues with discussing the choice for attending a smart city exhibition. A delimitation description concludes this section.

The theoretical framework for sustainable lifestyles came mainly from two extensive studies on different scenarios for a sustainable living in 2030 and 2050. These scenarios were analysed and compiled, together with results from interviews, into a number of guidelines for sustainable lifestyles. A literature review, internet search, study of SRS research projects and a visit to a Smart City Expo formed the base for the choice of the ICT solutions that had the potential to promote sustainable lifestyles. A concept was then formed based on these solutions, the literature review and interviews.

Literature

The literature chosen for this study consisted of books, scientific articles and research papers mainly on the subjects of persuasive technologies, ICT's connection to environmental sustainability, sustainable lifestyles and smart cities. The literature was chosen on an international basis to give a broad understanding of the latest being done in the field of ICT and environmental sustainability. These formed the base for the study's theoretical framework. Numerous policy papers regarding the

SRS project were also studied to give a clear understanding of the reasoning from the city of Stockholm behind the new environmentally friendly neighbourhood.

Interviews

Open and not too structured interviews were chosen as a research method to allow us to delve further into the issue and understand the complex dynamic between the different actors that are involved. A number of questions had been formulated beforehand but a large part of the interviews took the form of open discussions to allow a deeper understanding of the interviewees opinions regarding our research questions and to allow for a better adaption to the responses given. An explanation of our research was given beforehand to allow for the interviewees to be prepared. The chosen interview persons are grouped into categories and presented below:

- Representatives from the city of Stockholm
- Representatives from utilities and the Swedish tech industry
- Researchers connected to the SRS research projects
- Representatives from Swedish government agencies dealing with sustainability issues

From the city of Stockholm we interviewed a planning architect and the environmental coordinator responsible for the SRS. This was to study the city of Stockholm's view on ICT as a potential for improved environmental sustainability and their work with implementing in the SRS. We also wanted to understand the potential benefits and difficulties they perceived.

Representatives from ABB and Fortum were interviewed as both of these companies had been involved in SRS and especially the research project of the "Active House" where the impact of the lifestyle of a test family in terms of environmental sustainability caused by extensive ICT solutions in the home was studied. We wanted to understand the views of these kinds of actors' on the same issues to understand how they viewed the role of ICT in future cities and how the interactions with other actors would look like.

Numerous researchers involved with the SRS research projects were interviewed. They represented universities such as the Royal Institute of Technology (KTH) and the Stockholm University but also independent companies and institutes. These were interviewed to give an understanding of the latest research and especially of how they perceived the role of ICT in the future of the SRS.

A representative from the Swedish Environmental Protection Agency was interviewed to better understand the concept of sustainable lifestyles and the importance for these in the future of Sweden. This functioned as a complement to the literature review of sustainable lifestyles.

Many of these interviews functioned more as guiding elements in our research and as such they are not explicitly listed in the paper or in the references. The reasoning was that we wanted to interview a wide array of people informally to give us a picture of the ICT landscape and the possibilities this field could have, something which we did a further analysis of in the paper.

As the result of any research is very much dependent on the chosen method it is important to assess whether the choice was a good one or whether a different method had been more suitable for answering the research questions. The choice of mainly qualitative research methods for this paper was the most suitable choice due to the nature of our research questions. As the research questions were largely explorative, interviews with relevant interviewees was a good method for answering

them. An improvement that could have been made and that would probably have improved the results is the interview sequence. It would have been better to group the interviewees into similar fields of expertise and conduct the interviews accordingly. This is because the answers of certain interviewees opened up new questions that could have been best answered by people which had already been interviewed and did not have time for new interviews in a reasonable amount of time. This would however have been difficult to organize so that we still could interview all the people in the timeframe for our research.

Smart City Expo

A visit to the Smart City Expo 2013 in Barcelona was done as a way to keep track of the latest ICT solutions and their connection to environmental sustainability. It was also done to understand the actors and their views on the implementations of their solutions in cities.

Delimitation

A delimitation that had to be made in this research is that the environmental impact caused by the ICT industry has not been considered. There are several research papers indicating that the potential environmental benefits by ICT far outweighs its potential negative effects but this discussion has been deemed to not be of major importance for the specific purpose of this paper. Nor have we considered other negative aspects of ICT technology such as social exclusion or exclusion based on age. There are those who argue against a wide-scale adoption of new technologies as these can work to exclude certain groups from the population. This is however a complex discussion not directly linked to the aim of this paper and since the implementation of ICT into the SRS has been deemed an important strategy we have chosen to not discuss this further.

We have also excluded ICT solutions which work mostly with automation as the focus of this paper has been on ICT solutions that promotes sustainable lifestyles and thus implies behaviour change. Furthermore, we have not studied the so called rebound-effect of measuring energy consumption which, according to some studies, indicates that energy efficiency measures can lead to increased energy consumption.

Reading Guidelines

This research paper is divided in five main sections.

Section I contains the introduction, problem formulation, aim and methodology.

Section II presents the literature review that has been done and gives an understanding of relevant theories and definitions. It presents the main topics that the research paper is based on.

Sections III presents the context for the chosen research area of Stockholm Royal Seaport, the visions for it and relevant research projects that have been carried out or are in progress.

Section IV contains the results and is divided in three main parts.

In the first part we present an image of sustainable lifestyles in the future based on both the literature review and interviews. The sustainable lifestyles are divided in five main categories and each category is concluded with a list of guidelines for a sustainable lifestyle.

The section continues in the second part with a collection of ICT solutions from throughout the world that promote a sustainable living. The solutions are chosen based on the guidelines from the previous section and grouped into concepts.

The third part presents the Smart City SRS Concept which we developed and which is based on sustainable future lifestyles and suitable ICT solutions. The section further presents an analysis of the potential gains and losses for affected actors.

Section V contains a discussion of results connected to section IV and a way forward.

II. Literature review

To be able to answer our research questions it is important to understand the current research that has been carried out in specific areas and concept that relate to our study. The areas of interest that have been identified are Sustainable Lifestyles, Smart Cities and Climate Persuasive Technology (e.g. ICT). A literature review of the relevant subjects and concept therefore follows.

Sustainable lifestyles

The concept of sustainable lifestyles in the field of urban planning and design is a relatively new one and there is therefore no extensive academic research on which to rely upon when wanting to define it. It can be linked back to the concept of sustainable development, which itself was defined in the UN commissioned Brundtland Report as *“development that meets the needs of the present without compromising the ability of future generations to meet their own needs”* (United Nations, 1987). Sustainable development was further clarified and developed as a concept in the corresponding report of several UN commissions and conferences that followed (Bratel, 2012). These were Agenda 21 in Rio de Janeiro, Brazil in 1992 and the Johannesburg Declaration in Johannesburg, South Africa in 2002.

During the World Summit on Sustainable Development (WSSD) in Johannesburg in 2002, sustainable consumption and production was recognized as an essential part of sustainable development and a 10 year framework of programmes was called for to accelerate a shift towards it (UNEP, 2011). The Marrakech Process, a UN global process, was launched in 2003 as an answer to this call. It in turn launched seven task forces divided between seven countries to reach the goal of sustainable consumption and production, one of which was Sustainable Lifestyles. The task force for Sustainable Lifestyles was set up by the Swedish Ministry of the Environment with the stated role to *“engage, exemplify, enable and encourage people, civil society organizations and governments to further sustainable lifestyles”* (Swedish Ministry of the Environment, UNEP, 2005).

The description given by the task force is that sustainable lifestyles imply a rethinking of the way we lead our lives, from the way we consume products and energy to the way we interact with our community (Swedish Ministry of the Environment, UNEP, 2005). Lifestyles are a way for ourselves to form our identity and connect with other people and it has social, cultural, political and economic aspects. The need for such a task force, aiming at understanding how we can achieve sustainable lifestyles, indicates that our current way of life is unsustainable. This is especially true for the developed world where it can be said most people lead unsustainable lifestyles that cannot be sustained in the face of the increasingly pressing environmental issues threatening our planet. We are for example today globally exceeding the world's bio capacity by more than 50 %, a figure expected to reach 100 % by year 2030 meaning we, theoretically, will need two earths to sustain our lifestyles (WWF, Zoological Society of London, Global Footprint Network, 2010). There are several other indicators pointing to the unsustainability of our lifestyles.

The explicit definition used by the task force is the one that is most commonly used and which comes from a research paper written at the University of Westminster:

“Sustainable lifestyles are patterns of action and consumption, used by people to affiliate and differentiate themselves from other people, which; meet basic needs, provide a better quality of life,

minimise the use of natural resources and emissions of waste and pollutants over the lifecycle and do not jeopardise the needs of future generations” (Bedford, et al., 2004).

The research paper further concludes that a change in lifestyles is necessary but that people will object to any changes perceived to reduce their quality of life. The changes therefore need to incur minimal inconvenience and cost for them to be accepted, the authors cite the wide spread of recycling as a positive example.

The task force however also acknowledges the possibility for this definition to change, noting that it is important to consider changes to the concept of sustainable lifestyles that will be brought forth by business leaders and entrepreneurs. This opens up for a discussion of what constitutes a sustainable lifestyle and how the concept can be adapted to countries’ and cities’ different conditions.

Discussing lifestyles or advocating for a certain lifestyle over another has long been a sensitive subject as it can often time be too subjective and ideological for it to be incorporated into public policy, as explained by the task force. Despite this there seems to be a general consensus that this is a vital discussion to have as a solution to the environmental issues facing us is difficult to envision without a changing of attitudes and behaviour towards a more sustainable lifestyle.

A European project, funded by the European Commission, entitled “*SPREAD Sustainable Lifestyles 2050*”, further addresses these issues mainly from a European context. They identify four main “*lifestyle impact areas*” which are consuming, living, moving and health and society (Backhaus, et al., 2011). The expressed goal is that the shift to sustainable lifestyles in 2050 will not require consumers to always be aware of the environmental, economic or social impacts of their consumption or behaviour. It should instead be the norm that these will be sustainable making it very effortless for individuals to lead a sustainable lifestyle (Backhaus, et al., 2011).

Smart Cities

A common and increasingly used term is “Smart City”. Similar names are digital, cultural, creative and intelligent cities. But they all share the common elements of citizens, technology and community as the core of the concept. Lövehagen et al. defines Smart City as “a city that meets its challenges through the strategic application of ICT goods, network and services to provide services to citizens or to manage its infrastructure” (Lövehagen & Bondesson, 2013). A city can be considered as smart when ICT services are in use, when ICT infrastructure is implemented and when the knowledge of its use exists.

Smart Homes is a key component of smart cities and an increasingly common ICT service with necessary functions and infrastructure to provide services to its user. There are numerous definitions of smart homes; it is for example defined by the DTI Smart Homes Project as “A dwelling incorporating a communications network that connects the key electrical appliances and services, and allows them to be remotely controlled, monitored or accessed” (King, 2003). Blumendorf adds that smart homes work proactively and autonomously through artificial intelligence (Blumendorf, 2013). He further states the aim of smart homes as being the simplification of processes and routines in everyday life, contribution to independent living for elderly and disabled people and a decrease of resource use. But he claims that technical solutions are not enough and may cause more problems than they actually solve. The key is changes in user consumption and behaviour patterns for

sustainable development of cities. ICT-solutions can play a huge role in this regard in addition to increasing the comfort for residents.

Many of today's neighbourhoods with sustainable homes are limited in their aim of self-sufficiency. For instance additional food and energy needs to be bought since urban agriculture and the keeping of livestock cannot supply users with all their necessities in food and building materials while solar panels for example only generate a surplus during daytime. Therefore, since we are externally dependent, we need to make smart choices in our consumption which ICT can help facilitate through the distribution of information (Blumendorf, 2013).

Blumendorf claims "we can't manage what we can't measure" and states that hidden details in our consumption and behaviour need to be visualized in order for us to change. He sees eco-feedback technology as a potential facilitator in this regard. It can also inform consumers how they compare with other community members, thus increasing social awareness among citizens. Examples of such feedback technologies are temperature surveillance, energy and water monitoring and waste disposal feedback.

Blumendorf highlights numerous studies that have been carried out on eco-feedback technologies impact on the decrease of energy consumption. He mentions for example a minimal energy consumption display in homes, social web sites with personalized eco-information on individuals, "robotic plants" that provided feedback on waste disposal etc.

Our future lifestyles with ICT

The "*Scenarios for Sustainable Lifestyles 2050*" project led by the UNEP in collaboration with the Collaborating Centre on Sustainable Consumption and Production (CSCP) has developed four different sustainable lifestyle scenarios in Europe, two of which are presented below. The scenarios present patterns for sustainable lifestyles that meet the demand of different cultures and desires from residents across Europe (UNEP; CSCP, 2012). Furthermore, they present evolvement over time, which explores patterns that can contribute towards environmental sustainability. Sustainable living is defined as 8000 kg of material footprint per annum and per person (UNEP; CSCP, 2012).

Scenario 1: Singular Super Championships

Sustainability has set itself as a great opportunity for business. Self-learning and self-achievement is heavily promoted in the society. Public resources in Europe are invested in companies and consumers to cope with the transition to a new industrial revolution. New materials and production technologies are developed. Huge investments were made in the fields of education and research & development centres in all member nations. What was previously known as waste is now the key to the success of many enterprises. The technology made up-cycling of raw materials beneficial. New distribution and service models that emphasized sustainable relationships with the consumers enabled the stored resources back into production. The technical influence on our lifestyle has led to the replacement of cars and large single-family houses. Urbanization has created very dense cities and the talented people seek to be in downtown areas. Sustainable housing alternatives for the mainstream exist since the prices depend on location and not space. Transparency standards regarding energy and natural resource consumption are agreed upon from the biggest enterprises, thus enabling information to flow freely and allowing development of stocks and prices of natural resources accessible to consumers.

ICT-solutions in our everyday life in the Singular Super Champion society are presented in a variety of ways to achieve sustainable lifestyles. There are for example informative applications, software and social networks allowing us to view our purchases, behaviour and consumption history and also decrease our demand for material goods. People pay more nowadays for supplies and luxuries. There are new rail systems along with smart mobility solutions provide transportation between and within metropolises. Cars are now mobile solutions for electricity in the post-oil era, where locally produced renewable energy is stored in car batteries when parked. Education is embedded in everyday life; for example programs for sustainable choices in fridges through smart screens and school programs in smart devices. The wealthy invests in sustainable living pattern instead of consuming. The leisure time is spent on education and learning since a moral obligation for development of skills exists among citizen. Example of family leisure time is sustainable family games such as Biodiv Battle or SimSust to enhance ecological awareness among citizens. Sustainable use of resources is realized through the free flowing energy information. Smart grid systems are implemented throughout Europe. Energy efficient sensor in homes ensures sustainable decisions in terms of clothing care, dinner preparation etc. Control boards for household services are implemented. Waste is reduced through creation of awareness by smart packaging of food. Sensors, cloud computing and other efficient ICT solutions enable people to reach different levels of personal optimization which are socially and professionally rewarded.

Scenario 2: Governing the Commons

A new industrial revolution is achieved through 3D-printers which help personalize lifestyles, i.e. through manufacturing of own design desires in the local shops. A ubiquitous technology makes computing accessible everywhere which enables a virtual world of peer-to-peer sharing. This enables a shift from material mass consumption to interaction digitally. Microchips in our built environment provide user feedback to change behaviours and enable smart sustainable living. Wikidemocracy is created through peer-to-peer social and interest networks which empowers the users within the political field and ultimately replaces the representative democracies with traditional political parties. Traditional institutions are abandoned and replaced through the networks. A new type of P2P-economy is formed where the networks provide new skills to users with the information, digital training support and peer-to-peer learning, thus enabling new models of work and welfare, for instance self-employment. New innovation is driven by open source and free flowing economy. Companies that have adapted sustainability dominate the market.

Our smart homes and active homes use free flowing energy consumption data to enhance energy efficiency and promotes sustainable living in terms of green cooking, preventing food waste etc. Classrooms and offices were redesigned as flats and public spaces due to the expansion of the virtual world with online communities and smart storage while new building construction is absent. Leisure time consists of digital interactions. Internet defines our lifestyles and creates personal identity, communities worldwide are connected through networks and universal translation apps enhance the worldwide communication. Smart consumption monitors citizens' climate impact and decreases the ecological footprint along with electric cars. The largest enterprises offer programs such as smart life and smart city, services that help users to take smart decisions such as eating healthy, buying resource efficient food, sustainable mobility choices etc. Virtual tourism is a reality. Personal food shopper assistance guides us to healthy diets. ICT makes constant feedback for mobility consumers possible, suggest different types of vehicle and ride sharing schemes and propose day for your

mobility activity in regards to energy efficiency if differences in your preferences are small. Installed sensors in the body enable health monitoring and deliver information to hospital. Consumers recycle their products in 3D-printers. Finally, environmental sustainability is also achieved through a Europe-wide super-grid.

Persuasive Technology

Computers and mobile phones are continuously increasing in a rapid pace while at the same time becoming cheaper and more widespread throughout the planet. This has led to greater focus being put, from both the academic and business world, on the potential for these technologies to be used as persuasion devices. The study of computers as persuasive technology is called Captology, a term coined in 1996 by the Stanford professor BJ Fogg, a pioneer in this field of study (Stanford Persuasive Tech Lab, u.d.). Fogg et al. describes Captology as the study of the “*planned non-coercive attempt to change attitude or behaviour through technology*” (Fogg, et al., 2012). It is clear from this definition that methods using coercion, manipulation or deceit cannot be considered persuasion. Neither can a change of attitude or behaviour be considered persuasion if it is not intentional.

Fogg considers *Persuasion* to be the fourth and latest wave of computing, the three previous being *Functionality*, *Entertainment* and *Ease of Use*. He further states that the main difficulty with designing technologies aimed at persuasion is our limited understanding of persuasion, despite it having been studied for over two millennia, leaving us to rely on a set of theories and models describing behaviour, influence and motivation. To aid in the development of persuasive technologies Fogg has developed several models, guides and guidelines to be followed, based on extensive research. While Fogg acknowledges that persuasion can be both a change in attitude or behaviour, he states that a change in behaviour is much more relevant when it comes to issues such as politics, health and environment (Fogg, 2009).

The main model Fogg offers for designers is the *Fogg Behaviour Model* which shows that “*Three elements must converge at the same moment for a behaviour to occur: Motivation, Ability, and Trigger*” (Fogg, u.d.). The absence of at least one of these elements means a change in behaviour will not follow. This guide is meant to be used by technology designers or developers to identify why a wanted behavioural change is not occurring and in turn remedy it. It can be seen by the model that motivation and ability can be traded off. If the motivation is high ability can be low or vice versa, providing there is a trigger of course. If for example a person is not very environmentally conscious then he/she is willing to change their behaviour only if it is very easy to do.

Fogg mentions eleven fields, the most obvious one being commerce, where he reasons persuasive technology products can have an impact. These are for *example Education, Fitness, Safety, Community Involvement and Environmental Conversation* (Fogg, et al., 2012). To be able to achieve the expressed goals through such technology however, the computers or computer products need to be perceived by the user as having a certain degree of credibility. Just as people are more likely to be influenced or persuaded by people whom they perceive as credible, computers who are perceived as being credible will have a higher likelihood of successful persuasion. The most important traits to achieve this perception of credibility are *trustworthiness* and *expertise*. As with credibility, it is always the perception of these traits that have an impact.

Fogg further explores some ethical problems that might arise with the use of persuasive technology, mentioning things such as ensuring the technology “advocates what’s good and fair” and that it does

not exclude anyone based on for example social standing. He concludes the discussion with stating the importance for the designers of persuasive technologies to be aware of and to properly address this issue.

ICT as persuasive technology – Environmental sustainability

The concept of persuasive technology has gained speed in the last years, as evidenced by the annual International Conference on Persuasive Technology started in 2006 in Eindhoven, the Netherlands, as an international forum gathering and presenting the latest advances and research in the field of persuasive technology. The first conference put an emphasis on persuasive technologies that aimed to be beneficiary to human needs in the form of, amongst other things, improving health and well-being and increasing environmental conversation (IJsselsteijn, et al., 2006). This acknowledgement of the possibilities for persuasive technologies to achieve environmental sustainability can be seen in numerous research papers. One aspect of reaching higher environmental sustainability is the need for sustainable lifestyles to be more widely adopted. This entails a change in peoples' attitudes and behaviours.

In a research paper exploring the connection between ICT, persuasive technologies and climate impact Zapico and Turpeinen identifies three technological trends they perceive as key for climate persuasion, namely: mobile devices, pervasive sensing and social media (Zapico & Turpeinen, 2011). As the use of mobile devices has boomed in the last decades, making it the most widespread technology in the world, so has the potential for them to acts as powerful persuasion devices grown. In addition to this, sensors are becoming ever smaller, cheaper and more ubiquitous making it cheaper to measure behaviour and track changes which is a vital part when wanting to change behaviours. Also affecting behaviour is social interactions and communication. Social media has, with web sites such as Facebook, in the last years increased the social impact to millions making it a very powerful persuasive technology.

Zapico and Turpeinen further discuss several persuasion principles they found in the existing web and mobile applications they studied, grouped in three clusters: tracking carbon footprints, sharing goals and making it easy to live green. From this they offer six important features and possible improvements:

- 1. Effortless, accurate, individual CO₂ data**

The use of accurate, user-specific data can increase credibility.
Needs to be gathered without user effort, can be done through pervasive sensing technology.

- 2. Feedback for more responsibility**

Real feedback about peer's behaviour is needed to maintain trust of others in reaching the common goal. This can also be done through sensing technology.

- 3. Normative influence**

"Make the green behaviour look normal, not the normal behaviour look green"

- 4. Exploit a mass principle of cause and effect**

Linking the big problem of global warming with the many small decisions of individuals can strengthen persuasion.

5. Make it fun

Implementing game-like functions can trigger competition, cooperation and recognition.

6. Make it mobile

Mobile phones can be combined with mobile sensors and mobile social media tools to become even more powerful persuasion tools.

They also have a great potential for “*providing suggestions at opportune moments*” which can be used for breaking habits or persuading the user at the moment of decision.

Analytical framework of ICTs opportunities

ICT have an important role to play in decreasing the environmental impact by facilitating a sustainable energy use. It can enable locally produced energy sources through smart grids, decreased use of energy in buildings and transportation among many (European Commission, u.d.). Mitchells states five main principles in regards to urban and planning design on how ICT can support environmental sustainability in his book “*Urban life, Jim - but not as we know it*” (Mitchell, 2000).

1. Dematerialization, physical goods can be replaced through the virtual reality;
2. Demobilization, travels can be replaced by telecommunications;
3. Mass customization, intelligent personalization is able to decrease consumption;
4. Intelligent operation, enhanced intelligence in operations regarding water, electricity and fuel;
5. Soft transformation, structural adaption to informational technologies regarding physical infrastructure and the built environment.

Kramers et al. has further developed on these principles and conducted an interesting analytical framework to identify the opportunities for ICT to facilitate cities aim of reducing their energy use (Kramers, et al., 2013). The framework presents different household functions and the potential of ICT applications in Table 1.

Energy Use %	ICT opportunity Household functions	Demateri-alization	Demobil-ization	Mass customization	Intelligent operation	Soft transformation
35	Personal	i	n.a	o/p	p	o
32	Housing	o	n.a	o	o	o
13	Food	n.a	n.a	o/p	o	o
11	Care	n.a	i	i	o	o
5	Common	n.a	n.a	n.a	n.a	n.a
4	Support	n.a	i/o	o/p	p	o

Table 1 - The ICT solutions into (i) - already implemented solutions, (p) – pilot solutions, (o) – opportunities for new ICT solutions and (n.a) – not applicable or very little potential (Kramers, et al., 2013)

Kramers et al. presents the household function “*personal*” as everyday activities such as sleep, entertainment, leisure trips, holiday homes and clothing hygiene (Kramers, et al., 2013). Furthermore it includes goods for our daily lives such as televisions, computers, cell phones, DVD’s, books, clothes and also consumable goods such as beverages, tobacco, hygiene products and services such as restaurants visits etc. Car travel for leisure represents the biggest energy consumer. Air travel and consumer goods such as cellular and laptops also contribute to a negative environmental impact. The

opportunities for ICT in this category are dematerialization, mass customization and intelligent operation. Demobilization is not applicable since a travel for leisure is hard to replace. Consumer goods can be integrated to a single device and thus be dematerialized. For instance videos, discs and books can be found as media files and integration of goods into one device such a smartphone. Examples of mass customization and dematerialization are subscription to a car-pool with a booking system to replace the personal car and cloud computing to decrease the resources for computer processing. Kramers et al. claim that integration of different systems is further researchable and presents itself as an opportunity for ICT. Intelligent operation can support energy management, visualize consumption to create awareness among citizens and help environmental friendly mobility. Finally, soft transformation is possible for instance towards a walkable community through optimizing use of urban infrastructure and public spaces.

"Housing" is the second biggest source of energy use and ICT possess numerous solutions to decrease it. Housing includes services such as lightning and heating, furniture and textiles, management and operational functions in the house. Heating is the biggest energy consumer in the category. Kramers et al. states that ICT solutions are not used to a greater extent for decreasing energy consumption in the house and thus the category possesses itself as an opportunity. Smart grid is a major intelligent operation solution and the technology can be used to cut peak usage of district heating, dematerialization of activities can be realized through the virtual reality. Mass customization of management systems for lightning and heating could be implemented. Soft transformation, facilitated by ICT solutions, can occur through reduced number of heated and cooled spaces, optimize usage of space. For instance, excess energy trading between buildings for energy efficiency can decide arrangement of buildings and thus neighbourhoods.

Production of food that is controlled by our demands is alongside with storage and cooking the main source of energy usage. Mass customization and intelligent operation can decrease our ecological footprint through awareness but also in optimization of food logistics. Dematerialization is not applicable to food but can be used in the category *"care"*, which consist education, social security and healthcare. This can be realized through distance education, remote healthcare in smart phones etc. Mass customization can facilitate care takers through personalization and soft transformation can support localization of care services for residents with the intention to minimize travel through ICT.

The final category where ICT possesses itself with applicable opportunities is *"support"*. The category only consist work travel which can be demobilized through video-meetings, telephones etc. Mass customization could be realized through car sharing and intelligent operation could distribute knowledge regarding environmental friendly transportation. A soft transformation can be achieved as an effect of demobilization of commuting. Work hubs can be located in the living environment and create new type of neighbourhoods with necessary equipment for the professional businesses. Furthermore, Kramers et al. also states other opportunities for ICT solutions to decrease energy use in this category.

III. Background

The success and challenges of sustainable urban development in Stockholm

Stockholm's environmental achievements has gained international recognition and the City of Stockholm promotes the city's high quality of air, water, waste management, developed public infrastructure and well planned urban development projects (Cars, et al., 2013). The city aspires to continue to be a frontrunner in urban sustainability and have launched major policy programs such as Vision 2030, "Capital of Scandinavia" and the highly ambitious urban development project Stockholm Royal Seaport.

Stockholm's success is being showcased globally. Swedish urban planning and architecture firms are finding success in branding themselves as sustainable and Scandinavian. Cars et al. argues how high environmentally profiled cities such as Stockholm have an edge in attractiveness in a competitive globalized world and how its public environmental policies can create economic growth in Swedish export, related to the environmental sector. One successful example of this is the brand concept SymbioCity which is an initiative to package Swedish urban sustainable development for export worldwide. SymbioCity has become the official national platform to market environmental technological products and services, mainly due to the strong political will in strengthening the status of Swedish environmental technology worldwide.

A main element in marketing material for Sweden alongside with SymbioCity is showcasing the development of increased GDP and decreased carbon dioxide. However, Cars et al. questions this success by claiming that the calculations only consider carbon emissions from the production side and not those coming from consumption. They further advocate that analysing consumption patterns gives a more accurate picture of the ecological footprints of our lifestyles which have increased in the past decade. Analysing our lifestyles and how transportation, urban form and accessibility of commercial and non-commercial areas impact our behaviour is necessary to understand urban development. Cars et al. states that private and public stakeholders need to design an environment that facilitates sustainable choices.

Furthermore they claim that Sweden's discourse regarding sustainability is to handle the emerging conflicts between economic growth and environmental aims, which reflects the discourse of ecological modernization. This discourse brings forth the economic market and entrepreneurs as the pursuers of solving environmental problems through new technological solutions such as electric cars and ecological products. It further advocates development of technology and industrialization for achieving sustainable growth, an idea that can also be found in the comprehensive plan for Stockholm. Innovation and efficient management are likewise seen as solving environmental problems. However Cars et al. states that the city of Stockholm also needs to emphasize the built environment, technology and lifestyles that demand less out of our resources. In order for Stockholm to continue as a frontrunner in urban sustainability the city needs to challenge the prevalent development structure and be open to redesign it.

Stockholm Royal Seaport

Stockholm Royal Seaport is one of the most extensive urban development projects in Europe. The main aim is to meet the needs of the city's rapid growth and this former industrial area will therefore be transformed into 12 000 new homes and 35 000 work places, which will be combined with a modern port and a new public transport system (City of Stockholm, 2013). The project will be a flagship project for sustainable urban planning and the sustainable solutions will enable Stockholm Royal Seaport to offer one of the most modern and attractive urban living environments in Europe (City of Stockholm, 2013).



Figure 1 – The Stockholm Royal Seaport (The City of Stockholm, u.d.)

Environmental Profile

The environmental ambitions are very high and the main overall objective is a fossil fuel free district in 2030 and with emissions of carbon dioxide below 1,5 ton per person and year in 2020, a climate positive neighbourhood, low use of energy, water, materials and other natural resources and environmental effective transportation and buildings (City of Stockholm, 2010).

The city's vision is that Stockholm Royal Seaport will be developed into a world-class eco-neighbourhood and that it will use the experiences from Hammarby Sjöstad to build the next generation of eco-friendly neighbourhoods, which could become an international role model for sustainable urban development (City of Stockholm, 2010). The project will take the lead in realizing the latest climate and environmental engineering. Smart systems will reduce energy use, waste and transport demands. Innovative resource consumption and wise recycling philosophy will also be implemented. Advanced ICT technology will enable visualization and control of smart homes and infrastructure. Innovation activities will facilitate the development of sustainable solutions and the constant monitoring to ensure the ambitious goals. The innovation of environmental technology in

Stockholm Royal Seaport will also help market Swedish environmental technology and expertise in sustainable urban development that can lead to international co-operation and exports.

The Stockholm Royal Seaport will include energy-efficient buildings such as zero-energy houses and plus houses. The energy supply will be renewable and the buildings will be designed to generate a part of their own solar power (City of Stockholm, u.d.). When the weather allows, wind and solar power will be produced. A smart grid power system will allow residents and other users to use electricity efficiently and also customize their usage to current prices. Food waste will enable production of biogas as apartments will have garbage disposal units. Vacuum waste systems will reduce transportation and help to dispose and sort the waste in the best possible way. The district will have a variety of sustainable transportation modes: expanded pedestrian and bicycle lanes, trams, boats, car pools, buses and metro. Opportunities to recharge electric cars will be provided throughout the area. The proximity to everything, combined with e-service solutions will hopefully reduce the need for transportation. It should be easy for residents to see how consumption and cost increases or decreases depending on their use, for instance through user-friendly installations facilitating sustainable use of hot water and electricity.

Stockholm Royal Seaport innovation - R&D projects

Stockholm Royal Seaport Innovation is an arena for city administrations, enterprises and academia to come together for research purposes and develop innovative environmental sustainable solutions (City of Stockholm, 2013). It is a place for knowledge exchange where new research and development projects can be initiated to reach the city's ambitious environmental goals for the Stockholm Royal Seaport.

Pilot projects for the area have been initiated and is undergoing. Innovative environmental technology is being tested and new business models and commercially viable concepts are being validated (City of Stockholm, 2013). Some of the major research and development projects are presented below.

The Active House

"*Active House in the sustainable city*" is an on-going research development project in collaboration between ABB, The Interactive Institute, KTH, Fortum, Electrolux, NCC, JM, HSB and ByggVesta (Stockholm Royal Seaport, 2013). The project studies a family that lives in an apartment with smart solutions, the Active House, with the aim to understand technology's use in our everyday life.

The family is testing the future energy-efficient housing for two years in the Active House (Näs, 2013). The house is equipped with a display mounted on the wall where the family can see the indoor temperature, water consumption and also control lightning and electrical home appliances. Information is also available through an app on their smart phones. Another environmental solution is the washing machine that, when loaded, starts automatically when the price and the carbon impact is the lowest. An "*Away/Home*" button ensures that no appliance is using unnecessary electricity (Alpman, 2013). Additional technical features will be installed continuously throughout the project. One of the project's purposes is to see if and how energy consumption changes when the family becomes aware of the cost and availability of renewable energy (Näs, 2013).

Spacetime – CERO

Spacetime Communication AB is developing a travel planner linked to social networks to handle increased demand by passengers without causing congestion and negative environmental impacts (City of Stockholm, u.d.). Residents, enterprises, organizations, service providers and the city of Stockholm can interact together to optimize personal transportation. The main element of the system is the travel planning tool "Köjk" which compares the environmental impacts, costs, and health aspects of different types of trips. Furthermore, the system enables easy carpooling and group travels through social networks. Carpools and taxis can be connected to the system.

One of the main focuses in Stockholm Royal Seaport is sustainable transport through visualization of environmentally friendly travel options, using social networking in the context of travel, supporting individual travel planning and understanding how the system can facilitate the introduction of new solutions for passenger transportation (City of Stockholm, u.d.).

Smart City SRS

Smart City SRS is a research project that is being carried out by 18 different actors in academia, city and business. The project aims to make Stockholm Royal Seaport into a world leader in the field of sustainable smart neighbourhoods through the use of real-time data (City of Stockholm, u.d.). This is meant to be accomplished by analysing how interactive environmental data flows can be collected, stored and used in an information platform. The platform is intended to be an environmental database for monitoring Stockholm Royal Seaport's sustainability goals (City of Stockholm, 2013).

The goal is that residents, construction developers, property owners and administrations responsible for operation and maintenance are able to follow their consumption and thereby be encouraged to make active choices that reduce the environmental impact (City of Stockholm, 2013). For instance, it should facilitate for residents to use energy in a sustainable way, visualize which route is the smartest or where a free charging station for electric cars is available. Finally the overall objective of the information platform can be perceived as to provide the right information at the right time and in the right place (City of Stockholm, u.d.).

Smart ICT for living and working in Stockholm Royal Seaport

This project, led by Swedish ICT Research AB, aims at creating a generic and open ICT infrastructure for communication in the home (City of Stockholm, 2013). The goal is to integrate completely different areas such as energy consumption, media and transportation which will be able to communicate with one another and utilize the same system. The generic solution will enable new innovation, openness and co-operation and thus contribute towards a more sustainable city (Swedish ICT, 2013)

Other

Fortum is leading a project called Smart grids along with private and public partners to create an innovative and intelligent system to use energy more efficiently. The vision is to integrate renewable energy sources and that the smart grids will give the customer opportunities to have greater control over their energy consumption.

Envac develops innovative waste collection which includes developing the current vacuum waste systems with innovative new technology and will provide solutions in the ability to weigh the waste at the individual level (City of Stockholm, 2013).

The project *“Design of environmental information in public places”* is coordinated by the Interactive Institute and the aim is to combine design with continuously updated environmental information to the residents (City of Stockholm, u.d.).

IV. Results

Sustainable Urban Lifestyles



Figure 2 - (Woods Bagot, u.d.)

It is widely acknowledged that our current lifestyles in the modern world are not sustainable as they put a significant strain on the environment. A change is therefore needed to assure that we can sustain a comfortable living whilst decreasing our environmental impact. The environmental vision in Stockholm Royal Seaport is to promote sustainable lifestyles as a way to reach environmental sustainability in the area. To reach the high set goals of SRS becoming a climate positive neighbourhood free of fossil fuels with a carbon dioxide emission per capita of less than 1, 5 metric tons major changes are needed in the way the residents in that area lead their lives.

In the following we present a vision of sustainable lifestyles as compiled through quantitative and qualitative methods and divided in five categories. Firstly we present the current trends in Sweden in each category to explore their level of unsustainability. Then we present an alternative for a more sustainable way of living that puts less pressure on the environment. We conclude each category by listing some measure that can be taken to reach a more sustainable lifestyle.



Figure 3 - Housing (Svenska Hus, u.d.)

Housing

Housing has traditionally been seen as a basic social right meeting essential needs but for over a century it has become increasingly easy to use housing to give high comfort as functions such as heating and water supply have become mechanized and thus do not require any significant involvement from the residents (Gullberg, 2011). This has also led to decreased energy costs and has therefore caused the use of larger areas in housing in ways that often are very energy consuming leading to the so called rebound effect. The significant increase in perceived comfort level for indoor climate in just one generation has also greatly contributed to the increased energy use in homes. Housing related energy end use in Sweden accounts for up to 40 % of the country's total energy consumption and as much as 80 % of energy consumption in residences is connected to the unit size.

The norm in Sweden in the 1980's was a separate room for each family member, not including living room and kitchen (Sanne, 2012). Two-thirds of the population lived by these standards and overcrowding was hardly ever seen. Since then, the floor space increased by 30 % and today 44% of the population have a standard of living that involves more than one room per person, not including living room and kitchen. Sanne discusses that there will not be any significant reduction in energy usage in housing stock because it increases with only 1% per year and a radical renovation of the million program housing will be very expensive to implement. As the construction industry cannot be effective to the same extent as other industries, it is important that we change our lifestyles and embrace "compact living" in order to utilize the existing housing in the best possible way. The

accommodation is also important in the sense that it affects our quality of life, availability, our social network and our travel demands, which all are important in regards to our environmental impact.

These housing habits are affected by what people see as the normal level of comfort, as explained by Gullberg (Gullberg, 2011). This perceived level of normalcy shifts throughout time and can be especially visible when looking at the indoor temperature. The indoor temperature perceived as comfortable or normal have increased with the changing of our habits and the tolerance for lower temperatures have decreased. Thus expectations of suitable indoor clothing have changed together with this decreased tolerance and have created ingrained habits that need to be altered. This effect can also be seen in the increased space standard. The perceived “normal” apartment size has increased and large surfaces that allow household members to choose activity such as TV or music without consideration to other household members is seen as important and offering a comfortable living environment. Sweden, Denmark and Norway today have the highest residence area per capita in the whole world with the average Swede having around 45 m² of residential area at their disposal (Gullberg, 2011). The area for the average resident in Stockholm is somewhat less, standing at 42 m² mainly due to higher costs of living and the fact that only 24 % of the houses are occupied by their owners as opposed to 45 % for the whole of Sweden. It has been shown that the average owner occupied home is larger than one that is rented. Additional space is also kept unused in many homes during most of the year just in order to accommodate situations that occur once or twice a year. This increase in average residential space has also led to an increased per capita land use, both of whom have decreased the concentration of services and an increase in distances through urban sprawl.

Other factors that can affect residential housing area are income and financial capital as more wealthy households have on average a greater residential area per person (Gullberg, 2011). Gullberg also explains the tendency for people to want larger accommodations as 14 % of Swedes states that that they want a larger home while the figure for middle-aged persons in Stockholm reaches as high as 27.5 %. Pennanen also argues for compact living but claims that some problems need to be solved. We need to use space more effectively in the future (Pennanen, 2013). Today office spaces are left unused during nights and weekends which is an inefficient use of space. Pennanen also believes more local work is possible in the future but might be difficult to achieve as humans beings are social creatures that needs to meet and interact with each other.

Earlier Swedish housing policy promoted newly constructed households to the families so that they could have a good and spacious home (Sanne, 2012). When the children grew up in the spacious home and moved out, the parents remained in an oversized home. This phenomenon is common in the older dwellings, since incentives to move out is lacking. It's also often cheaper to stay in the older accommodations because the production cost of new construction has tripled in 20 years and a move can incur more than 1000 SEK in increased rent (Gullberg, 2011). A move can further be complicated by households' accumulation of possessions making smaller dwelling neither viable nor attractive (Gullberg, 2011). Furthermore, a bond gets created with the neighbourhood and community over time, thus there is no reason for the dweller to move and lose the familiar surroundings, service functions and the social network. Sanne calls this a social law of inertia; as long as the housing is good enough and fairly satisfactory economically, socially and health wise, there is no need to maximize the utility to find new optimal accommodation.

Sanne claims that we could reduce construction costs and energy consumption if we could live more efficient in terms of space but points out that it is particularly sensitive to intervene in people's choice of residence (Sanne, 2012). But we have to seize the households' willingness to move in line with their needs and facilitate senior housing, implying that older households move to increasingly custom homes where they do not have to perform up keep of the house and garden to the same extent, thus increasing the comfort level while using the living space more efficiently. But at the same time he does not believe that it necessarily should result in breaking the ties with the neighbourhood and the community, but that relocation instead should be done in the same area.

Ahlner believe that moving in to a new home is an opportunity for a change in our lifestyle to a more sustainable one (Ahlner, 2013):

"You can change people's behaviour when they undergo a major change in life, for instance having children, when moving to a new neighbourhood, retirement etc. I.e. anything that happens in life that makes you open for a change. We are then most receptive to change in our lifestyles. Moving to a new home is a big transformation and therefore a good opportunity for new platforms. Especially if you're surrounded by sustainable solutions such as social networks for sharing, techniques that visualizes energy consumption, carpooling, etc."

It will be challenging to achieve a shift of living habits towards greater sustainability as it will elicit questions regarding how the human need for autonomy and creativity amongst other things will be satisfied in smaller living spaces. But this is an important shift that can steer us away from today's unsustainable use of living accommodations.

By having a well-functioning and affordable market for extra overnight rooms, meeting rooms and party halls Gullberg argues that both households and businesses will manage with much smaller permanent spaces thus increasing efficiency in the use of space (Gullberg, 2011). Gullberg also states that an increase in a collective use of space could be reached by having greater cooperation between households, companies and associations. This cooperation could be facilitated by the use of internet-based platforms that could make the handling of these collective spaces easier through a flexible booking system. A shift to more work being done at home would also help to decrease required work site space and enable a more efficient use of homes as areas that would otherwise be left unused could functions as work spaces.

Households also need to be more aware of their energy consumption in their homes. Pennanen argues that it must be easy for individuals to do the right choice (Pennanen, 2013). A simple thing such as knowing that it is both cheaper and more environmentally friendly to start the washing machine in the evening instead of during the day could alter people's behaviour. The Lindell family benefitted greatly from having a display showing their consumption as it raised awareness and motivated them to shift to more sustainable practices (One Tonne Life, 2011). By being able to identify the sources to their energy consumption and how large their impact was they shifted to a smarter energy consumption behaviour regarding shower, dishwashing, use of washing machine, cooking and indoor temperature.

Conclusion:

- Reduced living quarters
- More efficient use of spaces

- Greater consideration to indoor climate
- Enhanced energy consumption awareness
- Adoption of smart energy consumption behaviour
- Use of smart energy efficient home appliances



Figure 4 – Bike Sharing (The Bike-sharing blog, u.d.)

Mobility

Travel has increased and changed greatly during the last century as the car and other means of transport have seen a rapid technological development allowing people to travel ever longer distances in shorter time (Höjer, 2011). Commutes of 10-20 km are seen as normal when having access to a car or public transport and vacation travel to faraway places have been enabled by the expansion of air travel. Although mobility has given the ability for people to satisfy their needs and wants trips are not uniform but can rather be divided in categories and an increase in travel does not necessarily have to be connected to greater welfare. Höjer et al. mention a division made in a Swedish transport future study between ‘desired’ and ‘structurally forced trips’ and states that “traveling more can be seen both as an increase in possibilities and as a sign of compulsive mobility” (Höjer, 2011). Desired trips are mainly leisure trips while structurally forced trips are commuting, business travel and shopping trips. The increase in possibilities is caused by the fact that mobility can open up opportunities for people to reach more goals whilst compulsive mobility is caused by the view that people can travel further to perform their daily tasks.

The negative impact of the car has been discussed for decades. Beside noise and air pollutions it causes accidents, congestion, interferes in our daily environment and creates “urban sprawl”, locking the citizen into a car dependency (Sanne, 2012). The car has to a large degree become the normative mode of transport due to the fact that many cities have been designed for the car as a dominant transport mode (Lundin & Gullberg, 2011). Historically an expanding transport system has been viewed as beneficial and essential for economic growth but during the last decades ever more attention is being paid to its negative aspects.

More than 20 % of Swedes' annual energy use is coupled to their travel where household travel accounts for 83 % and business trips the remaining 17 % (Höjer, 2011). Car ownership in Stockholm is significantly lower than the rest of the country due to good access to public transport, but people living in Stockholm travel by air 80 % percent more than the Swedish average. Even though Stockholm residents fly so much more their average energy consumption for travel is not higher than the Swedish average since they use public transport instead of cars to a far greater extent than the average Swede. Furthermore, discussions about travel often revolves around commute and support trips even though these only account for approximately 20 % of private travel whilst leisure trips account for much more.

Travel in the Stockholm metropolitan area consist today mainly of local trips and trips to and from the inner city. Local trips outside of inner Stockholm are predominately made by car and thus greatly contributing to the unsustainable transport systems (Höjer, 2011). These local trips need to shift to other modes of transport that are suitable for shorter local trips such as walking, cycling and using public transport. The trips to and from the inner city on the other hand is characterized by exposing the transportation system to heavy loads. The trips are often concentrated in time and space during for example rush hours. The solution of expanding the road network which is most often proposed to this solution is one that is a threat to the sustainability aspects as it will very likely increase traffic and thus emissions. It is therefore vital to look for other solutions such as trying to spread out traffic more evenly to reduce the heavy loads on the system during certain periods. One possible solution for this, similar to congestions fees, is to have time differentiated tariffs on public transport (Gullberg & Lundin, 2011). A period of free travel during the least congested hours in public transport could for example be introduced to decrease the heavy loads during rush hours.

The urban planners in Sweden struggle with the question on how to provide travel to citizens in a society where the car is dominant and beloved (Sanne, 2012). Although the car has historically meant freedom to go anywhere this importance has decreased significantly with the ever increasing alternatives of public transport and other means of transport. Different economic and political instruments along with traffic measures have been implemented which has hampered the car's dominance and at the same time promoted and invested in walking and cycling. But the political and economic measures can only do so much and we need to assess strategies regarding our behaviours to decrease the unsustainable way of travel.

The demand of fast pace travel will decrease with more spare time that follow from decreased working hours and slower more sustainable ways of transportation can be achievable. Since there will be more time, and thus greater demand, for leisure activities these can be more spread out throughout a city meaning the share of walking and cycling in people's transportation needs can be increased (Sanne, 2012). A decrease in working hours may also mean a decrease in commuting and since the desire to pay for speed is low non-motorized transportation means become more attractive. This would enable the promotion of public transport, including both pedestrian and bicycle traffic, to becoming the standard for shaping new housing and transport structures as proposed by Gullberg and Lundin (Gullberg & Lundin, 2011). Gullberg and Lundin also stress the need for a greater integration between different transport modes to break up the current traffic segregation and make it easier to transfer from one mode to another. More parking spaces for cars and bicycles will also need to be constructed in close proximity to public transport to increase the geographical reach that public transport has. This would especially be suitable in suburban areas with

a too sparse building pattern where an expansion of public transport would not be a viable option. There is a great potential for bicycling to serve as a supplement to public transport in Stockholm as currently only around 5 % of trips in the city are done by bicycle where as in the similarly sized city Copenhagen the figure is as high as 35 % (Gullberg & Lundin, 2011). Another solution that could motivate people to go by bicycles more would be to make it easier to bring the bicycle along when going with public transport rather than having to park it at the station.

ICT has enabled carpools and car rentals to a greater extent and is more sustainable than owning your own vehicle. It has been showcased that the ones connected to a carpool has decreased their car travel with 30 % (Sanne, 2012). Carpooling has also showcased that the need for car per person has decreased as a car can be shared by up to 40-60 people. Other benefits of carpooling is a reduction in demand of parking space and that vehicles gets chosen based on the need, for instance alone, family, transportation of goods etc. Therefore a more sustainable way of travel is enabled. Carpooling would further increase the load level of vehicles and thus decrease the strain put on the road system. It is suggested that more people will be connected to carpools when the economic costs and the displeasure of owning a car exceeds the happiness of it. Furthermore, our social and physical barriers of perceiving car rentals and carpooling as bad last alternatives need to be broken down, they should be perceived as smart choices. There also needs to be attractive options that allow carpooling for the practice to become more widespread amongst people (Gullberg & Lundin, 2011).

Alongside greater emphasizes on public transportation, the electric car has huge potential to reduce our environmental impact and is perceived as a sustainable mode of traveling. It can function as the “everyday car” for families and when necessary rental can provide the long distance vehicle. Also, the ownership of car showcase that you travel more if you have access to your own personal car. Households with more than one car travel more. An explanation is given through that we travel alone in a large extent. However, to what extent electric vehicles will be sustainable depends on several factors, one of which is how the electricity is generated.

If we continue along the same path as today, the forecast predicts that we will double the amount of air travelling by the year 2030 (Gullberg, 2011). Our air travels need to be reduced and shortened in order to move towards a sustainable development. Business trips recall for 25 % of today’s air trips internationally. Accordingly, we will need to continue to increase our videoconferences and other ICT meeting solutions. Companies are moving in the right direction but the reward culture and status of being a “frequent flyer” remains. So the change in behaviour and attitude is just as important as economic measures. 75 % of all the airfares consist of leisure purposes. In a sustainable world the habit of weekend travels in the metropolises of Europe needs to be broken. Only one leisure travel per person and year is acceptable. 12 % of the Swedes travel internationally at least 4 times a year.

In the future image Slow by Höjer the leisure travel done by air has decreased and other modes of transport have increased as people tend to have less money and more time (Höjer, 2011). A greater demand for leisure activities allows the activities to be spread more evenly throughout the cities and thus not requiring people to travel long distances, concurring with Sanne’s vision. Commuting is also decreased as more people work from home or work fewer hours and non-motorized means of transport are popular as people are less willing to pay for speed.

As the Lindell family showed with the One Tonne Life project a huge reduction in the emission of greenhouse gases can be made by just adopting simple measures (One Tonne Life, 2011). The family chose to make their vacation travel to Åre rather than Greece as previous years. They also replaced their two petroleum driven cars with one electrical one whilst also decreasing the amount they drove to less than a third compared to before the start of the project. This was achieved through a greater use of carpooling and public transport. The family had no problem with the electrical car's range as they only needed to charge when arriving at home which was sufficient for their daily driving needs. All these measures allowed the family to reduce their emissions from transport by up to 95 %.

Conclusion:

- Use electrical vehicles
- Increased public transportation use
- Promotion of walking and use of bicycles for shorter distances
- Use of carpooling
- Decreased leisure air travel



Figure 5 - (The Nomadic Pinoy, u.d.)

Living & Working

For a society to change to a more sustainable one that does not deplete the planet's natural resources a change in consumption is needed. Opposition to these types of changes are however to be expected since they differ so much from the current norm. Another aspect is therefore needed that can help to overcome these types of barriers and present a sustained or even increased high life quality. Pettersson et al. explains how the time factor can work towards this aim (Pettersson, et al., 2011). Statistics have shown the negative effects that the time pressure of the modern society has on both mental and physical health. Free time has become sort of a rare commodity which can be seen by the pursuits of people to use time-saving products or by the fact that as people's incomes increase so does their demand for services that frees up some time. The paradox is that for people to afford these time-saving products they need to work even harder thus creating a viscous cycle that rather than creating more disposable time is increasing the tempo in society. Time can furthermore, contrary to money, neither be saved for future use nor yield any interest.

A common trend that can be seen in more prosperous countries is that as income levels rise, so does the consumption of goods even though it negates the benefits of the increased income, the so called rebound effect (Pettersson, et al., 2011). Economic development is seen as a goal in itself rather than a mean for increasing free time. Therefore, economic development has tended to increase time shortage for working people rather than decrease it.

One of the steps in the right direction towards a sustainable lifestyle and away from the consumption society is less work and more leisure time as also proposed by Sanne (Sanne, 2012). He suggests that the 40 hour work week should be reduced by 25 %. He believes that the reduction of the volume of

work can decrease our production and reduce the economic growth and thus consumption. It can be applied by shorter weeks of work or seasons of intensive and longer vacations, depending on the line of work.

However the new founded leisure time will be spent in different ways. It is not advocated to travel, use equipment and consume in a way that impact our natural resources negative in the same manner as today. The new reduction of work in our lifestyle is being perceived as an opportunity to change unsustainable behaviours and increase social interaction for the stressed ones. More time will be invested with family and friends, relaxation and maintain the belongings and therefore decrease the demand for new products. It is an opportunity to cook “real” food from scratch and therefore decrease consumption of unsustainable processed food products. Sanne believes that a reduction with 25 %, 10 more hours of spare time, is a huge opportunity for a difference maker in life since the todays spare time is locked to different obligations such as sleeping, eating, taking care of the kids etc., so a lot of today’s spare time is not actually spare time and in this context 10 hours is arguably a lot (Sanne, 2012).

Höjer et al. states that the recreational time is being increasingly rationalized which also contributes to the feeling of time shortage and stress (Fuehrer & Pettersson, 2011). People organize fewer leisure activities themselves and instead buy and consume commercial recreational activities such as gym time or participation in sport activities. This forces people to try and synchronize their personal schedules to the schedule of the professional supplier of the activities while also linking leisure activities to the households’ income levels. The fact that the leisure activities costs money also makes people want to maximize the benefit they can gain from it which also affects how non-commercialized recreational time is used.

The basic idea of working less is further supported by Jonas Claesson at the City of Stockholm who states that a decrease in working hours not only enables people to have more time for choosing sustainable alternatives but it also greatly decreases carbon dioxide emissions due to the decrease in work commute traffic (Claesson, 2013). Claesson means that the Stockholm Royal Seaport should facilitate for example for people to work from home. There could for example be office hubs in the neighbourhood connecting people that want to work close to home rather than having to go to a traditional office. This would eliminate the need for people to have large apartments with a home office as they could instead easily rent a work place at these office hubs.

Long business travel will also need to decrease and meetings will more often than not take place through telecommunications technology rather than by traveling to another destination. As technology will improve, businesses will no longer feel the need to send employees on business trips to other cities or countries but will rather realize both the economic and environmental gains by having videoconferences. This will especially be viable considering that the new generations are much more comfortable with and used to new technologies and means of communications.

In the book “Images of the Future City” a future image called “Slow” is proposed which promotes a very different temporal culture than today’s where “The socially and culturally defined time press and its socio-technical control devices, such as clocks and pocket diaries, has lost its compulsory grip as an increasingly pluralistic time culture with space for individual and local time rhythms develops” (Fuehrer, 2011). The gains made in productivity in this future image enables reduced working hours rather than increased consumption. The decrease in working hours can mean a decrease in daily

working time or a decrease in the number of work days in a week. There could also be a greater variation in work intensity throughout peoples' working lives by for example using time banks that follow the worker when they change jobs. This would enable parents with small children to decrease their work rate when they children are young and increase it later on. The same household consumption possibilities however remain. The shorter and more flexible work hours also enables more personal household production and increases awareness of the importance of product cycles and recycling. Consumptions patterns are therefore geared towards consumption of goods that are energy efficient, have a long working life and able to recycle or repair. The practical benefit to the consumer takes a greater focus.

Conclusions:

- Reduced work hours, more leisure time
- More efficient use of spaces
- Increased work in proximity to the home
- Enhanced energy awareness
- Decreased business travel
- Adoption of sustainable choices



Figure 6 - (Dinnerit, u.d.)

Food

Our relationship to food has significantly shifted during the last century due mainly to the development of food production (Wallgren & Pettersson, 2011). No longer is food production a part of our daily routines as it has been separated from our day to day lives and food has become a consumption commodity. We no longer have a connection to the source of food production as most of us only come in contact with the final product in grocery stores and supermarkets. Food is no longer in short supply in Sweden and has instead gained somewhat of a luxury status. The disconnection between consumer and production is not only psychological as the fact that people today tend to buy very refined products rather than raw ingredients has caused today's food to be transported long distances to be refined.

The average Swedish consumer has benefitted from the development in food production as the variety of products in Swedish supermarkets today is huge, with products from all around the globe. This however also causes negative consequences, not only coupled to the increased emissions and the following emissions and noise but also the fact that greater use of chemical additives is needed to ensure the food products can endure the long transports without going bad or ripen too fast (Wallgren & Pettersson, 2011). We have in addition never paid so little for food as today, mainly due to increased agricultural productivity (Sanne, 2012). This causes a negative impact on the climate in which methane and nitrous oxide are the main culprits. The increased productivity is also found in food management, i.e. from "farm-to-table" and has led to large amounts of waste. Although most of it consists of unavoidable waste, a large proportion consists of household's unnecessary waste. The wasted food has required land for production and caused unnecessary emissions. Sanne claims that

15% of waste in food handling can be reduced. For a more sustainable development, we need to change our eating habits, but it may be met with strong resistance.

The modern food production system requires a lot of energy. The rational agricultural society with a closed loop and use of mostly renewable energy sources has been replaced by a larger scale food production that is dependent on external energy sources, mainly from fossil fuels (Wallgren & Pettersson, 2011). In addition to the energy used in the production process itself energy is also needed for the increasingly long transport that distribute the food. Energy is also needed to refine the food products and to prepare and store them at home.

An increasing trend that can be seen is a gained popularity for ready-made food (Wallgren & Pettersson, 2011). Wallgren & Pettersson describe how this trend is driven by increased welfare, poor knowledge of food preparation, time shortage, increasing amount of smaller households and lastly the technological innovation that has allowed food to be processed and stored for longer periods of time. This trend causes more refinement and in turn greater use of resources in the food industry.

The average Swede's favourite items in their eating habits are also the ones that have the most impact on the environment. Meat accounts for about 60% of the food's greenhouse gas emissions; with beef accounting for the largest portion and 20% consisting of dairy products. Today, our meat consumption in Sweden has increased by 40% compared with 20 years ago. Roughly estimated, a steak correspond to 3-4 miles of driving with a petroleum driven car, thus there is strong reason to decrease our consumption of beef. If we were to reduce beef consumption by a fifth, we would reduce emissions from agriculture with approximately 7%. Those who find it difficult to reduce meat consumption could replace the beef with pork or chicken instead, which also gives a reduced environmental impact. Sanne believes that we would need to cut our cheese and beef consumption in half to move towards sustainable development (Sanne, 2012). Furthermore, he believes that the savings in household shopping trips, smarter food preparation and storage could contribute to reduced carbon emissions. E-commerce and home delivery could reduce travel and also have a positive effect.

Organic farming is a farming method that does not destroy the soil and minimize emissions of nutrients, which contributes to sustainable development. These methods contribute to society's desire to protect the environment. However organic farms are estimated to double the cost of production which results in higher prices for organic or "fair trade" products. But there are good opportunities to keep food costs down while consuming green products with high quality. This is because the food budget accounts for a smaller share of total household consumption and studies show that our households have bad habits regarding food handling. The national food administration estimates that an average household throws food at a value of about 4500 SEK per year. Home cooked food from raw materials decreases the processed food and avoids industry additives, which may also provide significant economic savings.

Private cultivation can provide products free from toxins that exist in the industrialized farming and Sanne argues for increased farming and gardening as more than half of Sweden's population has access to private land (Sanne, 2012). The gardens are filled mostly with lawns and ornamental plants but could produce vegetables throughout the country that would be enough to supply the whole nation's vegetable demand. This can however be difficult to achieve since many of us do not want to

grow in such a small scale as it is perceived unnecessary. Furthermore, it would require good storage facilities and time invested. But both Wallgren & Pettersson and Sanne argues that the decrease in work time will enable an increased food production in the city as people will have more time on their hands. And even though this might be perceived as wanting to go back to a long gone era the fact is that leisure time cultivators in Sweden are today already producing around 90,000 tons of potatoes, 30,000 tons of vegetables and around 80,000 tons of fruits and berries (Wallgren & Pettersson, 2011). Technical information systems than enable the consumer to track their food to the source could further strengthen the bond between consumers and local producers and increase consumer knowledge and confidence.

Increased vegetarian diet, urban farming and better management of food are all habits that should be advocated. Today's behavioural trend is moving towards the wrong direction in the form of fast food. More time through reduced working hours couples with schools' ability to increase knowledge can reverse this trend.

To reduce energy use in food preparation people could eat food that was prepared in large batches in large kitchens or restaurant to increase efficiency (Wallgren & Pettersson, 2011). Cooking larger batches and using it for other dishes or freezing it for use other days can also be done at home. In addition a shift from conventional ovens to microwave ovens would also contribute to a decrease in energy use. Another beneficial action would be to crease the consumption of pre-cooked frozen food as the processing, storing and transportation of this food entails high energy use. The energy used for transport of food can further be decreased through wider adoption of e-commerce. This type of e-commerce could be especially suitable for a big and rather dense metropolitan area such as Stockholm and could significantly reduce energy use caused by shopping for food.

A return to more traditional preservation models such as fermentation, drying and home conservation can further decrease the energy need for storing of for example vegetables and fruits (Wallgren & Pettersson, 2011). This can be done in various scales but there need to be a teaching of the know-how as our modern societies have drifted far from these types of traditional techniques.

The Lindell family was assisted with information on how large emissions different types of food caused, how to reduce food waste and given inspiration on how to cook appealing dishes. The family minimized food waste by using left overs to cook good food and their storage management of food product was enhanced so the products lasted longer (One Tonne Life, 2011). Seasonal vegetables and fruits were chosen by the Lindell's and they varied their choices of meat since chicken and pork is better alternatives. Furthermore they chose to eat vegetarian and fish several times a week. These measures reduced the family's emissions from food with 50 %.

The family decided to reduce their environmental footprint as far as possible by the end of the project by substituting milk products with soy and oat products, stop eating meat and fish and eating only seasonal vegetables (One Tonne Life, 2011). They also brought with them lunch boxes from home instead of eating lunch at a restaurant as they could better control the products used in they consumed food and they could also avoid fast foods. Restaurant visits also often entail transportation needs. The emissions from food were reduced by 80 percent compared to the beginning of the project.

The Lindell's believed that the reduced consumption of meat and dairy products was the biggest difference makers. However, they state that they would have had liked to get access to more information in the stores on how to choose food to reduce the carbon footprint (One Tonne Life, 2011).

Conclusion:

- Decreased consumption of meat and dairy products
- Adaptation to seasonal food
- E-commerce
- Larger batches of cooked food each time
- Reduced consumption of ready-made frozen meals
- Greater use of lunch boxes
- Decreased food waste by better adaptation of purchases and preparation of food to needs
- Increased private cultivation



Figure 7 - (Axel Johnson, u.d.)

Consumption

Our consumption patterns has changed significantly during the last century as increased living standards have allowed us to have a more diverse consumption not consisting of only the bare necessities (Pettersson, et al., 2011). Rising incomes has caused a decrease in the share of food and clothing in private consumption and an increase in the share of leisure activities, housing, health, trips and household equipment. Households started having more electrical devices, appliances and cars in their homes which together created a more flexible household life and changes in the societal structure.

But these changes in consumption patterns cannot solely be attributed to rising incomes and purchasing power as education has had an important role in shaping values and outlook on life and thus purchasing habits (Pettersson, et al., 2011). Improved education has for example led to a decreased consumption of goods such as tobacco, alcohol, clothing and domestic travel whilst increasing consumption of things such as goods and services connected to social contacts, travel abroad, child care, gifts and health care. Lately an increase can be seen in the consumption of travel abroad, restaurant and hotel services, cultural and information products and equipment to provide free time. Although there has been a shift from consumption to solely satisfy materials needs and towards a greater consumption of services and experiences the material consumption has not decreased.

Even though households have increasingly become prosperous this has not decreased the pursuit of material needs. Increases in incomes have instead been coupled with increases in consumption thus causing the expected benefits to be diminished (Pettersson, et al., 2011). The households' wellbeing

tend to a large degree remain constant. Even the increased free time has not reduced the sense of time-scarcity as the gained free time has tended to be more goods and consumption oriented. Consumption of time-saving equipment in households has also not showed any significant decrease in time shortage but instead led to increased household productivity. Although one might expect an increase in household productivity should correlate to reduction of time shortage this is not the case due to the fact that the time saved will be spent on different areas. Increased productivity therefore leads to rising incomes but also increases in time shortages.

Pettersson et. al. further explains how an increase in time scarcity often leads to worsening maintenance of goods. An imbalance in the productivity increase of goods production compared to service production could lead to maintenance becoming more expensive causing consumers to opt for exchanging their products rather than performing maintenance. It has become cheaper to produce products that can be thrown away before needing any maintenance which has huge environmental consequences. This argument is also backed by Sanne who mentions how even products that are marketed as environmentally friendly might in fact not be when considering the products whole lifecycle (Sanne, 2012). He believes we have fallen into a habit of constantly wanting to change our material goods even though there is no actual need for it. We should instead keep our products for a longer time which might require greater emphasis being put on maintenance. This is especially true for the fashion industry that constantly urges us to purchase clothes according to new seasons and change the clothes in our wardrobes. This is very troubling as a majority of clothes are made of cotton and cotton farming is incredibly water intensive and uses poisons that affect both farmers and textile workers. It would be more sustainable to keep last season's clothes and up cycle them, this can become a new trend in the fashion industry as it is creative and stimulating. Sanne however also brings up the potential problem of the commerce sector fighting back if they feel threatened.

Ahlner reasons along the same line and also believe we need to keep our products longer, repair them to a greater extent and choose less resource demanding products (Ahlner, 2013). She however also acknowledges the difficulty in doing this as we are constantly urged by advertisement to go against this more sustainable way. Our attitudes are also seen as a hindrance towards sustainability as we often link the exchange of products with our identities. Sanne also believes this to be the case and brings up the social comparison factor where people often compete with other people in the form of an escalated consumption (Sanne, 2012). Sanne however argues that this might change as people create stronger bonds and get to know each other better. People's values and thoughts regarding consumption are then believed to change.

Höjer et. al. explains how information technology can be used to create networks to give advice on which products to choose in terms of both price and other aspects through peer reviews (Fuehrer, 2011). Due to the wide reach of information technology it can also support services facilitating the sharing of goods, a view that is also shared by Sanne who believes this technological development has finally made the collaborative consumption trend viable. These types of services will be suitable to the projected future lifestyles with fewer and more flexible work hours as the need to use resources, such as a co-owned car, will be more evenly spread out through the day. Suitable things to be shared or co-owned are amongst other things vehicles, tools, living spaces, garden tools and gardens. The sharing of things will also decrease the need for storage space as households will decrease the amount of products they own.

The main changes the Lindell family did to reduce the environmental impact of their consumption were to cut back on shopping, buy products of higher quality and longer life spans, opt for buying second-hand products and to buy products and services with lower CO2 emissions (One Tonne Life, 2011).

Conclusions:

- Upcycling of products
- Longer use of products
- Sharing or co-owning products such as tools
- Choosing sustainable products (life cycle perspective)

Persuasive ICT-Technologies



Figure 8 - (Asia-Trip, u.d.)

A study of existing ICT solutions and their environmental sustainability aspects has been carried out and is presented below. The solutions are divided by five main categories and grouped into concepts that are explained. The choice of concept was based on the sustainable lifestyles guidelines that are also presented in the beginning of each category. For each concept a number of ICT solutions are presented, chosen according to their potential environmental benefits. We have also chosen solutions based on their persuasion abilities according to the six principles presented by Zapico and Turpeinen (as discussed in the theory section):

- 1. Effortless, accurate, individual CO₂ data**
- 2. Feedback for more responsibility**
- 3. Normative influence**
- 4. Exploit a mass principle of cause and effect**
- 5. Make it fun**
- 6. Make it mobile**

Where persuasion principles have played a part in choosing the ICT solutions these principles have been listed.

To gain a good understanding of existing and potential ICT solutions a number of interviews were made with researchers and various stakeholders such as Swedish ICT to complement the literature review. The research projects in SRS were studied to understand what type of solutions were being thought of and researched. A trip to the Smart City Expo 2013 in Barcelona was also made as a further study of innovative ICT solutions for a sustainable development.



Figure 9 - (A-huspro, u.d.)

Housing

- Reduced living quarters
- More efficient use of spaces
- Greater consideration to indoor climate
- Enhanced energy consumption awareness
- Adoption of smart energy consumption behaviour
- Use of smart energy efficient home appliances



Figure 10 - (Elektro Hain, u.d.)



Figure 11 - (Cisco, u.d.)

Smart Homes

Smart Home is an integrated system and infrastructure that allows smart solutions in the home. Some of the major features and benefits of a smart home system include visualization of energy consumption so residents can find out where and how much is being consumed in real time. The smart home also enables creation of different light illumination scenarios and makes it possible for the user to shut off lights and appliances in rooms that are not being used through the control platform.

Furthermore, residents can with a simple “home away button” turn off all electronics with standby modes and lightning that consume electricity unnecessarily when the users are not home. The family can also use home appliances, such as dishwashers and washing machine, in a smart way and request that the fully loaded machine turns on when the environmental impact and the electricity price is at its lowest level in terms of emissions and price.

Through simple clicks and real time information provided to the user through the smart home system, an increasingly energy smart behaviour and decision making can be adopted by the user. Spaces are utilized in the best possible ways through control of the energy consumption of spaces that are not being used.

The main persuasion principle with this type of solution is that these platforms offer direct feedback to residents linked to their activities in their homes. By always making residents aware of the consequences of their actions in term of environmental impact a behavioural change can be achieved towards more sustainable actions.

Persuasive principles: 2



Figure 12 - (ABB, 2014)



Figure 13 - (Eco Suite, u.d.)

Active House

A smart home system is being tested in an apartment in Stockholm Royal Seaport called the active house. This service enables the user to get a full control of their appliances as they can turn them off remotely through their mobile phones (Djurgårdsstaden, u.d.). By connecting every electrical device in the home to new controllable smart outlets the user can instantly see the energy consumption of each device as well as turn them off remotely. Furthermore, the users receive real-time information through an application. For instance, notifications on when electricity is cheapest during the day, which family member leaves or enters the home, information on the dishwasher and the washing machines cost and environmental impact after the dish and the laundry is finished, how much energy is consumed in the different rooms etc.

Although the technology is expensive, the current experiment has shown positive trends that the test family living in the apartment has reduced its energy consumption. This can be seen as a direct result of the persuasion aspects of this technology. As with the very similar smart home systems, the residents were able to directly see the consequences of their actions and could adjust those actions accordingly. An added persuasion principle with this solutions is that it also makes it mobile, this

further facilitates a behavioural change as it becomes much easier for residents to get the feedback instantly to their smart phones.

Persuasive principles: 2,6

Similar: Ciscos NEXT living Ecosuite

Smart home management

Fortum Home Control

Similar to the active house the user gets control of many of their appliances as they can turn them off remotely through their smart phones (Fortum, 2013). The technology is however not integrated in the home as it is in the Active house. It instead relies on external equipment.

Through an online portal the user can get full control of their power consumption with statistics and graphs divided per room and even per appliance depending on the number of smart outlets the user chooses to install. The user can then either use existing smart controls and program them for their specific habits and routines or they can also create whole new smart controls that can fully accommodate their needs.

The user can furthermore install smart thermostats that can also be controlled remotely and give the user control of the indoors temperature and allow them to adjust it both in specific zones or in the home overall. By setting a budget the user can continually see how they are doing in regards to their decided energy goal and adjust accordingly.

This is a similar solution as the two previous and therefore also has the same persuasion principles. The difference with this solution is that it can much more easily be retrofitted to existing homes.

Persuasive principles: 2,6

Similar techniques: Fibaro Home Center, Vattenfall EnergyWatch

ELIQ

Similarly to Fortum Home control, ELIQ offers visualization of the home's energy consumption. But the uniqueness of Eliq is that users also have the ability to compete with other households connected to the service in order to bring in a competitive aspect to energy saving and motivating users to further decrease their consumption (Exibea, u.d.).

This solution resembles the Fortum Home Control but with the important difference of incorporating a competition element. This is to further motivate people to change their behaviour as it makes energy efficiency a bit more fun and also social.



Figure 14 - (Nest, 2014)



Figure 15 - (Fortum, 2013)

Persuasive principles: 2,5,6

Nest Thermostat

The Nest thermostat is a modern programmable thermostat that aims to make an impact on energy used to warm up homes (Nest, 2014). The user only has to either turn up or turn down the thermostat and it will automatically learn and adapt to the users schedule and routines. It becomes programmed so it can for example turn down the heat when the user is sleeping and automatically turn it up again when the user awakens. It also turns down the heat when the house is empty to not waste any unnecessary energy and turns it up again when the user gets back home. It furthermore indicates with a leaf symbol to the user to show that the user is saving energy and thus encourage energy saving behaviour.

This type of automatic thermostat that does not require a lot from the user can potentially have a good impact on households' use of energy to warm up their homes as it allows them to easily control and have an overview of the energy used. And since it learns automatically it can become quite smart and adapt the heating to the user's needs.

An important persuasive principle with this solution is that as the thermostat learns and adapts to each households specific characteristics and preferences it makes the environmentally friendly behaviour seem normal. The thermostat setting will by default be environmentally friendly and this would change only by a conscious effort from the residents. The solution also offers direct feedback for the residents to easily know how environmentally friendly they are at the moment in terms of the heating of their residence.

Persuasive principles: 2,3

Collaborative housing

Collaborative housing which is one aspect of the sharing economy can be seen as a concept that solves the problems with our inefficient underutilization of our living spaces. The concept encourages compact living through different platforms and is created by modern social architecture. It promotes rental of different residential spaces such as kitchens, laundry rooms, homes, rooms etc. This enables more dense and dynamic urban areas and creates a financial benefit for the users through rental. Accordingly, the energy consumption per square meter per person declines, thus it positively affects the environment. If the concept would get a more widespread reach in Sweden, it could reduce the demand for new construction. Furthermore, urban areas can be transformed and introduce collaborative use and sharing schemes in terms of consumption and transportation to further reduce our environmental impact.

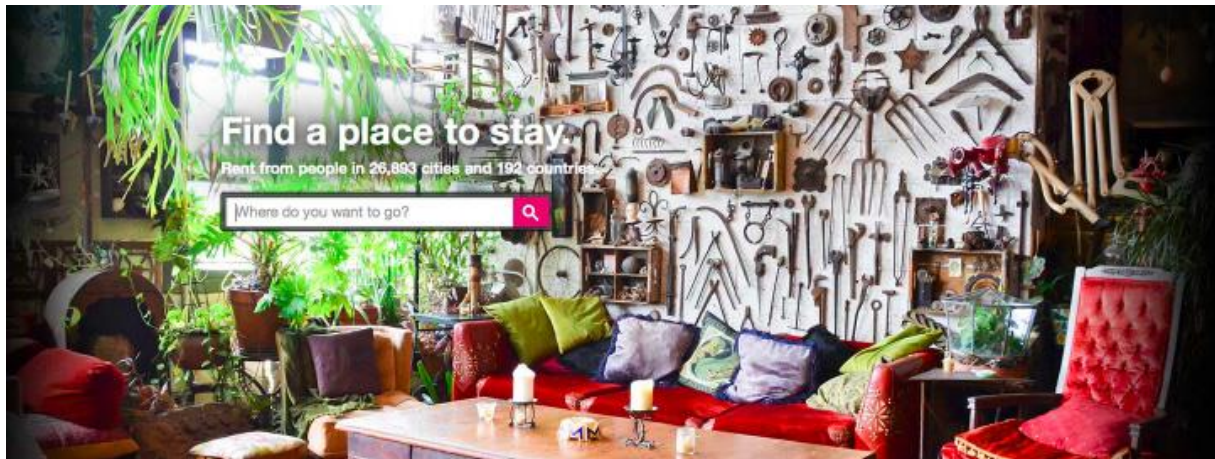


Figure 16 - (Airbnb, u.d.)

Airbnb

Airbnb was founded in 2008 and has since grown to becoming one of the biggest websites in the world enabling people to list and rent accommodation throughout the world (Airbnb, u.d.). By creating a marketplace for people to list their apartments or houses to people who wishes to secure accommodation, this has led to a more efficient use of people's property while at the same time created an additional source of income for these people. Instead of having to leave an apartment or house empty and unused during certain periods of time people can use Airbnb to rent it out to people looking for a place to stay. This means that instead of having to book rooms at a hotel travellers can stay at apartments or houses belonging to locals. As this type of accommodation spreads it can lead to a more efficient use of the current built environment.



Figure 17 - (Airbnb, u.d.)

Innovative home devices

It is hard for the residents to know what appliance in their home consume the most energy at any given hour. Innovative home devices reveals hidden energy information in a new and innovative way through smart and stylish solutions without the residents actively needing to act or take action to access the energy consumption information. The smart devices with their unique design, without

complicated graphs and numbers, enable the whole family to find out their energy consumption and find the energy culprits in the house. The aim is to create awareness among residents and change their behaviour in terms of electricity and water consumption.

The Power Aware Cord visualizes the real time electricity use of home appliances connected to it with intensity of light, pulse and flow (Interactive Institute, u.d.).

Waterpebble reduces water use in a unique way. The device monitors water going down the plug hole when showering and indicates when to finish showering by remembering your first shower time and using it as a benchmark (Waterpebble, u.d.). It flashes with a series of lights from green to red. It automatically reduces the shower time by fractions, helping the user to save water.

The energy aware clock is in wireless contact with an electricity meter in the fuse box (Pike Solution, u.d.). It receives information about the current consumption in the home every second and visualizes it in the form of a clock.

The Uji showerhead encourages the residents to take more energy efficient showers by gradually fading from green to red as the shower time increases.

Persuasive principles: 2,5



Figure 19 - (Waterpebble, u.d.)



Figure 18 - (Yanko Design, 2014)



Figure 21 - (Pike Solution, u.d.)



Figure 20 - (Interactive Institute, u.d.)



Figure 22 - (Zero Emission Motoring, u.d.)

Mobility

- Use of electrical vehicles
- Increased public transportation use
- Promotion of walking and use of bicycles for shorter distances
- Use of carpooling
- Decreased leisure air travel

Electrical charging stations

A charging station infrastructure has to be better developed in order for electrical vehicles to become viable alternatives, especially considering the fact that electrical vehicles still have a comparatively short driving range. Despite the economic and environmental benefits of electrical vehicles the lack of a proper charging station infrastructure is still standing as one of the biggest obstacles. There are currently several charging stations located mainly in the largest cities in Sweden but the fact that they are far less common than gas stations owning and driving an electrical vehicle requires some planning which reduces some of the freedom aspect of car ownership. There needs to be both more charging stations and an easy way for the driver to find them.

Utility companies and electric car manufacturers, as well as technology companies such as ABB, have an interest in increasing use of electrical vehicles and they are therefore also working with increasing the presence of charging stations.



Figure 23 - (Response, u.d.)



Figure 24 - (Flickr, u.d.)

ChargePoint

ChargePoint offers the world's largest network of charging stations in a dozen countries (ChargePoint, 2014). It allows charging stations owners to connect to their online platform from which electrical vehicle drivers can find the nearest station. Users can also monitor the charging of their car and get a notification when it's fully charge, thus eliminating the need to wait to see if the car has been charged. By making it easier for EV drivers to find charging stations the issue of range is becomes less important.

By making charging stations more ubiquitous and making it very easy to find them this can make driving electrical vehicles more normative and therefore the default choice for many new drivers and car owners.

Persuasive principles: 3

Smart travel planners

Travel planners are getting increasingly smarter and more intuitive as the rapid technological development has enabled them to collect real time information to a much greater extent from various sensors. By turning users into information collectors the smart travel planners can get a better and more up to date overview of the traffic flow and present the user with cheaper, faster and

more environmentally friendly alternative routes. As these travel planners help to decrease traffic concentration and thus the heavy loads experienced on the road networks this entails gains not only to individuals but to the society as a whole in terms of a better traffic flow, decreased emissions and decreased time loss.

Waze

Waze is a smart user community-based navigation app that collects information automatically from its millions of users to get an overview of the traffic system and offer users alternative routes to circumvent traffic jams, accidents or road hazards (Waze Mobile, 2013). Users are also able to actively report for example accidents or road work and also help update maps. By directly engaging users Waze is able to collect vast traffic information and use it to help users find more efficient routes to save both time and money. By decreasing traffic congestion a reduction in emissions can also be reached as vehicles consume more gas and emit more CO₂ as they drive slowly and spend more time on the road. Thanks to users reporting gas prices at different gas stations Waze can also navigate users to the cheapest gas stations along their route.



Figure 25 - (Waze Mobile, 2013)

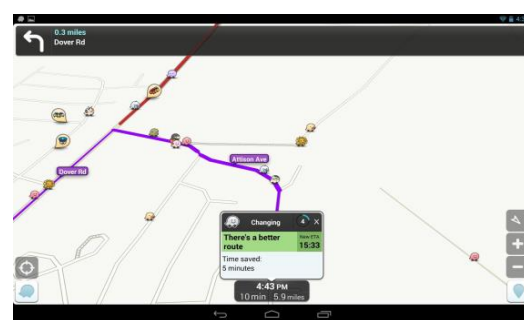


Figure 26 - (Waze Mobile, 2013)

In addition to this users can use Waze to synchronize meetings with friends or colleagues as the mobile app enables them to see each person's position and expected arrival time. This decreases idle time when having to wait for friends to arrive.

This navigation app makes choosing an alternative route that causes less congestion and emissions the normative choice by automatically offering the driver the alternative route. As it is mobile it also is more directly linked to the action of driving and can thus more easily influence a behavioural change.

Persuasive principles: 3,6

Spacetime Application

The Spacetime travel application is a travel planning tool that enables direct comparisons of cost, environmental impact and health aspects of different travel options, facilitates carpooling and enables administration of group travel within the user's social network. The system provides support for selecting the desired parameters based on economy, environment and health. It also facilitates sharing of transport resources including cars, vans and bikes in various groups and makes coordination of carpooling easier through social networking. The application leads to savings in time and money, decreased environmental impact and increased social meetings.

Persuasive principles: 1,6

Nunav

Nunav is a smart travel planner that works in a different way than other planners. As opposed to other travel planners that identifies traffic congestion and then divert traffic to smaller streets Nunav works with assessing the risk for eventual traffic jams to arise and pre-emptively work to avoid it (Graphmasters, u.d.). This is done by reserving time slots for cars on the road and thus allowing the app to see both present and future positions of participating cars on the road network. The app's advanced algorithm can then calculate shortest routes very quickly and present it to the user. By working in this proactive way Nunav has been able to decrease congestion and CO2 emissions considerably.

Persuasive principles: 3,6



Figure 27 - (Graphmasters, u.d.)

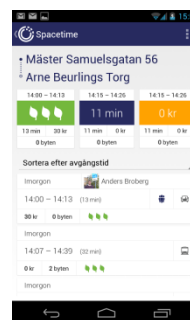


Figure 28 - (SpaceTime Communication AB, 2013)

Car and bike sharing

The idea of collectively owning a car or a bike and sharing has existed for a very long time. Instead of every individual owning their own car a group of people can go together and share the costs and upkeep of the car but also the time they can use it. This kind of car ownership has had difficulty becoming more widespread. But lately a new type of service have begun gaining traction where one can become a member in a car sharing website and thus having the comfort of easy access to a car but without all the trouble of owning one.

This kind of service addresses the problem that a vast majority of cars and bikes are only used a few hours per day which is very inefficient. Instead of owning you own car with all the costs and time that entails you can become a member in this type of service and have most of the comforts of owning a car but without all the hassle. If more people joined these types of services it could have a major impact on congestion and greenhouse gas emissions.



Figure 29 - (Zipcar, 2014)



Figure 30 - (Zipcar, 2014)

RelayRides

RelayRides is the world's largest peer to peer car sharing service (RelayRides, 2014). It offers private individuals to list their vehicles online and determine the time they are willing to rent out their vehicle and for what price. The car owner is covered by the company's insurance to remove any risks for them. The risk is also decreased by the screening of potential renters to sort out any drivers with bad driving history or unconfirmed identity and prevent them from renting.



Figure 31 - (Zipcar, 2014)



Figure 32 - (ipac, u.d.)

Zipcar

Zipcar is a website where people, once becoming members, can book a car for a few hours or a whole day (Zipcar, 2014). One of the reasons for the popularity of this service is the ease of use, members get a member card and can book a car online or via the company's mobile app. The cars are spread out throughout the cities where the company operates and the goal is that you should not have to travel long distances to reach the car you have booked. Once reaching the car you simply have to hold the members card to the windshield to unlock the car and then just drive thus eliminating the need to go physically go into an office to retrieve the keys or sign papers. Furthermore, the cars can be booked and accessed 24/7 and the company operates in cities throughout the world with thousands of cars.

Stockholm City Bike

The mobile application for Stockholm City Bike enables residents to find vacant bikes and also vacant parking spaces for the bikes (Stockholm City Bikes, 2013). The system for rental requires a membership and a rental card. These are bought in the SL Center, Stockholm public transport centre. The rental card is used to swipe over a reader and the bike is then accessible for three hours. The bike is then returned to one of the many bike hubs in the city after the travel is finished. The easy way of renting a bike through the application enables a more healthy and sustainable mode of travel.



Figure 33 - (Mayne, 2012)

MOTIT

MOTIT is a service that provides electrical bikes through the web or the smart phone (Going Green, u.d.). The service allows the user to pick up the bike anywhere in the city and return it to any destination within the city. The service causes zero emission and allows the user to move free and fast in the city.



Figure 34 - (Ortega, 2013)

The user chooses to reserve the bike by time or distance depending on their choice. It is possible to modify the reservation up to two hours before the reservation starts. A notification is sent to the driver 5 minutes before the booking starts. The driver then approaches the bike and starts it with her or his smart phone. The user returns the bike in the destination selected when the reservation was made. Extra fees or penalties occur if this rule is not obeyed. When the battery is low, the operator in the city can locate the vehicle and change the battery.



Figure 35 - (iThinkTechno, 2013)

By making it so easy for the user to pick-up and drop-off the vehicle, MOTIT can facilitate a behavioural change towards greater use of electric motorcycles for medium distance trips that might otherwise have been carried out by a regular car.

Persuasive principles: 6

Ride Sharing

One of the largest disadvantages in car use is that the cars very seldom are fully occupied. Rather you can often see on the highways that only the driver is in the car or maybe plus one passenger. This is one of the reasons why public transport is more environmentally friendly as buses for example are much more often filled with people and thus more efficient. Ridesharing aims to make it easier for drivers to connect with passengers around the world. Passengers who want to go to a certain location on a certain time can search to see if there are any drivers with cars that are headed the same way. In this way cars that would otherwise have been empty save for the driver can carry more people and thus decrease the impact per passenger on both the environment and income. By splitting the gas cost the driver can also decrease the cost to getting to the location he/she was anyways going to.

These types of services have a potential of being able to improve the environmental sustainability of car use whilst at the same time decrease traffic on cities' often highly congested roads.

Sidecar

Sidecar is a service that allows people to find people to share rides with through their smartphone app (Side.cr, 2013). Users can use the app to see whether there are people with cars going towards the same destination and virtually “hitch a ride”. This service enables a more efficient use of cars and can therefore reduce the number of cars on the road.

This service makes it very easy for people to directly see whether they can share a ride with someone. By making it so easy and quick to see this it can encourage more people to consider ridesharing as a viable alternative to other means of transport.

Persuasive principles: 6

Why Drive for Sidecar?



Offset the Cost of Your Car

Drive where you want, when you want. Some drivers make more than \$30 per hour – just a few hours of driving can help cover costs for parking, insurance, repairs and gas.



Meet New People

Have great conversations and get to know people in your city you might not otherwise meet. Our drivers are engineers, journalists, athletes, sales reps and actors – join them!



See the City in a New Way

Discover new restaurants, great shows and hidden parts of your city through the eyes of locals.

Figure 36 - (Side.cr, 2013)



Figure 37 - (TimeOut, u.d.)

Living & Working

- Reduced work hours, more leisure time
- More efficient use of spaces
- Increased work in proximity to the home
- Enhanced energy awareness
- Decreased business travel
- Adoption of sustainable choices

Peer 2 Peer services

Why should we pay an unnecessary amount of money and resources for simple services such as transport, cooking, shopping and other daily errands when the help is next door? Peer to peer sharing conveys instead all different types of services, whether it is professional or everyday physical services, through mobile and web-based platforms in a comprehensive way. The concept helps to increase employment at a local level and creates social interactions within the community. In the meantime, the positive effects on the environment are vast through the decrease of unnecessary expensive and unsustainable transportation.

The concept has gained huge popularity across the United States and has even led to some people resigning their jobs. They have instead made a living entirely through advertised services in their respective preferred line of work, through peer to peer platforms. Thus, Peer 2 peer sharing has contributed to letting the users choose what they want to work with. Peer 2 Peer sharing also helps people to find new time. For instance, parents can outsource some of their daily errands or work so they can have more time with their families.

Finally, peer-to-peer services allows workers to float between different jobs and encourages entrepreneurship through the grading system where good grades on the provided services can enable you to charge more money and get more assignments. A more local economy would not only lead to a decrease in service related transportation but also to a decrease of transportation in terms of everyday work.

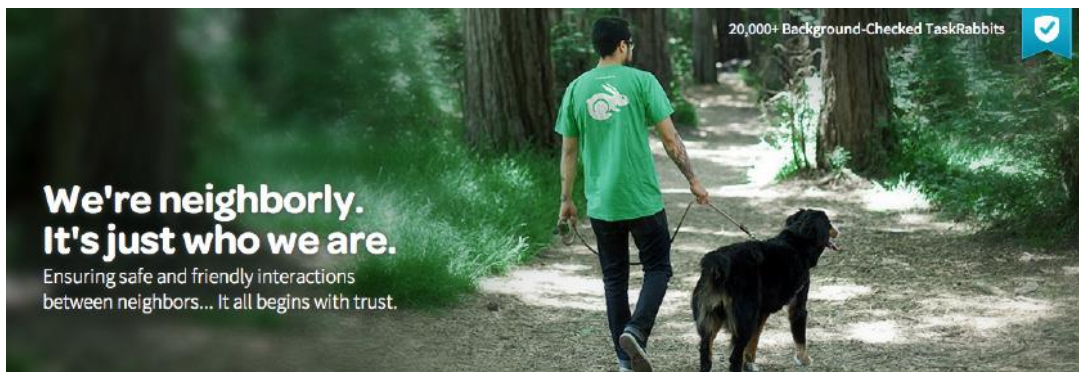


Figure 38 - (TaskRabbit, 2013)

Taskrabbit

Taskrabbit is a marketplace for peer-to-peer services and have gained over millions of users and is being perceived as the flagship company in the world of peer-to-peer service sharing. The platform enables user to advertise the type of service they need assistance with, when and where through TaskRabbit's website or application (TaskRabbit, 2013). They then specify a price or decide to request bids. The users can choose who performs the service from the "friendly TaskRabbits" or let TaskRabbit choose for them. Payment is made after service completion and the user is satisfied.

A variety of services can be advertised, for instance shopping, packaging and preparing Christmas gifts, catering, handyman or professional work such as graphical design or even virtual services like research or vacation planning. TaskRabbit lets the user to run errands for fun and gain some quick money and even allows you to be your own boss and work in a more permanent way.

Similar: Hinnerdu.se (Swedish version), DogVacay (focused on dog sitter services) and more

Augmented reality

Lauren Drell defines Augmented as “a way to use technology to redefine space, and it places a virtual layer over the world with geographic specificity ensuring a good fit” (Drell, 2012). The concept enhances reality by utilizing smartphones or glasses to access beneficial visualized real time information from our physical environment. Augmented reality is perceived to create a data-driven urban living by enabling visualization of information that normally is not visible in the urban space. Applications enable the user to point their smartphone towards physical objects such as bus stops, buildings, signs, etc. and the user obtains in-depth information. It’s really just the imagination that puts limits on the information that can be visualized.

This concept can facilitate people to live more sustainable through a variety of examples. Bus stops can provide real time information about where your bus is located while you are waiting for your bus through a smart map in the mobile, instead of the classic “minutes remaining”. Furthermore, by pointing your phone at various objects augmented reality allow visualization on for instance vacancies in Internet cafés for workspaces, bicycle parking in bicycle garages and vegetarian options on a main street. Thus, augmented reality can support sustainable travel, sustainable actions and also green consumption by in-depth real time information. It also supports the use of the urban environment through the information provided. The concept can also be used by planners and cities in numerous ways, for instance in traffic planning or to recognize buildings that consume the most amount of energy in an area.

A prototype of an augmented reality application for Stockholm Royal Seaport is under development in the project “Smart City SRS” and is intended to enable people to adapt a green lifestyle by creating awareness among citizens.

Smart Santander RA

Santander Augmented Reality Application developed in the project Smart Santander is an application that contains information on about 2,700 places in Santander (Smart Santander, u.d.). The information is sorted into different categories such as shops, public buses, taxis, parking places, bikes, museums and more. The real-time information that is displayed in the app can for example include bicycle rental, weather reports, shops and bus services and create a unique system for the residents and visitors as they walk through the city. When residents walk past a shop, he or she can then get information about what’s available in the store, its opening hours, nearby bus stops and more. In the application, there is also a so-called “augmented reality view” that creates a layer with



Figure 39 - (EliNext, 2012)



Figure 40 - (Businessweek, 2014)

nearby points of interests that can be selected, which then provides additional information about the various POIs.

As augmented reality can still be considered somewhat of a novelty, this kind of solution incorporates an element of fun in encouraging people to make more environmentally friendly choices in the city. It also makes the access to information mobile which makes it much easier for residents to consider environmental sustainability when making different types of choices.

Persuasive principles: 5,6

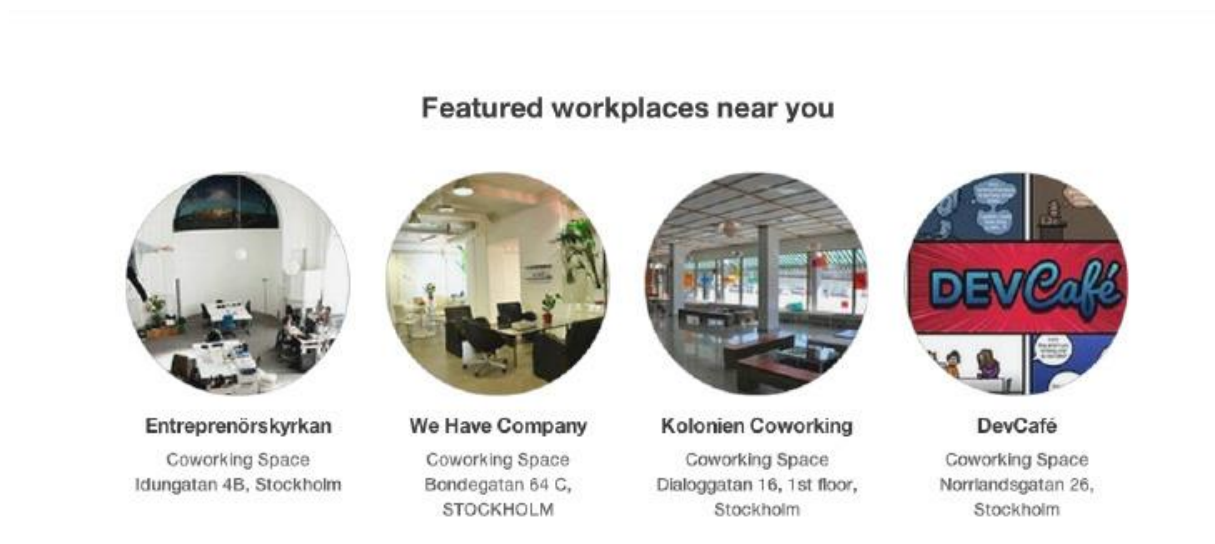


Figure 41 - (ShareDesk, u.d.)

Collaborative Workspaces

Do we really need to travel every day to get to work? Collaborative workspaces is a concept where anyone is able to rent space in a flexible workspace nearby in order to do their daily work. This means that the workers, depending on the type of work, will be able to work more locally and thereby contribute to reducing emissions from transportation. The user can choose to rent space over a longer period of time or select to rent workspace over a shorter time span such as a couple of times or once a week. In addition to decreased travel time, freelancers can take the advantage of software programs available at these flexible workspaces that otherwise would have cost a single user a lot more. Workplaces are equipped with Internet and necessary equipment. As cloud services are increasing, collaborative workspaces, can gain even further popularity.

This type of flexible office hubs has become more widespread in the city of Stockholm. There are spaces today in Stockholm Royal Seaport enabling collaborative workspaces through such office spaces provided by the housing cooperatives. The demand for living space can decrease by this concept since families do not need any office rooms or office spaces. Instead they have access to such facilities through membership in the different housing cooperatives.

ShareDesk

ShareDesk is an online platform that allows residents to quickly and easily find flexible workplaces nearby (ShareDesk, u.d.). Business centres, corporate offices, co-working spaces, start-up incubators

and meeting facilities are available for rent and users can search within their comfort zone according to price and proximity. Users can rent by the hour, per day or per month and avoid the administrative burden of having their own office. ShareDesk makes working around the globe easier and enables new social interaction and new collaborations.

Similar: Gangplank, Share Your Office and more.

Energy awareness platforms

Energy is a rather abstract concept for the average person. It is therefore difficult to understand and react to. What does it mean that we release X kilograms of CO₂? Even though we see carbon dioxide information everywhere we can't fully grasp the meaning of it. That in turn makes it difficult to understand the benefits of certain green actions or to compare certain actions to each other to see which is more beneficial. Platforms for energy awareness enable such comparison and can also inform the user about other options and the consequence of them.



Figure 42 - (Carbon.to, u.d.)

Carbon.to

Carbon.to aims to simplify the understanding of carbon dioxide for the user as used in an energy saving context (Carbon.to, u.d.). To understand what for example one kilogram of CO₂ means the user is allowed to convert it to another measurement such as for example hours of flight or kilograms of beef consumed. By using the service the user can easily see for example that traveling 1 km by car equals 12 km by train in terms of CO₂ emissions or that 1 kilogram of beef equals to 66 portions of rice.

By using this type of service individuals can better get an understand of the impact on the environment cause by certain actions they take and how big of a difference it could make to exchange one action with a similar but more environmentally friendly one.

This service offers users the ability to grasp what their consumptions or travels means in term of CO₂ emissions. As CO₂ is a rather abstract concept this type of comparison makes it much easier for people to put it in relation to other more easily understandable things. This increased understanding of the consequences of their personal choices can in turn motivate them to alter their behaviour.

Persuasive principles: 1

Smutselskollen

Smutselskollen enables a clear and simple understanding of how environmentally friendly the user's current electric utility is (Smutselskollen, 2013). Moreover, the user can compare with other companies and switch to the "greener" company.

Similarly to the previous solutions this helps to increase peoples' knowledge of their everyday choices, in this case regarding their electricity consumption.

Persuasive principles: 1



Figure 43 - (Smutselskollen, 2013)



Figure 44 - (The Cute Epicure, u.d.)

Food

- Decreased consumption of meat and dairy products
- Adaptation to seasonal food
- E-commerce
- Larger batches of cooked food each time
- Reduced consumption of ready-made frozen meals
- Greater use of lunch boxes
- Decreased food waste by better adaption of purchases and preparation of food to needs
- Increased private cultivation

Food awareness platforms

Food awareness platforms increase our understanding of our food consumption and how our food choices affect the environment. This knowledge will help us make smarter decisions and change our behaviours to more sustainable ones in regard to the environment. Food awareness platforms enhances consumers awareness through knowledge on what our different groceries and food products contain and their environmental impact, their route to the store, the country of origin, whether they were locally produced, durability of the groceries before it is inedible and more. This can help increase consumption of locally produced goods, fish and healthy vegetarian options. It can also decrease the unnecessary food waste in regular households and lead to better food management through increased knowledge of food.

Bonde på Köpet

This is a food app that reveals the origin of the food products and groceries in our supermarkets (Lantbrukarnas Riksförbund, u.d.). The user uses his or hers mobile phone to scan the article and a thumbs up or a thumbs down on the screen indicates if the item is Swedish or not. Several of the products market themselves as Swedish but the “Bonde på köpet” application can show if indeed all the ingredients are Swedish or not. It is also explained on their website why consumers should choose products from Swedish farmers. The app is an effort to increase the knowledge of Swedish goods.



Figure 45 - (Gefle Dagblad, 2013)

This app makes it easy for consumers to get information about their grocery shopping directly when they are in the store. By offering the information at the precise moment when the choice is made this app can have a strong effect on the food consumption habits of its users.

Persuasive principles: 6

Similar: ShopGun, FoodSwitchApp

LifeSum

Lifesum is a mobile application that helps its users to embrace a healthier lifestyle through smarter food choices (ShapeUp Club, 2013). By scanning the food in the fridge, the app keeps track of what kind of food you consume. The application gradually learns about your food behaviour and helps you adapt to a healthier lifestyle. In the app, users can set calorie goals and receive help with meeting the objectives. The app contributes to increased vegetarian diet and reduced unhealthy diet such as chips, ice cream etc.

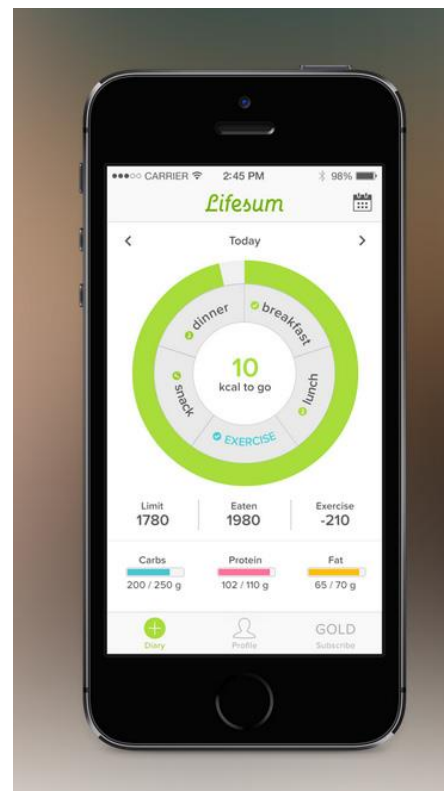


Figure 46 - (WND, 2013)

Persuasive principles: 2,6

Släng inte maten

Släng inte maten, Swedish for “Don’t throw away the food”, is a website that enhances knowledge regarding the durability of the food products and groceries. It helps users to understand suitable temperatures for food storage, the expiry date of different products and what it means, tips on reducing food waste and recipes using left overs (Konsumentföreningen Stockholm, u.d.). Thus “Släng inte maten” decreases food waste and enhances food management through awareness in regular households.

Sustainable recipes

It is not obvious for everyone to know how to cook sustainable food. For instance, sometimes it is difficult in terms of inspiration on vegetarian dishes or how to cook food from scratch. Sustainable recipes are different recipe banks that promote vegetarian diet, organic products and food with as little additives as possible. The concept of sustainable recipes is to learn how to cook appealing dishes with “green” ingredients and decrease our consumption of pre-made food such as meat balls, breaded fish and so on.

Ekomatsedeln

Ekomatsedeln is a recipe bank that creates organic food menus that are SMART-compliant (EkoMatCentrum, 2009). This means that all the recipes in the bank follow a SMART distribution model and that the recipes, on average, complies with the Swedish nutrition recommendations. The SMART distribution model implies that the recipes have fewer shares of “empty calories”, a large proportion of vegetables, correct type of meat and vegetables, and is transported efficiently. By purchasing and cooking according to the S.M.A.R.T.-model, the food will be better for the environment and health, while not being more expensive.

The users can find recipes based on meal and the size of the household. The user can also receive ecological and nutritional customized weekly menus and suggestions on how existing recipes can be converted into eco-friendly ones with organic ingredients. Finally, the user can access various guides such as a consumer guide for fish and seafood and descriptions of organic food.

Similar: Smarta Maten

Simply Scratch

Simply Scratch is a website with a blog and numerous recipes with appealing pictures of dishes made from scratch. The recipes use fresh ingredients and unhealthy frozen versions are avoided (Simply Scratch, 2014). The food cooked from scratch is not only healthier but is also cheaper. Simply scratch



Figure 47 - (Simply Scratch, 2013)



Figure 48 - (Simply Scratch, 2013)

encourages to buy organic products when it is hard or too time consuming to make everything from scratch, for instance fresh pasta at times.

Similar: Äktamat, From scratch recipes and more

Food Sharing

Leftover food is being wasted in our households and restaurant visits with unsustainable food is increasing. Food sharing is a new concept and is based on a social interaction sharing scheme that leads to less food waste, reduced restaurant visits and decreased energy consumption per portion served. More food can be cooked simultaneously by inviting neighbours over for dinner or lunch which creates a stronger bond with users' peers and can also decrease restaurant visits. In addition to inviting people to their homes, the food sharing encourages giving away extra portions instead of throwing it away. Dinner parties, barbeques, weddings, food cooked at home for a lot of people etc. creates extra portions that sometimes go to waste. Instead, the concept of food sharing encourages giving the extra portions to neighbours, thus also creating social interaction.

Casserole Club

This website enables neighbours to enjoy a plate of delicious home cooked food from somebody in the neighbourhood (CasseroleClub, u.d.). Users can sign up to cook on the website and search for diners in their area. They then agree on when the diner can pick up the extra portion created by the cook.



Figure 49 - (CasseroleClub, u.d.)

EatWith

EatWith is a website and community engaging people to dine in other people's homes. Users can connect with different hosts and share their experience and a homemade cuisine made by the host (EatWith Media, 2014). It can be perceived as an alternative to restaurant visits and enhances the social interaction in the neighbourhood. The user then rate and write a review about the host who thus can receive recognition for their service.

Persuasive principles: 5

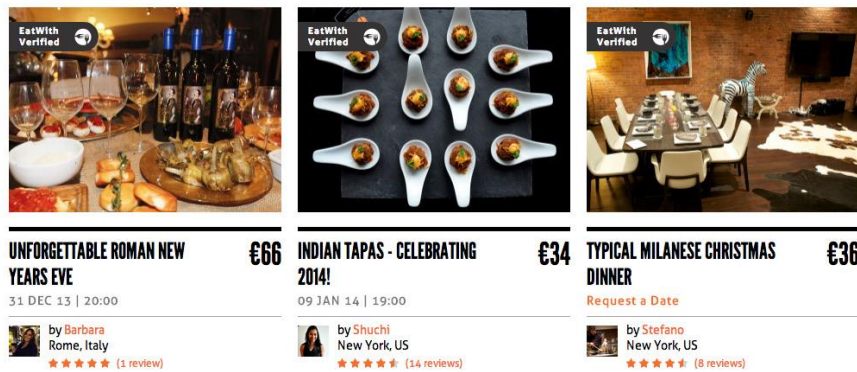


Figure 50 - (EatWith Media, 2014)

Grocery bags

Grocery bags is a concept that makes it easier and less time consuming for families to buy their groceries. The families do not have to use expensive and emissions-intensive transportation to get to the supermarkets, instead various companies can deliver the food to their home. These companies prepare a bag of groceries for several dinners which are delivered to the homes with recipes, thus making the family life as easy as possible. The families use the Internet to decide what type of grocery bag they want and can also choose to only use organic food in their bags. Furthermore, a significant amount of emissions can be reduced if companies are using sustainable transportation such as electric cars. It can also be perceived as an option to restaurant visits. Families get access to new luxury dishes with the grocery bags and not the ordinary ones that are normally cooked at home. Furthermore, cooking the menu at home with the whole family can lead to a new type of leisure time.

Ecoviva

Customers order their grocery bags on the Ecoviva website and receive delivery once a week. There are mainly two different types of grocery bags to choose from and both include locally produced, organic and seasonal ingredients (Ecoviva, u.d.). At least one of the four courses is vegetarian and at least one dish contains seafood or fish as the main source of protein in grocery bag "Ecoviva Classic". All four dishes and 75% of products are organic in the second grocery bag called "Ecoviva Vego". Furthermore, it contains vegan meals and limited amounts of dairy products, eggs and cheese.

Similar: ICA Matkassen and many more



Figure 52 - (Ecoviva, u.d.)



Figure 51 - (Ecoviva, u.d.)



Figure 53 - (Town Talk, u.d.)

Consumption

- Upcycling of products
- Longer use of products
- Sharing or co-owning products such as tools
- Choosing sustainable products (life cycle perspective)



Figure 54 - (Lai, 2012)



Figure 55 - (Tate, 2012)

Recycle

The modern consumption based society has led to us throwing vast amounts of things. Even things that still works or that only needs a simple repair are thrown out as people cannot repair the things by themselves and it is often cheaper to buy new things rather than send them for repair. Our wear and tear society has led to the dying out of repair skills amongst the ordinary citizen and to people throwing things away without much consideration.

A growing awareness of the wastefulness in our wear and tear society and the ensuing environmental issues have led to different initiatives throughout the world promoting a fall back to a more repair oriented society. Modern technology has made it so easy and cheap to produce and buy new things instead of holding on to and repairing them. This has led to vast mountains of waste that we create each year that needs to be taken care of in an environmentally friendly way but which unfortunately is often not. The long term goal of the techniques in this concept is to empower the consumer and change their attitudes towards repairs. By making it easier for people to learn how to repair their things the longevity of these things can increase which means less things have to be produced, shipped and be recycled or become waste. A greater movement towards repair can be significant in addressing the many environmental problems in production.

Repair Café

The Repair Café initiative began in Amsterdam as a non-profit organization providing professional help for local groups in different countries wanting to set up repair cafés (Repair Café, u.d.). Repair Café wants to change our view of our possessions and make us understand how easy it can be to repair broken things and expanding their lifespan. A repair café is a free meeting gathering likeminded people wanting to learn or teach how to repair things easily instead of throwing them away. People are provided the tools, materials and know-how at the repair cafés to enable them to learn how to easily repair their things.

iFixit

iFixit is an online platform that aims to gather as many free repair manuals as possible (iFixit, 2014). It is a community driven website where people can upload their own instructions on how to repair a wide variety of different gadgets. It was started as a response to the fact that many companies do not make available repair manuals to their products, instead forcing people to pay for costly repairs or buy new products. The idea was to empower the individual user and give them greater knowledge about how to service or repair simple malfunctions in the products.

This solution can aid a change in peoples' attitudes towards their material possessions. By making it easy for anyone anywhere to obtain the knowledge for performing simple repairs the old attitude of wear and tear can be altered.

Persuasive principles: 3

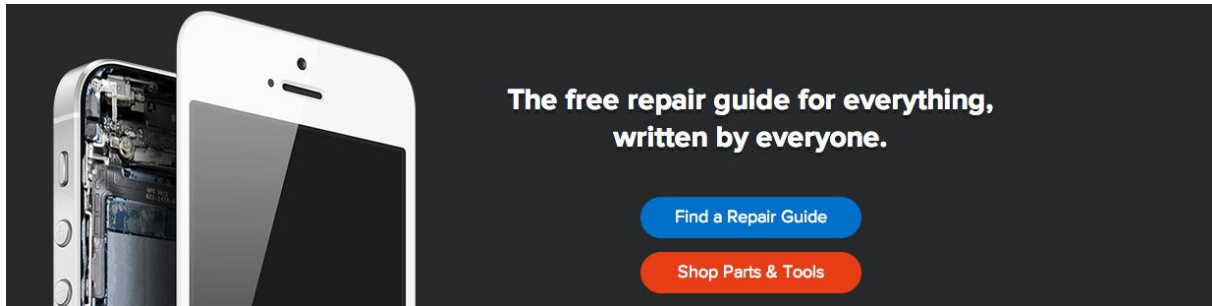


Figure 56 - (iFixit, 2014)

Upcycle

As an effort to decrease waste and increase environmental sustainability the process of upcycling is gaining popularity. Upcycling entails converting old, sometimes non-recyclable, products or materials previously considered as waste into higher quality products. Upcycling works as a complement to recycling to reach those materials and products that cannot easily be recycled and would have become waste and often gone to landfills.

TerraCycle

TerraCycle is a company that aims to address the issue of the waste that, for whatever reason, is not scooped up by existing recycling programs (TerraCycle, u.d.). This waste is collected and either recycled or upcycled. The company's ambitious goal is to eliminate the idea of waste. The company tries to collect people's waste, which has previously been non-recyclable or difficult to recycle, through waste collection programs. There are numerous such programs divided by the sort of waste they aim to collect, ranging from food packaging to office supplies. The collected waste can then be shipped to the company in exchange for points that can be used for charitable means. The actions of collecting this waste therefore has a two-fold benefit, it both leads to environmental sustainability as well as steers funding to charitable and non-profit organizations.

The collected waste is then recycled or upcycled into a wide variety of new consumer products that are available for sale through different physical and online retailers. These products can then in turn also be put back through the system to be recycled or upcycled and enable the user to earn more points. The service is currently available in numerous countries throughout Europe, North and South America as well as in Australia and New Zealand. This is an innovative new way to collect the waste that has previously slipped through existing recycling programs and that can help to decrease the mountains of waste our modern societies are creating each year.

Persuasive principles: 3

Eliminate the Idea of Waste[®]



Figure 57 - (TerraCycle, u.d.)

Trash To Trend

Trash To Trend is an open platform that enables organizations working with upcycling to showcase their products to the public (Trash To Trend, 2014). The platform is mostly geared towards the upcycling of old working clothes and company textiles as the quantity is usually very large and the quality remains high after they have been discarded. These fabrics can be upcycled to new clothes and textile products, thus extending their lifespans and decreasing the strain on the environment. There are also large quantities of textile fabric and product leftovers that are causing headaches for producers and retailers despite them being of high quality. Trash To Trend therefore also aims to function as a meeting point between these sources of secondary materials and designers, producers and customers to enable and simplify the process of recycling.

Shared economy

One of the many ways environmental sustainability can be achieved is through a decrease in consumption and in turn production. There are many benefits to this, mainly it decreases resource use and transportation need. This can be achieved by a so called shared economy, which promotes a sharing of goods and services. By promoting sharing in a community it strengthens the community and decreases its impact on the environment by enabling people to share and thus not need to buy so many things by themselves. Many of the things we buy today are left unused a vast majority of the time. Things such as tools, furniture and even cars and some clothing are only used for short and rare periods of time. Why not then borrow some of these things instead of buying them?

In our modern societies clothes are no longer only for protection from the elements and worn until they are worn out. Clothes are instead thrown out when we get tired of them and want to make room in our closets for newer or more fashionable clothes. This is of course increases consumption and all the environmental impacts associated with consumption. Peer to peer services for sharing clothes and other material things is therefore gaining traction.



Figure 58 - (Kulturföreningen KREATIVET, u.d.)



Figure 59 - (Lundin, u.d.)

Lånegarderoben

Lånegarderoben works basically like a library but instead of borrowing books people can borrow clothes. The idea with it is that people can for a small sum per month renew their closets with a few clothing items without causing increased consumption (Kulturföreningen KREATIVET, u.d.). There are many similar services to this, some of which focus on renting out clothing such as dresses and suits that are used only during special occasions.

Swishing

Swishing is a company also promoting a decreased clothing consumption but through facilitating for people to swap clothes with each other (Futerra Sustainability Communications, u.d.). People are encouraged to bring the clothes that they no longer use to swap them for other clothes that they may want. This is seen as a more environmentally conscious way of shopping for new clothes as the lifespan of the clothes is extended.

Reflection regarding the ICT solutions

The results of the research were interesting and helped to explain the challenges in implementing widespread ICT solutions in the Stockholm Royal Seaport to promote sustainable lifestyles. The clearest difficulty or potential problem as explained by several interviewees and researchers is the issue of access to information. The ICT solutions presented in this paper are all reliant of information to work properly, as are most, if not all, similar solutions. The issue is that the actors in control of that information are not always willing to share it. This can be due to security concerns, competition concerns or simply that they do not believe there is a viable business model for them to want to share that information. Another issue is that the information needed by any given ICT solution is fragmented and spread out among many actors. This further complicates things as it is very resource demanding, both in time and money, to reach out to all these actors and convince them to share the information they possess. As these difficulties can exclude smaller companies with innovative ICT solutions there needs to be a large scale effort, perhaps backed from the government, to create a platform with the information in the SRS that is needed by ICT solutions promoting sustainable lifestyles. This has been done in other European cities and is a potential solution worth further exploration. No indications can however be seen for such an initiative in the SRS.

The information problem can also be seen as a cause behind the fact that many of the present ICT solutions are reliant on the installations of hardware in the home. Many solutions for example

require information screens or smart electricity outlets. This is not very sustainable as it would be much more efficient and sustainable to use existing appliances in peoples' homes such as smart phones or tablets. This issue however cannot be fully addressed by opening up existing information as that information is often time not sufficient for the ICT solutions. But as smart meters measuring everything from heating to water consumption will be more common in new homes there needs to be platform where this information can be shared to reduce the need by ICT solutions to have separate measuring equipment.

Smart City SRS Concept

ICT has a great potential in promoting sustainability and sustainable lifestyles in Stockholm Royal Seaport and there should therefore be a greater consideration to it and to how it can be implemented throughout the neighbourhood. We have chosen those solutions that are most suitable for the neighbourhood based on the research done and that can realistically be implemented and also used by the residents. These solutions have been combined into a full concept of how ICT can be used in a city neighbourhood, and in Stockholm Royal Seaport specifically, to enable and encourage a sustainable living based on the guidelines for sustainable lifestyles previously presented.

As we look at sustainability in the urban perspective there is also a necessary connection to the urban structure and how alterations can be made in it to, together with ICT solutions, work towards a more sustainable neighbourhood. Although ICT has a great potential for encouraging people to change to more sustainable behaviours this is also often reliant on the urban structure to facilitate it. When it comes to promoting green behaviours one of the most crucial aspects is to make it easy to adopt these as most people will not change their behaviours if it requires too much effort.

Urban structure

Residential buildings have shared spaces, preferably at ground level, which can be used by the residents for various activities. These spaces are flexible and can be used for everything from hosting people, playing music or having different events. By having these shared spaces there is no longer need for very large apartments that can accommodate every possible activity household members might want to do.

There will be several returning events that promote sustainable lifestyles and that engage residents in sustainable activities. These will have the added benefit of increasing interest in sustainable behaviour and the ICT solutions available in the neighbourhood that facilitates this. Amongst the events will be repair-café that helps residents decrease their product waste by learning how to repair and keep their products for a longer time. There will also be Up-cycling events where residents can interact and together up-cycle products and clothes in an effort to further decrease waste. Events for swapping will also be held where residents will be able to swap unwanted possessions.

The shared spaces also have cooking facilities where people will be able to meet and cook together. This will create a community of sharing sustainable cooking experiences such as using seasonal produce, reduce meat consumption and cooking more with locally produced products. Cooking together is also more sustainable as it is a more efficient use of the cooking facilities. These types of social cooking meeting can also be an opportunity for residents to learn more of which products that are more sustainable and healthy to use.

To decrease the need for work commute there are shared work spaces in, or in close proximity to, the residential buildings where people can book a work space for a certain time period and day. By having these collaborative work spaces the social aspect of going to work is preserved whilst at the same time reducing the need for long commutes every day. This will further decrease the need for having larger apartments with part of them reserved as a home office.

Electrical vehicles are viable alternatives in the neighbourhood as there is an extensive network of electric charge stations in attractive location in connection with parking garages, homes, work places, restaurant and larger stores. Several businesses use the charging stations as a competitive advantage

and offer for example free charging when shopping or dining. There is also a local bike sharing system of both electrical and non-electrical bicycles to have a greater use of bicycles in the area.

Carpooling is an important element in the neighbourhood's transport composition and has a prominent role as the cars are located in attractive central areas to make them easily available for residents. By having an extensive carpooling service the need for privately owned cars is reduced as it is very easy to access a car when needed during anytime. Electrical motorbikes that can be rented and dropped off at any location in the neighbourhood or central part of the city are another popular alternative.

ICT solutions

An online platform is created for Stockholm Royal Seaport as a central hub for the ICT solutions in the area that promotes sustainable lifestyles. This platform contains several functions connected to the physical solutions in the urban structure. Residents can for example book work spaces in the collaborative work area which makes it very easy to have a flexible work schedule and work more often locally. There is also the possibility to view cafés nearby that offer Wi-Fi and are suitable to work from for people that would prefer that setting or only need to do a few hours of work. To encourage residents to work more from these spaces they are offered a certain amount of days they can use these spaces free of charge per month.

The platform contains a similar booking system for the shared common spaces that residents can book beforehand if they plan on having a gathering or if they need the space for other reasons.

The platform also link residents directly to each other making it easy to have peer to peer sharing of services, material things and spaces. One function enables residents to find neighbours or people in the area that can perform certain services that they need, it can be everything from fixing a computer, help install something, dog walking or babysitting. This takes advantage of skills that exists in the area to reduce the need for people coming from other parts of the city to perform tasks or services that can instead be done locally and thus not require any transport. Residents can also advertise that they have a free room or apartment that they want to rent out either short or long term which makes the use of space more efficient.

Another important function of the platform is the possibility for residents to search for recipes for sustainable meals and also share their own recipes. This makes it much easier for residents to know how to cook sustainably depending on their skills, preferences and means. To decrease food waste the platform also enables people to share any excess food or produce they might have with interested neighbours.

All the events mentioned in the previous section and the relating sustainable behaviours are also available virtually in the platform to encourage continuous engagement. Residents and businesses are able to discuss regarding simple repairs, up-cycling and swapping which have gained popularity thanks to the events. There is also the possibility to rent or borrow certain rarely used clothes such as suits or dresses to reduce the need to buy these garments. This virtual presence enables a wider connection with residents throughout the neighbourhood.

One of the most important aspects of a sustainable Stockholm Royal Seaport is for residents to have greater understanding of their environmental impact in terms of for example consumption and

energy use in a very simple way. Firstly, every new resident in the area is offered to buy a smart energy management and information packet for a reduced price. The packet contains ICT solutions for, amongst other things, managing heating, electricity and water consumption in a smart and non-obtrusive way. This gives residents a much better overview of their energy consumption and how their actions affect it which motivates them to adopt more sustainable behaviours and habits.

Residents can also access information on the sustainability rank for local businesses which has motivated businesses to improve the sustainability of their business practices. This service is also available through a mobile application with augmented reality that residents can use as they walk along the neighbourhood streets and directly see the sustainability rank of the businesses.

The ecological stores in the area have developed a service for customers to get a detailed account of their purchases and their environmental impact. These stores also offer home deliveries of organic products with the use of electrical vehicles. This is seen as a competitive advantage to distinguish themselves from other stores. All stores in the area have a requirement to make information of products environmental impact during the whole of their life cycles available to customers.

The online platform also contains travel planning functions such as the ability for residents to easily find people that they can share a ride with. The platform contains smart travel planners that can analyse and predict traffic congestion and offer alternative less congested routes to users. Residents can further use the platform to access all the vehicle renting and borrowing systems in the area so they can get a quick overview of all available systems and their locations. The platform also gives residents an overview of the available electric charging stations in the area and show which of them are vacant. A further benefit is a function to plan ones travel depending on chosen mode of transport and see the environmental impacts this will have. The vehicles in the public transport system in the area have been fitted with wireless sensors that enable the real time function in the platform where users can directly see the current position of for example the bus they want to take.

Actors

To implement the presented Smart City Concept a number of actors will need to be involved. The implementation of the concept will, as is the case for all major changes, lead to gains for certain actors and losses for others. It is important to acknowledge the actors for whom these proposed change will cause losses as these actors will oppose the changes and potentially delay them. The concerned actors, their involvement, potential gains and losses are presented below divided by the different measures in the concept.

1. Shared common spaces

Actors	Involvement	Gains	Losses
City of Stockholm	Incorporates shared spaces in local plans	More social interactions, greater environmental awareness and sustainable living amongst residents	
Architects	Designs the shared spaces and the new smaller apartments	Additional assignments of design of shared spaces	
Building developers	Builds according to the plans		Decreased profits as the size of the average apartment decreases

Consultants	Analysis of where shared spaces should be located and how they should be design depending on where they are located. Can work with building developers to shape the spaces.
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2. Shared work spaces

Actors	Involvement	Gains	Losses
City of Stockholm	Incorporates shared work spaces in local plans	Decreased emissions and congestion	
Architects	Designs the shared work spaces	Increased assignments	
Building developers	Builds according to the plans	More shared work spaces building assignments	Decreased demand for large scale office buildings
Small businesses	Can rent work spaces for their employees	Does not need traditional work spaces	
Shared work space companies	Provides and maintain shared works spaces	Increased business	
Cafés	Offers Wi-Fi and places to sit and work	Increased business	
Public transport system		Decreased congestion and heavy loads during rush hours	
Consultants	Analysis of the demand for the work spaces, where they should be located and how they should be designed. Analysis for small companies to show how they can benefit from shared work spaces. Analysis for public transport operators (e.g. SL) on how this can affect the traffic flow and they can adapt to it.		

3. Events

Actors	Involvement	Gains	Losses
Up-cycling companies	Sponsors up-cycling events and offer knowledge	Creates interest for their own products	
Swapping companies	Sponsors swapping events	Creates interest for their own services	
Spare part manufacturers	Sponsors repair events and offers knowledge	Creates interest for their own products	
Eco-stores in the area	Sponsors cooking events and offers knowledge	Creates interest for their own products	
Local farmers	Participates in cooking events	Creates interest for their own products	
Retailers			Decreased sales as people buy new products less often

Traditional food stores	Decreased sales of non-ecological products
Traditional restaurants	Decreased sales
Consultants	Analysis of suitable events in different areas and relevant companies. Management consultants can manage the events for the companies and have a follow up to analyse the effects in the businesses. A service can also be offered to existing companies to help them move towards greater sustainability and promote themselves through similar event.

4. Electric charging stations

Actors	Involvement	Gains	Losses
City of Stockholm	Incorporates spaces for these in attractive locations	Increased use of EV amongst residents, decreased emissions	
Charging station manufacturers	Builds stations that can communicate with the online platform	Increased business	
Local businesses	Offers spaces for charging stations	Increased business	
Gas stations	Offers charging possibilities at the stations	Increased sales of other products and food as people wait for their cars to charge	Decreased sales of traditional fuels
Green electric companies	Sells electricity in charging stations	Increased sales of sustainably produced electricity	
EV manufacturers		Increased demand for their products	
Car manufacturers			Need to offer EV also to stay relevant. Decreased demand for their traditional cars
Consultants	Analysis for City of Stockholm on where these stations would be most suitable. A projection of the expected growth of the EV share of the vehicle fleet. Can also aid charging station manufacturers and gas stations in the building process and finding business models.		

5. Carpooling

Actors	Involvement	Gains	Losses
City of Stockholm	Makes room for parking	Decreased emissions	

	places for carpooling in attractive places. Integrates this into the online platform	and congestion
Carpooling companies	Establishes in the area	Increased business
Car manufacturers		Decreased sales
Consultants	Analysis for City of Stockholm on suitable locations for parking spaces for carpooling companies.	

6. Online Platform

Actors	Involvement	Gains	Losses
City of Stockholm	Creates and promotes the platform	Increased environmental awareness amongst residents	Financial resources for creating and maintaining the platform
Sustainability focused businesses	Helps shape and finance the platform	Are promoted by the platform	
Traditional businesses			Decreased sales
Consultants	Manage the creation of the platform and involve sustainability focused businesses in the area to finance it. Can offer a service to local companies to aid them in increasing their sustainability and being part of the platform. Can also do analysis of the sustainability of local businesses and rank them in the platform.		

7. Smart energy management packet

Actors	Involvement	Gains	Losses
City of Stockholm	Offers the packets for reduced prices by striking deals with manufacturers	Increased environmental awareness amongst residents	
Manufacturers of smart energy products	Makes agreements with the City of Stockholm to sell their products for a reduced price as part of the packet	Increased sales and strengthening their profile	
Electricity companies			Decreased sales as households decrease their electricity consumption
Consultants	Connect City of Stockholm with suitable manufacturers of energy management equipment and develop a business model that is mutually beneficial.		

8. Product environmental impact information

Actors	Involvement	Gains	Losses
Eco food stores and	Creates and offers this	Increased sales due to	

other sustainable retailers	service for their customers	competitive advantage
Manufacturers of sustainable products	Makes environmental impact information available for all their products	Increased sales
Manufacturers of products with low sustainability and unsustainable retailers		Decreased sales
Consultants	Aid the sustainable retailers in assessing the environmental impact of their products. Can also aid companies in moving towards a product line with more sustainable products.	

V. Discussion

Although ICT solutions have shown their merit in aiding the shift towards more sustainable lifestyles it is nonetheless important to also consider the potential negative effects. It can for example be argued that a big reliance on technology to achieve sustainable lifestyles can alienate large groups of the population, both due to age and economic resources. When looking at a project such as the Stockholm Royal Seaport for example it is clearly visible that the residents will mainly consist of people in the upper classes of society due to the high costs of living there. So the solutions that are developed there might not have the same validity when wanting to implement them in different neighbourhoods with a different mixture of residents. Other types of solutions might be needed there.

It can also be argued that it is in fact the people who are considered lower on the social ladder that are the more environmentally friendly as their limited economic resources prevent them from things such as excessive shopping and taking several flights per year. The focus on ICT solutions in newer residential neighbourhoods can therefore be seen as a misguided effort.

Although all these points might have some validity it is still important to consider the proven benefits of ICT solutions in persuading people to adopt sustainable lifestyles or more sustainable habits as it can be an important tool for cities in their sustainable development. By implementing ICT solutions in a new neighbourhood it can act as sort of a testing ground to refine and distinguish the most effective solutions so they can be implemented in a wider scale throughout the city. This can also be aided by focusing more on ICT solutions that are not too reliant on expensive hardware but rather can be run on smart phones and tablets as these have gained a wide spread throughout the Swedish society. There needs to be a greater consideration to the potential alienation aspects of ICT solutions when developing and implementing these to assure a positive outcome. This is an important aspect and one that would benefit from more extensive research as a way forward.

To study how the presented Smart City SRS Concept can be implemented into the Stockholm Royal Seaport a more extensive research is needed regarding the actors that need to be involved. A better understanding is needed of which roles and responsibilities these actors will have and how they will interact. This would also be a suitable topic of research moving forward.

Works Cited

- ABB, 2014. *Inflyttning i det Aktiva huset i Norra Djurgårdsstaden*. [Online]
Available at: <http://www.abb.ca/cawp/seitp202/b00e7765160bf8ffc1257b3b004f0abd.aspx>
[Använd 15 January 2014].
- Ahlner, E., 2013. [Intervju] (15 October 2013).
- A-huspro, u.d. *One Tonne Life*. [Online]
Available at: http://www.a-huspro.com/web/One_Tonne_Life_19.aspx
[Använd 2 January 2014].
- Airbnb, u.d. *About us - Airbnb*. [Online]
Available at: <https://www.airbnb.com/about/about-us>
[Använd 3 January 2014].
- Alpman, M., 2013. *De är testpiloter för nya smarta elnätet*. [Online]
Available at: http://www.nyteknik.se/nyheter/energi_miljo/energi/article3666235.ece
[Använd September 2013].
- Asia-Trip, u.d. [Online]
Available at: <http://www.asia-trip.info/city-lights-architecture-beijing-bridge-china-city-colorful-night-skyline.html>
[Använd 14 January 2014].
- Axel Johnson, u.d. [Online]
Available at: <http://www.axeljohnson.se/en/ah lens-provides-guidance-to-more-sustainable-consumption/>
[Använd 15 January 2014].
- Backhaus, J. o.a., 2011. *Sustainable Lifestyles: Today's facts and tomorrow's trends*, u.o.: u.n.
- Bedford, T., Jones, P. & Walker, H., 2004. *"Every little bit helps..." - Overcoming the challenges to researching, promoting and implementing sustainable lifestyles*, u.o.: Centre for Sustainable Development, University of Westminster.
- Blumendorf, M., 2013. *Building Sustainable Smart Homes*. Zurich, u.n., pp. 151-156.
- Bratel, Y., 2012. *Sustainable Lifestyles - An Experiment in Living Well: Northern European examples of sustainable planning*, Stockholm: u.n.
- Businessweek, 2014. *Best iPhone Augmented-Reality Apps for Business: Navigating New York's Subways - BusinessWeek*. [Online]
Available at: http://images.businessweek.com/ss/09/11/1102_best_iphone_reality_apps/8.htm
[Använd 15 January 2014].
- Carbon.to, u.d. *Carbon.to - Carbon so you can understand it*. [Online]
Available at: <http://carbon.to/about>
[Använd 13 December 2013].

Cars, G., Hult, A. & Bradley, K., 2013. From eco-modernizing to political ecologizing: Future challenges for the green capital. i: *Sustainable Stockholm* . New York: Routledge , pp. 168-188.

CasseroleClub, u.d. *www.casseroleclub.com*. [Online]

Available at: <http://www.casseroleclub.com/>

[Använd 15 December 2013].

ChargePoint, 2014. *Network Overview*. [Online]

Available at: <http://www.chargepoint.com/network/>

[Använd 4 January 2014].

Cisco, u.d. [Online]

Available at: <http://newsroom.cisco.com/press-release-content?articleId=496261>

[Använd 15 January 2014].

City of Malmö, 2006. *Miljösatsningarna på Bo01 i Malmö*, u.o.: Bording AB.

City of Malmö, 2009. *Miljöprogram för Malmö stad 2009 – 2020*, u.o.: u.n.

City of Malmö, u.d. *Om Västra Hamnen*. [Online]

Available at: <http://www.malmo.se/Medborgare/Stadsplanering--trafik/Stadsplanering--visioner/Utbbyggnadsomraden/Vastra-Hamnen-/Om-Vastra-Hamnen.html>

[Använd 30 September 2013].

City of Stockholm, 2010. *Övergripande program för miljö och hållbar stadsutveckling i Norra Djurgårdsstaden*, u.o.: u.n.

City of Stockholm, 2010. *Övergripande program för miljö och hållbar stadsutveckling i Norra Djurgårdsstaden (Stockholm Royal Seaport)*, u.o.: u.n.

City of Stockholm, 2013. *Hållbar stadsutveckling*. [Online]

Available at: <http://bygg.stockholm.se/Alla-projekt/norra-djurgardsstaden/Miljostadsdel/>

[Använd September 2013].

City of Stockholm, 2013. *Innovationarena*. [Online]

Available at: <http://bygg.stockholm.se/Alla-projekt/norra-djurgardsstaden/Miljostadsdel/innovation/Hallbara-utvecklingsprojekt/>

[Använd September 2013].

City of Stockholm, 2013. *Norra Djurgårdsstaden*. [Online]

Available at: <http://bygg.stockholm.se/Alla-projekt/norra-djurgardsstaden/>

[Använd September 2013].

City of Stockholm, u.d. *Norra Djurgårdsstaden - Miljö, teknik, innovation och kretslopp*, u.o.: u.n.

City of Stockholm, u.d. *Smart City SRS*. [Online]

Available at: www.stockholm.se/PageFiles/.../Inbjudan%20till%20Smart%20City.pdf

[Använd September 2013].

Claesson, J., 2013. [Intervju] (28 October 2013).

Dinnerit, u.d. [Online]

Available at: <http://dinnerit.ca/author/dennis/>

[Använd 3 January 2014].

Djurgårdsstaden, u.d. *Aktiva Huset - Norra Djurgårdsstaden*. [Online]

Available at: <http://djurgardsstaden.se/aktivahuset/>

[Använd 14 December 2013].

Drell, L., 2012. *7 Ways Augmented Reality Will Improve Your Life*. [Online]

Available at: <http://mashable.com/2012/12/19/augmented-reality-city/>

[Använd 17 December 2013].

EatWith Media, 2014. *EatWith*. [Online]

Available at: <http://www.eatwith.com/>

[Använd 18 December 2013].

Eco Suite, u.d. *Tridel's NEXT Living EcoSuite at Reve*. [Online]

Available at: <http://www.ecosuite.ca/revegallery.php>

[Använd 26 January 2014].

Ecoviva, u.d. *Matkasse Stockholm / Ecoviva - ekologisk matkasse i Stockholm och Uppsala*. [Online]

Available at: <http://www.ecoviva.se/>

[Använd 19 December 2013].

EkoMatCentrum, 2009. *Ekomatsedeln - Vad är Ekomatsedeln?*. [Online]

Available at: <http://www.ekomatsedeln.se/sida.aspx?id=6>

[Använd 17 December 2013].

Elektro Hain, u.d. [Online]

Available at: [http://www.elektrohain.de/upload/A_Comf_Wohn_Int_H\(1\).jpg](http://www.elektrohain.de/upload/A_Comf_Wohn_Int_H(1).jpg)

[Använd 15 January 2014].

EliNext, 2012. *10 Secrets in Mobile Augmented Reality - Elinext Group*. [Online]

Available at: <http://www.elinext.com/10-secrets-in-mobile-augmented-reality>

[Använd 15 January 2014].

European Commission, u.d. *ICT for Sustainable Growth*. [Online]

Available at:

http://ec.europa.eu/information_society/activities/sustainable_growth/cities/index_en.htm

[Använd September 2013].

Exibea, u.d. *Vad är Eliq?*. [Online]

Available at: <http://www.eliq.se/sv/elig/elig-energidisplay>

[Använd 13 December 2013].

Flickr, u.d. [Online]

Available at: <http://www.flickr.com/photos/fortum-sverige/4189608469/>

[Använd 15 January 2014].

Fogg, B., 2009. *Creating Persuasive Technologies: An Eight-Step Design Process*, u.o.: u.n.

Fogg, B., Cuellar, G. & Danielson, D., 2012. Motivating, Influencing and Persuading Users. i: *The Human-Computer Interaction Handbook: Fundamentals, Evolving Technologies and Emerging Applications*. u.o.:u.n., pp. 133-144.

Fogg, B., u.d. *What Causes Behavior Change?*. [Online]
Available at: <http://www.behaviormodel.org/index.html>
[Använd 20 September 2013].

Fortum, 2013. *Fortum Hemkontroll*. [Online]
Available at: <http://www.fortum.com/countries/se/privat/energismart-hemma/smarta-produkter/hemkontroll/pages/default.aspx>
[Använd 13 December 2013].

Fortum, 2013. *Gör vardagen enklare med Fortum i mobilen | fortum.se*. [Online]
Available at: <http://www.fortum.com/countries/se/privat/mina-sidor/om-mina-sidor/app/pages/default.aspx>
[Använd 15 January 2014].

Fuehrer, P., 2011. Chapter 26 - Time Use Today and in Images of the Future. i: *Images of the Future City*. u.o.:Springer Dordrecht London New York Heidelberg, pp. 309-318.

Fuehrer, P. & Pettersson, R., 2011. Chapter 15 - Time Use in the Future. i: *Images of the Future City*. u.o.:Springer Dordrecht London New York Heidelberg, pp. 215-240.

Futerra Sustainability Communications, u.d. *Swishing - Ethical Fashion, Clothes swapping | Home*. [Online]
Available at: <http://swishing.com/>
[Använd 20 December 2013].

Gefle Dagblad, 2013. *LRF:s gratisapp berättar var maten kommer ifrån - Gävle - www.gd.se*. [Online]
Available at: <http://gd.se/nyheter/gavle/1.5810264-lrf-s-gratisapp-berattar-var-maten-kommer-ifran>
[Använd 15 January 2014].

Going Green, u.d. *How it works*. [Online]
Available at: <http://www.motitworld.com/eng/how-it-works>
[Använd 17 December 2013].

Graphmasters, u.d. *Nunav | public.azurewebsites.net*. [Online]
Available at: <http://www.graphmasters.net/content/nunav>
[Använd 16 January 2014].

Gullberg, A., 2011. Chapter 11 - Housing and Other Premises. i: *Images of the Future City*. u.o.:Springer Dordrecht London New York Heidelberg, pp. 147-162.

Gullberg, A. & Lundin, P., 2011. Chapter 9 - Future Cities – Possible Changes. i: *Images of the Future City*. u.o.:Springer Dordrecht London New York Heidelberg, pp. 101-108.

Höjer, M., 2011. Chapter 13 - Travel. i: *Images of the Future City*. u.o.:Springer Dordrecht London New York Heidelberg, pp. 185-200.

iFixit, 2014. *iFixit: The free repair manual*. [Online]

Available at: <http://www.ifixit.com/>

[Använd 19 December 2013].

IJsselsteijn, W. o.a., 2006. *First International Conference on Persuasive Technology for Human Well-Being*. Eindhoven, Springer, pp. 1-4.

Interactive Institute, u.d. *STATIC!*. [Online]

Available at: <http://dru.tii.se/static/poweraware.htm>

[Använd 13 December 2013].

ipac, u.d. [Online]

Available at: <http://ipac5.wordpress.com/category/environment/>

[Använd 15 January 2014].

iThinkTechno, 2013. *Electric Scooters | Launched in Barcelona - iThinkTechno*. [Online]

Available at: <http://ithinktechno.com/electric-scooters/>

[Använd 15 January 2014].

King, N., 2003. *Smart home – a definition*. [Online]

Available at:

[http://www.housinglin.org.uk/library/Resources/Housing/Housing_advice/Smart Home - A definition September 2003.pdf](http://www.housinglin.org.uk/library/Resources/Housing/Housing_advice/Smart_Home_-_A_definition_September_2003.pdf)

[Använd 09 2013].

Konsumentföreningen Stockholm, u.d. *Släng inte maten*. [Online]

Available at: <http://slangintematen.se/>

[Använd 18 December 2013].

Kramers, A., Höjer, M., Lövehagen, N. & Wangel, J., 2013. *ICT for Sustainable Cities: How ICT can support an environmentally sustainable development in cities..* Zürich, u.n., pp. 183-188.

Kulturföreningen KREATIVET, u.d. *Lånegarderoben*. [Online]

Available at: <http://www.lanegarderoben.se/>

[Använd 12 December 2013].

Lai, V., 2012. *Sip Lattés and Fix Busted Stuff at the Repair Café | Wired Design | Wired.com*. [Online]

Available at: <http://www.wired.com/design/2012/05/fixer-collectives/>

[Använd 15 January 2014].

Lantbrukarnas Riksförbund, u.d. *Våga fråga - få en bonde på köpet*. [Online]

Available at: <http://www.bondepakopet.se/>

[Använd 20 December 2013].

- Lundin, L. S., u.d. *Färgningsmanifestet - Lina Sofia Lundin*. [Online]
Available at: <http://cargocollective.com/linasofialundin/Fargningsmanifestet>
[Använd 15 January 2014].
- Lundin, P. & Gullberg, A., 2011. Chapter 8 - Stockholm's Urban Development. i: *Images of the Future City*. u.o.:Springer Dordrecht London New York Heidelberg, pp. 77-100.
- Lövehagen, N. & Bondesson, A., 2013. *Evaluating sustainability of using ICT solutions in smart cities – methodology requirements*. Zürich, u.n., pp. 175-182.
- Mayne, K., 2012. *Dutch / I Do Not Despair*. [Online]
Available at: <http://idonotdespair.com/tag/dutch/>
[Använd 15 January 2014].
- Mitchell, W. J., 2000. *Urban life, Jim - but not as we know it*. u.o.:Cambridge Mass.: The MIT Press.
- Nest, 2014. *Life with Nest Thermostat*. [Online]
Available at: <https://nest.com/thermostat/life-with-nest-thermostat/>
[Använd 3 January 2014].
- Nest, 2014. *Life with Nest Thermostat / Nest*. [Online]
Available at: <https://nest.com/thermostat/life-with-nest-thermostat/>
[Använd 26 January 2014].
- Näs, L., 2013. Deras lägenhet är ett forskningsprojekt. *DN*, p. 8.
- Olsson, A. R. & Metzger, J., 2013. Urban Sustainable Development the Stockholm Way. i: *Sustainable Stockholm*. New York: Routledge, pp. 197-199.
- One Tonne Life, 2011. *One Tonne Life Final Report*, u.o.: u.n.
- Ortega, M., 2013. *Barcelona estrena un servei de 'motosharing' elèctric*. [Online]
Available at: http://www.ara.cat/societat/Barcelona-estrena-servei-motosharing-electric_0_915508568.html
[Använd 15 January 2014].
- Pennanen, G., 2013. [Intervju] (1 October 2013).
- Pettersson, R., Fuehrer, P. & Mårtensson, M., 2011. Chapter 10 - Time and Consumption. i: *Images of the Future City*. u.o.:Springer Dordrecht London New York Heidelberg, pp. 109-146.
- Pike Solution, u.d. *Aware Clock*. [Online]
Available at: <http://www.awareclock.com/>
[Använd 13 December 2013].
- RelayRides, 2014. *How the RelayRides car sharing marketplace works*. [Online]
Available at: <https://relayrides.com/how-it-works>
[Använd 17 December 2013].

Repair Café, u.d. *About the Repair Café « Repair Café*. [Online]

Available at: <http://repaircafe.org/about-repair-cafe/>

[Använd 18 December 2013].

Response, u.d. [Online]

Available at: <http://response.jp/article/img/2013/10/04/207885/610131.html>

[Använd 15 January 2014].

Sanne, C., 2012. *Hur vi kan leva hållbart 2030*, u.o.: u.n.

ShapeUp Club, 2013. *Lifesum by ShapeUp Club Free Calorie Counter, Food & Exercise Journal by Lifesum*. [Online]

Available at: <http://lifesum.com/>

[Använd 18 December 2013].

ShareDesk, u.d. *How ShareDesk Works*. [Online]

Available at: http://www.sharedesk.net/how_it_works/

[Använd 17 December 2013].

Side.cr, 2013. *Overview - Sidecar*. [Online]

Available at: <http://www.side.cr/>

[Använd 17 December 2013].

Simply Scratch, 2013. *Simply Scratch » Buffalo Chicken Flatbread Pizzas*. [Online]

Available at: <http://www.simplyscratch.com/2013/01/buffalo-chicken-flat-bread-pizzas.html>

[Använd 15 January 2014].

Simply Scratch, 2013. *Simply Scratch » Spicy Sriracha Steak Lettuce Wraps*. [Online]

Available at: <http://www.simplyscratch.com/2013/12/spicy-sriracha-steak-lettuce-wraps.html>

[Använd 15 January 2014].

Simply Scratch, 2014. *Simply Scratch*. [Online]

Available at: <http://www.simplyscratch.com/>

[Använd 18 December 2013].

Smart Santander, u.d. [Online]

Available at: <http://www.smartsantander.eu/index.php/blog/item/174-smartsantanderra-santander-augmented-reality-application>

[Använd 3 December 2013].

Smutselkollen, 2013. *Smutselkollen - en sida från TelgeEnergi*. [Online]

Available at: <http://www.smutselkollen.se/>

[Använd 17 December 2013].

SpaceTime Communication AB, 2013. [Online]

Available at: <https://play.google.com/store/apps/details?id=se.codemill.spacetime>

[Använd 15 January 2014].

Stanford Persuasive Tech Lab, u.d. *What is Captology?*. [Online]
Available at: <http://captology.stanford.edu/about/what-is-captology.html>
[Använd 15 September 2013].

Stockholm City Bikes, 2013. *Artikel | Stockholm City Bikes*. [Online]
Available at: <http://www.citybikes.se/p/site/kontakta-oss>
[Använd 17 December 2013].

Stockholm Royal Seaport, 2013. *Norra Djurgårdsstaden*. [Online]
Available at: <http://djurgardsstaden.se/aktivahuset/>.
[Använd September 2013].

Swedish ICT, 2013. *Smart ICT for Sustainable Living in Stockholm Royal Seaport*. [Online]
Available at: <https://www.sics.se/projects/smart-ict>
[Använd September 2013].

Swedish Ministry of the Environment, UNEP, 2005. *Task Force on Sustainable Lifestyles*, u.o.: Futerra Sustainability Communications.

Svenska Hus, u.d. [Online]
Available at: <http://svenskahus.se/images/uploads/image/backgrounds/bo-hos-oss-darker.jpg>
[Använd 4 January 2014].

TaskRabbit, 2013. *How TaskRabbit Works*. [Online]
Available at: <https://www.taskrabbit.com/how-it-works>
[Använd 17 December 2013].

Tate, J. T., 2012. *Repair Cafe/Trashlab - JTT*. [Online]
Available at: <http://justintylertate.weebly.com/repair-cafetrashlab.html>
[Använd 15 January 2014].

TerraCycle, u.d. *TerraCycle | Outsmart Waste*. [Online]
Available at: <http://www.terracycle.com/>
[Använd 17 December 2013].

The Bike-sharing blog, u.d. *NYC's Citi Bike Launches with Much Excitement*. [Online]
Available at: <http://bike-sharing.blogspot.ae/2013/05/nycs-citi-bike-launches-with-much.html>
[Använd 5 January 2014].

The City of Stockholm, u.d. *Norra Djurgårdsstaden*. [Online]
Available at: <http://bygg.stockholm.se/norradjurgardsstaden>
[Använd 15 12 2013].

The Cute Epicure, u.d. [Online]
Available at: <http://thecuteepicure.com/2013/09/21/must-read-article-of-the-week/>
[Använd 6 January 2014].

The Nomadic Pinoy, u.d. [Online]

Available at: <http://www.nomadicpinoy.com/2011/12/where-i-work.html>

[Använd 3 January 2014].

TimeOut, u.d. *Drink n' Draw, formerly of 3rd Ward, is coming to Bat Haus*. [Online]

Available at: <http://www.timeout.com/newyork/things-to-do/drink-n-draw-formerly-of-3rd-ward-is-coming-to-bat-haus>

[Använd 16 January 2014].

Town Talk, u.d. *Shipley Market*. [Online]

Available at: <http://www.bingley.towntalk.co.uk/events/d/60160/shipley-market/>

[Använd 6 January 2014].

Trash To Trend, 2014. *Trash To Trend*. [Online]

Available at: <http://trash-to-trend.myshopify.com/>

[Använd 18 December 2013].

UNEP; CSCP, 2012. *Scenarios for Sustainable Lifestyles 2050*, u.o.: u.n.

UNEP, 2011. *Paving the Way for Sustainable Consumption and Production - The Marrakech Process Progress Report*, u.o.: United Nations Environment Programme.

United Nations, 1987. *Our Common Future*, u.o.: UN Documents.

Wallgren, C. & Pettersson, R., 2011. Chapter 12 - Food. i: *Images of the Future City*. u.o.: Springer Dordrecht London New York Heidelberg, pp. 163-184.

Wangel, J., 2013. Hur hållbara är Hammarby sjöstad och Norra Djurgårdstaden?. i: *Hållbarhetens villkor*. Malmö: u.n.

Waterpebble, u.d. *Waterpebble - your little water saver*. [Online]

Available at: <http://www.waterpebble.com/>

[Använd 13 December 2013].

Waze Mobile, 2013. *Free Community-based Mapping, Traffic & Navigation App*. [Online]

Available at: <https://www.waze.com/>

[Använd 15 December 2013].

WND, 2013. *Lifesum Is Taking Its Playbook Straight From Spotify — And A Few Of Its Executives*. [Online]

Available at:

[http://mobile.wnd.com/markets/news/read/25887055/lifesum is taking its playbook straight from spotify %E2%80%94 and a few of its executives](http://mobile.wnd.com/markets/news/read/25887055/lifesum-is-taking-its-playbook-straight-from-spotify%E2%80%94and-a-few-of-its-executives)

[Använd 15 January 2014].

Woods Bagot, u.d. *XIASHA ECO BUSINESS PARK WINS 2013 AIACC AWARD FOR URBAN DESIGN*. [Online]

Available at: <http://www.woodsbagot.com/news/xiasha-eco-business-park-wins-2013-aiacc-award->

for-urban-design

[Använd 4 January 2014].

World Health Organization, UN-Habitat, 2010. The Rise of Modern Cities. i: *Hidden Cities: Unmasking and Overcoming Health Inequities in Urban Settings*. u.o.:WHO Library Cataloguing-in-Publication Data, pp. 6-10.

WWF, Zoological Society of London, Global Footprint Network, 2010. *Living Planet Report 2010 - Biodiversity, biocapacity and development*, u.o.: u.n.

Yanko Design, 2014. *Insic Wall Socket by Muhyeon Kim » Yanko Design*. [Online]

Available at: <http://www.yankodesign.com/2010/09/13/encouragement-plug-for-environmentalism/>

[Använd 15 January 2014].

Zapico, J. L. & Turpeinen, M., 2011. *Persuasive services: Using ICT for communicating sustainability*, Stockholm: Centre for Sustainable Communications.

Zero Emission Motoring, u.d. *Hertz electric car rental kicks off in New York City*. [Online]

Available at: <http://www.zemotoring.com/news/2010/12/hertz-electric-car-rental-kicks-off-in-new-york-city>

[Använd 3 January 2014].

Zipcar, 2014. *Car Sharing, an alternative to car rental and car ownership – Zipcar*. [Online]

Available at: <http://www.zipcar.com/>

[Använd 17 December 2013].

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