

DESIGNING SUSTAINABLE FUTURES

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ABSTRACT

This paper discusses how future studies and design could enable a more conscious and participatory engagement in our common future. The starting point being that representations of the future are often done in an abstract and quantitative manner, which hinders a broad engagement, and understanding of the implications of the scenarios presented. We discuss how on-going research including experimental design methodologies can be used to make images of the future more concrete and accessible. Finally, we argue, not only for prototyping as a method to make the ungraspable future more concrete, but foremost for a designerly approach to the most important of all stakes - the future.

INTRODUCTION: CREATING DESIRABLE ALTERNATIVES

In its most basic sense the future is one of three time modalities, the past and the present being the other two. According to Western secular philosophy the future does not exist in any other way than in our imagination. This renders the future outside the scope of objective investigation. That the future does not exist implies that it is characterised by openness and surprise but also that it is possible to influence.

Design is profoundly engaged in the future; in how to make tomorrow's everyday life better working, looking, smelling and tasting, more supportive to our bodily needs and the ecological limits of our planet. In short, design is about "how things ought to be" (Simon 1969). To accomplish this, design methods need to be able to cope with an abyss of complexity, contradiction and

insufficient information (Nelson & Stolterman 2003). As such design can be seen as an archaeology of the future, since it like archaeology of the past, tries to make a coherent image of something we know very little about (Dahlbom et al. 2002)

Being a user-oriented and problem-driven practice, design have tended to focus on developing products and services that are incremental, close in time, familiar and intended for tomorrow rather than the next decades or century. But sometimes, typically in times of large societal challenges, the object of design becomes larger, more speculative and ambitious in scope. The past is filled with such examples, such as the Stockholm exhibition in 1930, where architects and designers created a modernistic, light city infused with dreams of a society with no housing shortage, diseases or dirt.



Figure 1: The restaurant "Paradise" at the Stockholm exhibition 1930

The exhibition and the later book "Acceptera" (Asplund et al. 1931), made a tremendous impact on artists, politicians and academia at the time. It convincingly demonstrated a new way of life and this "functionalism"

soon became the aesthetical language of the large scale Swedish societal reformation project “Folkhemmet” (i.e. “the Peoples home”) for the 20th century. Another and more recent example is how research and development within ICT in the late 1990s was inspired by imaginative scenarios from literature. One example being Mark Weiser’s famous visions of a world infused with computers (Weiser 1991), or Gibson’s “Neuromancer” – a more dystopic but still engaging description of a world of networked computers and digital data called Cyberspace (Gibson 1984). These two examples are very different, but they have in common that they envisioned ideas about the future in such a way that it attracted peoples’ creative powers and channelled their work to a joint goal.

Today we face challenges that are even larger than in the 1930s. While modernisation has brought about great achievements, we know today that the modern society also has severe consequences. Climate change, water stress and biodiversity loss are just a few examples of an on-going environmental and social degradation that must be halted. While many targets and roadmaps are formulated with a timeframe of fifteen, thirty or fifty years, the transition to a more sustainable society needs to start now. The last decade there has been an increased interest on the role of design in sustainable development evident in fields such as product design (Chapman 2005), design for social innovation and sustainability (Manzini & Jegou 2003), interaction design, (Broms et al. 2010), and critical design (Mazé & Redström 2009).

However, in light of the radical and systemic changes needed the typically small-scaled nature of design in which specific products or services are in focus is insufficient. There are a number of reasons to this. Firstly, for such small-scaled experiments, interventions or developments to make a substantial contribution in respect of sustainability they need to be widely disseminated or carried out in such a way that they alter also the larger scale structures of society (Manzini & Rizzo 2011).

Secondly, even if such an up-scaling would be achieved the gains achieved through cleaner production and greener technology are still being outpaced by the increasing volumes of consumption and rebound effects (Stø et al. 2006): “What does it help that airplane engines become 1 percent more fuel efficient if air travel at the same time increases by 5 percent?” (Sanne 2012, author’s translation). In order to counter or avoid rebounds and to achieve a more sustainable consumption it is not as much the products and services as the practices, i.e. what we do and how we do it that must be altered.

Thirdly, and related to both the first and the second point, the focus on products and services alone, or even taking these as the starting point, is problematic also as it fails to take into consideration the complexity of social practices, i.e. the socio-material micro-contexts in which these new products or services are to be fitted.

Only through a successful integration of the new product or service in the everyday life practices of people can a wide dissemination become achieved (Shove & Pantzar 2005).

Fourth, these new products, services and practices also need to be integrated into a bigger picture vision of what a sustainable society could be. A vision in which sustainability is seen not as a vague ‘something better’ but as a clearly defined level of resource use and environmental impacts that is within the carrying capacity of Earth.

However, imagining how a sustainable society could look like and how to get there can be hard. Partly because present structures and trends can appear almost impossible to alter – how will we ever be able to break out of this consumption bonanza? Partly because a sustainable future can appear so dull – no holiday trips to Barcelona, no fancy apartments, no basmati rice? One reason to why a sustainable future might seem dull is because it often is depicted on basis of a number of restrictions only – we are lacking desirable alternatives. This is where backcasting comes into the picture. Backcasting is an explicitly normative futures studies approach by which target-fulfilling images of the future can be developed. But as will be discussed later, when it comes to the potential of initiating radical and systemic changes such as a transition to sustainable lifestyles also backcasting has its shortcomings, something that we think a closer collaboration with design can help to abate.

The aim of this paper is twofold. The first aim is to discuss how design methods together with backcasting can create scenarios of sustainable futures that are engaging, participatory and concrete. The second aim is to introduce the on-going research project “Prototyping the Future” that seeks to accomplish such a merge. This also includes reporting on some early results derived from a pilot study within the project.

BACKCASTING

Backcasting is a normative futures studies approach that was developed in the 1970s as an alternative way of energy planning (Robinson 1982, Quist & Vergragt 2006). The prognoses of that time pointed at a future with an accelerating energy demand and a need for a substantial increase in energy production capacity. With the risk of energy crises in mind and a growing environmental awareness such a future was conceived as highly problematic and undesirable. In contrast to the predict-and-provide approach of traditional energy planning, backcasting enabled taking the starting point of what a desired future level of energy use would be, and designing policies accordingly (Robinson 1982, 2003). Since backcasting was first developed, energy systems as such have remained quite a dominant object of study, especially in connection with climate change but backcasting has also been used to explore more sustainable futures in terms of transport and mobility,

food, water, land use, buildings, cities, and household activities such as cooking.

A typical backcasting study includes by three central subsequent elements: (1) the formulation of a demanding target which cannot be reached without major societal changes; (2) the development of one or more images of the future in which this target has been met; and (3) an analysis of these images in relation to e.g. other societal goals and/or in relation to the present state. The resulting scenarios and analyses can be used to problematize contemporary trajectories and to raise awareness of the tension between short-term gains and long-term targets, through showing that an image of the future in which environmental targets has been met cannot be reached without more radical changes than are proposed today. Furthermore, backcasting can be used to examine how the gap between the desired (sustainable) future and the present could be overcome and what potential conflicts or synergies for other societal targets or high priority issues this could imply (e.g. Höjer et al. 2011; Robinson 1982, 1990). The images of the future developed through backcasting also serve an important role as counter-prognoses, challenging and altering what changes are conceived as possible, and how they could be initiated and managed (e.g. Dreborg 1996; Höjer et al. 2011; Robinson 1988). It is this function, the process of altering expectations, which is in focus here.

ALTERING EXPECTATIONS

In his lecture memo on 'Visibility', Italo Calvino writes: "[a]t one time the visual memory of an individual was limited to the heritage of his direct experiences and to a restricted repertory of images reflected in culture." (Calvino 1993, p. 92). The historian and philosopher Reinhart Koselleck (2004) conducts a similar line of reasoning through denoting our "field of experience" (that which we have experienced) constitutive for our "horizon of expectations" (that which we can expect). In other words, we cannot expect something of which we do not have any experience.

However, our pool of expectations is not only a direct result of our pool of experiences, but also of our imagination through which our experiences can be reconfigured and combined in new and unexpected ways: "The imagination is a kind of electronic machine that takes account of all possible combinations and chooses the ones that are appropriate to a particular purpose, or are simply the most interesting, pleasing or amusing." (Calvino, 1993, p. 91). To gain further insight into how scenarios contribute to this, Aligica (2005) proposes using theories of thought experiments and conceptual blending. Backcasting is a way to facilitate this reconfiguration and to focus the imaginative power in a desired direction. As other types of stories scenarios can thus be used to diversify and challenge understandings and practices through re-narrating everyday life habits in an unfamiliar way (Eckstein 2003; Rasmussen 2005), thus contributing to

activate creativity and stimulate discussions through what Robinson (1988) denotes as a process of unlearning and relearning.

TWO PROBLEMS WITH BACKCASTING

To engage people in the development of an image of the future, or for disseminating results, the content of a backcasting study must be represented in a way that makes it interesting and accessible for the intended target groups. However, while backcasting scenarios can be used to provide exactly the kind of explicit and bigger picture vision of a sustainable society lacking in design, the scenarios produced are often too macro-scaled, quantitative and abstract to communicate with people who are not policy-makers or planners (Wangel 2012).

Part of this problem can be dealt with through changing the level at which the changes are elaborated. Besides traditional 'Policy Orientated' types of scenarios, there are also 'Design Orientated' scenarios where the changes are explored at the level of end-users (Manzini & Jegou 2000; Green & Vergragt 2002). The original idea of the design oriented scenarios was to create inspiration for 'designers' (in industry, government, universities or NGOs) to develop products and services that could contribute to realise steps towards these scenarios. Through being elaborated at the level of everyday life, design oriented scenarios also hold the potential to in a more tangible way than the policy oriented scenarios, show how life in a sustainable future could be like.

The other part of the problems associated with traditional backcasting calls for rethinking the ways images of the futures are being represented. In spite of the ambition to alter the expectations of people, the images of the future are often represented in rather technocratic and scientific ways only and are typically (mainly) disseminated as scientific publications. An image of the future is often described through a combination of quantitative and qualitative statements. The quantitative part of an image of the future can be described as a fictitious statistic, telling the reader about demographics, precipitation, the number of electrical vehicles per person, or other information seen as relevant or illustrative. The qualitative part of an image of the future is typically made up of a narrative through which the future state is described by words instead of numbers.

The starting point for the project "Prototyping the Future" is to abate these two problems through combining backcasting and design methodologies. Using an already existing backcasting study as the basis the project seeks to developing concrete, accessible and micro-levelled representations of desirable and sustainable futures in which sustainable life-styles has become the norm.

PROTOTYPING THE FUTURE

Prototyping the Future is a two-year project situated at Green Leap, an arena for design and sustainability belonging to CESC, Centre for Sustainable Communications at KTH - the Royal Institute of Technology in Stockholm, Sweden. The project brings together a multidisciplinary team that includes researchers from design, future studies and environmental systems analysis with practitioners in product, service and digital design.

Instead of developing yet another scenario of sustainable urban life we take as a starting point for our design process the book *Images of the Future City: Time and Space for Sustainable Development* (Höjer et al. 2011). The book develops six different scenarios of a future (2050) sustainable Stockholm based on how space and time is used by the citizens. Here fourteen researchers from numerous disciplines offer details on a variety of aspects of a future sustainable city, including travel, housing, eating, time use, consumption and urban form. In the book, areas of everyday life such as personal consumption, housing, food, transport and care are discussed in detail, providing a rich material for the design process. In spite of its title (and to the amusement of the designers in the team) the book is however completely lacking images.

The study presented in the book sets some important and strict delimitations of what a sustainable future is regarding the use of energy. For example embedded energy in consumer goods is accounted from a consumption perspective meaning that it debits the nation where the good is bought and used and not where it is produced. Sweden's use of electronics would therefore be attributed to us and not to e.g. China. From a consumption based perspective Sweden's ecological footprint is not slowing down as the official reports claim, but is steadily growing (SEI 2012). Another important outset is that the energy resources are equally divided between all citizens in the world. In other words, we will not be able to use more energy at the expense of others. Based on this and taken into consideration technical development, renewable energies and higher efficiency, it is estimated that we need to lower our energy use with 60% compared to present levels (Höjer et al. 2011).

We are of course aware of the inherently ambiguous nature of sustainability, but still settle for a natural science based definition of what a sustainable level of resource use is (in this case focusing on energy) while allowing for diversity in terms of how life could look like within these boundaries; in other words, to design (for) a variety of sustainable lifestyles.

The overarching aim of Prototyping the Future is to normalise sustainable life-styles. Normalisation is an interesting process as it can change what we perceive as perfectly normal to completely alien in a very short time, such as when smoking was prohibited in public spaces in Sweden. Going back to the discussion on

altering expectations it is also important to point out that expectations are not 'innocent' mental constructs, but are constitutive to what actions we take (or do not take) when striving for sustainability (Albrechts 2010; Sandercock 2003). As our expectations concerning what futures we consider probable, possible and preferable are not only the result of personal taste, beliefs and imagination, but are socially mediated (Asplund 1986, Edwards 2008) the process of normalising sustainable lifestyles must address people as social beings, and not as individual decision makers. The challenge is thus to develop representations of sustainable futures that can be shared, discussed, debated and altered, and that embrace and acknowledge a variety of drivers and barriers for change as well as diversity in terms of what a sustainable lifestyle could be like.

What we see before us is some kind of digital experience, or game, where a user, alone or in a group can explore what a sustainable lifestyle could be like. The aim is to make this 'game' available on the internet and also to log how users interact and what choices they make. In order to get feedback for further development we strive to create a prototype that is open, inviting and accessible for a multitude of different users. The project Prototyping the Future is however best looked upon as a prototype in itself, a first attempt to combine design methods, future studies, environmental systems analyses with prototyping methods and digital tools for design.

PROTOTYPING METHODS

The project adopts a broad understanding of design practice and research, where design is seen as a tradition of its own, a culture of inquiry and action (Nelson & Stolterman 2003). In this view, the process of design is an efficient way of enabling intentional change. Design provides an "ability to act based on an overwhelming amount of insufficient information within restrictive limits of resources and time" (ibid). However, we also acknowledge the creative and artistic part of the design practice, and seek to incorporate also these tools and methods into the research project.

Prototyping is an established method for design and innovation as a way of quickly making ideas tangible and to spur the creative process. The prototype is used to create a common platform for different actors and enables stakeholders to easily comprehend, engage in and discuss the proposition. The prototype becomes a vehicle for development; materializing ideas, norms, tacit knowledge and bringing potential problems to the table (Kelley 2001). Prototypes are a kind of early sketches that, as Schön (1983) remarks "talk back" to the designer thereby enabling the creative process. Sketching and quick models such as mockups comes from architecture and product design, whereas rapid prototyping originates from software development. Both concepts has merged and found its way into immaterial areas such as service design and lately social innovation were it has been described as a way to "fail early to succeed sooner" (Burns et al. 2006).

Today prototyping refer to all sorts of quick and sketchy ways to test ideas to stakeholders early in the design process. A prototype could be a “staging” of a service situation in a physical space, it could be a scenario made concrete by a comic strip or it could be a paper version of a an interactive web design. Prototypes does not even have to be rapid, slow prototyping is preferred were a more organic evolution is needed and could provide a gradual scaling up process. Prototyping could be seen as a vehicle to reveal both opportunities and dilemmas in a design space. This “agonistic space” allows a polyphony of conflicting voices to exist side by side (Mouffe 2000). The concept of an agonistic space has been used to describe living labs as prototypes, not for a solution for a problem, but rather as an arena for experiments in social innovation (Björgvinsson et al. 2010; Hillgren et al. 2011).

The outset for Prototyping the Future is that a similar approach can be used to envision also larger-scale changes such as a sustainable future. In some respects this is very similar to the Stockholm exhibition, however with less focus on architecture and urban planning. But exactly how this will be done is still a topic for research and design. Long term future envisioning is very different from ordinary product design. It resembles more of service design in that it constitutes of a system of practices interwoven with socio-technical materialisations. But while service design and social innovation mostly takes place in a near future and involves citizens and end-users that are present today in a participatory approach the design of sustainable lifestyles placed in 2050 become more problematic from the perspective of participation.

Backcasting studies seldom include pictorial images. One reason to this is because images are perceived to increase the risk that the entire scenario of the future is rejected on basis of details that are essentially irrelevant in relation to the changes explored. One example of such a detail could be the visual expression of electrical vehicles in a backcasting study of hydrogen futures. Within prototyping this issue is described as *resolution*. The design of the prototype, its finish and focus needs to be carefully crafted to direct peoples’ attention to the relevant issues at stake, and down-play those aspects that are insignificant in respect of the aim of the prototype.

RELATED RESEARCH

There is a vast amount of experiments and research in the field of future studies, backcasting and prototypes, but if we delimit our overview to the area of design and future envisioning’s, the work could be grouped into three loose categories; critical products, scenarios and digital tools.

The first category includes explorations of how critical design can create engagement and behavioural change, and make people aware of unsustainable lifestyles, for example energy consumption in everyday life. Here the goal has been to challenge the norm of a conventional

electricity meter and explore the possibilities of the design space. The Static! project explored this in depth, developing a number of design concepts, based on familiar products such as lamps, cords and heaters, which in various ways visualized energy use (Backlund et al. 2006; Mazé 2010). In the Aware project, energy conservation was seen in a larger perspective of lifestyles and consumption and the aim was to support sustainable behavioural patterns with new designs. The Power Aware clock, for example, takes inspiration from the kitchen clock and visualises in real time, electricity use of the entire home (Broms et al. 2011). As Pierce and Paulos (2012) conclude, research to increase awareness of energy and motivate individual conservation behaviour has grown to a field of its own within HCI during the last decade. Even if these projects in one sense are more conventional in that they resulted in physical objects, “designs”, they have in common with Prototyping the Future that the goal was to make something abstract and invisible (electricity/the future) concrete and graspable, to engage, create awareness, spur innovation and eventually lead to change of behaviour.

Another way to use design to visualize an alternative future is through using design approaches to create prototypes, fictitious props (Johansson 2005; Mazé & Önal 2010) or ‘Living Labs’ in which the future is experienced as an alternative present (Scott et al. 2012). In the work by Mazé and Önal (ibid.) fictitious “evidence” of future energy behaviour such as TV-reports, Wikipedia articles about Do It Yourself “socket bombs” used by eco-activists, creates a suspension of disbelief and spurs imagination of what is possible.

In the second category, one of the earliest examples of future scenarios with a design approach is the SusHouse project (Strategies towards the Sustainable Household 1998-2000). An EU project that looked into how the three household functions eating, clothing and shelter could be carried out in more sustainable ways (Vergragt 2000). Related to that but with a more participatory approach is social innovation and design for sustainability (Jegou & Manzini 2003). Here the focus is on enabling collaborative services and creative communities in a not too far away future. One approach argued for is to look for existing promising practises that can be scaled up, spread and eventually reach a system level. The ideas are mainly visualised through simple scenarios in the form of comic-strips, cartons, images or narratives (Jegou & Manzini 2008; Meroni 2007).

This approach has been developed in the more recent SPREAD project (SPREAD 2012) that looks at how sustainable lifestyles could be reached in Europe 2050. The project identifies unsustainable as well as promising trends and factors that influence behaviours for the future. The trend spotting and analyses has been material for workshops with citizens all over Europe and resulted in four different future scenarios for 2050. Finally, the project will result in a roadmap and

recommendations for policy makers for a sustainable Europe 2050. The scenarios are presented as timelines with different threads of social, technical, economical and political developments that eventually lead to the envisioned future. The four scenarios should not be seen as mutually excluding but rather as parallel activities and lifestyles for different groups or areas. The scenarios have also been complemented with short films that present different scenes of everyday life.

These examples have in common that they aim to engage participation and spur new lifestyles with the help of new products and services as seen from a *user* perspective. A very different approach is taken by city-planners who seek to involve citizens or visualize changes. In this third category, digital planning tools or games, almost invariably depict the city from above, either using a real map, or an image of a fictitious city. The Ipad game 2021, developed by Mistra Urban Games (2011) uses Google maps as a base to engage young people in deliberation over how the Gothenburg city area should develop. It should however be noted that this is in no way connected to real planning or policy-making. SymbioCity is a design awarded city planning game, where the player is the new Mayor of a growing city confronted with problems to solve to enhance social, economic and environmental factors. However, the not so hidden agenda is rather to promote Swedish clean-tech innovations than to spur the imagination. Other similar games are Clim City, IBM's City One, Simutrans, Dumptown, and City Rain, all of them building on the same strategy gaming concept and birds-eye view (see www.urbangames.se for an overview in Swedish). Most of these examples paint a very simplified picture of the future and the problems confronted and are focusing on short term and incremental changes. The simplicity can however be an asset as in 'My Blocks' ('Mina Kvarter') which is an application to the game Mine Craft where you build a world in blocks very similar to the popular toy Lego. The application was developed by Svensk Byggtjänst (a Swedish association for developers and construction companies) as a way to involve young people in the future of their neighbourhood.

These planning games are focused on altering the existing through intervention or co-creation, however without painting a larger picture of systemic change. Moreover, sustainability impact assessments are often missing or sustainability is approached in a rather incremental way.

PROTOTYPING THE PROJECT

As a first test of the project methodology a ten week long pilot study was carried out with third year design students at the Industrial Design bachelor program at Konstfack – the University College of Arts, Crafts & Design in Stockholm, Sweden. The ten students were commissioned to develop design proposals for products, services or systems that signified a future where sustainable lifestyles had become the norm. To allow

for also substantial changes this future was placed in 2060.

The design brief handed out to the students included a few but central starting points and demands. Firstly, their design proposal needed to address a major sustainability problem. In Sweden as well as in many other high-income countries most of environmental impacts come from activities related to food, transports and housing (Naturvårdsverket 2011). Secondly, the proposal needed to make a substantial contribution to decrease the sustainability problem, which also implied that the target group/s could not be too narrow. Thirdly, with the aim of showing a future where sustainable lifestyles are normalised it was important that the proposals were represented in a way that did not focus only on material and technical details but that also integrated them into the context of everyday life.

THE DESIGN PROCESS

The students were asked to work with a service design method introduced by two professional designers from the service design company Transformator. This method is a customer insight driven development tool in which the final solution is based on the logic, need and relevance for the user. A central part of the method is to gain a deep understanding of the needs, driving forces and behaviours of the prospective users and to use this as a basis for the drafting of prototypes. These are then used as trigger materials – as “what if-solutions” – used in subsequent rounds of user interactions. The prototypes are thus not to be looked upon as sketches of the final service, product or system but as tools to gain an even better understanding of the user. While this specific design method and the design tutors were not chosen by the project but by the Konstfack teacher, a user-centred approach such as this was seen as fruitful to the project as this encourages an understanding of both drivers and barriers for adopting more sustainable ways of life. In addition such an approach is also beneficial as this in a natural way places the focus on the societal micro-level of everyday life rather than the macro-levels of policy and planning.

The student projects were introduced by a lecture on the project Prototyping the Future in which also backcasting and the major environmental challenges society faces were explained briefly. The students were also introduced to the backcasting study “Images of the Future City” (Höjer et al. 2011) and were encouraged to use this as a backdrop to their work. The different stages in the design method were introduced by the Transformator designers. In short the students had to work with numerous iterations including interactions with prospective users, analysis and clustering, and prototyping. Besides the lectures the students met with the Transformator designers for tutoring, both individual and in group. The students also had two individual tutoring sessions each with a future studies and environmental systems analysis researcher from the Prototyping the Future project. This was both to ensure

that the developed proposals were within the scope of the design brief and to provide an opportunity for the students to discuss issues of sustainability, futures thinking and other related questions. The students were asked to deliver their proposals in three different forms: a short movie, pictures and a report.

RESULTS

After ten weeks of working the students presented their final design proposals. With few exceptions all ten proposals clearly fulfilled the requirements specified in the design brief; the proposals addressed one or more major sustainability problem, had a clear potential to abate these and were outlined and presented in a concrete way and integrated into an everyday life setting. The proposals differed widely both in terms of what type of changes that were suggested (physical/ technological, service, knowledge, values and habits) and the sustainability areas addressed (food, buildings, health, transport, consumption and education). While most proposals focused on one sustainability area only the majority included more than one type of change, for instance a combination of new technology and a change in values. As it is outside the scope of this paper to present all proposals the interested reader is directed to the project webpage (www.greenleap.kth.se) for further information on this matter.

The proposals also varied in terms of how imaginative they were, i.e. to what extent they diverged from what the students saw as realistic. It was a most rewarding (and painful) experience to witness how the students struggled with the seemingly internalized urge to create something realistic while at the same time being commissioned to create something radically new. Most of the students did however take this challenge on. With this in mind it is very interesting to see that many of the students, in spite of their ambitions to come up with something radically new, ended up with proposals that they after a while realized already existed. Adding to this tension was the (sense of) uncertainty resulting from the action research design method where the students were urged to 'trust the process' in a more fundamental way than they had been doing before. In the following three of the student proposals are presented. However, as the format of a paper does not allow us to present the movies we will have to keep to pictures and texts. This is unfortunate as it was in the movies that the proposals got the most life and meaning. These can however be accessed through the project website at www.greenleap.kth.se/projekt/prototypingfuture.

One of the most imaginative proposals was a new super-material, a gel-like substrate that through being added to facades enables urban vertical farming (Figure 2). The substrate keeps the plants in place and retains water, mainly gained through collected rainwater. The substrate also contains natural nutrients that are fed automatically to the substrate when needed. The substrate and the plants help to insulate the facades

during winter and summer, it reduces noise levels, enhance biodiversity and supports ecosystem services and provides a better air quality. In this future "...nature is closer to us. The houses are more beautiful to look at, interesting to feel and various scents follows you through the city. Food is locally produced. Food that is grown on your apartment is for you and your neighbors to consume."



Figure 2: Vertical farming by Hedvig Carlin

A seemingly much more down to earth proposal was the bike path "Way2Go" in which bicycling is made more convenient through providing a roof over bike lanes (Figure 3). As the roof is covered by solar cells this also contribute to a local production of renewable energy. In difference to the vertical farming super-material this is a proposal that is technically possible to install today. The proposal does however also comprise a redevelopment of the transport infrastructure with a strict prioritization of bikes, pedestrians and public transport over cars, which makes it much more radical and demanding than a first glance might reveal.



Figure 3: Way2Go by Tom Lindberg

Even more radical however was the proposal “Conscience” (Figure 4). Conscience is a sustainability monitoring system synced to each individual and business that tracks what and how often they purchase and recycle. The system is linked to economic incentives and disincentives; depending on your Conscience level you will either get tax cuts or penalties. Everything sold will need to have a “Proof of Conscience” code holding information on sustainability impact which can be scanned using a smart phone to see how a purchase would affect your Conscience. At any point of purchase or recycling the code and your individual Conscience is registered and your Conscience level fluctuates accordingly. Not only would this take massive investments in systems for generating and disseminating data, it also demands that governments start playing a way more active role in promoting – or coercing – sustainable development than has been seen to this date.



Figure 3: Conscience by Tetsugaku Sasahara

DISCUSSION

In this article we have outlined the rationales for and possible benefits of combining prototyping methods of design and backcasting. While prototyping can help making backcasting scenarios more concrete and accessible, backcasting contribute by providing a solid, bigger picture of what a sustainable society could look like. However, even though stemming from two very different disciplines both backcasting and design are tools to make mental constructs about the future more concrete and to challenge them, to open up ideas of what is possible and to invite citizens to engage, participate and influence the scenarios and prototypes presented. In this way the future can be brought closer to us, and become a matter of a more informed discussion.

The project Prototyping the Future is still very much work in progress. Through the student pilot project it became evident that our tentative methodology and design brief worked sufficiently well in regards to the

intended outcome, but that there also are some aspects that need to be further considered.

One thing that was not tested in the pilot is how well the proposals communicate to people who have not been involved in the project. This is something that will need to be carefully planned in the continuation of the project so as to allow for reoccurring rounds of interaction with test groups.

One thing that became evident was that working with such far away futures as 2060 creates uncertainty and tensions that must be taken seriously if a balance between realism and radicalism is to be achieved. While broad user participation is often sought after, the pilot study points to that a user-oriented approach might not be the most fruitful way forward when aiming for designing something radically new. This is something that also can be seen in many participatory backcasting projects where participation tends to contribute more to realism than radicalism. To go beyond the present to create something new for an unknown future is admittedly hard; even in such a creative environment as a design student studio, and for most people it takes practical experience to learn to trust the process and deliberate from present normality while at the same time keep a critical eye open.

What is needed is an emancipated enquiry, a conceptual blending of different mindsets, where artistic and creative expressions are allowed to converge with a scientific approach. In the next step of the project Prototyping the Future, the research team will cooperate with a professional design consultant. The result of this stage will be ready in the end of 2013. What the end result will be is still very open. But as the students had to do, we too need to trust that the process of design will lead us across the abyss of uncertainty to somewhat safer grounds.

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