LIVINGGREEN LABS

A report on the development of a co design-based engagement method.

Livinggreen.eu

About this publication

This publication is a synthesis report of the Livinggreen Labs that have been organized in the course of the Livinggreen.eu project. It is compiled out of reports of each separate Living Green Lab (publication 1-6 in this series) and includes an overall introduction and conclusion.

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Preface

The publication in front of you presents the full results of the six Livinggreen Labs that have been organised during the course of the Livinggreen.eu project. The primary goal of these Labs was to develop and test a methodology to engage stakeholders, including end-users, in sustainable renovation of cultural heritage buildings. This was a part of the project as a whole, about which you will also read.

A separate publication was made for each individual Livinggreen Lab. This overall publication pulls these results together, providing an overview of the methodology as was developed and tested with these labs. By considering the full results it is easier to recognise the flexibility that needs to be allowed when considering to use this 'Livinggreen Lab' method in the future.

The five themes in the project were Energy, Water, Eco-Materials, Architectonic values and Climate Resilience. On all topics the project team from Delft University of Technology (DUT) worked together with another partner. These were respectively: City of Ludwigsburg (Germany), EcoHouse Antwerp (Belgium), National Trust (UK), City of Lille (France) and White Rose Foundation (The Netherlands).

The diversity of themes and partners combined with the desire to develop a methodology that can be repeated was a formidable challenge, on which the DUT team has worked with a lot of energy. Each development, expected and less so, has contributed to our overall insights of the usability and relevance of the methodology "Livinggreen Labs". Besides pulling the reports of each individual Lab together, we will share some of these insights with you in this document, and refer to deeper analyses in related papers that the team has produced.

The result of all this hopefully being that this approach will be used for suitable situations in the future.

We would like to thank all contributors, both to the Labs as well as to this publication.

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Reading guide

To help you navigate through this publication and to the parts that are of more interest to you, this reading guide outlines briefly which information can be found where. For new readers to get their bearings and readers of the individual lab reports alike this reading guide will clarify the differences with the individual Livinggreen Lab reports to avoid fruitless searching for sections that no longer exist. The main set-up of this overall report is:

Section 1: Introduction: the Livinggreen.eu project
The Introduction part is subdivided in: One: Description of the overall project context. Two: The five Livinggreen Centres and their concrete renovation cases as executed during the project. Three: Brief description of the Knowledge transfer methods developed in the project. This section includes tips for further reading.

Section 2: The Livinggreen Lab method and reports of the Labs
The second section starts with the quintessence of the Livinggreen Lab approach, the specific knowledge transfer method that the DUT-team was focused on, followed by the individual reports of each Livinggreen Lab. The reports follow the sequence of organising the Labs, i.e., Energy, Water, Eco-materials (I/II), Architectonic values, Climate Robustness.

Section 3: Epilogue and Acknowledgements
Finally, the main conclusions that can be drawn from organising six Livinggreen Labs are shared in the Epilogue,, followed by acknowledgements of all visuals and partners.

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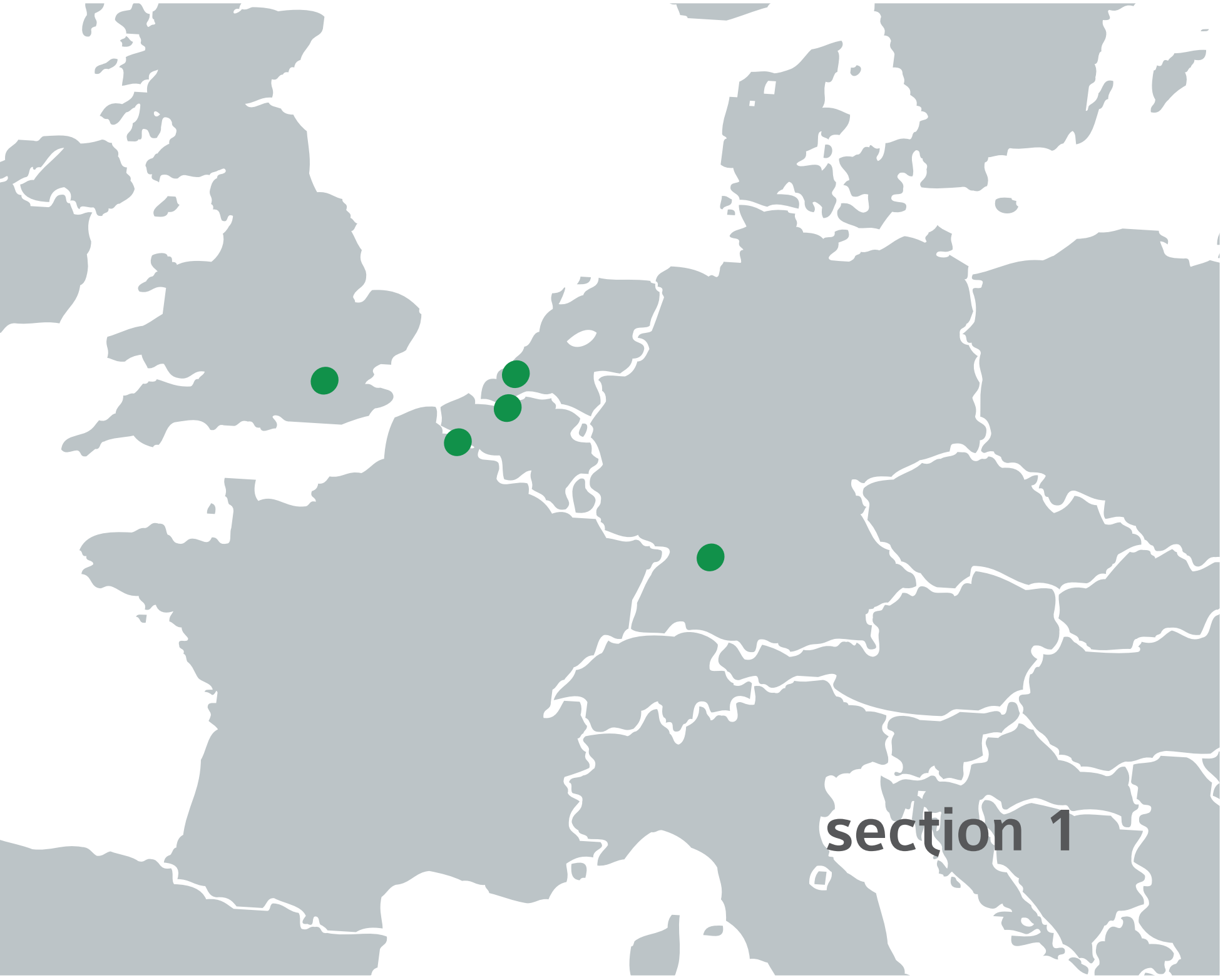
section 1

Demonstration of sustainable renovation

The renovation challenge in North West Europe

North West Europe is characterised by its rich urban heritage, which is an asset of the North West European cities. Existing building stock gives identity to cities as 'places to be' for the creative class and innovative economic activities.
For conservation and renovation of the existing building stock, sustainability is a prerequisite for mitigation of climate change. For new buildings there is a vast range of examples and standards about the integration of sustainability principles. However, the number of new buildings that are added to the existing building stock in North West Europe, is about one per cent per year. Applying sustainable technologies in new buildings thus has very little effect on the overall quality of the built environment, while renovation of the existing building stock can achieve enormous gains in sustainability.
Currently there is a risk of neglect and deterioration of architectural heritage. Maintenance and renovation require small scale, labour intensive operations and craftsmanship. Building at the city fringes is thus cheaper and faster. Nevertheless, there is a great market potential for sustainable renovation. The do-it-yourself market, the construction and installation sector, the practice of housing corporations, consultants and public authorities offer intriguing opportunities to make our built heritage sustainable. However, the possibilities of how to renovate, restore or ameliorate the existing building stock in a sustainable way are generally unknown to house owners, housing corporations, public authorities, contractors, investors and consultants. If we wish to keep the architectural quality, multi-functionality and social cohesion of our urban centres, and foster our local economies, action must be taken. Technology is available. The challenge is to bridge the gap between knowledge and practice, to engage people in sustainable renovation.

Livinggreen.eu to demonstrate the possibilities

The Livinggreen.eu project, supported by the European Union in an Interreg IVB program, aims to demonstrate technologies, methods and strategies for sustainable renovation. Five cultural heritage buildings in North West Europe are renovated in a sustainable way to demonstrate the possibilities of sustainable renovation.
Additionally, two knowledge partners work with methods for product and service development and knowledge transfer. The project partners have defined five focal themes for the project: (resilience) efficient use of energy, efficient use of water, sustainable building materials, architectural values and climate resilience.

Livinggreen Centres

Five of the Livinggreen.eu project partners invest in the renovation of a cultural heritage building. After completion these buildings will have a public function, exploited by a foundation or a municipality. These 'centres for sustainable living' act as live examples of sustainable renovation and actively promote sustainable renovation among their target groups, ranging from policy makers to construction companies, house owners and families.
The renovation projects are:

The City of Lille, France, renovates a nineteenth century industrial building to promote eco-housing and eco-building. The main objective is to bridge the gap between supply and demand: by welcoming and advising inhabitants, by qualifying, federating and guiding professionals in the housing and construction/renovation sector.

The City of Ludwigsburg redevelops an old barrack area and turns it into the new residential area called "Hartenecker Höhe". In this area the listed monument flak-hall will be renovated sustainably by using a house-in-house concept. The old flak-hall will house a Child and Family Centre. Moreover, together with local partners a public building (KUZ) that already houses public services and a library will be used for an exhibition with focus on sustainable renovation (Energetikom). This will create intensive PR and strengthen the advisory services about energy savings. Thanks to the location a high number of visitors and public perception are guaranteed.

The EcoHouse in Antwerp, Belgium, is a former warehouse located in a nineteenth century, densely populated area. It was renovated in 2001 and since then functions as a centre for sustainable liv-

Fig. 1. Industry building in Lille.

Fig. 2. The public building housing the Exhibition in Ludwigsburg.

Fig. 3. The EcoHouse in Antwerp.

Fig. 4. Front façade of the White Rose Building.

Fig. 5. Stable yard entrance of the National Trust.

ing. The EcoHouse serves as an example for the other centres for sustainable living in this project. The building will be expanded with an “eco-practice”: a working place and advice centre for building owners and professionals, including a help desk and ICT-applications to calculate saving of resources.

The White Rose Foundation from Delft, The Netherlands, renovates a listed monument (sixteenth to nineteenth century) in the historic city centre of Delft. In this building the foundation will open a centre that focuses on demonstration and learning of sustainable practices in everyday life.

The conservation charity National Trust for England, Wales and Northern Ireland renovates a nineteenth century stable yard and waterwheel in Morden Hall Park (South-West London) where visitors can experience how renewable energy and other technologies for sustainable living can be used in their lives. Especially the waterwheel will enable homes and businesses based along the river to look at options to harness the power of the river.

Knowledge transfer and product development methods

In addition to the practical challenge of renovation of cultural heritage, involvement of and communication to the target groups of the Livinggreen Centres is an important aspect of the Livinggreen.eu project. Two approaches are explored in depth by Espace Environnement and Delft University of Technology. The investing partners themselves already have a number of ways to promote and communicate about sustainable renovation or are currently developing them. Furthermore, the project can make use of the experience of the Dutch Curnet foundation, lead partner of the project and coordinator of the communication and dissemination of the project outcomes. The Curnet Foundation creates and facilitates coalitions of partners from the building sector, the urban and regional planning sector, the water management sector and relevant knowledge institutions and authorities in the Netherlands.

Reno-teams - a team approach to renovation

The Reno-teams method is an approach in which groups of house owners work together with professionals in sustainable renovation. The process is organised by Espace Environnement and Eco-Construction. The Renoteams approach are training sessions and excursions focusing on specific problems. Such as how to insulate a 19th century wall, while respecting its architectural characteristics. Also financial aspects such as the owners' budgets are addressed. Espace Environnement and Eco-Construction make the methodology available to the other partners and assist in the implementation of the method in their centres for sustainable living.

Livinggreen Labs - a user-centered approach to renovation

With the Livinggreen Labs, Delft University of Technology applies a user-centred design approach to come up with innovative concepts for products and services. Every year during the project, a Livinggreen Lab is held with one of the partners. The design challenges are related to the local situation of the partner and will be taken up by local stakeholders. The aim is to develop a method during the project that can be applied independently by the partners or similar organisations.

Livinggreen toolbox - synthesis of the Livinggreen.eu project

Together all partners will contribute to a toolbox for sustainable renovation, in which the experiences, lessons learned and recommendations are combined, so that other parties can also benefit from the Livinggreen.eu project. The toolbox development is coordinated by Curnet and due by the end of the project.

Fig. 6. A Reno-team meeting.

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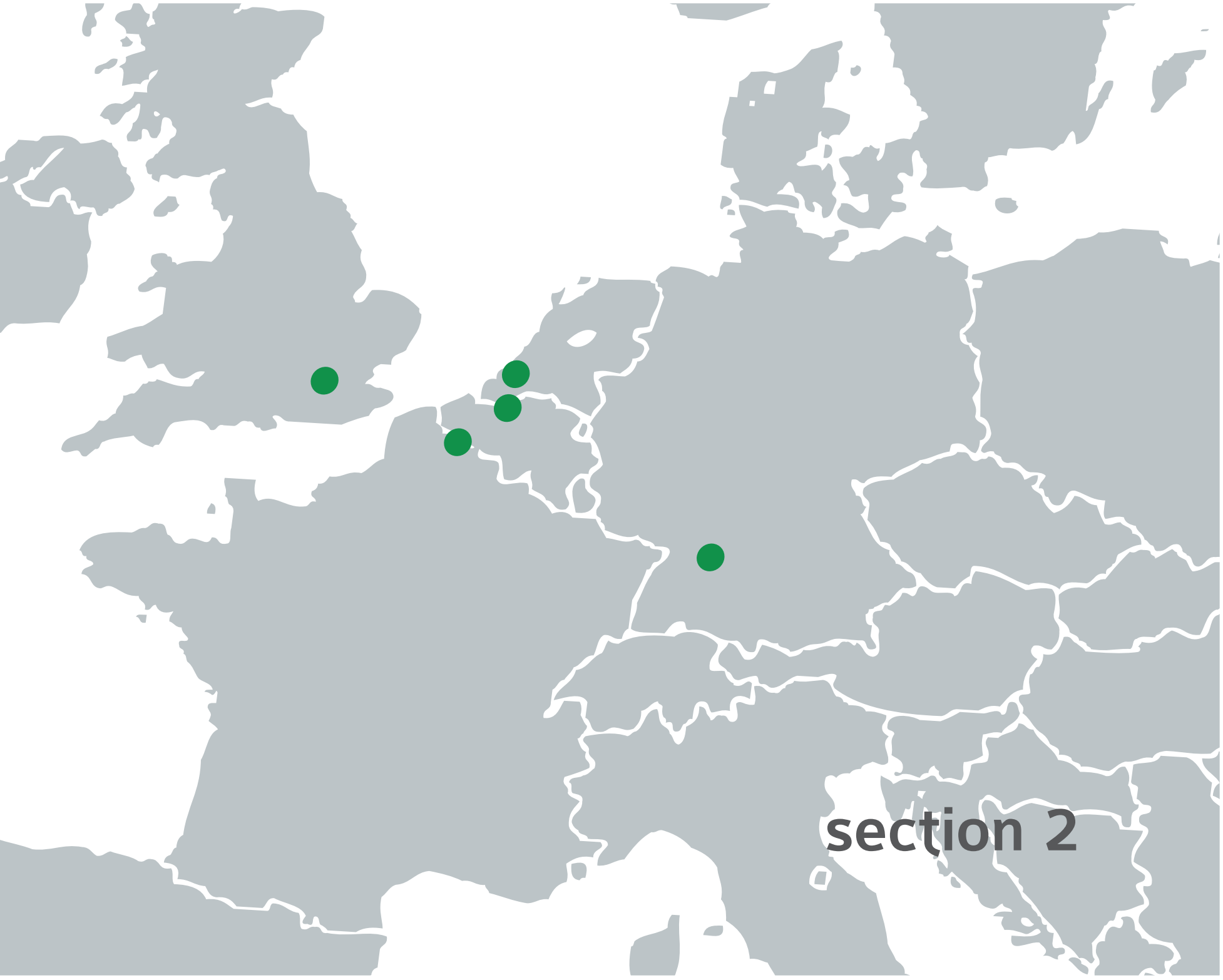
Fig. 7. creative session during a Livinggreen Lab.


section 2

Quintessence of the Labs

Background

The Livinggreen Lab is one of the methods used in the Livinggreen.eu project to promote sustainable renovation. Rather than providing information to end-users or companies, we sketch ways in which sustainability can be incorporated in products and services, taking into account both users with their practices and behaviour, and technologies. The core of the Livinggreen Labs is a user-centred design approach, which springs from the field of Industrial Design. A key expertise at the Faculty of Industrial Design Engineering of Delft University of Technology combining technical aspects of a product with the way users perceive and interact with products and services.

In building construction and renovation little attention is being paid to how the renovation practice can benefit from engaging the people that actually live and work in a building or install the systems. These are the users of the products and services. They decide whether and how they adopt a certain product or service. Their decision is very much dependent on factors that are not directly related to the actual functioning of a product, but to personal circumstances and preferences such as accessibility, aesthetics, ease of use and perceived value.
Additionally, user behaviour is a significant determinant of environmental impact[1]. While technical innovations permit increased efficiency of product (or building) operation, the user behaviour has a major effect on the energy or other resources used[2].

To enable the effective adoption of sustainable technologies and behaviour, it is therefore important to approach product and service development from a user perspective.

Development of the Livinggreen Lab method

The initial outset of the Livinggreen Labs was to make a user-centred design approach available to the Livinggreen partners and to produce a number of product and service concepts that can be implemented by the Livinggreen Centres or their local partners.
With each partner a Livinggreen Lab was organised addressing one of the Livinggreen themes that was most relevant for the specific context per Livinggreen partner. The aim was to develop a Livinggreen Lab method that can be used independently by the Livinggreen partners after completion of the Livinggreen.eu project.

In the course of the project, based on lessons learned and better insights in the different requirements for each theme, the emphasis shifted from design of products and services to knowledge exchange between users and development of skills that enable end-users to take their own decisions and manage their own renovation processes better. Central to the Livinggreen Labs remained the use of techniques from design to engage the participants in the topic at hand. This shift resulted in a framework of techniques rather than one fully developed method. The latter would have been a ‘one size fits all’ approach, which would not be the best way to reap the benefits of the experience gained with the Labs.

The science of the Livinggreen Lab method

The theoretical basis of the Livinggreen Labs is formed by a co-design approach to product and service development as well as by lessons from conventional methods to engage people in behavioural change to mitigate and adapt to environmental problems. Below, the elements, i.e. principles that guide the design of a Livinggreen Lab, will be briefly addressed. For deeper theoretical underpinnings about the reasons for using these techniques we refer to the article: *Engaging households in sustainable renovation – Exploration of a complementary approach*[3]. Per Livinggreen Lab the emphasis and mix of the used techniques was differentiated to suit the specific context of that Lab.

Participation of end-users in the design process

There are several ways in which end-users can be involved in the generation of concrete product and service ideas as well as more general future visions. They can be observed or interviewed, but also actively take part in (part of) the design process; this variant is called co-design[4]. It is an interesting approach since successful innovation often addresses a (latent) need of end-users. This approach takes user's desires and needs as a starting point for innovation, rather than technology.
In the Livinggreen Labs we use the desires, needs and perceptions of the users and look for ways how technology, embedded in products or services, can meet these diverse user requirements.

Bringing stakeholders together

An interdisciplinary approach is crucial for innovation in sustainability. Often it involves the development of complex systems of products and services and re-organisation of the value chain into new networks may be required[5]. To be able to envision such complex systems one has to get actors from different fields together, to exchange ideas, develop ideas together and collaborate to realise them.
In Livinggreen Labs, such actors like end-users, local authorities, companies, designers, advisors (the precise mix depending on the context) are brought together. Designers are trained to translate ideas from a technology perspective and an user perspective into one concept. Their presence is therefore valuable to help bridge the gap between user practice and technology.

Creativity techniques

Creativity can be defined as all the ways of thinking that lead to something new and useful for the thinker[6]. A creativity technique can help generate new ideas, break through fixed ways of thinking, think beyond current solutions, facilitate cooperation and stimulate an exchange of ideas. Quite a number of commonly used creativity techniques exist. A creative session typically makes use of several techniques and goes through diverging phases in which everything is possible and converging stages where clustering and selection of ideas takes place. In the Livinggreen Labs we make use of these tools to come to a successful cooperation between stakeholders and reach results that are novel and interesting to all stakeholders.

Designing into the future

The degree of innovation can be measured on a scale from incremental to radical innovations[7]. With incremen-

tal innovation we see small changes compared to the existing system, e.g. changing the fuel type needed for a car. Radical innovation breaks with the existing system, e.g. the current system of cars for personal transport will be replaced by a different transport system. For long-term sustainability we have to think in terms of radical innovation; in system innovation rather than product innovation.
In the Livinggreen Labs we try to facilitate the discussion and development of radical ideas by looking at the future. For the future visions that are being discussed and developed, one can draw a road map towards that situation. This technique is referred to as back casting[8]. Generally it is used for technological innovations, but on a smaller scale it can also allow end-users to think about and make first steps towards the adoption of new ideas, behaviours, products and services for their daily life.

Skill development through design activities

In the course of the project, design activities were used as a way to develop skills, in addition to transfer knowledge. The design activities can empower participants to look at a topic in different ways and to apply new insights. Application on real life cases, although not necessarily referring to their own home or city, aims to provide a basis for application of new learned skills to the own situation as well, outside the safe environment of a Livinggreen Lab.

Livinggreen Labs from theory to practice

Each Livinggreen Lab was organised together with one of the Livinggreen partners. This means that the Livinggreen Labs were tailored to the co-organising partner, based on their expertise, main target groups, and general programming of their Livinggreen Centre. Additionally each Livinggreen Lab was to address one of the themes of the Livinggreen project. This makes every Livinggreen Lab unique and therefore also different in the way the underlying theory was applied. A common element in the Labs is the use of design activities to actively involve the participants in the topic at hand. The results can be seen in the thematic chapters of this synthesis report. The conclusions after all six Livinggreen Labs are shared in the last chapter.

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WHAT'S NEXT?

Concepts for regeneration in the Weststadt of Ludwigsburg
Livinggreen Lab Energy

In October 2009, the first Livinggreen Lab was held. A group of approximately 20 persons joined forces to come up with novel ideas for a specific area of Ludwigsburg. The workshop took two days in which the group was guided through a process of vision formulation for the area to the development of more concrete combinations of products and services. In the following the context of the Livinggreen Lab, the design challenge for the Livinggreen Lab and the results of the Lab are explained.

Fig. 1. Aerial view of The Weststadt.

Context & set-up: energy concepts for redevelopment in the Weststadt

Ludwigsburg

The city of Ludwigsburg originated from the 18th century, when Duke Eberhard Ludwig von Württemberg established a pleasure palace. Later this was followed by the founding of a city through which he projected his absolutist power. Ludwigsburg is the county seat of local government and has about 85.000 inhabitants spread over seven suburbs. Ludwigsburg is one of the most prosperous economic centres in the state. The city is also a centre of education. It accommodates the University of applied sciences, a teachers' training college and the only film academy of the state. The greatest and best-preserved baroque palace in Germany is situated in Ludwigsburg. The city is said to be the cradle of Swabian poetry and in the past the kings of Württemberg resided here[1].

City development concept

Since 2004, the municipal administration, town council and the citizens of Ludwigsburg have been addressing questions about the future in various areas of activity. This resulted in the city development concept (known in German as Stadtentwicklungskonzept, SEK in short). Ludwigsburg examined the situation in its very own way by discussions with experts and feedback and discussion rounds with the citizens and the town council. The process of formulating a city development concept showed new perspectives and illustrated the scope of local government opportunities and political challenges in many areas for the first time.
On 28th June 2006, the town council approved the principles and strategic objectives for urban development in eleven areas with an overwhelming majority. The principles describe a picture, a vision of the town with reference to topics that are significant to local government. The strategic objectives derived from these lead the way to realise this vision. It is the dynamic basis for the long-term development of Ludwigs-

burg, together with forward-looking financial and budgetary planning, the process of a learning administration and the extension of intermunicipal cooperation.
In terms of energy, the SEK aims for sustainable energy use (efficiency and renewable energy use), with objectives for the development of beacon projects in renewable energy, energy efficiency in new and existing buildings, development of a future proof energy concept, independent and local energy supply with public works and effective PR and advisory service[2].

The Weststadt

125 years ago the industrial area Werkzentrum Weststadt came into being as production location for the Eisfink firm, which became known for their high-end refrigerators. Over the last 20 years this area is slowly redeveloping and is now host to 22 media-related enterprises. The Werkzentrum Weststadt has become a pool of creativity for the entire region. In addition to the media-related activities, the municipality wants to create a hub of 'green' industries in this region. The 'ENERGETIKOM - Energiekompetenz und Ökodesign', a center for energy competence and ecodesign, will function as the main node[3].

Design challenge for the Livinggreen Lab Energy

For the Livinggreen Lab a topic was chosen that could feed the municipality of Ludwigsburg and the Energetikom with ideas for the regeneration of the Next area in the Weststadt of Ludwigsburg. This area is planned to become a hub of 'green' enterprises, with a focus on energy related activities. The design challenge of the Livinggreen Lab thus became to develop a vision for the Next area, and to translate that vision into concepts of product-service combinations.

Setup of the Livinggreen Lab Energy

The workshop took two days during which the participants were guided through the following phases:

- Sensitization
- Introduction
- Vision forming
- Concept development
- Presentation

Sensitization
In preparation of the workshop, participants were asked to fill in a 'sensitizer'. The 'sensitizer' served as a mental warm-up. It contained a number of open questions, amongst others about their vision on sustainable living and working in 2025.

Introduction
The first day of the workshop started with the an 'ice-breaker' exercise. Ice-breakers are meant to get to know each other, to loosen up the atmosphere in the group and to open up hierarchical differences.
The 'sensitizer' was used as a basis for the 'ice-breaker' and served to share the first ideas about living and working in the future.

Vision forming
The group was split in sub-groups of 4 to 5 persons. Each group formulated a future vision for the area. They used several techniques to form an image about living and working in the Next area, such as flower associations, a tour through the

area in which the participants were given some more background information about the Next area, answering “how can you”-questions and creating personas who are situated in 2025. At certain moments the results were presented to all the groups in order to be able to benefit from the ideas of the whole group, to cross fertilise ideas between the groups.

Concept development
The visions of each group and ideas generated by brain drawing, formed the basis for concept development on the second day. Each group selected a number of ideas to elaborate into product and service concepts to make their vision concrete. On this day, an expert from Energetikom joined the workshop to help the participants with technical details of the energy concepts.

Presentation of concepts
The second day was concluded with a presentation of the final results to the municipality, the investor and other local stakeholders of the Next area. It took place before the opening event of the Energetikom. The attendees were invited to vote for their favourite ideas, by way of putting stickers on the ideas indicating that: a) they liked a concept as it was, or b) they could see the potential and recommended further elaboration.

Evaluation
The participants of the Lab were asked to compare their ideas and concepts to the present situation. To do this, they performed an evaluation. Because the results were in the form of ideas and concepts, the evaluation can only be indicative. No hard conclusions can be drawn, but a quick and dirty scan provides a first indication on what the improvements could be.

references

1) www.ludwigsburg.de; www.werkzentrum-weststadt.de/home.html

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3) www.werkzentrum-weststadt.de; www.energetikom.de

Results

Three groupes of participants produced a vision on the Weststadt; Sky-living, Diversity now, and Heart of the Weststadt. Each of the visions have a different starting point, but together form a holistic concept for the new Weststadt and offer a glimpse into what the Weststadt may soon look like. Central to all visions are sustainable energy production and use, mixed with educational, social and historical themes.

Sky-living

" In 2025 the Weststadt is an energy independent area that fulfils multiple functions as a knowledge centre about sustainable development. "

The Weststadt will be used as a mixed type urban area, where living, working and recreation melt effortless. The urban development will grow with the development of the sustainable aspects, as they influence each other heavily. The focus of settling companies is on sustainable development, culture and creativity. The large variety of working possibilities and cheap, green housing attracts a young and dynamic target group. Innovative concepts of sustainable living, sustainable energy production and use are stimulated and tested in the area, to provide not only a more sustainable Weststadt, but also to act as a showcase and research facility.

Sustainable Energy Knowledge Center

The joint forces of the Energetikom, Stadtwerke and local companies will be used to create a fully experience-able sustainable energy production. Visitors are welcome in the SEKC "Sustainable Energy Knowledge Centre" where they can learn about sustainable energy. It is shown how the energy flows in the Weststadt are controlled, how sustainable development can be made economically interesting etc. In

this building the central energy storage for heat and electricity is based, to be able to show this directly as well. Different types of information facilities are providing answers to private visitors, company boards, municipalities, and other interested institutions.
Where does which energy come from, how is it stored and how and where is it used again? What are the types of energy sources used, what are their possibilities, advantages and problems? How can more energy be saved? How does this apply to my home, to my city, to my factory? Which type of energy would be best in my case? How does new insulation reduce my heating costs? What are new innovative solutions to energy related problems? These questions will be answered in the SEKC.

This can be used as a tool to convince investors, but also to educate people about the possibilities of sustainable energy; it can act as a symbol for the municipality and as a motor to the local economy.

Fig. 2. View on green roof on the Robertson Building, Toronto.

Sustainable Energy, knowledge, economy, and people

In the new Weststadt these factors are supporting each other and with a strategy of small steps a future of a sustainable living will be created.

Sky-living

Skygardens on the roofs of large buildings, populated with solar panel-trees are close to solar heat collecting panels, providing first hand information, publicity, and energy production. Several green roofs are connected by sky bridges to shorten travel distances. They give a different sight of the city. A 'sustainable solar tour' is created that travels throughout the city, partly on roofs and sky bridges to bring energy issues close to the people. The now widespread and fragmented parking possibilities are turned into large parking lots, which provides more space for green between the buildings and offer a large roof surface to be used for recreational purposes. Old roofs that cannot support the weight of a green roof can still be used as mounting space for solar energy generation. To enhance the living quality in the area, roof gardens and lower garden spaces are frequently connected. Large walls of old factory buildings are covered with a layer of insulation and ivy as well as other plants like bamboo, that rapidly grow and turn the appearance of the Weststadt into a modern and green place. This enhances not only the inner climate of the building and reduces its energy need, but also provides pleasant views for passing people.

Information Centre

We want Energetikom to have an information centre where people can learn about the various forms of energy generation. The centre should provide background information on the energy generating techniques, as well as some interac-

tive parts that show how things work. Part of the information should focus on children (as in the Nemo science centre in Amsterdam, the Netherlands, fig. 3). It is especially important to teach children about renewable energy since they are the future. Additionally they have to make or support future decisions about this topic.
It is interesting to show different techniques that can be implemented in a person's household. For example, a solar panel or wind turbine could be installed on a roof and a display in the living room showing how much energy it generates. In that case people can see directly how much energy is generated.
It is possible to integrate this centre in a lunchroom on roof level, where interesting things could be printed on a table (fig. 4) or on food trays (for example how a solar panel works). In this lunchroom there could also be a meter that shows how much energy the PV panels in the Weststadt are generating.

Pedestrian routes on the roofs

The ground level of the Weststadt is clearly not designed for pedestrians. A top view of the Weststadt shows all of the large factory halls (fig. 5). Instead of mainly improving the ground level, we want to take the pedestrians to the roof level. This idea came from the parking lots on the roofs that are connected through a bridge (fig. 7). We were also inspired by certain old New York train tracks, which were turned into a park (fig. 6).
Furthermore the possibility of connecting all or several buildings and their roofs should be studied. Where buildings are close enough, a bridge could be built, which carries pedestrians and greenery. Some nice cafés or lunchrooms could also be built on the roofs. There should be reasons for people to get up there. It should also be studied how the pedestrians would be able to get up, paying attention to less abled persons. One option would be to have staircases (fig. 8).

Although this might take some extra effort of the users, it would be a pleasant experience and have some additional health benefits. If the route is attractive, green and safe, it

Fig. 3. Interactive setting in Science Centre Nemo: a child gets familiar with the concept of energy trough a plasma ball.

Fig. 4. Bridge for cars between two roofs.

Fig. 5. Impression of the high line.

Fig. 6. The fairytale-like roof structure of the Ghibli museum.

Fig. 7. Artist impression of a green roof on a joint condominium housing complex, designed by Eco Brookly Inc.

Fig. 8. Tilted roof of the library of the Delft University of Technology.

Fig. 9. Solar panels on the roof of a factory hall.

is not that bad to walk. It is also possible to have a bus stop at the parking lot of the 'Kaufland' supermarket; in that case the pedestrians are already on the roof level. A tilted green roof like the library at the Delft University of Technology (fig. 9) is also possible.

Gardens on roofs

In addition to the pedestrian routes we also propose gardens on the roof tops. These gardens could be very basic, like this roof garden designed Eco Brooklyn Inc. (fig. 10), or more fairy tale like (fig. 11). The gardens will make the top of the Weststadt very appealing to tourists. When artwork would be placed in the gardens, they could make very special sculpture gardens. It will be very green and a place where the people from the Weststadt are very likely to have their lunch or a drink with colleagues. There could be bars and lunchrooms on specific buildings, where information could be provided about the area. As an additional benefit the green roofs also provide insulation. Since it is still quite a new technology some subsidies might be arranged. As people will walk and relax on the roofs, safety is very important

Solar panels on the roofs

An obvious concept is to put solar panels on roofs that are neither strong enough for gardens nor pedestrian routes. Because the solar panels are on the same level as the gardens, people will become more aware of the solar panels as means of generating energy.

Implementation

Structural analysis should be performed to determine which roofs are suitable for use as roof gardens, walkways and energy generation. This information can be the basis for a roof top plan, indicating the possibilities of creating a roof landscape. Ideally the roof level is structurally able to carry the proposed plan. If not, reinforcements should be made to

allow the whole Weststadt roof level to be used. With this plan the roofs that are most suited for solar panels can also be selected. After this the solar panels are the first to be installed, to generate energy. Next, the paths between the rooftops should be made and finally the gardens. Several spaces should be created on top of the roofs that will function as lunchrooms or bars and information centres.

Evaluation

This evaluation is about the use of the Weststadt and it does not include the extra environmental impact caused by the construction of the additional features. It should also be kept in mind, that what is perfect for now, might be 'bad' in a decade. Scale : very bad - bad - medium - good – perfect

Material use
Existing situation: In the old situation there was less activity, so less material was used. But when people use something somewhere they cannot use it somewhere else at the same time, so a ratio would be better to determine this. The parameters are: activity (low to high), materials used (few to much) and sustainability (bad (low) to good (high), the ratio is then: activity*sustainability/materials used. The higher the outcome the better. Because in the old situation sustainability and activity were very low, materials used make the ratio rise very fast.
New situation: If we look at the ratio, both sustainability and activity are a lot higher. Probably much more materials will be used because there is more activity. However, the ratio will probably end up higher because of the better score on sustainability. Sustainability is mainly higher because the Weststadt should try to use more local materials and materials with a low environmental impact (during their entire life cycle).

Energy use
Existing situation: The old situation is bad to very bad since it has very large buildings which are hard to heat, they don't generate their own energy and they don't seem to use energy in a very efficient manner (good insulation, energy saving products etc.)
New situation: In the new situation the Weststadt generates (part) of its own energy (photo voltaic) and it uses energy in an efficient way. For example with good insulation (which is also provided by the gardens on the roof) and the use of energy efficient products.

Water consumption
Existing situation: It is not in particular unsustainable or sustainable
New situation: The concept does not focus on changing the way water is used. The only difference is that the roof gardens might need some additional watering during periods with less precipitation. But when available water is effectively used this could be kept to a minimum. So the situation may become slightly worse, but the advantages that the roof gardens will bring are quite big.

Transport
Existing situation: It is not very comfortable to travel by public transport to the Weststadt. It is also not very nice to walk or cycle in the Weststadt. The Weststadt is mainly a car area.
New situation: The Weststadt will have a good public transport system. The Weststadt will have large parking areas at the outside and it will be nice to walk (via the roofs for example) from these parking areas to your workplace. Since the ground level should also get some attention to make it cleaner and greener, it should also be better to travel at this level by bicycle.

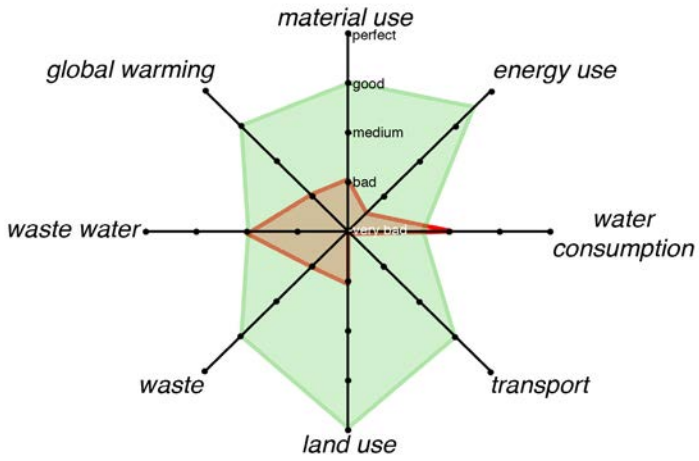


Fig 10. Scores of the old system (red) and the new system (green). Disclaimer: this evaluation is purely indicative and qualitative.

Land use
Existing situation: Many empty buildings and a lot of high buildings without multiple floors.
New situation: Very efficient use of multiple layers. This is done by giving a function to the roof layer and by building multiple floors in the currently empty factory halls.

Waste
Existing situation: Waste is not actively reduced and a large part of the waste is not recycled.
New situation: In the new situation as much waste as possible should be recycled or it should be used to generate energy. Next to that both companies and people that will live in the Weststadt should try to actively reduce their amount of waste.

Waste water
Existing situation: It is not particularly sustainable or unsustainable.
New situation: The new green roofs and the 'greening' of the area's public space offers great possibilities for rain water purification. Helophyte filters and green roofs filter the water before it is gradually released in surface water. Public spaces will function as precipitation buffers.

Global warming
Existing situation: The old situation does not seem to focus on mitigating global warming at all.
New situation: The new situation makes it possible to be sustainable and therefore reduce the CO2 impact and global warming. But since this design focuses on a limited number of aspects only, improvements can be made.

Conclusion

Our main conclusion is that our vision might seem a little out of the box at first but that it is possible. All of these ideas already exist but not on this scale. This will not only make the Weststadt more sustainable and attractive for its employees, who will be more motivated and therefore work better. Since it will be such a special place, it will also make the Weststadt very attractive to tourists. These people will generate extra income for the Weststadt, which will make the extra investments worthwhile.

Diversity now!

Vision

To develop a region like the Weststadt in Ludwigsburg, some basic things have to be changed. Technology can be a driver for innovation, city planning can urge a location to develop, but the focus of this project proposal is the social adaptation to the future. Instead of pushing products to people and urging them to change, it should be tempting to develop oneself and a challenge to control your footprint. The change is in the people, not the technology or government. This angle of looking at a problem has lead to the following vision for the Weststadt:

" In 2025 we want the Weststadt to be a habitat for a diverse community, which is responsible, proactive and future oriented. "

This vision has been the starting point in the development of four concepts for the adaptation of the Weststadt area. Every concept has a specific angle to bring the area to a higher level. The ideas behind the concepts are described and visualized briefly in the next page, and more extensively after.

Diversity now

The social cohesion can be inspired and influenced by the city planning. In the 'Diversity now' concept we want to bring different groups in society closer together, to learn from each other and have multifunctional buildings.

Fig. 11-14. Mood board.

Fig. 15-17. Mood board.

Fig. 18. Greenery in Lower Manhattan.

Fig. 19. Play.

Fig. 20. Future relics of todays reality?

Playing with the future

New technology often is something that has to be explored and adapted to by users. Innovation and change can be scary. By making a playing area for young and old to get used to new technology it becomes known and players become experts.

Relics of the past

Something old is not necessarily something bad. Industrial memories of different ages can be beacons in a new age - dinosaurs we have left behind but still cherish. The combination of the industrial nature of the Weststadt comes back in details in the area.

Social connection

Measuring yourself can only be done in comparison to others. Everyone needs mirrors, both in the physical and psychological sense. How are others doing, how do they cope and how can you imitate them? Big innovations in everyday life have to have a social base.
The Weststadt is changing. By developing the area and changing it from wasteland to sustainable centre, a future oriented progress is started. Pieces of the industrial past can be found all over the area. There are old chimneys, old cranes or train tracks. All those elements are now rusty and old. They cannot be used anymore but they provide a feeling of nostalgia. They give the area a past, a reference point. By growing plants in those old industrial relics, the progress of the area will be represented. Nature is taking over again.

Energy use control system (social connection)

The energy use control system is meant to guide residents in reducing their energy consumption and effectively make use of renewable energy. By connecting a screen that is situated in your house to the other screens in your neighbourhood a community is created. The community shares the common interest to use energy in a smarter way. In this community there is room to help each other and give tips. Additionally, the plotting of everyone's energy consumption creates a competition setting which in turn stimulates to improve ones own performance. In order to prevent the neighbours from pointing fingers to others, the network will be anonymous.

By having a 'soft' social control smart energy consumption becomes more desirable and easy; one is alone in making the effort. The system also helps to connect the neighbours, giving them the opportunity to interact with one another about for instance tips for energy saving and renewable energy production. The system also helps to connect the neighbours by giving them the common interest of saving energy together.

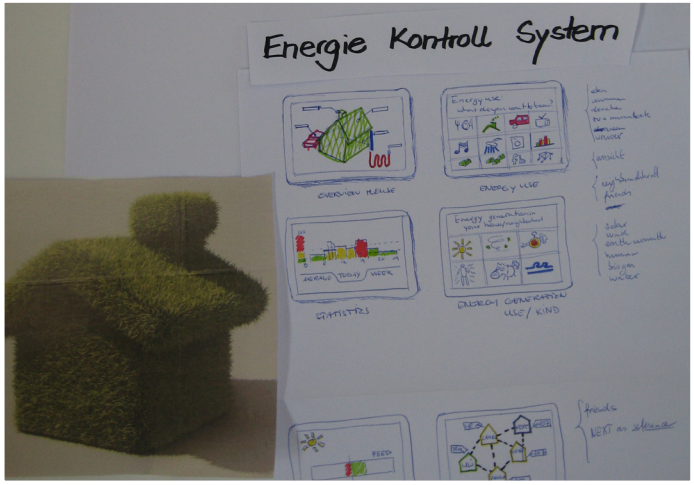


Fig. 21-23. Industrial relics

Fig. 24. Energie Kontroll System

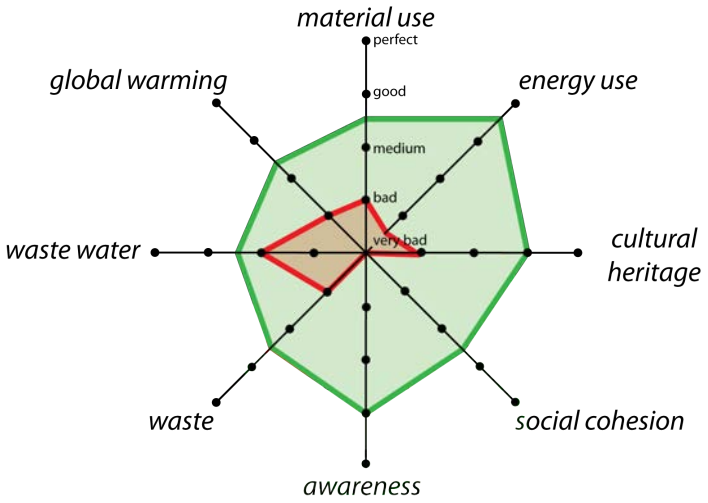


Fig. 25. Disclaimer: this evaluation is purely indicative and qualitative.

Reflection on concepts

The Energy Garden (playing with the future)
Playing with innovation is a new way of getting used to unknown technology. It speeds up the adaptation and adoption process. The garden is a relatively cheap way to educate people and it provides the area with a public space where everyone is welcome. One of the difficulties in developing this garden is the fact that it is hard to protect from for instance rebellious youths; it could be prevented by closing it off during the night, just like for example the playground made by 2012 architects. The playground should also evolve over the years, to keep it up to date and entertaining. A good example can be the Nemo museum in Amsterdam.

Relics of the Past
Even though everything changes around us, it is good to remember the industrial past. What are we actually fighting for and what went wrong in the industrial revolution? The relics are easy to implement because they use old parts of the infrastructure. Combined with some historic lessons and creativity the old relics can be used as public space, a get together.

Fig. 26. Playground made from wind mill parts by 2012 architects.

Energy use control system (social connection)
Comparing oneself with neighbours can be something stimulating and contribute to clever ideas. But seeing what somebody uses indoors can be something very private too. Some people may not want to give out their details and find it offensive if neighbours talk to them about their ecological footprint. Feasibility research has to be done to discover what is acceptable and when the implementation is successful. The actual footprint of the implementation of such a system has to be looked at too; there are other systems like this one that can be used or combined. The ecological footprint of the implementation should be earned back quite quickly by the reduction of energy used in the households.

The heart of the Weststadt

Weststadt: full of potential

The current Weststadt has a lot of potential with empty old factories, broad streets and squares and a mixture of architecture. It offers potential for jobs, housing, shops and leisure activities, like the disco that is already there. The Weststadt is a compact area with its own identity, which has to be developed to show all that potential again.
The area will be developed in the most sustainable way possible, considering both using the old buildings instead of tearing them down, as improving them to be energy efficient or even positive. The purpose of this project was coming up with more sustainable solutions to develop the Weststadt from an old unattractive industrial zone to a highly innovative neighbourhood that will make the city of Ludwigsburg proud.

" The Weststadt will have green streets and a park and clear broad avenues to give a transparent character – it will truly be an open city. "

In developing this area, many challenges rise to mind. First of all there is polluted air and noise, caused by the factories and the busy road with traffic jams around the Weststadt. There is hardly any room for pedestrians and cyclists and it's hard to reach by public transport. Furthermore the surrounding busy road makes it physically very disconnected from the rest of the city.
In the area itself there is a lack of public buildings and social meeting spots, and because nobody is living there, it is a deserted place in the evenings. There is an overload of cars that are parked on every street and square, and many buildings are empty. Combined with the lack of green, the area doesn't look inviting or attractive

The heart of the Weststadt

With these potentials and challenges identified, a vision for 2025 has been developed. In 2025 the Weststadt will be a car-free neighbourhood, of both living and working nature. It will have a heart of public spaces where all different people will meet, surrounded by avenues and full of pavements and bike tracks. By having both new public areas as commercial and industrial, it will be attractive for all generations and interests. The Weststadt will have green streets and a park and clear broad avenues to give a transparent character – it will truly be an open city. This will also connect it closely to adjoining neighbourhoods. The use of old industrial building styles combined with other old and new architecture will give a unique look to the area.

Fig. 27. Conceptual photograph

Traffic concepts

Using the vision, three concepts for the Weststadt have been further developed for the near future: tomorrow.

Fig. 28-30. Conceptual photograph

Cars
The centre of the area will be car-free. This means cars will be parked on strategic spots on the outskirts of the area. The traffic within the area will be by foot and bike; to make this possible there will be a bike rental facility at the main parking areas.

Pedestrians and cyclists
With the cars gone, the streets and squares will open up and ready to be enjoyed by children and elderly. The air will be less polluted and the level of noise lower; there will be room for green and clean transport. Strategic pedestrian avenues and bike tracks will connect different areas and make the Weststadt more of a unity.

Public transport
There will be a shuttle bus from the train station and city centre to improve the connection and accessibility. This will also encourage people not to come by car.

Public uses as 'heart' of the Weststadt

The current area has no clear centre or meeting point. To form a unity and to connect the people working and living in the Weststadt, there will be a centre as the beating heart.

The heart of the Weststadt will offer...

... green spaces and oases
To escape from daily life, the streets will be filled with green and even an actual park.

... a meeting place
There will be a municipal centre that offers space for individuals, groups, organizations and societies for meetings, parties and cultural events. On top of that the main square will host a library, cinema and place for exhibitions. It will be connected with a walkway past a café to the park.

... room for all generations
There will be a home for elderly people, combined with a crèche. This way, people will be able to have their children close and looked after when they are working. And the elderly can enjoy the company of children playing in the green.

Energy

The 'heart' will have the research and development centre Energetikom, combined with a central heating and power plant that will provide the whole area with power.

Awareness

The facades of all buildings will show how low on energy use they have been during the day, in a competative manner: 'I have used 4 trees today'. This will stimulate to save energy, and to put it in a perspective. The whole idea is to make people familiar with the amount of energy they use, and make them consider alternatives.

Regenerative

The roofs will be covered in solar panels that will supply the central power plant of Weststadt. The buildings will be renovated in a way that they are well insulated. Furthermore the extra warmth that is not used by every household and would normally be released into the air will be collected and reused, for instance to heat water or to regenerate power. The techniques for this will be developed in the Energetikom, with the goal that the Weststadt will be 100% regenerative in 2025.

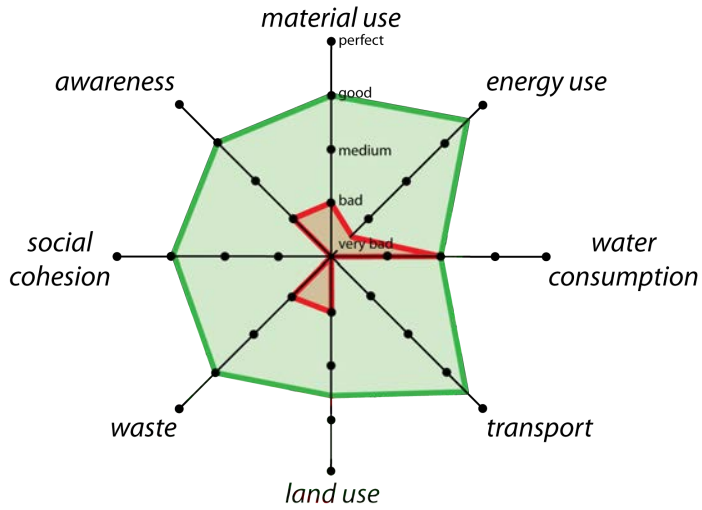


Fig. 31-34. Photographs of Weststadt

Fig. 35. Disclaimer: this evaluation is purely indicative and qualitative

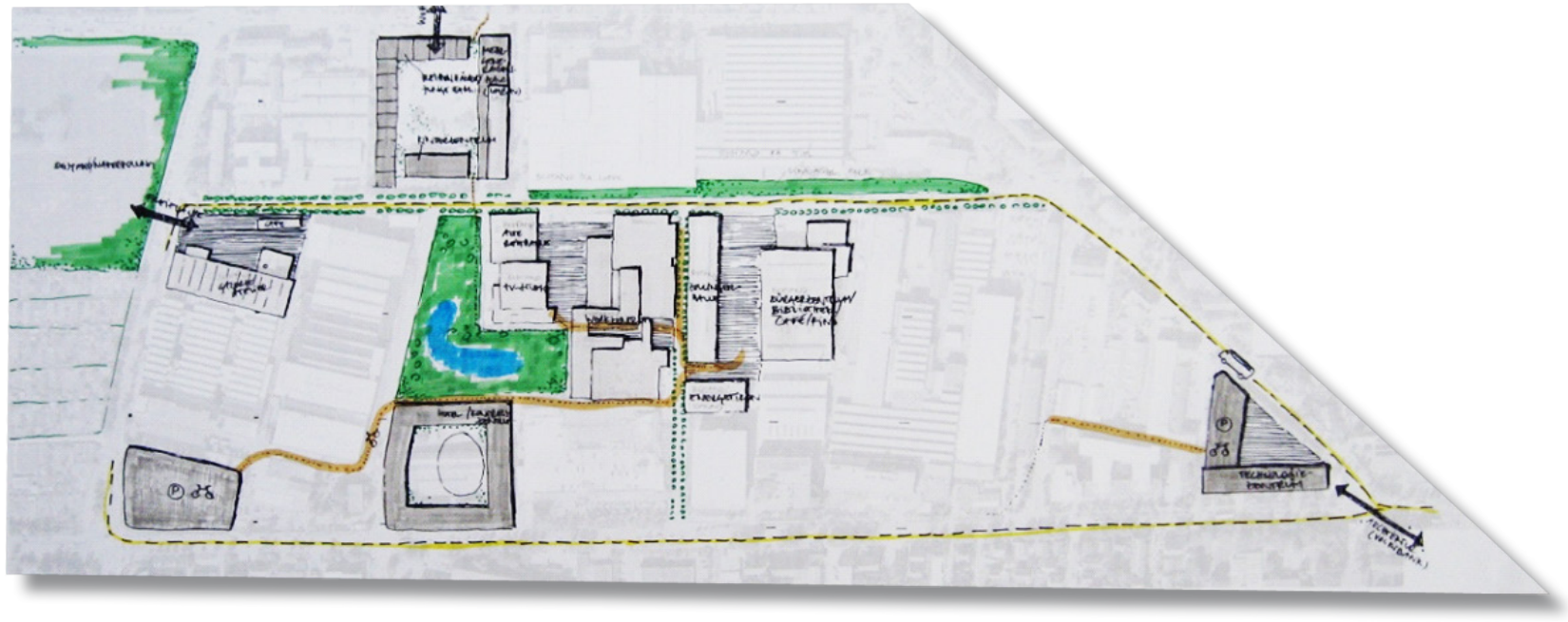


Fig.36. Concept drawing of proposal for Weststadt 2025

Evaluation

The Livinggreen Lab Energy was well received. The participants and the city of Ludwigsburg responded very positive on the novel approach to face the challenges the city of Ludwigsburg in transforming of the Next area. The proposed vision and product-service concepts provide input to the discussion about the transformation.

The three proposals were developed by three different groups, each with a slightly different focus. In combination, the proposals provide a view on the Next area as a showcase of urban regeneration from area to end-user level. All proposals include less cars inside the area, lots of green areas on several levels and a mixed use of space. In terms of energy, the proposals provide solutions for the entire area, in which local energy production was considered as an important element for the new Next area, and the interaction between the visitors of the Next area and the locally produced and consumed energy. Inhabitants would become active participants in the energy management of the area.

Hopefully proposed visions and product-service concepts provide useful input to the discussion about the transformation of the Next area. In this evaluation we would also like to take the opportunity to reflect on the Livinggreen Lab. In the Lab, we aimed to come up with concepts for products and services related to energy in the Next area. There was no clear vision yet for the area, so additionally we had to come up with one. Unfortunately this meant that there was not sufficient time to work on concrete product and service concepts. The results of the Livinggreen Lab Energy therefore focus on the scale of the whole area, rather than on concrete implementation of products and services.
The methods that were used in the workshop stem from creative facilitation of product development processes. We underestimated the amount of city planning involved in the workshop. In hindsight, to complement the creativity techniques, it would have been valuable to use methods from urban and community planning. To the contrary, the goal of the Livinggreen Labs is to come up with product and service concepts. Therefore it makes more sense to keep the urban

planning part outside the workshop, and start with a concrete vision that makes it possible to focus the workshop on the actual generation of product and service concepts.

The involvement of local stakeholders is key for two reasons. Firstly because then there is a problem owner, who can explain the problem and discuss all aspects in depth. Secondly, the local input is important for getting results that matter to the local stakeholders. The workshop also gains credibility and relevance when more local stakeholders are involved. In this Livinggreen Lab we could involve few local stakeholders. The design students were the majority, which in terms of flow of the workshop and new ideas worked very well. Very probably, the workshop would have yielded different end results with more local input of future users. The results are thus neither well grounded in the local context nor carried by the local stakeholders.

Still, we can say that the mix of professional and cultural backgrounds of the participants was successful. The participants valued the differences in insight and working methods of other participants and it yielded creative results. We were positively surprised that the groups leaned towards the social aspects of the energy issues, rather than only focusing on the technological or spatial planning aspects. In our perception this component is very important.

To conclude, the workshop was inspiring for the participants, the host, the public and ourselves. It delivered novel ideas for the regeneration of the Weststadt that the city of Ludwigsburg can refer to in discussions with their local partners. To come to more concrete product and service ideas, it may be useful for the city of Ludwigsburg to organise a second round of the Livinggreen Lab, this time with a stronger focus on concrete and innovative energy products and services for the Next area. And with a more involvement of local stakeholders that can play a role in the implementation or dissemination of the ideas.

We very much enjoyed the cooperation with our partner, the City of Ludwigsburg and gained valuable insights for the organisation of the Livinggreen Labs. We look forward to see how the transformation of the Next area progresses.

WATER IN HOUSEHOLDS

From new ways to bathe to a total switch in provision
Livinggreen Lab Water

The Livinggreen Lab Water is the second in a series of five. After the Livinggreen Lab in Ludwigsburg dealing with Energy, the theme this year was Water. Although water is all around us in North West Europe it is important to realise that much of that water is not potable. Worldwide the projection is that the availability of potable water will decline.

In response to that knowledge, this Lab focused on how more efficient use of potable water can be achieved, as well as how to make use of rainwater. The resulting product concepts were to be both attractive for end-users and an answer to the challenge to reduce potable water consumption in households.

Starting from the user perspective the participants worked their brains to come up with a specific problem to address in the Lab and how that could be solved. This creative process led to a proposal for a complete overhaul of the existing water system and novel bathroom concepts.

The Livinggreen Lab was hosted by the EcoHouse Antwerp (Belgium) on the 7th of October 2010. Where the results of the first Livinggreen Lab about energy resulted in general solutions on a city planning scale, this Livinggreen Lab was aimed to result in more concrete product concepts that could be developed in co-operation with partners of the EcoHouse. Before going into what happened in the Livinggreen Lab, the context of household water use is discussed.

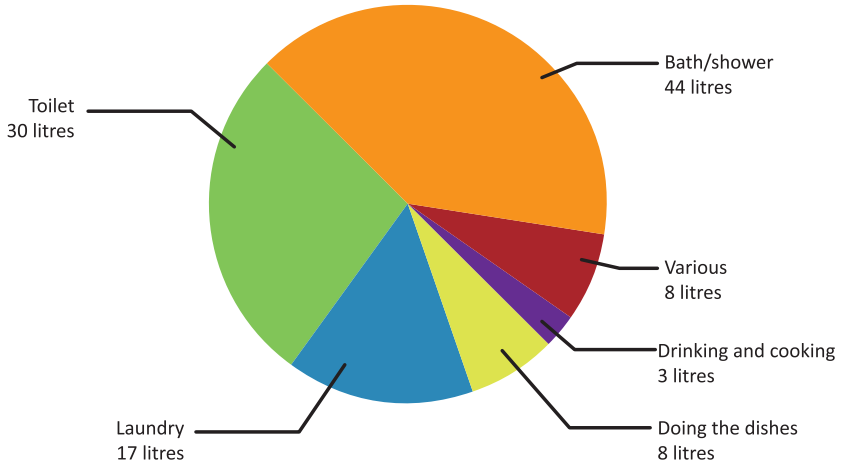


Fig. 1. Water consumption in Belgian households.

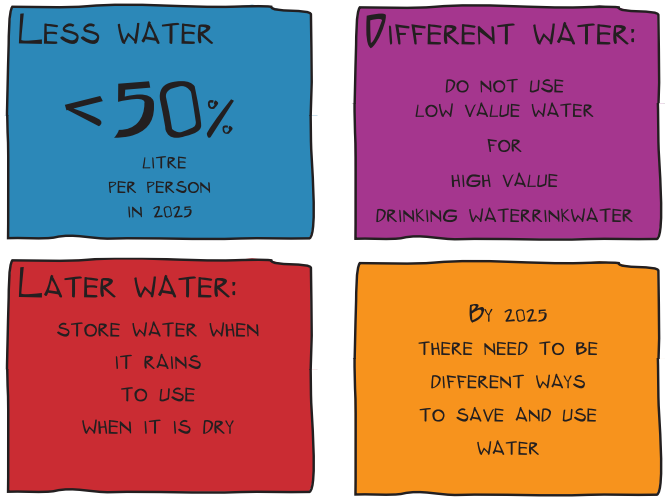


Fig. 2. Possible future scenarios for water use.

Context and set-up

Current water use in households

In our daily lives we use a lot of valuable water, and often add all kinds of chemicals. Every person in Belgium on average uses about 110 liters of water per day. The figure opposite shows how the consumption is divided over water using activities. Most water is used for bathing, the toilet and laundry. Most of the water that is used in households is of drinking water quality. On average only 3 litres are used per day per person for cooking and drinking. Smart and often simple technologies exist that can limit the use of water and chemicals. In practice, however, these technologies are very rarely applied in 'normal' homes. Reasons for this are that people are not aware that such technologies exist, high costs, or that technologies cannot easily be fitted in in a house or apartment. Rainwater is increasingly collected in underground storage tanks and from these tanks the water is infiltrated in the surrounding soil or used in households[1].

Future scenario for water use

With the changing climate it will be necessary to make changes to the water system. By 2025 we may face the following circumstances for water consumption:

Lower water consumption by 50%
We expect that the consumption of water must be radically lowered, due to the difficulty of procuring potable water and the expected irregular influx of precipitation year round. The less we are dependent on water, the better.

Use different types of water
In reducing the demand for water it is imperative to make the distinction between the different uses of water and the quality of water needed. In general, potable water is used

for almost every function in the house, even when it could use a lower quality of water, from flushing toilets to washing cars. We expect that the use of rainwater and groundwater in households will increase.

Water use planning
It may become more important to plan ahead in using water. When precipitation becomes more irregular and at the same time more intense, while there are extended periods of droughts, it becomes important to save water in times of plenty, to be able to use it in times of low availability.
To conclude, there is a need for other ways to save and use water, since in the near future it will not be possible to count on the water purification plants only to provide the (small) amounts of clean water needed in the cities.

Set-up of the Lab

The Livinggreen Lab was set up as a one day workshop in the EcoHouse. In addition to the workshop day, the participants were asked to do some preparatory work and the involved designers agreed to process the results to make them suitable for presentation.

Topics

Beforehand four topics were defined for exploration in the Livinggreen Lab. Bathroom: Personal hygiene is closely related to water consumption. How can we minimise water use while maximising comfort? Waterless toilets: Flushing toilets is one of the most water consuming activities in a household. Dry toilets exist, but they are hardly found in 'normal' households. What about a redesign? Cleaning: We are used to cleaning with water, but there may be other ways to do this. Or at least with less water and chemicals. Rainwater use: Exploring how rainwater can be collected and used in other (better) ways or how to make existing technologies more attractive.

Participants

The people that participated in the Livinggreen Lab were professional designers, with experience in water and/or sustainable design. Furthermore there were EcoHouse employees and volunteers. These are experts on several aspects of sustainable building and sustainable behaviour. The balanced mix of professionals (designers, planners and companies) and end-users that was aimed for in the organisation of the Livinggreen Lab could unfortunately not be achieved. This was due to time limitations of both companies and organising parties. This however did not affect the workshop format and potential outcomes. Based on the number of people in the workshop and the interest and expertise of the participants the group of participants was split in two:

- Bathroom & toilet (combining two of the initial topics) and;
- Rain water use.

Design brief

A design brief was formulated to give direction to the workshop. This design brief was kept general, so that all topics could fit, but also so that the participants could specify their assignment in the workshop.
The design brief was to develop products and/or services that enable people to live comfortably in accordance with the future scenario and that can be successful in the market.

The proposals had to take five aspects into account:

- Attractiveness
- Fitting in the home
- Cost/benefits
- User comfort
- Sustainability

Process

The process of the workshop was set up to follow a typical design cycle, which starts with formulating a design brief, followed by a diverging phase where many ideas are explored and judgement of ideas is withheld. After this phase, selection of ideas takes place and the ideas are elaborated.

Preparation
In preparation of the Livinggreen Lab a preparation exercise ('sensitizer') was sent to the participants two weeks before the workshop, to already start their thought process about the topics of the workshop by relating them to their own situation at home.

Workshop introduction
The participants were introduced to the design brief via a scenario of a family that looks into the possibilities of implementing water saving equipment, other cleaning methods, and a rainwater collection system. It is not so easy for them and they are looking for attractive ways of using water in a smart way. The scenario is used to provide insight in end users' concerns.

Redefinition of design brief
Each group redefines the design brief for their specific topic. In this way the groups themselves decide which problem to tackle and which direction to take. For creativity and cooperation this works better than a pre-defined assignment.

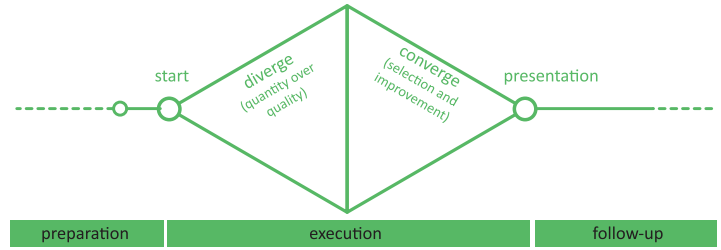


Fig. 3. A typical design cycle, from preparation, to execution and follow-up.
Fig. 4. Designing together in groups.
Fig. 5. Designing together in groups.

Divergence phase
Once the design challenge is clear, as many ideas as possible are generated that could solve the problem. The moderators take care that judgement of ideas is postponed as much as possible. Several techniques are used in this phase to stimulate creativity of individuals and the group.

Convergence phase
Ideas are selected for further elaboration. This is done based on the criteria that were formulated in the design brief. The selected ideas are improved to become concrete and feasible product proposals that can be developed now or in the near future.

Presentation
The workshop closes with a presentation of the proposals to an expert panel. Their reactions to the proposal are taken into account for further elaboration of the proposals.

Follow up
After the workshop the designers translate the proposals to presentable drawings that can be presented to a wider public and potential clients. Furthermore the proposals are presented to interested stakeholders that could develop them further.

references

1) PIDPA; www.pidpa.be/nl/overwater/water_milieu/spaarzaam.htm

Fig. 6. A scenario of a family that looks into the possibilities of implementing water saving equipment is used to provide insight in end-user's concerns.

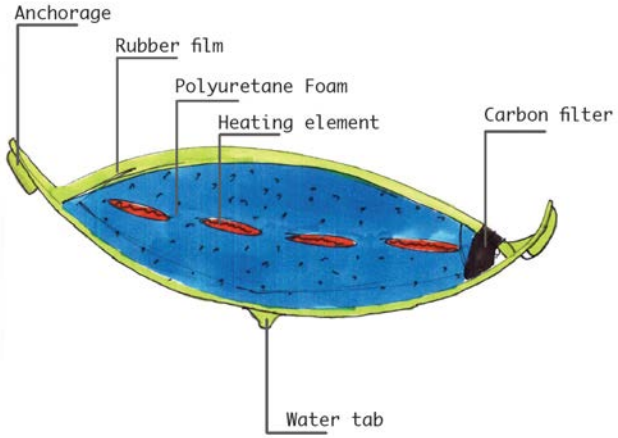
Existing products

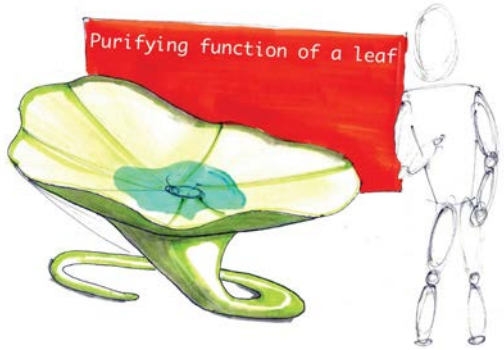
Fig. 7. Jun Yasumoto's Phyto-Purification bathroom.

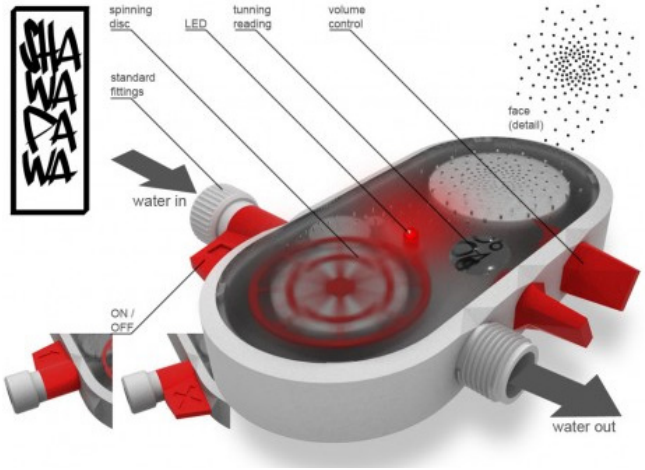
The question of reducing water use is constantly being addressed, but what is already out there? To give the participants of the Lab a headstart, we provided an inventory of radical or plain smart products that currently are designed and developed. These products set the standard for the results of the Lab. Although not all of the products are for sale yet, they still provide valuable insight in the current trends and expectations.

In the bathroom

Phyto-Purification
Jun Yasumoto's Phyto-Purification Bathroom is a conceptual system that turns your shower into a mini-ecosystem. The design is a clever take on the water-saving conundrum that relies on plants to do the dirty work. The bathroom works similar to a miniature river. Water from your shower travels







to a series of rushes, reeds, hyacinths, and lemnas—all plants that are known to absorb bacteria, metals and other water-borne particles. A carbon filter captures any particles that remain, and the filtered water is then recycled back into the shower system for use. (See: www.junyasumoto.com)

Lotus Bath
The Lotus Bath, designed by George-Emile Tokaya, saves at least 50% water by adapting to the body's shape. The bath is made of foam that takes the shape of the person sitting in it. In this way less space has to be filled with water. The design of the rubber bath is a mix between two chaises longue (Charles and Ray Eames, le Corbusier) and a lotus leaf. (Designed by George-Emile Tokaya at the Faculty of Industrial Design Engineering of the Delft University of Technology, contact: ingetokaya@hotmail.com)

SHAWAPAWA
SHAWAPAWA is a water-powered shower radio. It is self-powered, working without chemical batteries and induces a poetic exchange between power source and use. SHAWAPAWA plugs between the tap and the shower hose using standard fittings. The water flowing through the pipes makes a little turbine spin, producing enough energy for the radio to play. (Design by Arthur Scmitt, see: www.tart2000.com)

Water Pebble
Originally conceived as Water Watch, the Water Pebble is a unique water saving device and a world's first. Paul Priestman was inspired by a sign in a hotel bathroom to, "Please use water sparingly" and he started developing the concept for Water Watch on his return home. Water Pebble is a little product designed to help you reduce your water usage for simple daily tasks such as brushing your teeth or having a shower. Place it in your sink or shower and it indicates how much water goes down the plug hole. (See: www.waterpebble.com)

Fig. 8. Design sketch for the Lotus Bath.

Fig. 9. Design sketch for the Lotus Bath.

Fig. 10. Artist impression of the SHAWAPAWA.

iSAVE
This gadget, designed by Reamon Yu, easily attaches to your sink or showerhead to provide a digital readout of the amount of water that was being used in a faucet or shower. What's more, iSAVE is powered by energy generated by the water passing through it, using a small turbine embedded in the device. Two different models of the iSAVE were created, an integrated shower faucet with LED display and a handheld showerhead or standard faucet. Yu's inspiration was simple: people tend to waste water because it is difficult to know how much is being used (the more you know, the more you care). This is especially true when using a public bathroom, such as one in a hotel or an airport, thus warranting the need for a device that would make people conscious of their water usage. (Designed by Reamon Yu for the 2007 Next Generation Design Competition, see: www.metropolismag.com)

Fig. 11. The Water Pebble.

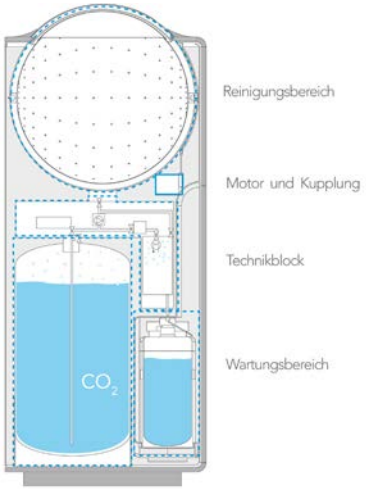
Fig. 12. Artist impression of the iSAVE.

Fig. 13. The eCO2 cleaning system for clothes.

Fig. 14. Section of the eCO2.

Cleaning around the house

CO2 washing
eCO2, designed by Barbara Grosse-Hering, is a cleaning system for clothes for the private household, designed to be formally integrated into the living space. eCO2 cleans with liquid CO2 instead of water. A main user benefit is that the machine needs neither water supply nor water drain, and the dirty laundry can be cleaned wherever it piles up - in the bed and bathroom. eCO2 has a plain and simple shape, therefore it is perfect for the combination with other home furnishings. The access to the "cleaning drum" is possible through a dome-shaped top, which gives the device a high recognition



value. Each year about 330 million cubic meters of water are needed in Germany for the cleaning of laundry. The goal of this project was to reduce the use of water. (Designed by Barbara Grosse-Hering at the Faculty of Industrial Design Engineering of the Delft University of Technology, see: www.grossehering.com)

Washup

Washup is a conceptual design integrating washing machine with toilet-flush. It suggests a sustainable water consumption by storing the wasted water in toilet flush tank and reuse it with flushing. Moreover, Washup brings a solution for the problem of location of washing machines in small bathrooms, overlapping washing machine usage space with toilet usage space. It is fixed on the wall above the toilet, so that loading of clothes would be easier for the user without bending or crouching down. An interface including three semi-sphere control units & two flushing buttons is designed for a practical usage of the product. (Designed by Sevin Coskun for the 2008 Greener Gadgets Design Competition, see www.core77.com/competitions/GreenerGadgets/projects/4609/)

Bio cleaning products

Ecover is a Belgian company that manufactures environmentally friendly cleaning products. There are products for washing up, household cleaning, laundry, personal care and more. Ecover products are made from plant-based and mineral ingredients. (See: www.ecover.com)

Microfiber cloths

Microfiber is made from a blend of high quality nylon and polyester. Using an environmentally-friendly heat-weaving process in which polyester and nylon fibers are repeatedly pressed, blended and intertwined, the result is the microfiber. Microfiber reduces the need for cleaning with chemicals or harmful substances. It is reusable and long lasting.And it is a good replacement for your paper towel, hence reducing not

Fig. 15. Artist impression of the Washup.

Fig. 16. Range of bio cleaning products by Ecover.

Fig. 17. Microfiber cloths.

only the use of water and chemical cleaning products, but also of paper. (See: www.bluewondercloth.com)

Collecting rain water

Collection systems
One example of a rain water collection system is the Rain-Keeper System. The system makes it simple and affordable to collect and use the abundant supply of naturally pure and soft rainwater that falls on your roof every time it rains. The shortage and cost of producing purified water for drinking is a growing problem, yet every day a large percentage of this treated water is wasted in homes and industry on uses such as toilet flushing, laundry, pool and hot tub filling, car washing, fire extinguishing, and lawn and garden watering. (From: UNEP, TU Delft; Every Drop Counts. Environmentally Sound Technologies for Urban and Domestic Water Use Efficiency; 2008)

Garden tank
'A Drop of Water' is a rain barrel that makes saving water really easy by providing a watering can that is automatically filled when it rains. This way, the user doesn't have to fill the can with our precious tap water, but uses 'free' rainwater instead for the garden. (Design by Bas van der Veer, see: www.basvanderveer.nl)

P.I.P.A.
The P.I.P.A. system is an attractive alternative to the current water delivery system found in rural areas of developing countries, where water infrastructure is deteriorated and inefficient. The P.I.P.A. System aims to deliver sufficient water (20 litres/ person/ day) for 10% of the population who

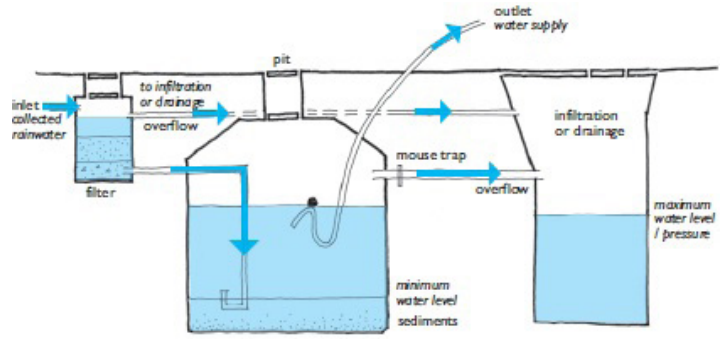


Fig. 18. Example of a rain water collection system.

Fig. 19-20. Artist impressions of A Drop of Water. The watering can is integrated in the rain water barrel for added user comfort.

Fig. 21. Artist impression of the P.I.P.A. System implemented in the slum areas of Rio de Janeiro, Brazil.

live in the slum areas of Rio de Janeiro, Brazil. It utilizes rain water and consumes less energy and chemical substances than existing water logistics systems. The P.I.P.A. System is typically installed on the rooftops to collect rain water and locally provide drinking water to households. (PIPA was designed by Fernando Del Caro Secomandi at the Faculty of Industrial Design Engineering Delft University of Technology, see: www.fernandosecomandi.com)

Filtration

Nano filtration is a technique that has prospered over the past few years. Today, nano filtration is mainly applied in drinking water purification process steps, such as water softening, decolouring and micro pollutant removal. During industrial processes nano filtration is applied for the removal of specific components, such as colouring agents. Nano filtration is a pressure related process, during which separation takes place, based on molecule size. Membranes bring about the separation. The technique is mainly applied for the removal of organic substances, such as micro pollutants and multivalent ions. Nano filtration membranes have a moderate retention for univalent salts. Other applications of nano filtration are: the removal of pesticides from groundwater and heavy metals from wastewater; wastewater recycling in laundries; water softening and nitrates removal. (See: www.lenntech.com)

Fig. 22. The application Nano filtration technique could be expanded into several different water purification techniques.

Fig. 23. The SinkPositive is an add-on to existing toilets.

Fig. 24. The W+W by Roca.

Going to the toilet?

Sink/Toilet

The SinkPositive is an add-on to the existing toilets. Upon flushing, fresh water from the supply pipe comes out of the faucet while the user washes his hands. The amount of water

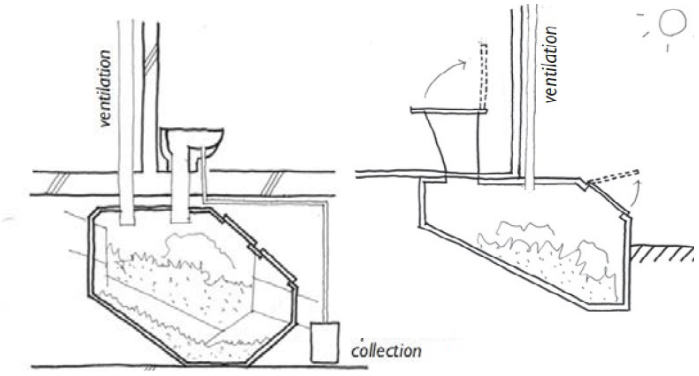
is the same as when a cistern is refilled, but the 'grey water' is drained from the basin into the bowl, which is then reused when the next person goes to the bathroom. (Taken from sinkpositive.com)

Roca, an international sanitary ware producer, took a more integral approach. They combined toilet and wash basin in one product, called W+W. The 'grey water' from the sink is filtered before it enters the cistern, allowing for sufficient hygiene. Furthermore the designers took care of ease of use and space use of the product. (Taken from www.roca.com.es/ww/index.html?en)

See-through tank
Visualising the water that is flushed down the toilet contributes to consciousness about water consumption. When the toilet cisterns show the volume of water that is flushed people are more inclined to push the 'stop' button. (Taken from The Sustainable Dance club)

Waterless toilet
Waterless toilets use no water for flushing and require only small volumes of water for cleaning. Therefore waterless toilets are an effective sanitation technology for the saving of water resources in the urban and domestic environment. The most common types are pre composting, composting and dehydration toilets, based on dehydration and composting processes. (Taken from UNEP, TU Delft; Every Drop Counts. Environmentally Sound Technologies for Urban and Domestic Water Use Efficiency; 2008)

Vacuum toilet
The RoeVac® vacuum toilet has been designed particularly as a water saving device and for maximum convenience. It is available for wall or floor mounting. Both models are available in China and the floor-mounted model is also available in stainless steel. The RoeVac® vacuum toilet operates as



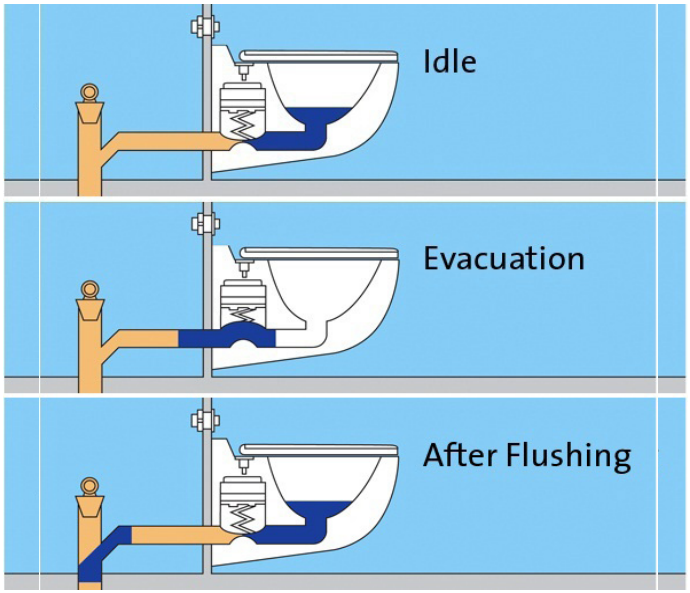


Fig. 25. See-through tank in the Sustainable Dance club.

Fig. 26. Variants on waterless toilet.

Fig. 27. The functioning of the RoeVac® vacuum toilet.

follows:
Step 1: The user pushes the flush-button, the interface valve is opened and the wastewater is evacuated. Air is also sucked into the system. At the same time the clean water valve is opened and rinsing water is sprayed into the bowl.
Step 2: The vacuum valve is closed but the water valve remains open. A small volume of fresh water is sprayed into the bowl.
Step 3: The water valve is closed, a small volume of clean water is retained in the bowl and the toilet is ready for use.
(Taken from http://www.roevac.pl)

Fig. 28. One more artist impression of the P.I.P.A. System.

Results

The amount of participants of Livinggreen Lab allowed for working on two themes, with group sizes that are favourable for workflow and an intimate atmosphere. The groups were given the choice on what theme to address. One group agreed that the bathroom and toilet should be worked on simultaneously and continued to work on this combined theme. The other group chose to work on a rainwater use on a larger scale, where most impact would be generated. In this chapter the process and result of each group is discussed.

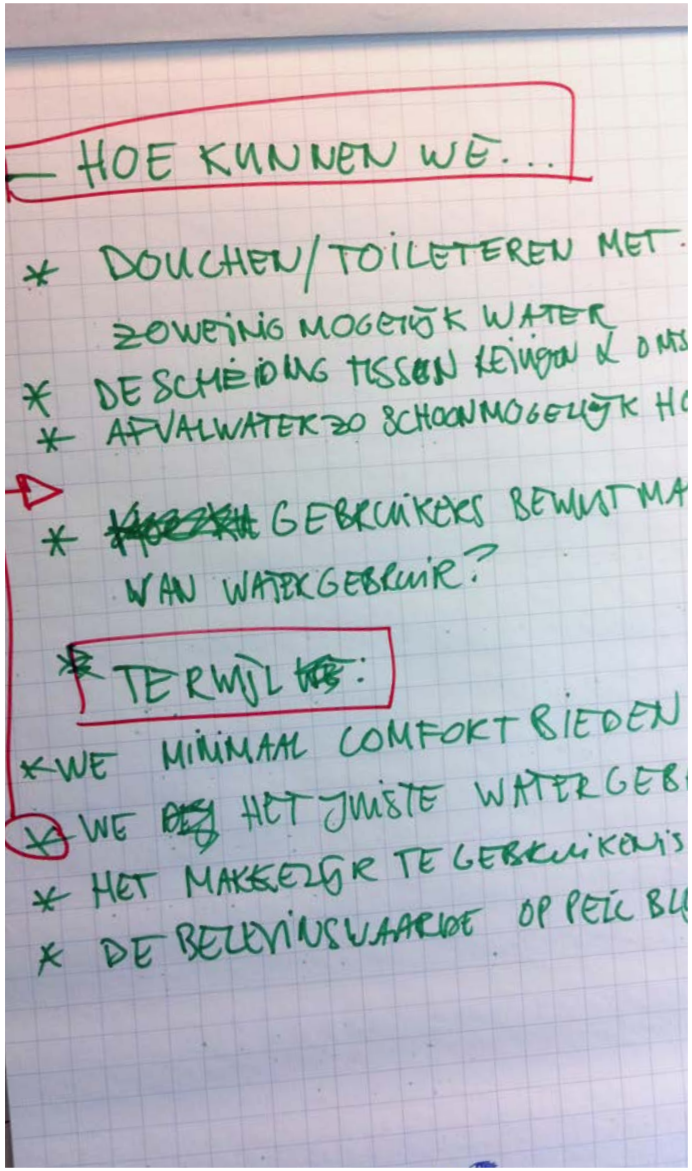
Bathroom & Toilet

This group worked on the bathroom topic, including the toilet. An inventory was done on what, according to the group, were important issues for water use around the house. From this inventory, they formulated their problem by defining the key conditions for any solution they would formulate later in the process. It was decided that any solution should offer a minimum level of comfort, should be easy to use, should make smart use of all kinds of water available in the house (rain water and drinking water), and should sensitise the user.

Design challenges

Next, the group identified the most interesting design challenges. Formulated as 'how can we'-questions these were the following:

- How can we shower or use the toilet using as little water as possible? The group decided that it was inevitable that toilets would continue to use water. The waterless alternatives were deemed impractical or inconvenient to use.
- How can we make a distinction between showering to clean and to relax? The group identified different goals to take a shower. They reasoned that these



goals offer opportunities to change the way we shower.

» How can we keep our wastewater as clean as possible? It seems that it becomes harder and harder to clean our wastewater. Therefore it would be smart to pollute the water we use as little as possible.

» How can we make people aware of their water use? In order to save water and use water sensibly people must be aware of their water use. This can be done by incorporating sensitising elements into a water related product.

» How can comfort be retained when using less water? The general belief is that saving water equals having less comfort. The group decided that it is important that the level of comfort should be equal. This also opened up the range of solutions.

Intermediate ideas

After having used several creativity techniques to answer the above questions, the following directions of solutions were chosen to be most interesting:

Use different 'forms' of water
By this is meant that steam, vapour and running water are forms of water that can be experienced differently. These differences can be advantageous for product experience.

Change rituals and choices
The group believed that people, when offered a reasonable choice, are willing to change. This choice and subsequent change should be incorporated in the product and its use.

Make the water use visible
According to the group the invisibility of water use facilitates the waste of water. By making both the water and the use of

Fig. 29. Formulating design challenges for the workshop.

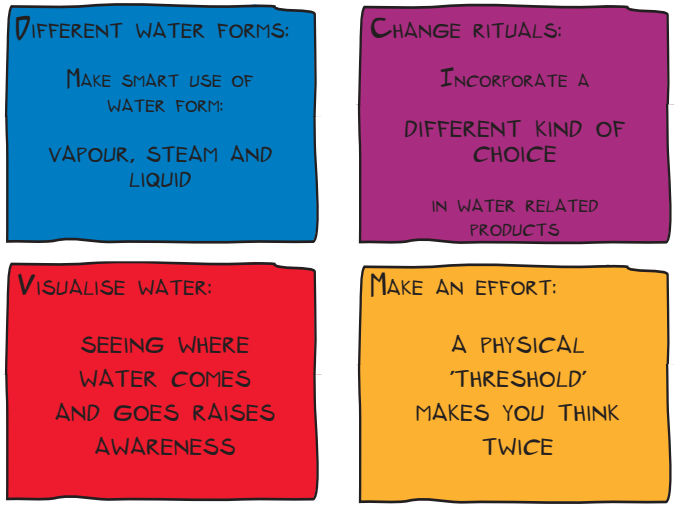


Fig 30. The four most interesting solution directions.

it visible they thought that the use of water and the people's awareness could be altered for the better.

Extra effort
Make people put in extra effort to use excessive amounts of water. When people physically feel that they have to make an effort to get extra water, they will be sensitised and might use less water.

Final concepts

For the final elaboration of the concepts, four ideas were chosen. They were selected based on their potential to be marketable. Each product additionally has a specific quality that makes it a potential success.

The toilet concept was chosen for its combination of ease of use and very low water consumption. Contrary to 'ordinary' waterless toilets, this toilet does not require the maintenance and care for the compost. The 'ecological' balance of the compost culture is very delicate; it can be fairly easily disrupted. Furthermore it is required to empty the compost container very often, a job that is not very appealing to many people. These drawbacks are solved in this concept.

The eco-button is an easily applicable solution to raise awareness concerning the use of water. Its simplicity is key in its success. Contrary to the existing thermostat taps, this eco-button has a gentle increase in the resistance when it is opened more. The gentleness is believed to be more attractive and less patronizing, while retaining its awareness potential.

The shower heavily draws on a luxury approach. While the use of different forms of water is intended to lower water consumption, the idea to be able to choose the form of the water is one of luxury. Following the diffusion of innovation theory, the group proposed to introduce this product to the high-end market segment and then diffuse it gradually to the masses. By this time the total amount of water saved will be significant.

The water meter is a device that takes water measuring out of obscurity. This is combined with a way to consciously decide the volume of water one will be using during a week. The attraction of the product lies in the role it can play in shortening the feedback loops concerning water in the household. In the regular situation in Europe, where potable water is delivered through a water provider, the consumer has no idea that potable water comes from a limited source. The intervention of the water provider cuts the consumer loose from its direct link with the water source. The product restores part of this relationship.

Water-free Toilet

" Don't use water, use a bag!
How to not use water when you have to go. "

The toilet is the product using the biggest amount of water in the household. About 30% of the water used in the household is used for flushing the toilet. Most households use drinking water for this. On average a person uses 37.800 litres per year. The Water-free toilet uses biologically degradable bags that are sealed air tight and thus do not smell. The closing mechanism is based on the well-known system for diapers. The packages are led away through a standard pipe. To make transport of the packages through the pipe easier, grey water is used (from shower, sink, washing machine etc.). When pushing the button part of the grey water will be released and will carry the package away. Once in the reservoir, the packages can start degrading.

Evaluation of the water-free toilet

Attractiveness
Is this solution attractive to end-users? The water-free toilet offers a number of appealing features to the users. Firstly, it greatly reduces the volume of water used. This translates to a reduction in water costs. Secondly, the toilet is soil-less and is odour free. Thirdly, there are few waste products like diapers that cannot be 'flushed' away.

Embedding in houses
The traditional place for the toilets in ordinary houses is possible. However, a vacuum system has to be installed and should be done in multiple houses. Renovation therefore is harder than construction in newly built houses.

Cost/benefit ratio
When considering renovation, the water-free toilet does not perform well concerning its cost/benefit ratio. The return-on-investment (ROI) will take too long, since the price for

Fig 31. Artist impression of the water-free toilet using airtight sealed bags with three steps:

- toilet is used
- package is compressed
- package is led away

water is very low. If the price of water will rise, it might perform better. In a new development project, this product can perform better, when applied on a larger (neighbourhood) scale.

Ease of use
The product is very easy to use; in fact, existing rituals do not have to be changed at all. The water-free toilet performs and is operated much like a usual toilet. The difference lies herein that the roll of bags will run out and will have to be replaced. Cleaning of the toilet will not be necessary as much as it is with traditional toilets.

Sustainability - Trias Ecologica
The water-free toilet reduces water use, and rainwater or grey water collectors can supply the little water that is used. The bags are made of biodegradable materials. The material of the toilet bowl itself is expected to be of porcelain, performing equally as before. The design of the bowl however, lacking a water container, will not use any plastics. Another bonus is that, with the lesser need to clean, the overall volume of wastewater created when cleaning will be reduced.

Sustainability - Resilience
The water-free toilet contributes to lower reliance of the household on drinking water. This is beneficial. On the other hand, there are less 'storage spaces' in the house, as the water container is missing.

Concluding
The water-free toilet opens up new possibilities for the use and design of toilets. However, in a renovation context is it less useful. The water free toilet will come to its maximum potential when integrated in new building development. The eco-performance exceeds that of a traditional toilet, both in terms of lower resource use and producing cleaner wastewater

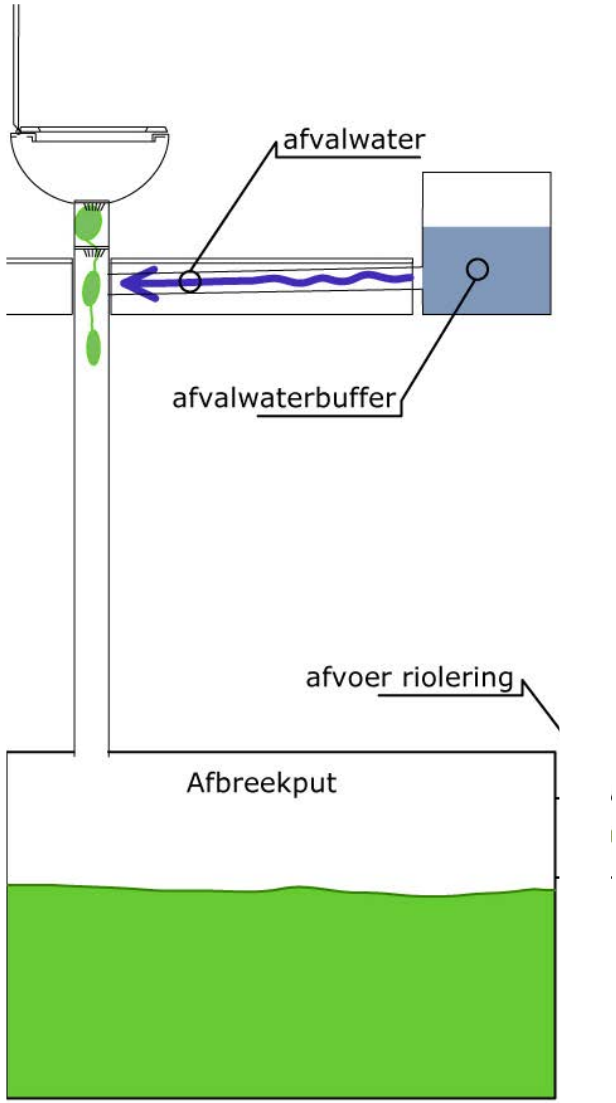
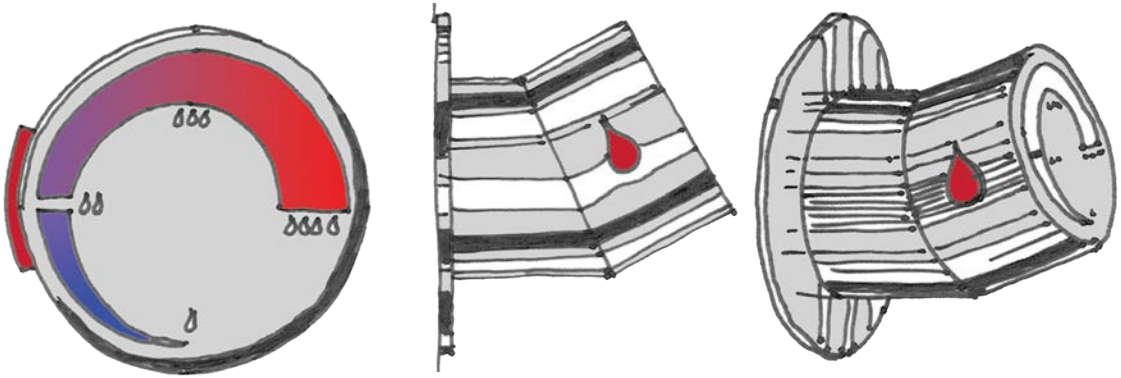


Fig 32. The sealed package is led away using wastewater.



The eco-button

" Are you prepared to put in that extra effort? Think twice when you feel the resistance. "

Ecological water management: the eco-button

The ecological water management is based on the temperature control in the shower where a button has to be pressed before one can turn the tap to increase the temperature. The eco-button uses this system to create a perfect balance between comfort and ecological water use. If the button is not pressed the volume and temperature of the water shall be ecological and at the same time feel comfortable. If the button is pressed and turned the parameters will rise: more water energy is used for washing hands or teeth than is necessary if one wants to do this in a manner that is water efficient.

Evaluation of the Ecobutton

Attractiveness
The eco-button will fit in well in any ordinary portfolio of taps. The look and feel of the button is designed so that it resembles a normal tap combining both the amount and temperature of the water in a single action. This provides a simple and elegant design.

Embedding in houses
This product is a bolt-on solution: it will easily replace any tap in the house.

Cost/benefit ratio
The tap will not cost more than any other ordinary tap. When in a renovation where taps are replaced anyway, this tap may be bought instead. When bought as a replacement before the old tap has worn out, the ratio will not be as favourable, as would be the case with any other tap.

Fig 33. Artist impression of the eco-button. The eco-button visualizes the amount and temperature of the used water.

Ease of use
The product is designed to be installed and used as an ordinary tap. However, the ease of use diminishes after the point where water and energy waste is highly likely. To accomplish this, the effort needed to turn the tap after this point is increased and increases until the maximum or hottest and largest volume of water.

Sustainability - Trias Ecologica
The Ecobutton has the ability to reduce the amount of water and energy used. This is ultimately determined by the user's behaviour. The product itself does not define this. The type and amount of material for the Ecobutton is comparable to the average tap.

Sustainability - Resilience
The Ecobutton is a tool to raise awareness and cannot raise the resilience of society or the household itself.

Concluding
The Ecobutton is an easy way of raising awareness in the use of water and energy. By being interchangeable with ordinary taps, the Ecobutton has a high success potential.

Three shower modes

" Choose the water that fits you!
... About showers and water meters. "

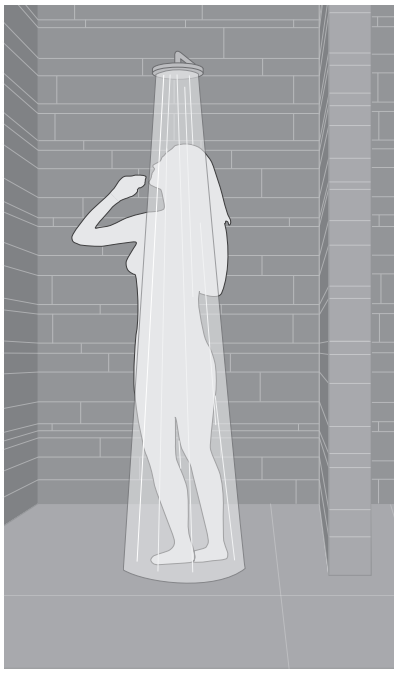
Choice of shower mode is up to the user

There are three different reasons to take a shower. To clean up, to freshen up or to relax. The showerheads on the market at the moment often have only a few modes for different water flows. However, the volume of water used is always the same.
This shower takes the different ways of usage as a starting point and changes the use of water accordingly. Not every form of usage needs streaming water.
The shower has three different modes. The modes correspond to what kind of shower the user wants at the given moment. The flow of water as we know it now can be used for cleaning, vapour can be used to freshen up and stream is suited if you want to relax under the shower. Choosing `vapour` or `steam` saves water. The use of water at that moment is significantly less than during the normal flow of water. The comfort and freedom of choice are kept by changing the way of water usage to the specific needs of the user.

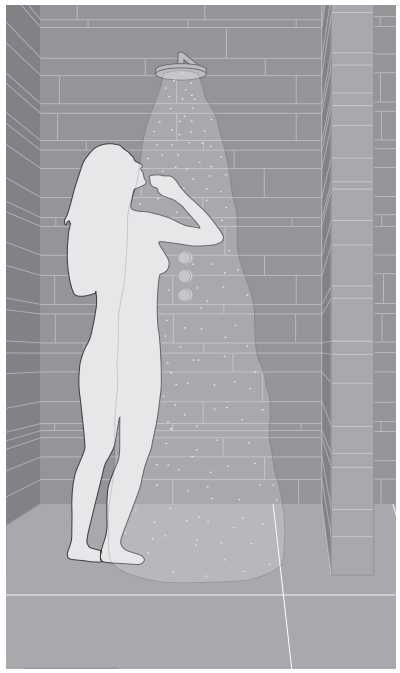
Evaluation of the three modes shower

Attractiveness
The product radiates luxury. The ability to choose one of three forms of water reminds people of spas, Turkish baths, saunas and the like. The design is of an attractive simplicity.

Embedding in houses
This product requires a rebuild of the bathroom. The instal-



Reinigende straal



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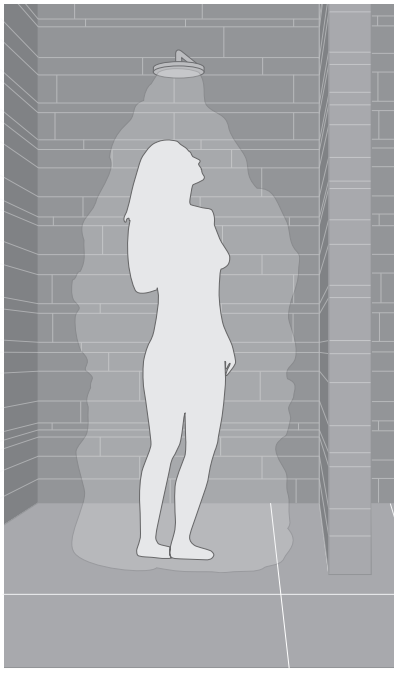

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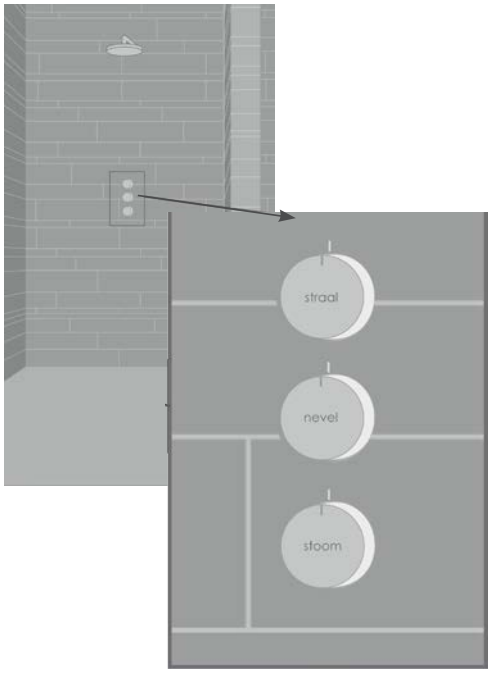


lations needed for producing vapour and steam have to be placed in or near the bathroom.

Cost/benefit ratio
With current water prices the installation of this product is only interesting if the added value to the bathroom as a luxury product is wished for. But rising water prices can turn this product from luxury into a money saver. the ROI break even point will then also be reached quicker.

Ease of use
The product is easy to use: for each form of water there is a separate button, indicating its function. Although theoretically this form of showering can limit the amount of water used, the user itself has to decide whether he or she chooses to switch water form depending on the reason for showering. Choosing a form of water is as easy as pushing a button.

Sustainability - Trias Ecologica
The shower has the potential to reduce the volume of water use and subsequently the volume of wastewater. There is no influence on the quality of the wastewater. The potential drawback of this product is energy consumption. Although producing water vapour will require less energy than an equal amount of hot water, the production of steam will cost more.

Sustainability - Resilience
The shower will be more dependent on electricity as an energy source, while it remains equally dependent on gas as a way of heating water.

Concluding
The goal of the workshop was to create awareness of water use and reduce the amount of water used in the bathroom, The product definitely performs well in this respect. The product fits well in the innovation models, as it will first serve as luxury product and later can be adopted by a larger group as water prices rise and alternative ways of water use and reduction are needed

Fig. 34. Artist impression of the different kinds of water use in the shower with three options:
- cleaning streaming water
- refreshing spray
- relaxing steam

The new water meter

The water meter helps to visualize the water usage in the house. Other than the water meters that at present are mostly hidden somewhere in the house, the water meter is clearly visible and readable. In addition to that, it is an aesthetic object that can be placed central in the house.
The water meter shows how much water you can and wish to use during the week and how much you have already used. This is how you can see immediately when you should use less and when you have not yet used a lot. It symbolizes the personal water storage. The product shown is for a family with four members that has a weekly storage of 700 litres (100 litres per day, 25 litres per person per day). The direct relation between the visible water meter and water consumption is a stimulus to use less water in the household.

Fig. 35. Possible application of the water meter in the kitchen.

Evaluation of the Water meter

Attractiveness
The Water meter is a low-tech device, requires little maintenance and provides direct feedback concerning the water usage in a household. The design can be altered to fit different styles, matching potential buyers' personal preference.

Embedding in houses
The device can be either a stand-alone product or be coupled to another tank. Either way, a storage tank of water, allowing for a days' or weeks' worth of water must be installed. That means that the house needs to have enough space.

Cost/benefit ratio
It's a low tech product and can be low cost in purchase. When used to limit the water use, the ROI will be acceptable and is likely to become better with rising water prices.

Ease of use
The product offers direct feedback; it is very easy to use.

Sustainability - Trias Ecologica
The device will contribute to the reduction in both water use and waste water. As it is an added product in the cycle of water use, it has an impact.

Sustainability - Resilience
This product is an awareness raiser and will help households to keep an eye on their water use. When water is scarce or expensive this product can help households.

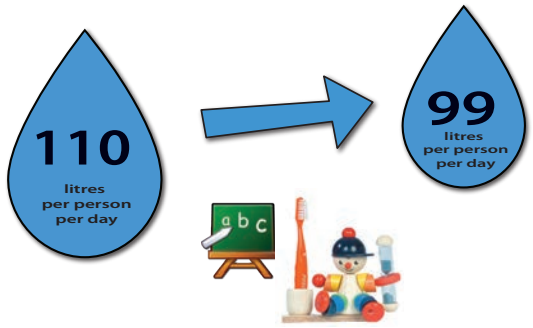
Concluding
This product is easily adopted in households and requires little or no time to invest to learn how to use it. Its direct feedback ability lends it to easily see how the household is performing on the water front.

Rainwater

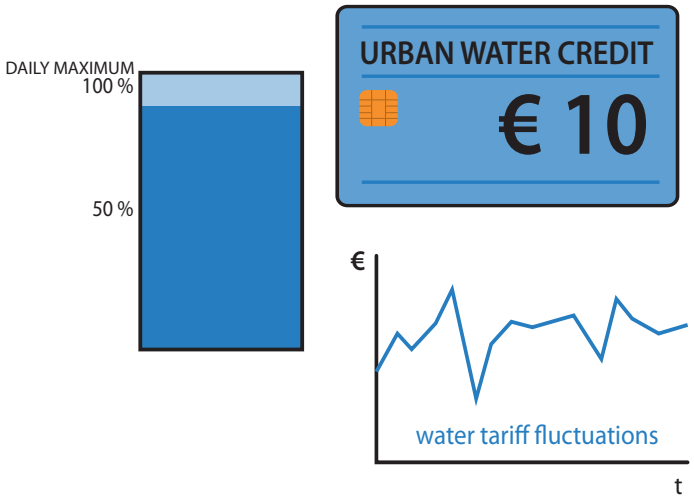
Starting point for this group were two questions: how can we promote rainwater use for activities that do not need water of drinking water quality? And what kind of products can facilitate use of rainwater in a household?

Use less drinking water

One approach to let households use more rain water is to reduce the amount of drinking water used in households, either by awareness raising or by a system change. The average water consumption in a Belgian household is about 110 litres per person per day. This number could be brought down by using a collection of smart gadgets and campaigns to make the user conscious about their water consumption. For example with:



Pre-paid water consumption
Each household gets cards with water credits. This way one has to be aware of the amount of credit left and actively ensure there is sufficient credit. Additionally it creates a direct link between the amount of water consumed and the costs related to water consumption



Water quota
Set a limit to the water consumption per person. When the daily quotum of water has been used, one starts paying more, will receive a message, or will not get water anymore

Water tariff fluctuations
In line with the previous idea: the more water consumption per person is consumed, the higher the price. Or the other way around, being frugal with water is rewarded

Visibility of water consumption
Water consumption has to be visible in kitchen, bathroom etcetera. This could be done by meters or lights on taps.

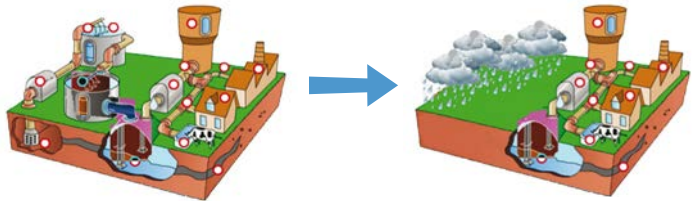
Educating the new generation
When children are taught well about saving water, for instance at school, they can take it with them into their adult life. Additionally children can engage their parents. Campaigns could use this, by for instance providing incentives for the children to engage their parents in water saving activities.

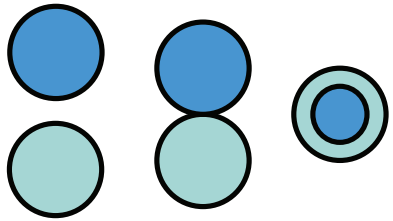
Fig. 36. Reducing drinking water use by raising awareness.

Fig. 37. Pre-paid water consumption; Water quota & Water tariff fluctuations.

System change

Less drinking water consumption can be achieved by campaigns and products that facilitate lower water consumption. Would that however lead to fundamental changes in user behaviour in favour of using rainwater? In addition to behavioural change, the water supply system would have to change.





Additional rain water infrastructure

The first option under consideration was to introduce a complementary water network for rainwater. The amount of drinking water consumption could significantly be reduced because rainwater would easily be available in the household. This can reduce the environmental impact of water purification. A fact to consider however is that implementing a new water network would be expensive and complex. Environmental gains in the water purification would be counteracted by the implementation of a new infrastructure. It was thus concluded that developing products and services for an additional infrastructure was not a feasible direction.

Volume of necessary drinking water

Analysis of the water consuming household activities was done. This showed that only about 10% of the water used in the household has to be of drinking water quality, for drinking, cooking, making coffee and brushing teeth. The remaining 90% could be provided by filtered rainwater. Therefore the following is proposed:

If only 10% of the water consumption in households has to be of drinking water quality, why don't we 'switch' the water provision to rain water quality? Instead of providing households with drinking quality water, households are provided by lower quality water, based on rainwater. The purification process can stay under control of the existing water works, thus providing a safe standard. The water companies will intensify the collection of rainwater, which will only need a light treatment

Fig. 38. System change.

Fig. 39. Additional piping for rainwater infrastructure: two pipes, combined pipes, pipe-in-pipe.

Fig. 40. reducing the use of drinking water by using rain water.

The rain water switch

"Almost straight from the sky ... fresh rainwater to be purified according to your own needs"

Produce drinking water at home

This 'Switch' means that users have to filter the water locally to make drinking water. This introduces a new product category with many possibilities. Novel products are to be developed that make it possible to purify water according to the actual drinking water needs. They can be a central filter system in the house, filter systems for under the sink and could include new taps that provide cold drinking water (after filtering), cold rain water and warm rain water.
Another direction is the introduction of 'drinking water makers'. These devices are dedicated to producing drinking water, in a similar way as we now make coffee or tea. In terms of product and service development this solution provides interesting opportunities. What about providing a variety of filters that have different effects on the taste of the water? The value of this direction is that drinking water is perceived as something valuable rather than a commodity. With a double piping system or filters that are not visible drinking water production would remain a commodity, as is for instance the case with central heating systems.

Evaluation of the rain water switch

Attractiveness
Changing the water system will not be easy to achieve. From a user perspective it requires a big change in the sense that one has to actively make sure drinking water is available. On the other hand, the system remains quite simple. A concern may be safety. When the quality of the provided water is guaranteed and drinking that water is not harmful when taken in at low frequencies, this concern may be overcome. It does need a carefully organised transition. Thorough product design as well as marketing/awareness raising programmes will need to be part of it. In terms of water purification devices, the differentiation in products can be attractive to end-users. It provides them with options to choose the product that fulfils their needs in the best way.

Embedding in houses
Major adjustments to buildings are not necessary. Implementation of either a filter system or water makers does not require big modifications to a building. The major change is made outside the buildings in the water purification system.

Cost/benefit ratio
Considering that water collection and purification will become more difficult, the price of water is expected to rise. When using lower quality water, process costs for water purification can be lower. Nevertheless the costs for purification in the households increase due to purchase and maintenance of in home purification systems, but also in terms of effort. It depends on the balance between the water price and the in home purification costs if the cost/benefit ratio turns out positive.

Ease of use
The convenience of opening the tap and having drinking water remains when central filters, or filters in the taps are used. A point of attention is the replacement of filters. The availability of filters (where to buy), how often it has to be done, and how will further determine the ease of use of the filter systems. For the 'water makers' ease of use can be compared to that of boiling water in a kettle or making coffee. According to the end-users demands and habits, drinking water can always or very quickly be available. Compare it for

instance with the water containers that can be found in offices, or preparing water for the day analogous to preparing a thermos with tea for a day. Product designers have the skills to develop 'water makers' that can satisfactorily address end-users concerns.

Sustainability - Trias ecologica

The switch reduces the environmental impact of water purification in water purification plants. However, decentralised purification means that more products and services are used in households. The environmental gain in the water purification plants may not balance this impact. In terms of water consumption, the switch may result in lower drinking water consumption, but does not assure lower water consumption overall. The system does make people conscious of their water use, which in turn would result in lower water consumption.

Sustainability - Resilience

With decentralised water purification in each building people will be able to produce drinking water. This is a very welcome fail-save mechanism in case of disasters or failures of the central water system.

Concluding

At first sight this solution may not be the most convenient for end users. We are talking about a paradigm shift in response to the changing circumstances related to the availability of water. In terms of environmental impact this solution may have more environmental impact due to the increased need of appliances. At the same time, the proposed solution has the potential to achieve a radical change in behaviour, drastically lowering the amount of water consumption.

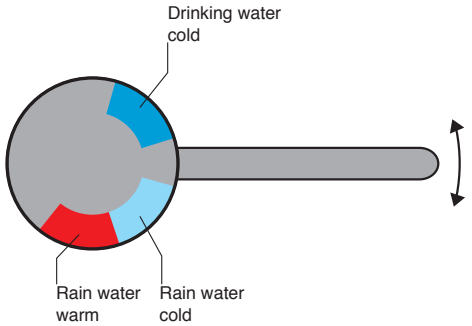


Fig. 41. Tap providing three 'types' of water. Cold drinking water, cold rain water, hot rainwater.

Fig. 42. A docking system that 'recharges' with drinkable water. The filters are installed under the counter. The filters could be differentiated, providing a variety of water flavours.

Fig. 43. A 'water maker': rain water is purified to drinking water, with an choice between hot and cold water. The use fills it with the amount of required water, thus avoiding to waste water.

Evaluation

Conclusions

Looking back at this edition of the Livinggreen Lab we can conclude a number of things. First of all the testing of the new format yielded good results. The participants were enthusiastic about the workshop and the elaborated results were of the expected quality. The one-day version of the Lab worked well, even though the timeframe was rather limited compared to the Livinggreen Lab Energy. Unfortunately there were also some disappointments. Also in this edition, the lack of company presence resulted in a one sided view on the issues related to Water. Also the number of participants was lower than expected and wished for. The focus on bringing together both companies and users to develop products and services will shift toward awareness raising of participants. We noticed in the evaluation that the participants indicated that they learned more about the subject than they expected, yet wished they would have learned even more. The participants also indicated that they became more aware of the issues and that they would try to act upon it after the Lab.

Concerning the results of this Livinggreen Lab, the expert panel to which the ideas were presented at the end of the day, expressed to be positively surprised by the novel views of the participants. They appreciated that the participants addressed the problem on both a product and a system level. Of course the proposals are not flawless. Time was too limited to fully think the proposals through. However, we hope that they can be starting points for further development of products and services. Again, we enjoyed the organization of the Lab and appreciated the cooperation with Ecohouse Antwerp and the special REcentre.

Epilogue

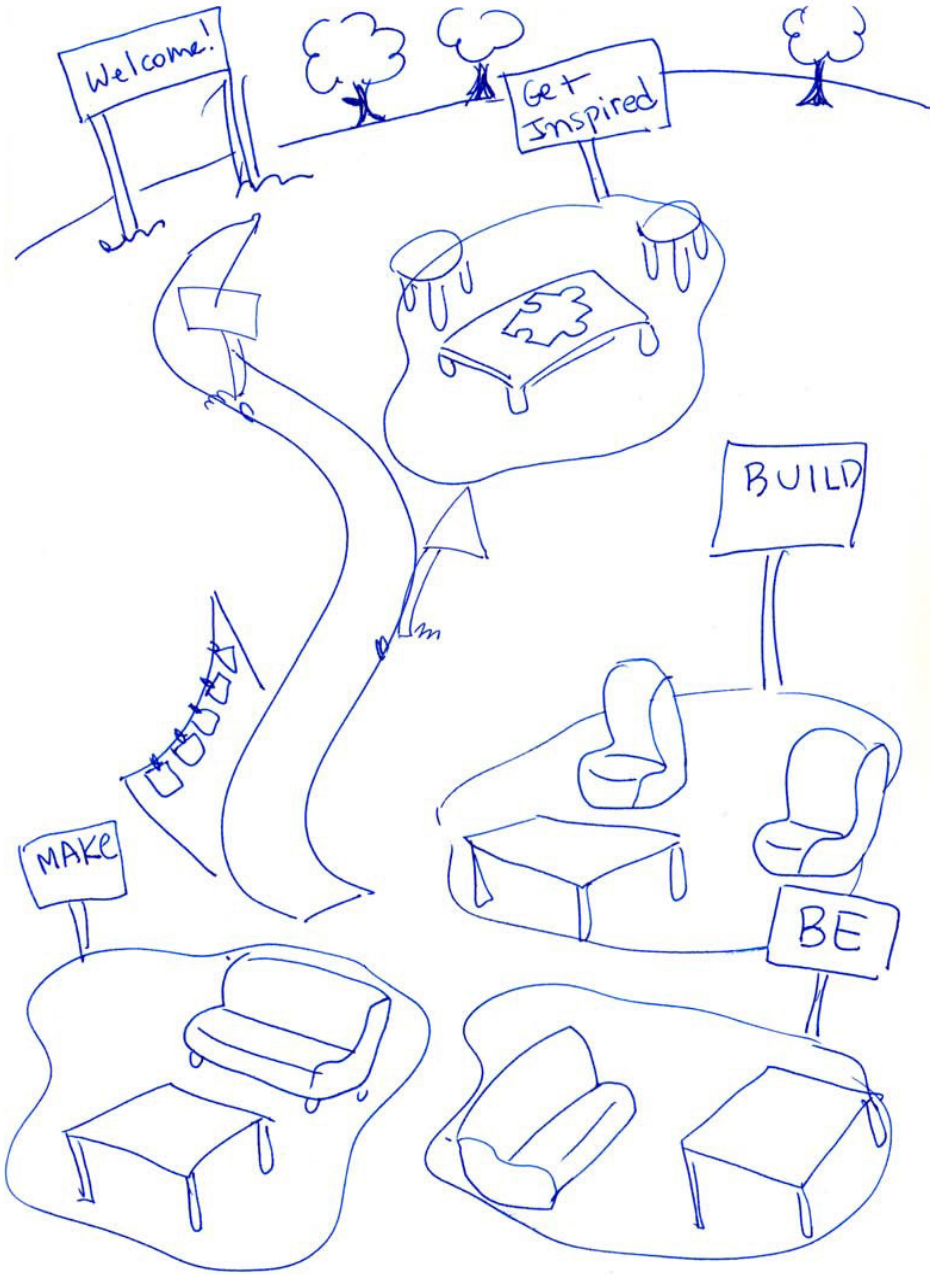
The format of the Lab is undergoing continuous improvements. Instead of focussing on several target groups at the same time, we now move to working with one target group at a time. Work is in progress for the next Livinggreen Lab, in London. The hosting organisation will be the National Trust, whose main target group consists of families. Therefore a

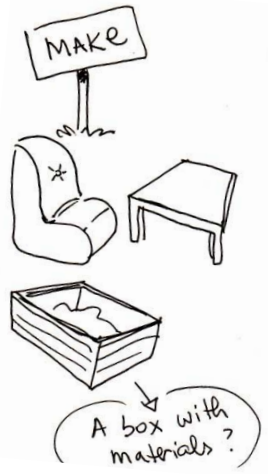
different approach is needed. In addition, we will be working closely with students, who will work with us to prepare the theme, Materials. In the mean time graduation students from the Faculty of Industrial Design Engineering take the promising results of this Livinggreen Lab as a starting point. They will elaborate on the theme and proposals of the Lab. We hope to produce prototypes of their designs before the end of this year.

INTERACTING WITH ECO-MATERIALS

Inspiring visitors about the use of eco-materials in buildings in a festival setting
Livinggreen Lab Materials - part 1

The Livinggreen Lab about Materials was organised in cooperation with The National Trust. Two Livinggreen Lab events were planned to be part of events at Morden Hall Park. The first event on the 'Green Day Out' took place on July 17th, 2011. The second one took place in November 2011 at the annual Livinggreen event, which was the opening event of the renovated Stable Yard. This report is about the first Livinggreen Lab which was part of the activities on The Green Day Out. The Green Day Out, organised by the National Trust in Morden Hall Park, is an annual festival where several (local) organisations related to sustainable living present themselves[1].





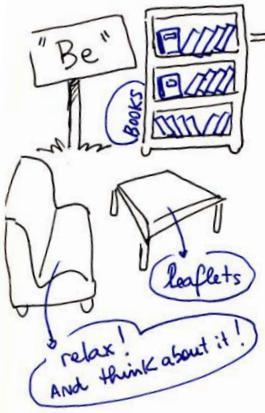
Available Recycling Materials

- Get in touch with recycling materials easy to find at home
- Imagine what you could make yourself (PHOTOS / BOOK showing examples)
- Make something (to take home?)

⇒ Building materials

Get in touch (samples of materials)
Get information about it
- How / where to use / get from
- € (price)

IMAGINE:
"Which materials would you use in your house?



⇒ How you can change your behaviour

→ leaflets (to take home?)
→ leave your thoughts (post-cards where people can write their comments)
→ Books to read about sustainable behaviour. (ask for books to charity shops)

The set-up of a festival stand

Fig. 1. Artist impression of the pathway for the Livinggreen Materials stand. Right of that sketches and concepts for the “Make”, “Build” and “Be” area.

The Livinggreen Lab was presented with its own stand on the festival. Goal of the Lab was to interact with visitors about the use of eco-materials in buildings. The visitors, our target group, are the general public of Morden Hall Park. These are people with education and income levels ranging from low to high. For the organisation of the Lab four students of the Master of Arts course Design for Development of Kingston University were contacted. This course “focuses on the value of design as a vehicle for addressing social and ecological concerns in both the developed and developing worlds”[2]. Participatory design methods and community engagement are an important part of the course. The students designed the Livinggreen Lab, in cooperation with, and based on the requirements of, Delft University of Technology (DUT) and National Trust (NT). In the preparation phase DUT met with the students at NT in Morden to introduce the Livinggreen Lab concept and to discuss how set-up this specific Livinggreen Lab. Further contact took place via e-mail and conference calls.

In contrast with the previous Livinggreen Labs, which involved a group of invitees in a workshop of several hours, this Livinggreen Lab was set up as a combination of activities and information to attract people passing by the festival stand and to engage them individually for a short while. The topics addressed were the opportunities to re-use materials in buildings and in daily life, in combination with a small exhibit on the insulation materials used in the renovation of the Stable Yard in Morden Hall Park. This set-up was chosen because the Livinggreen Lab was to take place at a fair, which made it more feasible to attract visitors for a short period of time rather than to ask them to commit to a workshop of a few hours.
Additionally, the theme to address was material use for a sustainable renovation. For most visitors this would be a topic that they are not familiar with. Therefore we chose to focus on a first step towards sustainable behaviour: creating awareness by showing several aspects of sustainability in relation to materials.

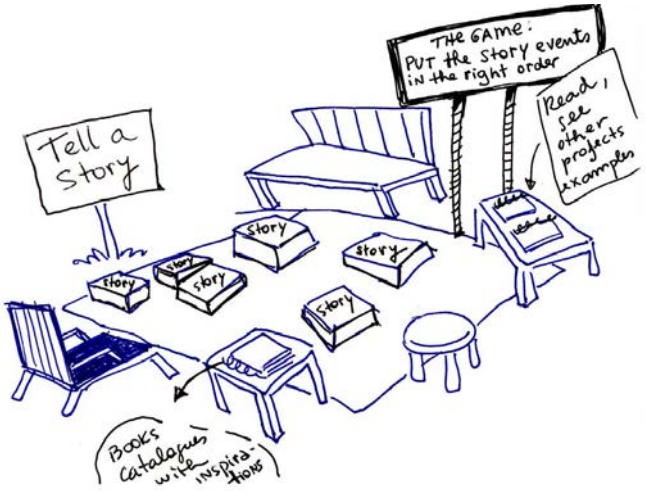
design of the stand

The pathway

The idea is to build the workshop as a pathway - a bit like an obstacle course - through which participants go. In this way, it will be easier to accommodate the fact that people won't arrive at the same time. There are three steps: the first step is a welcoming and introductory one where people are challenged to Tell a story about the life cycle of different building materials. The second step is to get inspired by the Inspiration Tree. The tree gives way to the third step, in which people can choose from three activity tables: "Make, "Build" and "Be"

Step 1: Tell a story

"Tell a story" is the welcoming and introductory step. On



a table, people are invited to play with a giant puzzle of wooden blocks. Each block represents a step in the life of a material. People have to put the pieces back in the right order. There will also be some blank pieces on which people will be encouraged to draw or write what else could be done with the material.
The materials that will be represented are also used in the renovation of the Stable Yard, namely wool, glass, cork and hemp and celotex. These materials are eco building materials, and have different sorts of possible life cycles.

Wool
Two possible life cycles for wool could be turning wool into thread to knit with, or to compress it into bales to be used as roofing insulation.

Glass
Two possible life cycles for glass could be turning glass into bottles, or to cut it into small pieces to make it into a colourful lampshade.

Fig 2. An overview of the stand.

Fig. 3. Artist impression of the "Tell a story" area.

Cork
Two possible life cycles for cork could be cutting cork into cylinder shaped pieces and use them as bottle stoppers, or to cut it and use it as wall insulation.

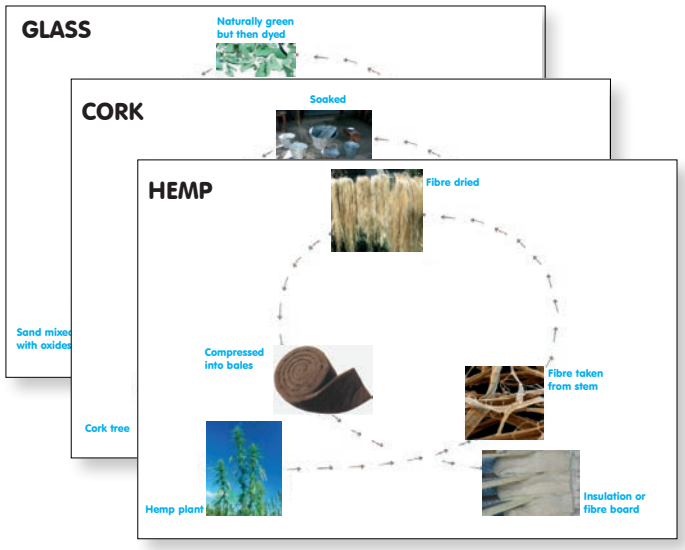
Hemp
Two possible life cycles for hemp could be spinning hemp into yarn to be woven into for instance mats, or to compress it into bales to be used as insulation or fibreboard.

Celotex
Celotex is a new material that is made out of cane fibre, blended together with chemicals and compressed into boards. These boards can both be used for insulation and as a vapour barrier.

Fig. 4. Examples of material boards (front: from a hemp plant to insulation material or fibre board).
Fig. 5-8. Inspiring recycle projects (clockwise):
- *K, coffee bar from washing machines;
- lounge from tires;
- Recycloop, wall from sinks;
- Wikado, playground from wind turbines.

Step 2: The inspiration tree

"The Inspiration Tree" represents a crossroad from which people can choose to go one, or several, of the three activity tables: Make, Build, and Be. Laminated images are hung on wires fixed around the tree in three lines, each corresponding to one of the activity tables. There will be three activity tables set up, with different offers of activities. All the activities aim to inform and inspire the visitors by getting them actively involved. For the Make activity, images and instructions for small DIY recycling and upcycling projects are displayed. For the Build activity, images of sustainable architecture projects are displayed. For the Be activity, inspiring messages for green living are displayed.

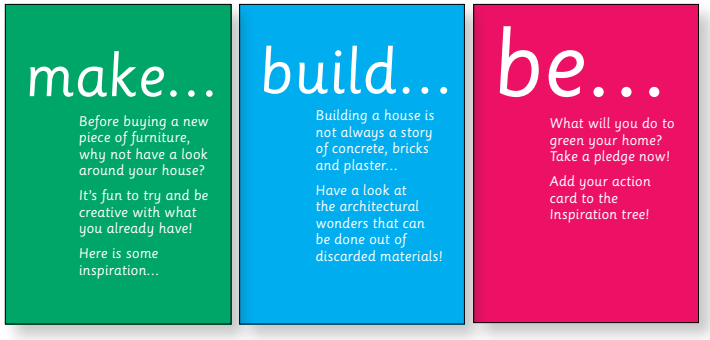


Step 3: Action at the tables

table 1: "Make"
People are invited to make small DIY projects to take home from discarded materials or objects, which will be left in a box at their disposal. People will be able to look at simple instructions and examples from the inspiration tree.

table 2: “Build”
People are invited to look in more detail at the renovation and building materials that they could use in their house. They can browse trough an information booklet, displaying details on the materials, where to get them, how to install them, and what price range they are in. They can also touch and look at samples from the Heart of the Park renovation. They are then invited to write / draw / take notes on which would be the most suitable for their house and display their ideas on a wall.

table 3: “Be”
People are invited to browse books on sustainable renovation and to take a small booklet compiling resources, ideas, addresses, tips, and other links. They are also asked the question: “What action will you take for your house?” The responses to which will be recorded either by writing them on a small blackboard, which the participant will hold and has his or her picture taken with, or by filling in a small card, which can be added to the “The Inspiration Tree”. This will also be a good opportunity to hand out the Livinggreen Labs evaluation form for the participants to fill out.



references

1) See also the report on http://nationaltrust-mordenhallpark.blogspot.com/

2) Information about the MA course on: http://www.kingston.ac.uk/post-graduate-course/design-development-ma/

Fig. 9. Main boards.

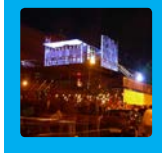
Opposite page:

Fig. 10. Selection of boards used in the stand.

Why not... live in a container city?

Containers are a very flexible method of construction, being both modular in shape, extremely strong structurally. Container Cities do not even have to look like containers!this alternative method of construction has successfully created youth centres, classrooms, office space, artists studios, live / work space, a nursery and retail space.

Why not... turn kitchen sinks into a fence?



Made with kitchen sinks from a local social housing estate about to be demolished, the Recyclips are temporary structures used as walls for a multifunctional cultural space in the Netherlands. Designed by Dutch architects 2012Architecten.

Why not... live in a paper house?

This student housing, in Newbern, Alabama has been made from the most diverse materials, ranging from number plates of cars to discarded paper. Designed and built by Samuel Mockbee and the Rural Studio.

Why not... turn old washing machines into a futuristic café?

Designed by Dutch architects 2012Architecten, the Espresso bar is almost entirely made of old washing machines.

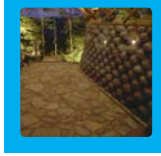
Why not... build a wall with glass bottles?

Bottle walls sounds like something a quirky eccentric would construct just for fun. In point of fact, the oldest surviving bottle house was constructed out of over 50,000 beer bottles in 1907, due to the lack of lumber available in the deserts of Nevada. Though many bottle buildings are decades old, recent structures around the world have been built out of necessity in places where both building supplies are scarce and other recycling methods are unavailable.

Why not... build a playground with unused wind turbines?

Dutch architects 2012Architecten, designed this playground for the charity Kinderparadijs Medicorn. It is entirely built out of 5 discarded wind turbines.

Why not... build a church out of car tyres?



Samuel Mockbee is an American architect who founded the Rural Studio, in which students worked hands-on to design housing for the poorest communities in Alabama. Because all projects had to be low cost, many materials were locally sourced. The structure of this church is totally made from earth filled car tyres covered with concrete.

Could you... give a new function to what others throw away?

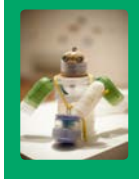
Rupert Blanchard is based in London. He loves collecting scrap wood, packaging, signs, old drawers, and all sorts of discarded objects which he turns into beautiful and functional furniture.

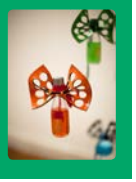
Could you... make Christmas glow even stronger with bottles?

To make these beautiful plastic bottles lights, grab some LED Christmas lights and start collecting those plastic empties! Just use a drill bit to make a hole that's just wide enough to fit the bottle over the light. It's better to start too small and size up gradually. Once you find the right sized bit, drill holes in the tops of your cleaned out bottles, fit them on, and you're ready to hang!

Could you... simply use what nature has to offer?

Could you... make toys from old packaging?

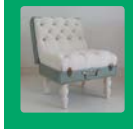




Could you... finally do something out of all those old magazines?

Hockenheimer Stool, amde with a pile of old magazines and a pillow. Designed by NJU Studio. Replicable by you.

Could you... find new uses for old stuff?



Rupert Blanchard is based in London. He loves collecting scrap wood, packaging, signs, old drawers, and all sorts of discarded objects which he turns into beautiful and functional furniture.

Could you... try to find beauty and luxury in plastic bottles?

Michelle Brand is a designer based in Manchester specialising in upcycling. She is most well known for her stunning lighting works, made of plastic drinks bottle bases, which have been cut, sanded and then tapped together. Every bottle base in her designs represents a bottle that has been creatively diverted away from landfill.

Could you... make a table from old magazines?

To make this plant stand, the only materials you need are magazines. Place the magazine vertically on a table and open it like you were going to read from the front. As you flip through, every 10 pages or so make a like crease and fold them into the binding. Continue through the whole magazine. When you reach the end, fold the front cover around the first crease. Voilà!

Could you... get growing with outdated newspapers?

Making seed pots from olde newspapers couldn't be easier. You'll need:
Scissors
A glass
Soil
Newspapers or magazines

Cut the newspapers into strips that are long enough to fold over the glass (use folded newspaper pages to get more strong pots). Fold the paper around the glass tightly. Push the bottom of the glass to any firm surface to secure the base. Fill the pot with soil and plant one of your seeds there.

Results

Heavy Rains

On the day of the Green Day Out there were heavy rains. This resulted in a very low number of visitors at the event as a whole, and thus also to the Livinggreen Lab. The Livinggreen Lab stand had about 15 to 20 visitors including two families with young children. The wet conditions made that these visitors would hardly engage in the activities offered. The following images and their descriptions give an impression of the materialisation of the concepts, and of the rainy context in which it had to be executed. See also the blogpost on MAD4D: http://mad4d.wordpress.com/2011/07/19/ finding-the-right-language-forsustainable-building-materials/

next page:

first line:

Fig. 11-15: "Tell a Story", The game shows the production cycle of materials used for insulation as well as other Tell products. And visitors are asked to add their own suggestion for the re-use or recycling.

second line:

Fig. 16. Introductory poster.

Fig. 17-18. The 'Make' exhibition with examples of how to re-use materials in the home ... they are all examples that one could easily do oneself.

third line:

Fig. 19. The 'Build' exposition, showing examples how (waste)materials are re-used in buildings. It also shows the renovation materials that are used in the stable yard.

Fig. 20-21. As one example of materials to re-use in the home, we were making and showing visitors how to use plastic bags as knitting yarn.


O U T


Come and be inspired about materials!
eco
DIY
CHECK
Livinggreen.eu
National Trust


make...
Before buying a new piece of furniture, why not have a look around your house?
It's fun to try and be creative with what you already have!
Here is some inspiration...
Could you... get growing with outdated newspapers?


Could you... make jewelry from soda cans?
Could you... make a table from old magazines?


Celotex


hi!
I'm Tom
To make my HOME greener I will
Keep Beas


be...
What will you do to green your home? Take a pledge now!
Add your action card to the Inspiration tree!


Thank you!

Evaluation

previous page:

Fig. 22-23. Making a kite ... and trying to fly the kite, which proved to be enough fun already.

Fig. 24-26. 'Be' people were asked to fill in two cards. One was evaluative of the workshop, the other to note down a pledge. Visitors were photographed with their pledge.

The aim of this Livinggreen Lab was to invite people to think about material use. A festival stand was designed for an annual fair at Morden Hall Park, the Green Day Out, where materials were presented in easily accessible ways. Rather than directly talking about what sustainable materials are and what materials are available for eco-renovation, the presentation showed activities and materials in ways that people with little knowledge about eco-renovation can relate to. As could be read in the previous chapter, the stand was up and ready for its first test on the Green Day Out. The weather however was a big barrier for people to come and visit. As a result of the very rainy day, there were hardly any visitors in the park. About ten persons actually came to the stand. They stayed between one to five minutes approximately. The lack of visitors unfortunately made it impossible to formally evaluate this Livinggreen Lab.

Therefore we can only say, based on this day, that the set-up has the potential to reach many people in a short period of time without having to invite them to commit for a workshop. Furthermore, the different activities have the potential to engage people in different ways and thus allow different angles as a starting point for discussion with different types of visitors. The visitors can decide for themselves which parts they engage in and how long they stay. Apart from a first introduction into materials in eco-renovation, which is knowledge transfer to the visitor, the set-up of the Livinggreen Lab also allows to gain insight about the visitors. In the interaction with the visitors the organisers can learn about their knowledge about and experience with sustainable renovation and the materials related to it. It would be worthwhile to organise the Livinggreen Lab in this setting again to learn more about it works out in more favourable circumstances.

YOUR FUTURE HOME

Insight in energy renovation and related materials by backcasting from a future vision of the home
Livinggreen Lab Materials, part 2

The Livinggreen Lab about Materials is organised in cooperation with The National Trust. Two Livinggreen Lab events were planned to be part of events at Morden Hall Park. The first event was organised as part of the 'Green Day Out', July 17th, 2011. The second one took place in November 2011 at the annual Livinggreen event, which is the opening event of the renovated Stable Yard. This report is about the second Livinggreen Lab event.

The set-up of the Livinggreen Lab on the Green Day Out was not sufficient for the ambitions of the Livinggreen project. While the Livinggreen Lab of the Green Day Out is a potentially good way to engage the local community to think about reuse of materials and the use of eco-materials for renovation, we decided to explore a format that focuses more directly on renovation activities and makes more use of Livinggreen Lab elements as anticipated beforehand, such as design activities and backcasting.

Additionally this Livinggreen Lab would be filled in as a workshop session. An existing tool, developed at Delft University of Technology in a graduation project [1] was used. The Livinggreen Lab provided a setting to evaluate the potential of that tool to inspire people for eco-renovation. The main goals of this Livinggreen Lab were to inspire people for (further) steps in the renovation of their house and to introduce a stepwise approach to renovation by working towards a desired future situation. The stepwise approach is introduced to allow people to dream about a future situation, while at the same time enabling them to define manageable steps in the renovation of their house.

Notes

1) This graduation project was executed with Inbo, a consulting firm for the building sector. See: www.inbo.com

Fig. 1-2. Participants at work during the workshop.

Set-up of the workshop

The set-up for this workshop is largely based on a method that was developed in a graduation project at the Faculty of Industrial Design Engineering of the Delft University of Technology by L. Talsma in co-operation with a consulting firm from the building sector. Two sessions were planned, one in the morning, one in the afternoon of the Opening event of the Livinggreen Centre in the renovated Stable Yard. The exhibition in the Stable Yard served as a tangible example of the possibilities for energy renovation and material use.
The primary target group were homeowners who consider to renovate their house. They were asked to participate with two persons per household, in order to allow for deliberation among the members of the households. Nevertheless, when only one person of a household could participate they were also welcome. In the following the initially proposed workshop programme is discussed. This proposal was based on a duration of approximately 3,5 hours. In consultation with the co-organisers at National Trust, it was however decided to shorten the workshop to two hours, for a better alignment with the overall programme of the Opening. The workshop programme as it was executed in practice is discussed in the next chapter.

Proposed workshop programme

The initially proposed workshop programme was based on at least 3,5 hours, to allow sufficient room for exercises and discussion. A small home assignment would be sent beforehand as a preparation for the workshop, by means of sensitization. The set-up involves experts in renovation related to energy efficiency measures who can reflect on the plans of the homeowners and answer their questions. The proposed programme was as follows

Home assignment

The participants are asked to prepare for the workshop via a simple home assignment. This assignment serves to sensitize the participants for the subject of the workshop beforehand. An additional advantage of such an exercise is that partici-

pants can gather information that is relevant for the workshop. Furthermore, it allows us to gain insight in the level of knowledge and awareness regarding eco-renovation.
The assignment for the participants was to walk around their house (even mentally, when not physically) to indicate where energy is lost in the home. This way they indicate where there may be problems in their home. Additionally some questions are asked related to the measures that have already been taken and to which extent the participants are concerned about energy efficiency (e.g. energy saving, considering investment in energy generators etc.).

The Workshop

The workshop programme consisted of the following parts:

1. Introduction
Word of welcome with a short introduction to the workshop and the other participants. Each person is given a booklet that one can fill in during the workshop. The booklet contains the exercises of the workshop. The idea behind it is that the participant can take it home and refer to it later on.

2. Tour
A guided tour is given through the exhibition in the renovated Stable Yard. The tour focuses on the eco-renovation of the building.

3. Mapping values
During this exercise the participants, who are ideally two persons of the same household, map their values concerning their home situation, for example comfort, energy-efficiency. The participants can select values from a set of value cards (see fig. 4) and place them on the map (fig. 3). The more in the centre, the more important the values are. Making the values explicit helps to define what drives people to take which measures for their home. The participants present their value maps to each other at the end of the exercise, to stimulate exchange of ideas and viewpoints.

4 and 5. Back casting
With the values in mind, the participants do a back casting exercise. Back casting is a tool for thinking about a desired future situation and define steps to reach that situation. The participants in the workshop make a scenario for the house that meets their requirements in the desired future. This ideal future can be more, or less realistic. Choosing a less realistic or utopian future may trigger more innovative ideas. On the other hand, a realistic future situation may facilitate thinking of more concrete solutions. For this workshop, the participants are suggested to think of creating an autarkic home in ten to twenty years from now and to imagine for themselves what their house would be like. When participants come up with other scenario's they are free to work on those.

After sketching the future situation, intermediate steps are defined to reach the desired future. For each step preconditions, barriers and facilitating factors can be identified, thus providing insight in how to approach the developments

Fig. 3. Front page of the booklet that was handed out to the participants

next page:

Fig. 4. One of the pages from the booklet that was handed out.

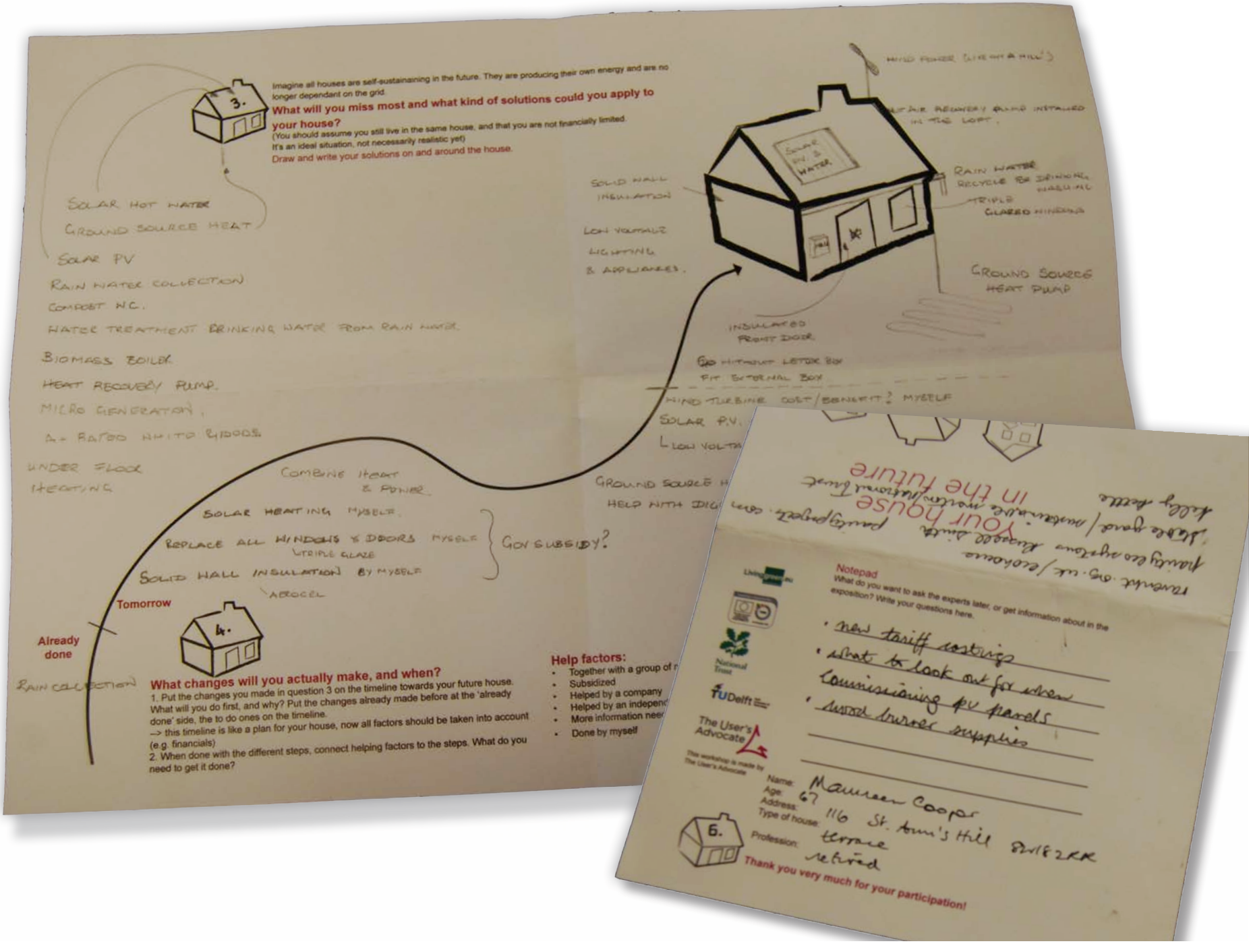
Fig. 5. Examples of the value cards that where used for the value mapping exercise.

toward one's ideal future home. The workshop facilitators help the participants where necessary with the construction of their roadmaps. All participants present their roadmaps to the group to initiate a discussion and exchange ideas.

6. Defining the first step
The participants make concrete plans for the first step on the roadmap. Questions related to planning this first step are: What resources are needed to realise this step? What materials can be used? What are barriers to overcome, e.g. costs or specialised knowledge? And what facilitating factors are there to realise this step, e.g. subsidies or community initiated projects? In this workshop the renovated Stable Yard can help the participants with information about materials, installations etc.

7. Review of roadmap with experts
Experts on eco-renovation are present during the workshop to assist the participants. They can help with suggestions for the steps on the roadmap and particularly regarding the execution of the plans for the first step.

8. Closure
The day concludes with a group discussion about lessons from the workshop, with reactions from both the participants and the involved experts. The participants are also asked to fill in a questionnaire for formal evaluation of the workshop.


3.
Imagine all houses are self-sustainaining in the future. They are producing their own energy and are no longer dependant on the grid.
What will you miss most and what kind of solutions could you apply to your house?
(You should assume you still live in the same house, and that you are not financially limited.
It's an ideal situation, not necessarily realistic yet)
Draw and write your solutions on and around the house.
SOLAR HOT WATER
GROUND SOURCE HEAT
SOLAR PV
RAIN WATER COLLECTION
COMPOST W.C.
WATER TREATMENT DRINKING WATER FROM RAIN WATER
BIOMASS BOILER
HEAT RECOVERY PUMP
MICRO GENERATION
UNDER FLOOR HEATING
SOLID WALL INSULATION
LOW VOLTAGE LIGHTING & APPLIANCES
SOLAR PV & WATER
RAIN WATER RECYCLE
TRIPLE GLAZED WINDOWS
GROUND SOURCE HEAT PUMP
INSULATED FRONT DOOR
WIND TURBINE
SOLAR P.V.
COMBINE HEAT & POWER
SOLAR HEATING MYSELF
REPLACE ALL WINDOWS & DOORS MYSELF
TRIPLE GLAZE
SOLID WALL INSULATION BY MYSELF
GOV SUBSIDY?
Tomorrow
Already done
4.
What changes will you actually make, and when?
1. Put the changes you made in question 3 on the timeline towards your future house. What will you do first, and why? Put the changes already made before at the 'already done' side, the to do ones on the timeline.
--> this timeline is like a plan for your house, now all factors should be taken into account (e.g. financials)
2. When done with the different steps, connect helping factors to the steps. What do you need to get it done?
Help factors:
Together with a group of
Subsidized
Helped by a company
Helped by an indepen
More information nee
Done by myself
Your house in the future
Notepad
What do you want to ask the experts later, or get information about in the exposition? Write your questions here.
new tariff costings
what to look out for when commissioning pv panels
wood burner supplies
Name: Maureen Cooper
Age: 67
Address: 116 St. Ann's Hill SW18 2RR
Type of house: terrace
Profession: retired
5.
Thank you very much for your participation!

The workshop day

previous page:

Fig. 6. One of the roadmaps that where made by the participants.

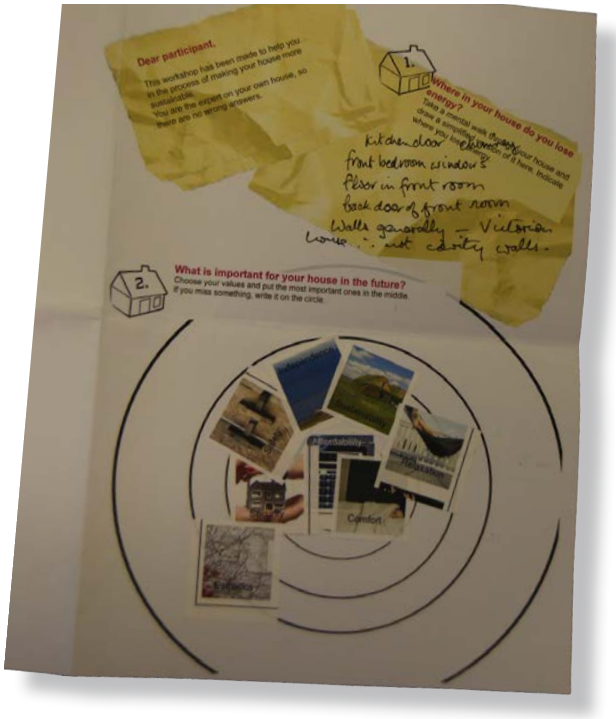
Fig. 7. Questions to ask the experts by one of the participants.

this page:

Fig. 8. One of the value maps that where made.

As the organisation of the Livinggreen Lab progressed, the programme of the workshop had to be adjusted. The duration was shortened to better match the full programme of the Opening Event. The homework assignment was cancelled, as communication with the participants was mediated via the National Trust who were short on time to organise this. Delays in communication meant that participants could not receive the assignment in time before the workshop. Additionally, local experts on renovation turned out to be hard to involve for this workshop. Therefor a local NGO was involved, Sustainable Merton, who promotes sustainable living in a broader sense. A person from their organisation was present at the workshops. Some of the partners from the Livinggreen project, also experienced with renovation projects, were participating.

In the end, there were 12 participants, of which two couples. Eleven attended the morning session from 10 to 12.30 hrs. Three of these participants also acted as experts, one from Sustainable Merton, and two from the Livinggreen Project.



One person with a small child came for the afternoon session. For the afternoon more persons had signed up, but unfortunately did not show up. Asking other visitors in the Park did not result in additional participants. Therefore the afternoon session lacked the interaction with other persons, and ended up more as a conversation between moderators and participant.

Final workshop programme

The workshop programme (morning session) as it was executed in the opening event of the renovated Stable Yard was as described on the following pages.

1. Introduction
After welcoming the participants, the workshop programme was briefly introduced. Each participant was then asked to present him-/ herself. Each person was given a booklet to fill in during the workshop

2. Mapping values
During this exercise the participants filled in the value map. They placed the values they find important for their home on a map in the booklet with a set of value cards. These values helped to define and explain what would drive the participants to take which measures for their home. Examples of these values are: comfort, health, aesthetic and sustainability.

3. Back casting
The participants were asked to envision their home as a self-sufficient, autarkic home. They then described and made a drawing of their house in the future. The second step was to draw a roadmap to that future scenario, taking into account barriers and solutions, on the way to reach the envisioned future. The workshop moderators assisted the participants where necessary. Figure 6 shows one of the roadmaps that were made. The participants presented their roadmap to the group which was asked for feedback.

Fig. 9. There was a lot of useful interaction between the participants.

Fig. 10. The workshop ended with a discussion to reflect on the roadmaps.

Fig. 11. The Livinggreen exhibition at Morden Hall Park.

Fig. 12. The Livinggreen exhibition at Morden Hall Park also features a wood burning stove.

4. Tour through exhibition
A guided tour through the exhibition was made, where the participants could see concrete examples. As the workshop time was limited, this tour was a short version of the commonly given tour, with a focus on turning the energy related renovation measures in terms of the installations and materials employed.

5. Refining the roadmap
After the tour, participants were asked to refine their plans on the roadmap based on what they saw in the exhibition.

6. Discussion
The last part of the workshop was a discussion to reflect on the roadmap the participants had made and the barriers and opportunities they saw. The discussion gradually shifted to examples from the UK and more general measures for a sustainable lifestyle.

Evaluation

At the end of this Livinggreen Lab the participants were asked to fill in a questionnaire to evaluate the workshop. This questionnaire is used for all methods in the Livinggreen project and addresses sustainable living in a broad sense, in this evaluation we focus on the aspects related to the workshop. Eleven persons filled out the questionnaire. The number of male and female participants was about equally divided with five males and six females. The majority was aged between 41 and 65. One person was younger (25-40 years old), two persons older (above 65 years old). All were homeowners, except one person who was a tenant. They all live in terraced, semidetached or detached houses. Most were from the neighbourhood and had visited Morden Hall Park before. Some also had participated in earlier activities related to sustainable living organised by National Trust. All participants indicated that they had some knowledge about sustainable renovation, ranging from basic to good knowledge. One of the goals of the workshop was to allow people to think about the steps they could take for the renovation of their own home. The renovation was viewed as a process, rather than a single event, in which clear, consecutive steps are taken, and viewed in relation to barriers for each of the steps and how to overcome these. In reaction to the workshop, participants indeed indicated that what they had learned related to seeing the renovation as a process over time which can be divided into steps. Furthermore, they appreciated that they had been stimulated to think about steps for their own home. One participant put the lesson from the workshop as “thinking outside the box about what is possible in terms of renovating homes in a sustainable way”. A second goal of the workshop was to inspire people to take further steps for renovation of their home. Approximately half of the participants (6 out of 11) indicated that they were inspired to do so. When asked what they had been inspired to, the answers ranged from taking new concrete actions to having been spurred to take the measures that were already under consideration. The intended actions mostly related to renovation measures in the home. One person took a broader perspective and included food production in his steps towards becoming more self-sustaining. Two persons gave

additional feedback to the Livinggreen Lab a few months after the workshop. Both indicated to have taken measures. These measures mostly related to lifestyle, like recycling used products or switching off appliances. Also both of them indicated to have monitored the energy consumption of their home and to try and make changes in their behaviours.

In terms of suggestions for the Livinggreen Lab, two points emerged from the evaluation. The first one is more advertising. The workshop was not widely advertised and it would have attracted more people. The second suggestion would be to take more time to deepen topics for reflection and discussion. Then also knowledge and know-how of experts can be incorporated. More discussion about the assignments in the workshop could deepen understanding and stimulate exchange of ideas and knowledge and know-how between participants. In this Livinggreen Lab, a discussion only happened at the end of the workshop. Afterwards, this discussion was valued very highly by the participants.

Fig. 13. Creator of the used method Laura Talsma from Delft University of Technology gave an introduction to the method.

Due to the limited number of participants a thorough evaluation of the approach taken in this Livinggreen Lab cannot be made. However, as a first application of the approach as a means to inspire people to undertake eco-renovation activities the results can carefully be considered positive. Repetitions of the workshop in different settings would be required to further evaluate the potential of the approach and to optimise it. For next sessions attention has to be paid to reaching more people to participate, involvement of experts specialised in eco-renovation, and most importantly, sufficient time to foster reflection, discussion and exchange of ideas between participants as well as with experts.

ARCHITECTONIC VALUES

Seeing opportunities instead of restrictions in architectonic values
Livinggreen Lab Architectonic Values

The Livinggreen Lab on architectonic values took place in October 2012 in Lille, France and was organised in cooperation with the municipality of Lille. Why a Lab on Architectonic values? The Livinggreen.eu project has a focus on listed buildings, to contribute to the sustainable preservation of the characteristic historic inner cities of Western Europe. Finding ways to implement sustainability measures in these listed buildings, without affecting their architectonic and monumental values, is key.
To owners of listed buildings, it may sometimes seem like the architectonic and monumental values of a building only lead to restrictions. For instance, it's forbidden to insulate on the outside of your building, because the façade is protected, or you can't install solar panels because it spoils a protected cityscape. The goal for this Livinggreen Lab was to help home owners see opportunities instead of restrictions in the architectonic and monumental value of their home.

Compared to previous Livinggreen Labs this Lab addresses the awareness and own creativity of home owners, and uses creativity techniques to empower home owners by teaching them a skill so they can make informed and decisions that are well thought through. How to balance sustainability measures and the architectonic quality that your home possesses. How do you fit these new measures in your home in such a way that it keeps or even enhances the architectonic values? For this Lab we have used an existing tool, that was developed at the Delft University Technology in a graduation project.

The workshop took place in the same building that was used as a case study object for the assignments, the 'Bourse du travail', a former labour exchange building. On the following pages first the set-up of the workshop and the used tool is explained, after that a report of the day is given. We conclude with an evaluation of the workshop based on a questionnaire that was given to the participants.

Fig. 1. View of the Bourse du Travail, the case study building in which the work-shop was held.

Fig. 2 One of the post-it's that were spread through out the building indicating architectonic qualities of the building.

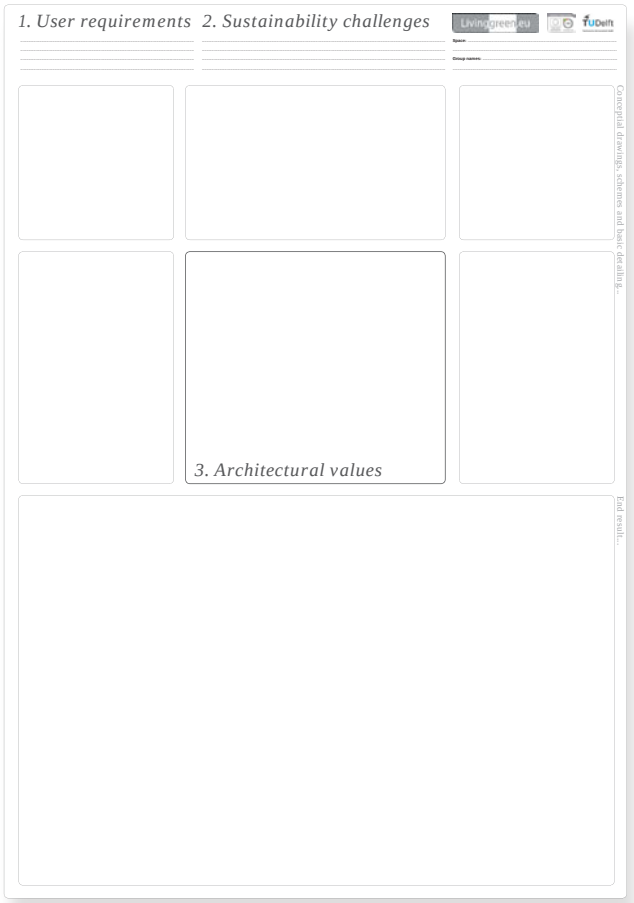
Set-up of the lab

The goal of the workshop was for the participants (home owners) to start seeing opportunities instead of restrictions in the architectoninc and monumental values of their home, when thinking about the renovation of their home. Architects are trained to see opportunities in restrictions, using design and creative thinking. The workshop uses this concept to help homeowners to see opportunities instead of restrictions too. During the workshop the participants will be taught to look at buildings the way an architect looks at buildings, and in this way gain insight in the concept of heritage assets and architectonic value. Also, they will learn about regulations concerning heritage protection and spatial planning, because often the knowledge of homeowners on this subject is limited, and sometimes even out of date or wrong. Thirdly, the workshop should inspire and inform the participants to take sustainability measures when renovating their home.

The workshop was designed to consist of two main parts; the first part is aimed at increasing the awareness of the participants on architectonic values by increasing their knowledge on the subject. The second part is about applying this new knowledge on a case study, to start developing their new skill.

1. Introduction
First a short introduction will be given on the Livinggreen project, and the concept and goal of the Livinggreen Labs. A round of introductions will also be made for the participants to get to know each other.

2. First tour through the case study building
The programme starts with a quick tour through the building, without any explanation by a guide. During this walk around the building, the participants are asked to become aware of, and rate their experience of the building. What do they like and don't like? The participants are asked to pay attention to all of their senses, and pay attention to what it is exactly that determines their experience, like maybe the way light enters a room, maybe the layout of a room, or the smell. Maybe they



like the details of the carved wooden doorframe, maybe they don't like the way the wallpaper feels. All the participants get a stack of green and red post-its, and they are asked to put a green post-it with their name on things they like, and a red post-it on things they don't like. This way the participants are sensitised to not only look at, but to start to consciously see the building, and specific parts of it. Pictures are taken from parts of the building that post-its are stuck to. These pictures are then used in a group discussion and for feedback sessions. If one's post-it is shown, that person is asked to explain why they put the post-it there.

3. Lecture: looking through the eyes of an architect
This lecture is about making the participants aware of the way architects look at buildings. The trick is knowing where to look. Architects can recognise patterns, identify the outlines, see proportions, and spatial relations. Architects can link information on the (use)history of the building to spatial and architectural details and explain the connection between the two. The idea for this lecture is to explain this by means of examples of buildings, taking a virtual tour through and around the building, explaining where to look and what to see. Explaining how to make the connection between the (use)history of the building and the physical structure of the building.

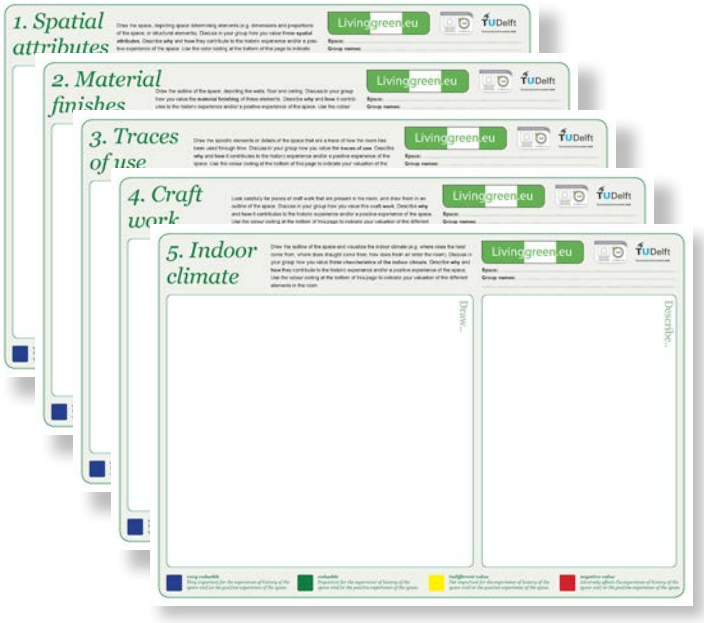


Fig. 3. The provided poster presentation format.

Fig. 4. The worksheets that were prepared for the value assessment of the immaterial values.

4. Lecture: rules and regulations
A lecture on rules and regulations concerning spatial planning and listed buildings in Lille will be given by an official of the City of Lille. This lecture gives an overview of the main regulations concerning spatial planning and listed buildings, that home owners are likely to come across when they want to renovate their homes

5. Value assessment of the immaterial values
The participants will be divided into groups of five. Each group is then assigned a focus area within the case study building. Each group will carry out a value assessment of the immaterial values for this specific area, to provide a basis for the design assignment. For the Lab worksheets had been prepared to guide the participants through their value assessment of the immaterial values. The tool that is used for this part of the workshop will be further elaborated upon on the next pages.

6. Lecture: Inspiration for eco-renovation
In this lecture inspiring examples of eco-renovation will be presented. The emphasis is on the way the architectonic values of the buildings have been used in the renovation. Group discussion is encouraged; do the participants think that the architectonic values have been kept?

7. Design session
The starting point for the design assignment is the field of tension between user requirements, sustainability challenge and architectonic value. For each group a design assignment is formulated for a specific part of the case study building. The assignments state a dilemma between user requirements, sustainability and architectonic value. Each group gets the assignment to first discuss the most important architectonic values that have emerged in the value assessment of the immaterial values. Brainstorm about possibilities to meet the set sustainability challenge, keeping the architectonic values in mind and do the same for the user requirements. For this assignment the participants are encouraged to visualise their ideas. This helps the own thinking process as well as provides a tool to communicate in the group and inspire each other. A poster presentation format is provided for the groups to present their designs on.

8. Presentation of the results
In the end the groups present their designs to each other, and give each other feedback. The focus should be on the question whether the architectonic values that had been stated by the groups have been kept or even enhanced by the proposed design. A jury will also give feedback to the plans. The jury will consist of Francis Lambert, as a representative of Ville de Lille, Geoffrey Galand, architect and designer of the Maison du Habitation Durable and Françoise Wellecam, the director of the trade union FO that is presently established in the case study building, the Bourse du Travail.

Assessment of the immaterial values

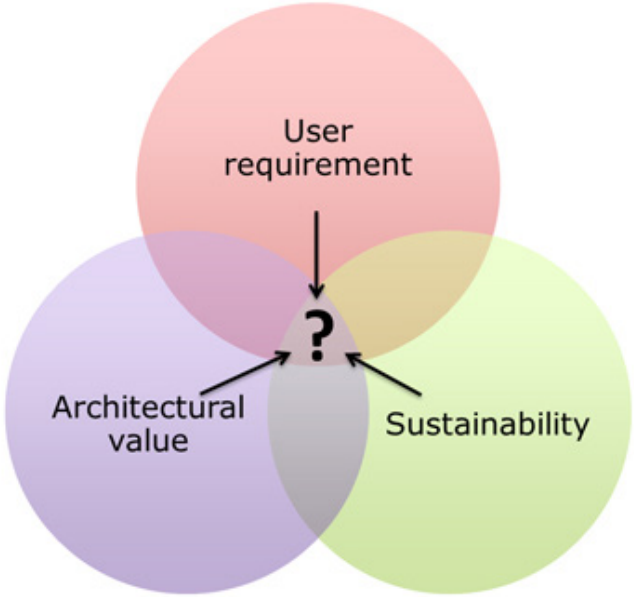
For the next part of the workshop an existing tool was used, that was developed at the Delft University Technology in a graduation project. This tool, the ‘value assessment of the immaterial values’, will first be explained.

Why a value assessment of the immaterial values?

If you want to renovate your home, this is often because your needs have changed. Maybe you would like more living

space, or you would like your home to be more comfortably heated. Then there is the challenge of sustainability, maybe because you would like to reduce your energy bills, or because you are environmentally conscious. If your house is a listed building, there are also the protected architectonic values of your home to take into account. The trick is to find the balance between these three aspects: user requirements, sustainability and architectonic values.

To be able to find this balance you need to know exactly what your demands and wishes are for the use, what the relevant sustainability challenges are and what exactly are the monumental values of your building. The architectonic and monumental values of a building are the reasons why it is important to keep the building. These values can for example be of importance for architectural historic, building technical or cultural historic reasons.



Authorities have set guidelines for a value assessment of the monumental values. In this assessment four levels of monumental value can be distinguished: high, positive, indifferent and negative monumental value. These are depicted on floor plans of the building, where the walls are coloured according to this classification. Blue represents a high monumental value, green represents a positive monumental value, yellow represents a indifferent monumental value and represents a negative monumental value. These drawings are coupled with a written explanation to substantiate the set value. This is a good method, because it gives a detailed and technical description of the values of the building. It is also more or less an objective method. However downsides of this method are that it doesn't provide practical starting points for an intervention and that it doesn't provide information about the experience of the space, nor about the experience of the (use) history of the building, or about the quality of the experience (nice/not nice). From the perspective of the homeowner who wants to renovate, these points are of even more importance. To fill this gap and to provide practical support for laymen who would like to renovate their home with respect for the architectonic values, we use an existing tool that was developed at the Delft University of Technology in a graduation project.

Explanation of the tool

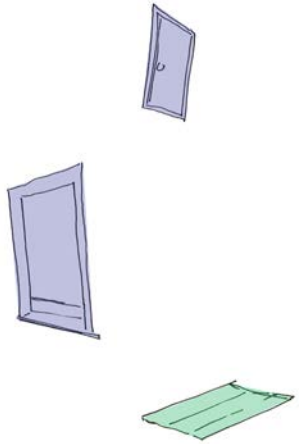
The aim of this assessment would be to value the material regarding their contribution to the feeling of historic consciousness that is invoked by the building. For this we have taken the perception of the space as a starting point to name five categories of spatial and material characteristics: spatial characteristics, craft work, material finishes, indoor climate and traces of use. After making an inventory of these characteristics, their immaterial values can be assessed.

Fig. 5. Finding the balance.

next page:

Fig. 6. Material values; above is a depiction of the material values of the ground floor of a building. This is the conventional value assessment, and is largely a literal translation of the concerning walls.

Fig. 7. Spatial values, his illustration shows the same ground floor, but now depicts the value of the space, based on their attribution to the historical experience. It is interesting to see the difference between these two value assessments.



Spatial qualities
The first category is that of the spatial characteristics. The relation between the height and width of a room for example, influences the way a room is experienced a great deal. Another very important spatial aspect in the experience of a room is the connection to surrounding spaces. The view through a window is an example of a spatial connection to other, in this case outdoor, space.

Craft work
Many scientific studies discuss the aesthetic quality of things that are hand made, that are crafted. This quality is closely connected to the information the craftwork gives us about the craftsman and the society he lived in.

Material finishes
Material finishes influence the experience of the space a great deal, by their feel, their structure and their physical characteristics. But also the way it fouls, ages or deteriorates adds to the experience.

Indoor climate
The indoor climate is a very important communicator between building and human. The climate (light, temperature, air movement, humidity, acoustics) influences the experience of the building. It also influences the sort of use and overall usability of a building or part of a building.

Traces of use
Old buildings that have been used bear the traces of that use. These traces compose an important part of the immaterial values, because they link directly to former use and the people who made use of the building. Together they form pieces of evidence by which the story of the house and its inhabitants can be composed.

Fig. 8. For example, when you look at this room, you see a lot of different things. If you would be present in this room, you would even see and experience much more.

Fig. 9. Traces of use.

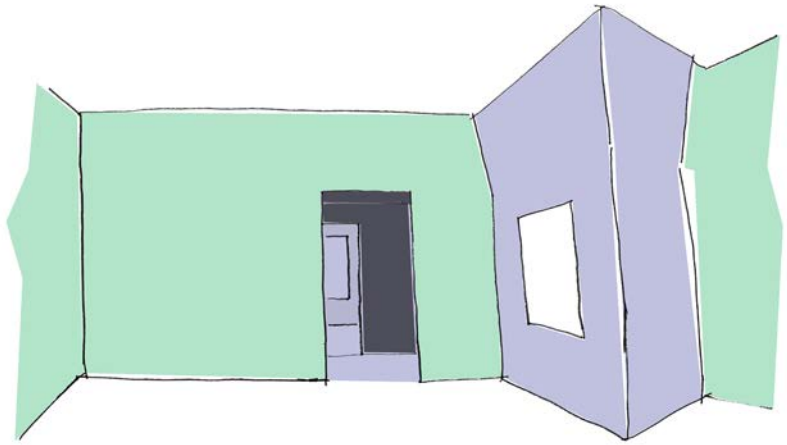
next page:

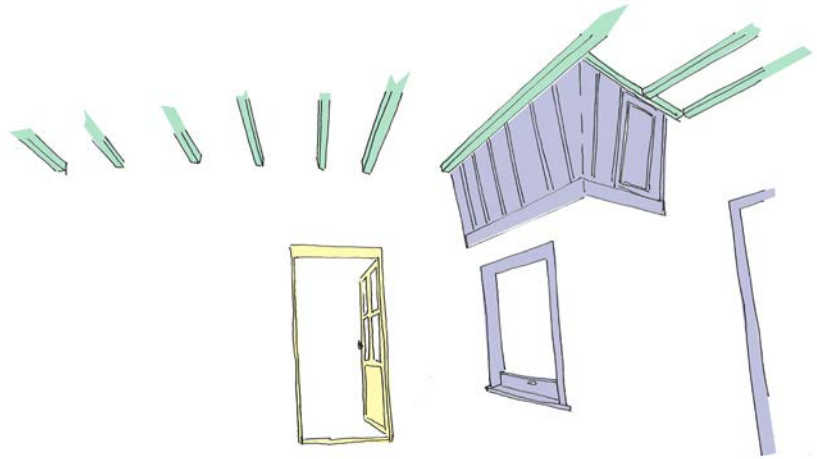
Fig. 10. Spatial qualities.

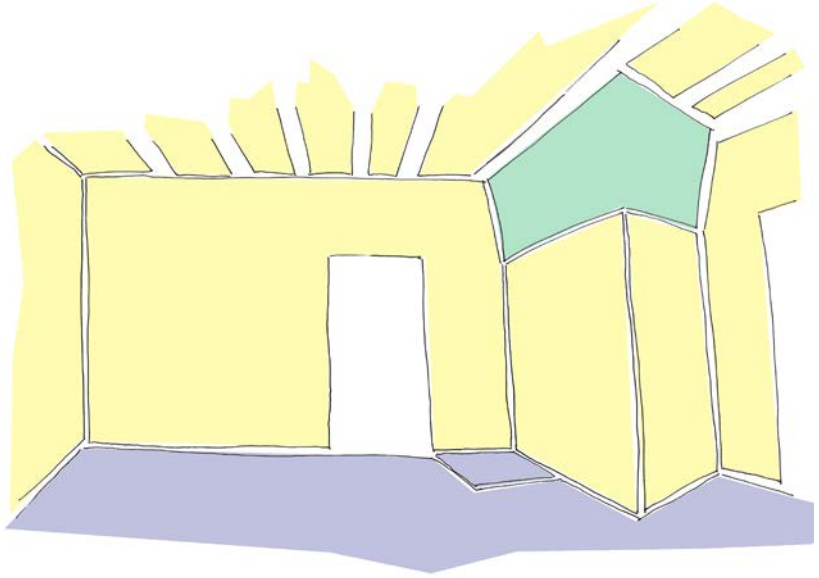
Fig. 11. Craft work.

Fig. 12. Material finishes.

Fig. 13. Indoor climate.







Report of the day

1. Introduction
After a short introduction on the Livinggreen.eu project by Francis Lambert of Ville de Lille and an introduction of the programme for the day, a short round of introduction was made among the participants. The group was diverse and consisted of home owners who where planning to renovate their home, staff from the trade union who were located in the case study building, architects and students.

2. First tour through the case study building
The day started with an exercise to help the participants to become more aware of the way they perceive space. The participants were asked to take a walk around the building and put green post-its on the parts that they liked, and red post-its on the parts they didn't like. Afterwards pictures where taken of the parts of the building with post-its and these pictures served as input for a group discussion.

3. Lectures
Looking through the eyes of an architect
Christophe Rouvres from CAUE (Le Conseil d'Architecture d'Urbanisme et de l'Environnement du Nord) gave an overview of the most common building types in the Lille area, touching upon the most common problems and possible solutions for these building types for eco-renovation.

Rules and regulations
The lecture on rules and regulations concerning monuments and spatial planning in Lille was given by Isabelle Roblin, a representative of the urbanism department of Ville de Lille.

Introduction to sustainable renovation techniques
Geoffrey Galand from Atelier 9.81, architect of the future Maison de l'Habitat Durable, gave an introduction to sustainable renovation techniques.

Fig. 14. The participants gathered together during a short introduction of the programme for the day.

Fig. 15-16. Participants at work during the design session.

4. Value assessment of the immaterial values
After the lunch the participants were divided into three groups of five or six persons. Each group was assigned one space within the case study building. Using the worksheets, the participants were asked to first discuss, then draw and describe their valuation of the building using the five categories and their own experience of the room as a starting point. The first space is the main entrance hall of the building and the inner courtyard. The second space is the angular room, a former classroom on the first floor. The third space is the main attic space, which is currently not in use.

6. Inspiration for eco-renovation
Geoffrey Galand gave an inspiring lecture on examples for eco-renovation, with among others his design for the future Maison de l'Habitat Durable.

7. Design session
Every group was assigned a re-design assignment, consisting of a user requirement, a sustainability challenge and their own value assessment of the immaterial values of the space.

Entrance hall
The assignment for group 1 was to enlarge the entrance to make room for a reception and common lunch area (user requirement) and the challenge was set to produce energy, collect water and enhance biodiversity (sustainability challenge). Group 1 had valued the mosaic floor, the crafted ceiling and the windows and doors to be the most valuable elements of the space.

Angular room
The assignment for group 2 was to make the space usable throughout the year with a constant climate (user requirement) and the challenge was set to save energy, to create a healthy indoor climate and to use sustainable materials. Group 2 had valued the entrance to the room, the height of the room and the height of the windows as the most important

The attic
The assignment for group 3 was to make offices in this now still unused space and the challenge was set to produce energy and collect rainwater. Group 3 had valued the light that came from the large semi circular window, the large uninterrupted space and the wooden construction as the most important.

The results

All groups were provided with a presentation format poster on which they could compile their results and illustrate their design. One member of each group gave a short presentation about their process and design. After each presentation the group provided feedback.

Group 1: design for the entrance hall

Group 1 proposed to conserve the entrance hall and its valuable craftwork and material finishes. The assignment was to enlarge the entrance to make room for a reception and common lunch area and the challenge was set to produce energy, collect water and enhance biodiversity. To make room for the additional functionality they proposed a glasshouse addition on the courtyard. Surrounding this glasshouse they proposed a water basin to collect rainwater from the roof. In a water ciruit installed under the roof, water is heated by insolation, providing a sustainable heating system. In the interior of the glass house there will be room for various tropical plants; on the exterior climbing plants will form a green façade.

Group 2: design for the angular room

Group 2 had valued the shape of the room and the placement of the entrance within the room as very important. In addition to that, the height of the room and the height of windows was highly valued. The assignment was to make the space usable for offices throughout the year with a constant climate and the challenge was set to save energy, to create a healthy indoor climate and to use sustainable materials. Based on the values that this group had found the most important, they proposed to add two split level floors in the room to increase the usable floor surface. These floors are aligned with the special spatial characteristics of the room to emphasise this special feature.

Group 3: design for the attic space

Group 3 had valued the light that came from the large semi-circular window, the large uninterrupted space and the wooden construction as the most important. Their assignment was to make offices in this now still unused space and the challenge was set to produce energy and collect rainwater. The group proposed to add a split-level floor, which was interrupted at the area of the semi-circular window, to emphasise this special feature of the room. This way the usable floor surface is enlarged without compromising the flexibility of the entire space. Also, the group proposed to add skylights on the part of the roof that is not visible from the street. The rainwater that would be collected from the roof is led through a small-scale water purifying system that would provide the pantry with water.

Fig. 17. The presentation poster of group 1.

Fig. 18. View of the entrance hall.

Fig. 19. View from the inner courtyard to the entrance doors.

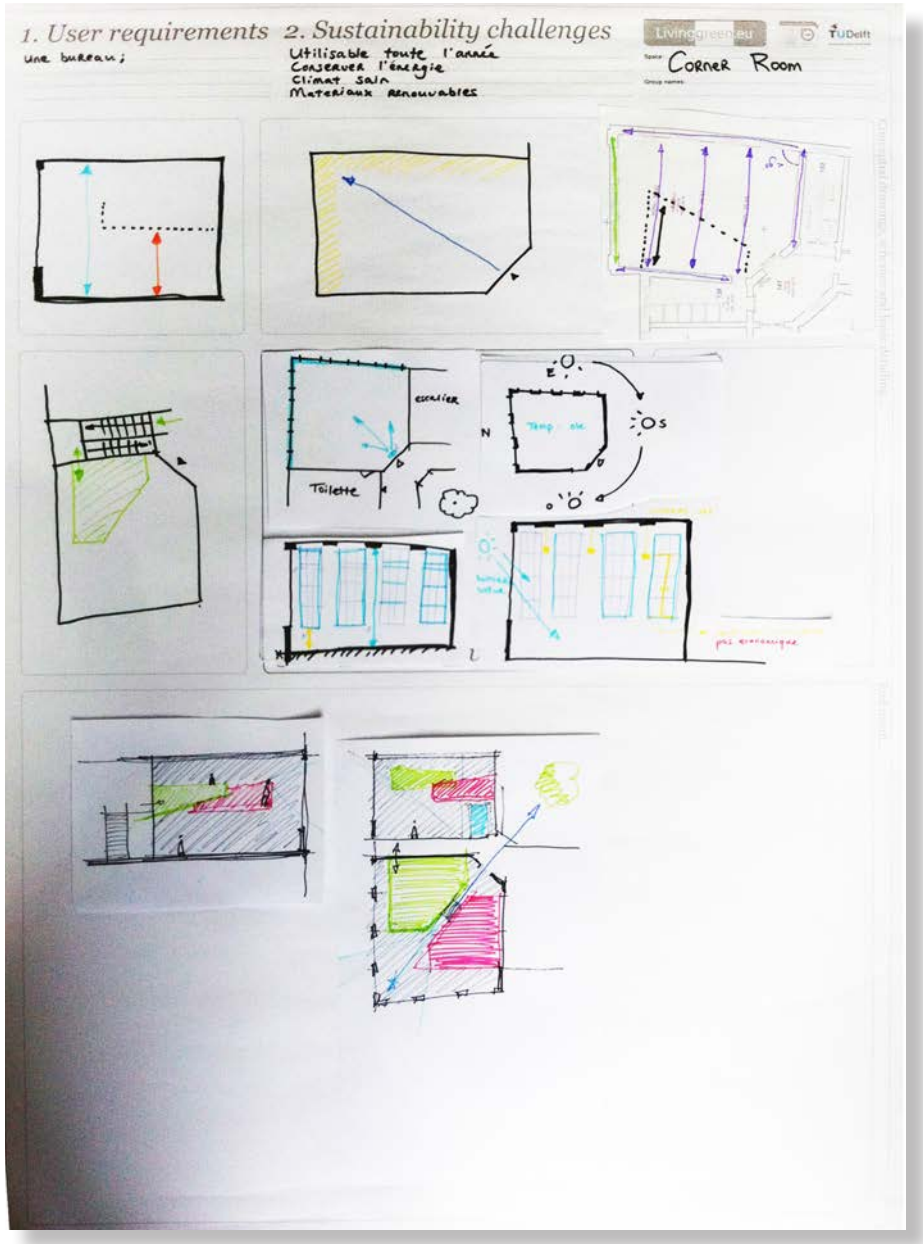
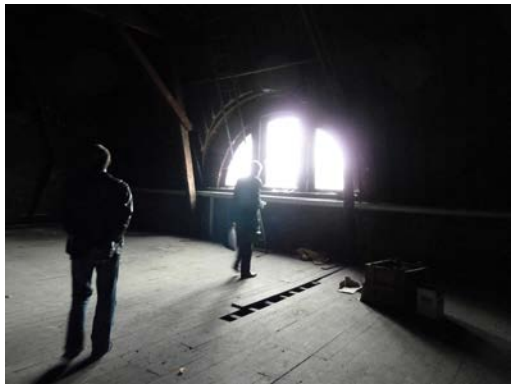


Fig. 20. The presentation poster of group 2.

Fig. 21. View on the high windows in the angular room.

Fig. 22. View of the entrance door to the angular room.



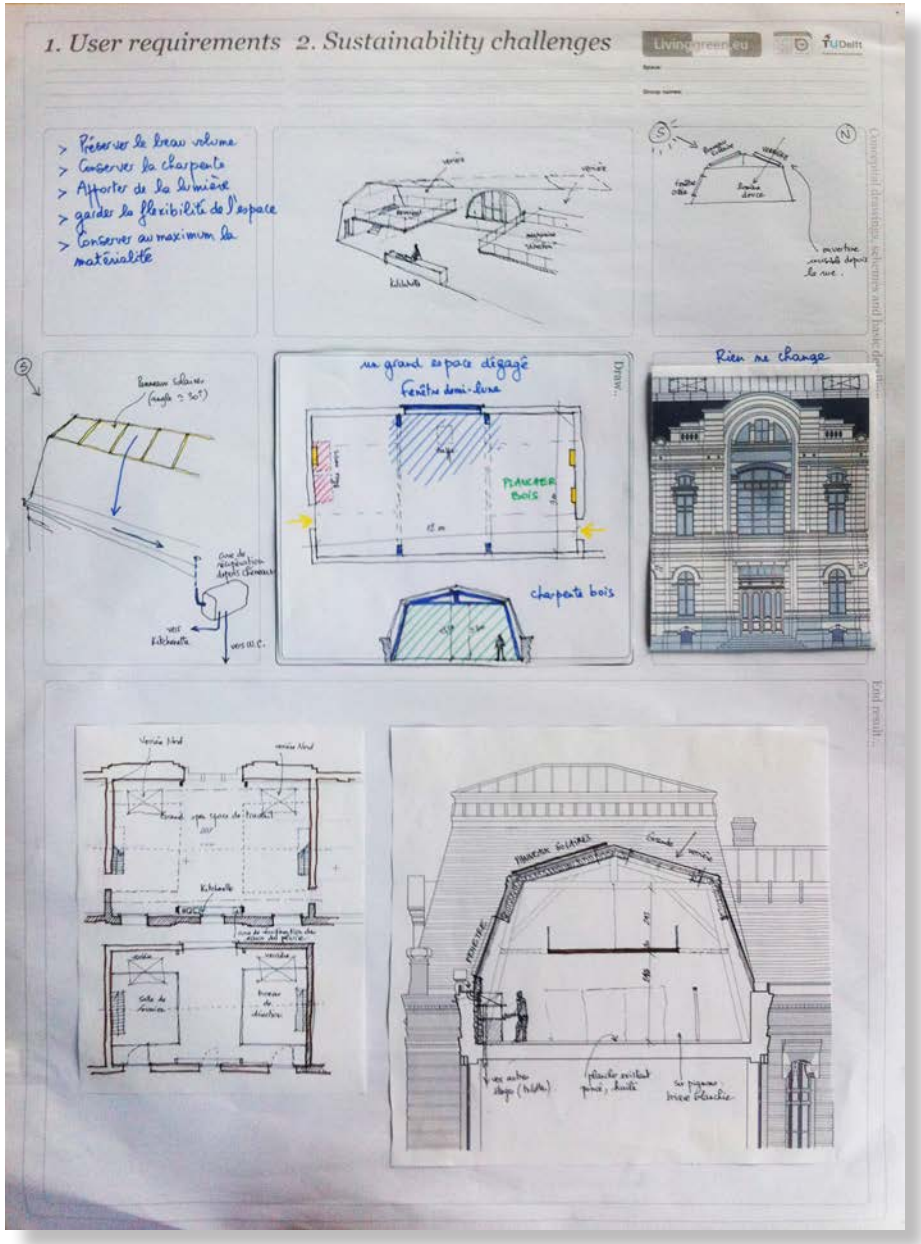


Fig. 23. The presentation poster of group 3.

Fig. 24. View of the semi circular window in the attic.

Fig. 25. Overview of the attic space.

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Fig. 26-29. An overview of the post-its that were placed in the building by the participants. The building had undeniable architectonic values.

Evaluation

To evaluate this Livinggreen Lab the participants were asked to fill out a questionnaire at the end of the day. This questionnaire is used for all methods in the Livinggreen.eu project and addresses sustainable living in a broad sense. In this evaluation we focus on the aspects related to the workshop. For the workshop we brought together a mixed group of people with different backgrounds and (levels of) expertise. Fourteen persons filled out the questionnaire. Of these participants four were home owners who were already renovating or planning to renovate their home, five were students, four of which were architecture students from Delft, the Netherlands, four were people that worked in the case study building, the Bourse du Travail and one professional, an architect. When asked how they appreciated this group composition of home owners, students, users and professionals, eleven participants answered good or very good. Most participants indicated to like the exchange with the professionals that were present best, compared to exchange with homeowners and students.

Most of the participants rated their knowledge on eco-renovation and architectonic values before the workshop as basic or good. This meant that the percentage of skilled people was relatively high. The participants were asked to indicate how much they had learned about eco-renovation, architectonic values and on how to deal with heritage aspects for eco-renovation during the workshop: nothing, a little, a lot or very much.

Four persons indicated to have learned a lot about eco-renovation in the lab, seven persons learned a bit and three persons didn't learn anything. Five persons indicated to have learned a lot about architectonic values, one person even learned very much. Four persons indicated that they hadn't learned anything. Eight people indicated to have a much better understanding of how to deal with heritage aspects in eco-renovation. Two people indicated to have a little better understanding and 4 people didn't get more understanding on the subject.

From these results we can conclude that most of participants have learned about architectonic values, more than on eco-renovation in general. The fact that five participants, the architect and the architecture students, were already knowledgeable on the subject will have probably influenced these results. The users of the building, these where the people that are not upfront interested in renovation or sustainability, indicated to be very much inspired to change or learn more about all the indicated eco-renovation aspects.
In addition to the question if people learned from the experience, we also asked whether the workshop had inspired to take further steps in the renovation of their home and to indicate what action they would take first. One person indicated to be very much inspired to continue the renovation of his home. He indicated to first take a good look at the architectonic values of his building: "1. Analyse the attributes of the building according to the colour codes (blue, green, yellow, red), 2. Re-study the previous usage of the building, 3. Try to conserve most things". Four persons indicated to be inspired a lot. The most mentioned actions to take first were electricity and insulation. Three persons were inspired a little bit, three people were not inspired. Three persons didn't answer the question.

The questionnaire also contained a few questions about the specific parts of the workshop. The participants were most inspired by the design session in groups that was executed in the afternoon. Rated the second most inspiring were the presentations by the architects. Third most inspiring was rated the first walk through the building with the post-it exercise. About the post-it exercise one participant mentioned: "Needed to observe well, you notice post-its on things I had overlooked."
The presentation about rules and regulations was rated least inspiring. As a negative comment some participants remarked that they missed input that was specifically aimed at their own renovation project. The presentation 'Looking through the eyes of an architect' was rated as the part of the workshop that most made the participants understand better how to renovate a listed building with heritage assets. Second best was rated the group discussion to reflect on the value assessment of the building. One participant mentioned as an explanation why this part was the most useful to better understand how to renovate listed building: "to reflect in a group on concrete things".
The design session was considered the activity that invited the most for active participation. Second most activating was the first tour through the building and third most activating was rated the value assessment in groups.

Conclusion

In conclusion, we can say that for most of the participants this Livinggreen Lab was instructive and inspiring, but that there were clear differences in the way the workshop was experienced between the participants. Some of the homeowners had expected to get personalised information for their own renovation project, instead of learning a skill that would empower them to make choices for their project. These homeowners were disappointed not to get the hands-on advice. Opposed to that were the homeowners that had expected to learn a skill, these participants were more inspired and appreciated the value assessment as a useful guiding instrument for their renovation. One of the participants remarked that the method that was introduced during the workshop helped him to structure his approach to his renovation, so that he could optimise the choices between the preservation of the architectonic value and his budget.
Also the results showed that the participants that were the users of the building rated their own knowledge on the treated subjects the lowest, indicated the highest increase in knowledge level and inspiration.

CLIMATE RESILIENCE

Increasing urban climate resilience by stimulating social networks
Livinggreen Lab Climate Resilience

Change, as always, is ever upon us. For the built environment these changes come faster than it can change. Extreme weather events, restrictions in use of energy and materials, social interaction in virtual places, this all affects the built environment in many different ways.

The Climate Resilience Lab posed this problem to a local network in Delft on the 19th of March 2013. The White Rose Foundation invited its peers, colleagues, municipal actors and local citizens to come and work on increasing the climate resilience of Delft. Focusing on social networks and its capital and taking existing capacities and activities as a basis, the group put forward a framework and practical ideas for Delft and made a start on a way forward towards better climate resilience.

Climate Resilience

Our time has seen many changes: resources and energy are becoming ever more scarce, climate is changing, social etiquette changes, and the economy is in a crisis. We have to change our bearings, but that's easier said than done: limited time and resources are at our disposal. But we have to adapt.

" The times they are a-changin' "

In previous Livinggreen Labs the themes Energy, Water, Materials, and Architectonic Values have been focus of attention. These themes were embedded in the built environment and principally dealt with physical changes therein. The technical sides of these themes are well known or in the process of development. However, having the technology alone is not sufficient to deal with ever changing circumstances in and around the built environment. The implementatoin plays an equal, maybe even bigger role. The question is when and how implementation takes place, who is the initiator, and who follows-up and ensures continuity consecutively.

To complicate matters, measures that are taken at any given moment will not have effects that are to last throughout changing circumstances: their effects are of temporary nature. When circumstances change, measures need to be reviewed, adapted and adopted.

The built environment is part of our heritage, of our society and represents its past and current ideals and actions. These are ever changing influences on the built environment and this will remain so.

It no longer suffices to deter changes, displaying robustness to change. We are required to rethink how we deal with indicated changes, considering our present resources, and to remain able to fulfil the needs of society. This is what we call resilience. The focus of this Livinggreen Lab lies on the social aspects of resilience: social networks. By social networks we refer not to online networks, but networks based on relationships between people in a physical environment.

In the Climate Resilience Lab a method is used that should lead to insights in the local social network of the participants, particularly the climate resilience potential that is present, using local capacities (both actors and resources) and consecutively strengthening the local climate resilience.

To make the concept of resilience operational, four aspects are distinguished:

- Adaptive capacity - The ability to change (parts of) a system in order for it to cope with changing circumstances while remaining operational.
- Diversity - Diversity on all levels in every aspect reduces and spreads risks and enhances adaptive capacity.
- Self-organising capacity - The capacity to (re-)organise itself, to deal with changing circumstances, within or without the system, or to change the system itself.
- Constructive feedback loops - These allow for swift communications within a system (such as in a city a system would be 'the municipality') or between systems (such as in a network of organisations in a city) . This decreases the response time for reacting to changing circumstances.

The organiser defines a climate resilient Delft as possessing these 4 aspects, or attributes, in a sufficient manner. The quantity that is needed is case specific, i.e. when taking a specific issue in the city the 4 aspects can by identified, quantified, and if necessary, improved upon.

Context and Set-up

The hosting partner: White Rose Foundation

The White Rose Foundation (WRF) is an independent organisation that aims to inspire and support urban residents in choosing sustainable behaviour by presenting sustainability as concretely and challenging as possible. The WRF has a widespread network, including municipality officials, local businesses, sustainability experts, local residents' respresentative organisations, etc. The WRF is well grounded in the Delft sustainability sector.

Set-up of the Lab

Aim and goals

The aim of the Livinggreen Lab is to create a service, that allows Sustainability Centres to:

- become a hub in their local sustainability sector;
- stimulate cooperation between companies in the sustainability sector;
- create a network of partners that makes optimal use of its capabilities and capacities and
- set a roadmap for how the network and cooperation should evolve over time.

The governing thinking is that optimal boundary conditions need to be created, within which not only participating actors but citizens alike, are challenged and invited to take part in a process leading to a climate resilient society. The

approach is a mix of top down and bottom up thinking. Initiatives, from either side, should be able to develop themselves freely.
In this Livinggreen Lab the climate resilience of Delft was mapped and used as the basis to shape a network of participating partners. Taking individual strengths, capacities, and current activities as a starting point, a roadmap for the foreseeable future was drawn up.

Process and Program

Participants
The foundation's network was asked to participate in the Climate Resilience Lab. Close to 20 participants took part in the Lab. The range of participants was wide: as diverse as policy makers from local municipality and (ex-) aldermen, to local entrepreneurs and representatives of local residents. An ideal group size lies between 6 and 10.

Process
The process consisted of four stages. The starting point of the process is the capacities and capabilities of the local Delft network of the White Rose Foundation. The end result is a plan to increase climate resilience by utilising and expanding the local network and its capacities.

Before the Lab: sensitizing participants
Prior to the Livinggreen Lab participants were asked to fill out a short questionnaire. This was done for two reasons. Firstly, answering the questions intended to sensitize the participant for the Lab and theme. Initial ideas about the topic could be expressed in the answers. Secondly, it provided the organisers with information about the level of knowledge of the participants on the theme and on their own network, capacities and activities, as well as their wishes or constraints concerning climate resilience. This knowledge was processed by the organisers prior to the Lab, to be used as a starting point for the three stages during the Livinggreen Lab itself, as described below.

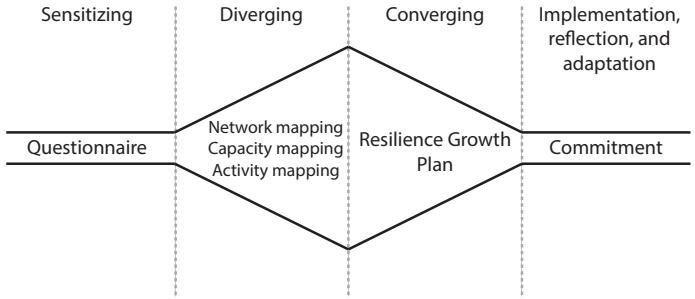
During the Livinggreen Lab
1. Vision forming
During this stage the information gathered with the sensitizer was combined to a draft definition of climate resilience. The 'vision' in this stage is a shared definition and understanding of what climate resilience means to the participants in the context of their locale.

2. Diverging stage
The participants were asked to discuss the provided analysis of their answers to the sensitizer questions concerning their networks, capacities, and activities. The analyses were presented in the form of visual representations, called mappings (fig. 1). These mappings were to be checked and completed, or replaced as necessary. Next, they were to be reviewed in light of the shared definition on climate resilience. The goal was to see whether the present network, capacities, and activities contributed to reaching or increasing the climate resilience and, if not, to conclude what would be necessary to do so.

3. Converging stage
To operationalise the definition of climate resilience, the participants were asked to create a so-called resilience growth plan. This plan is to represent all actions, capacities and actors, existing or to be created, necessary to increase climate resilience.

After the Livinggreen Lab
4. Implementation, reflection and adaptation
Although not part of the Livinggreen Lab itself, the intention and use of the mappings and resilience growth plan is to be used after the Lab, acting as a guide for future action and

Fig. 1. Process of the Livinggreen Lab Climate Resilience with respective activities during the Lab



networking. One of the goals of the Livinggreen Lab being to develop a service, the outcome of this Lab should be revisited after a while, to reflect on what has been done after this Lab and how the courses of action of the participants should alter with time. To get an indication of how participants would act in this stage, they were asked what they would commit to doing after the Livinggreen Lab.

Results

Introduction
After welcoming the participants, the Livinggreen Lab started with a presentation on the background and context of the Lab. Next, the goal and aims of the Lab were stated, to focus the group at the task at hand.

Vision forming - Plenary Part 1
The Livinggreen Lab continued with a presentation of the draft definition of climate resilience in the context of Delft. The definition came in two parts: a draft definition based on the sensitizer (illustrated by a Resilience Mapping, fig. 2) and a more general definition, following from literature.

The draft definition read as follows:

A climate resilient Delft:

- is sustainable in a social, economic and ecological way;
- is attractive to work, live, and recreate;
- realises its potential using local resources;
- foresees and adapts to changes in climate;
- manages its resources well and is autarkic in fulfilling its needs and
- nurtures networks of residents, organisations and governing bodies.

This was summarised in the following overall statement:

A climate resilient Delft uses integration, and local potential and creativity to reach sustainable quality and equilibrium in the built environment, socially, economically and ecologically.

Generally speaking, the presented draft-definition of resilience met with approval of the participants. Most remarks that were made were aimed at a more precise statement of specific parts of the definition given. The remarks reflected the wide diversity of the participants' backgrounds. The summary was found to be too vague. The discussion resulted

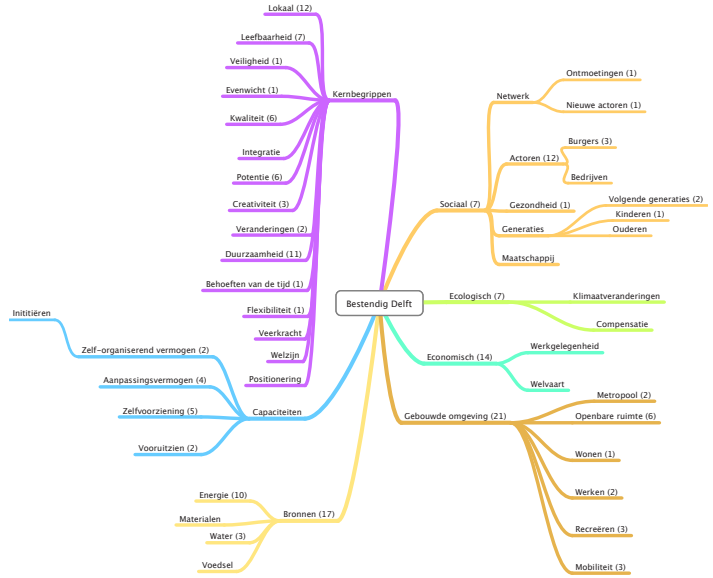


Fig. 2. Resilience mapping of the WRF's network

in the following modification of the components and overall statement:

A climate resilient Delft:

- » is sustainable in a social, economic and ecological way;
- » is attractive to work, live, and recreate;
- » realises its potential using local resources where appropriate;
- » foresees and adapts to changes in climate;
- » manages its resources well and finds new resources for the future;
- » is autarkic in fulfilling its needs at appropriate levels of scale;
- » nurtures networks of residents, businesses, organisations and governing bodies;
- » closes loops and
- » is dynamic and moves with changes in context, environment, etc.

A climate resilient Delft uses integration, and local potential and creativity to reach sustainable quality and equilibrium in the living environment, socially, economically and ecologically.

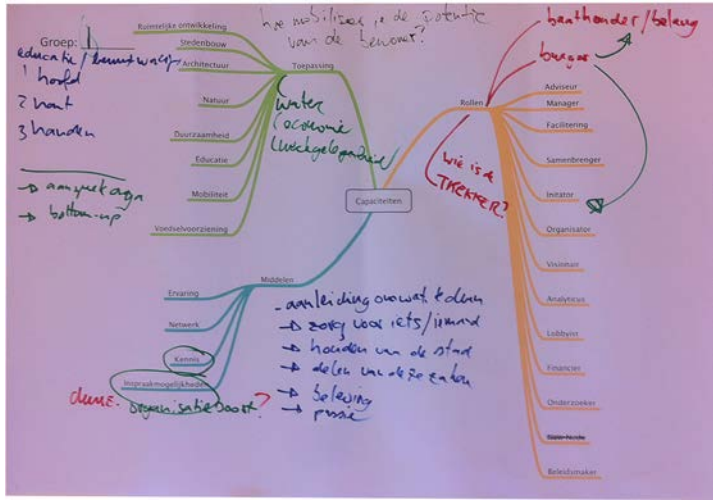
After the first stage, having the jointly established definition as common ground to work from, the group was split in two. This ensured a more intimate atmosphere in the group, in which more people are able to actively join the discussions. Furthermore, it makes facilitation easier. Group 1 deviated least from the intended Lab program. Nonetheless, the facilitator, to adjust for what the participants found most interesting or relevant to discuss, followed the flow of the group. This in itself is a demonstration of resilience on a small scale. In group 2, the planned schedule of the Livinggreen Lab was let go very early. Facilitation followed the flow of the group. Before the end of the session five concrete topics were picked as most interesting to base a Resilience Growth Plan on. Two of these topics were selected by the facilitators and proposed to the group to choose from for elaboration in a resilience growth plan.

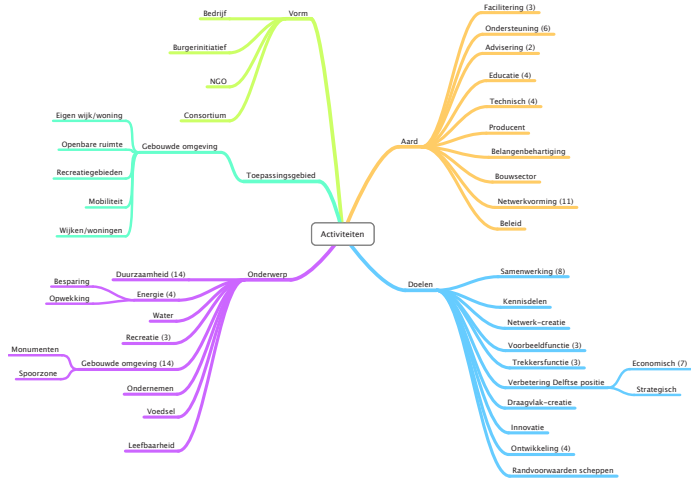
Group 1

Diverging stage

Network analysis

The group reflected that the diversity of the network that was present was adequate, but couldn't be specified in more detail without it being applied to a specific situation, for which then an 'ideal' team could be formed.





Capacity analysis (fig. 3)
To better be able to think of necessary capacities to reach a climate resilient Delft, the group found that it was imperative to include the Delft residents. The central question to work on was “How can the potential of the Delft residents be mobilised?” This led to the matter of why a resident would contribute to the climate resilience. The group identified four reasons for this:

- care for someone or something related to climate resilience;
- caring for the city and its survival;
- the sharing of this care or love with others;
- perception of what is important for the city.

On the list of roles on the capacity mapping ‘residents’ and ‘stakeholder’ were missing, according to the group. Simultaneously the question was raised who should be taking the lead in involving the resident. The answer seems simple, but has complex implications. The group discussed a coherent structure of four actors, an actor-quartet of citizens, businesses, government, and civil society. These actors are partners in achieving common goals, in this case in the public realm. Initiative can be taken by any partner, but responsibility is shared. Roles and tasks can be divided. A condition for this system to work is a mutual feeling of co-ownership and cohesion between the partners. The general feeling in the group was that in the current situation this partnership does not exist. According to the group, one of the major issues is that government has pulled too much responsibility towards itself, in such a way that the other actors are either powerless or don’t feel co-ownership. This leads to inaction, especially of citizens. The government should take the lead in adopting this model and should take a directive role. By setting boundary conditions and providing education to the other partners when needed and appropriate. The roles of the other partners may vary and each specific case has

Fig. 3. Capacity mapping of group 1

Fig. 4. Activity mapping of group 1

Fig. 5. Photograph of group 1 during the converging stage

its own unique requirements. The key would be to look for existing potential where it is needed and choose the right partner at the right place.

Activity analysis (fig. 4)
The question posed to the group was how they could, in their own daily activities, accommodate for more interaction with citizens. Each of the group members indicated what activities or aspects in their occupations have the potential to involve citizens, or involve them already. From the categories of group members their ideas are put forward:

Government (alderman): ask for more involvement of citizens, and make better, more appropriate use of own organisation in solving issues in the public space.

Business: set-up a consortium to redevelop desolate industrial areas, acting as intermediary between the businesses and other parties, use a social angle in improving existing building stock's energy consumption, stimulate sustainable mobility involving all partners, take over traditional governmental tasks, and create so-called Wijk Investerings Zones (Neighbourhood Investment Areas).

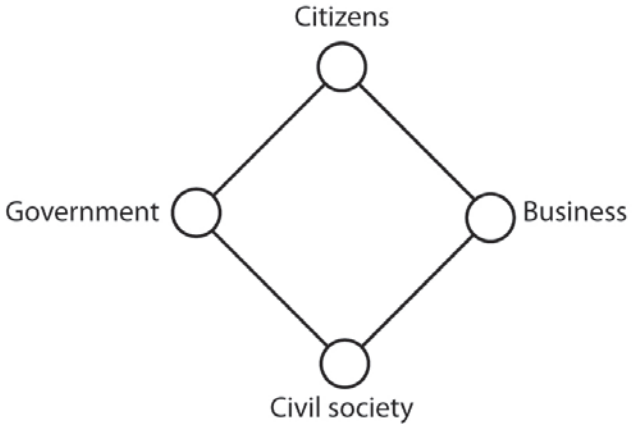
Education: use brain-power of the knowledge institutes IHE-Unesco (focused on Water) and Hogeschool Rotterdam (University of Applied Sciences in Rotterdam, also with much knowledge on Building and Water management) to solve societal issues concerning water management, stimulate food-loops and taster-classes as a binding agent between actors.

Social housing corporation: stabilise living expenses and 'obligating' oneself to use idle capacity (noblesse oblige).

As can be seen from the activity mapping, the group already had much contact with citizens before the Livinggreen Lab. There is room for improvement, though. The group members indicated themselves that at various junctions they came across barriers. These include amongst others a protective or unreliable government or restrictive legislation, but also citizens who do not want, or aren't able to take responsibility. From their experience it is obvious that the complexity of each individual case requires made-to-measure solutions.

Converging stage - Making the resilience growth plan
The group was hesitant to write, and commit, to a resilience growth plan. Instead, they opted to define boundary conditions, within which resilience can be grown using the actor-quartet as a basis (fig. 6). For each societal problem the following conditions should apply:

- in an open way the problem should be approached and solutions sought. No solution may be omitted beforehand,
- all stakeholders should be part of the solution process. Maximum use of existing structures should be made,



- » agreements that have a longer time span than 4 to 5 years should be made, to guarantee continuity,
- » transition stages should be acknowledged and accepted, meaning that changes cannot be made overnight but usually require a process,
- » flexibility in partnerships necessary, and
- » co-ownership should be created/stimulated, with accompanying acknowledgement moments for all partners, so credits are given when and where due.

Group 2

Diverging stage
In this group the discussion addressed the network, capacities and activities in parallel. They had difficulties grasping the abstractions of the actor network, capacities and activities' mappings, but were nevertheless triggered by the items on them. The discussion moved from concrete accounts of the activities of the persons at the table, to difficulties they encountered, as well as critique and suggestions for other organisations, the municipality of Delft for example. In this discussion the elements of the mappings were addressed albeit more implicitly. The moderators followed the discussion, noting down remarks that could be placed on the mappings and extracting topics that were energetically discussed and thus appeared of interest for the whole group.

Fig. 6. Actor-quartet

Fig. 7. Photograph of group 2 during the diverging stage

The main points of discussion were:

Network analysis
Network actors that should be added are civilians and schools. Civilians were mentioned as crucial actors in resilient Delft. The challenge is to activate them. This has been difficult in some neighbourhoods, for example in a poor high-rise neighbourhood. A remark made related to this, was that for each neighbourhood one has to look for specific ways to

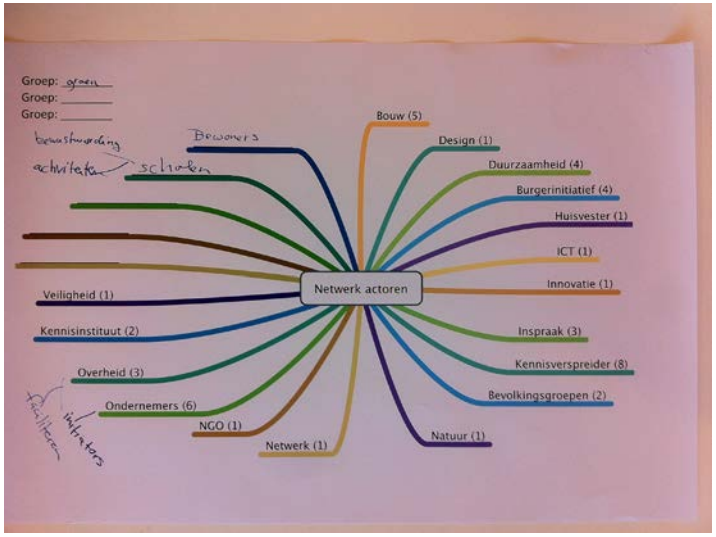


Fig. 8. Actor mapping

Fig. 9. Resilience Growth Plan of group 2

activate people, use the “energy of the neighbourhood”. Schools play a role in creating awareness with the children, and possibly their parents, to take along in their lives and translate to practice later. Furthermore school activities can directly be part of resilient Delft.

Capacity analysis

Some opportunities were mentioned to make better use of the capacities available in the city. Rules and regulations as well as inflexible municipality departments make it hard for some bottom-up initiatives to come to concrete actions, e.g. for establishing a small playground in an unused open space. The way the municipality works would have to change to better facilitate bottom-up initiatives.

A concept that was found interesting in this context was participatory budgeting, meaning that civilians and government cooperate on deciding how to spend the budgets for the public space and on implementing the decisions.

Space in and around the city was identified as an important means in fostering resilience. There are for example opportunities in the use of unused buildings. Their space could serve as temporary locations for activities that contribute to the livelyhood of Delft, for example for events or a pet farm.

Activity analysis

In terms of activities several aspects were addressed:

Providing examples of activities people can undertake or take part in is important. An observation was that one cannot easily see or hear about all the activities that take place. As a result there are just a few visible examples to get inspired from. To collect and share examples could be useful to stimulate people to become active.

The organisation of events was mentioned as a way to reach a large number of people and show possibilities to contribute to one’s environment. In some areas of the city this has been done already.

Entrepreneurs were mentioned as possible initiators of activities. An example is the local consortium aimed at implementation of energy efficiency and renewable energy in the city.

Converging stage - Making the resilience growth plan (fig. 9)

To converge the discussion, five topics that had shown to energize the group discussion were proposed by the moderators, and agreed by the participants, to focus on. These topics can be described as elements of resilience that the group had an interest in:

- Participatory budgeting and implementation
- Recognising and working with differences per neighbourhood
- Seducing people to take action
- Providing examples
- Making available and use data of the municipality (open data)

One topic was chosen to elaborate on and defined as follows: 'participative budgeting and execution for development and maintenance of public space'. For the resilience growth plan the goal was set that by 2020 half of the municipal budget would be spent through participatory budgeting. Later on, this goal was adjusted because obligatory participatory spending was not considered a good idea . The new goal: by 2020 it is possible to use participatory budgeting for development and maintenance of the public space. In other words, if civilians would want to (partly) organise it themselves, they would have to be able to do so. Time was too short to work out a roadmap towards this goal. Nevertheless ideas and suggestions were discussed:

- The municipality and bottom-up initiatives should look for opportunities together.
- Balancing the interests of involved parties has to be dealt with in a fair way. Who's argument for example will weigh most in the decision making, for example when it comes to parking policy in the innercity?
- When initiatives start, the municipality should embrace them and seek to capitalize on them.
- The municipality will have to facilitate implementation of an initiative, which does not need to be financially only. A more flexible municipality with less rules would be needed.
- Each neighbourhood can organise meetings, among neighbours but also with people from other neighbourhoods to encourage exchange of information and networking. Resident's association 1 already puts this into practice.
- When a politician (the more the better) commits to stimulating participatory budgeting or at least the fostering of initiatives from the community, there is a good chance some things will start to change in the municipality's way of working.

Commitment - Plenary Part 2

In the last group stage the participants were asked what they would commit to doing, trying to achieve the setting of the boundary conditions as indicated before, or what they thought someone else would be able to do. The commitments ranged from general to more specific.

In group 1 the most concrete were to setup a WIZ-pilot, improve residence energy performance to 'C'-label from an 'F'- label in their own portfolio. In the range of what others could do, the government should relieve pressure of policy and regulation, citizens should upgrade their residence energy performance and students should use their curriculum to work on societal issues, supported by their course directors.

In group 2 several activities by the parties at the table were jotted down as a contribution to resilient Delft, leading to some commitments of persons at the table.

- Residents' association 1: the representative will contact an alderman to adopt the topic of fostering bottom-up initiatives. She is helped to a contact by the present representative of the municipality

- » Residents' association 1: We can fulfil a mediating role between municipality and individual civilians
- » Residents' association 2: Continues cooperation with municipality in planning the exploitation of the community centre (which was closed down by budget cuts of the municipality)
- » Consortium on energy projects: we can develop projects with active neighbourhood groups, to for example assist in taking energy efficiency measures or to organise collective buying of solar panels.

An important result from the discussion was that the group found agreement on the idea that an environment needs to be created in which people are able to act instead of react. This means that the municipality has to change the way they work, by giving room to initiatives. And that 'bottom-up initiators' have to make use of this space to implement their ideas. This is a cooperative process. Both municipality and bottom-up/grassroots organisations, like the resident's organisations present, have a role in communicating these possibilities and supporting that ideas are actually put in practice.

Another important outcome was that participants got to know each other and exchanged experiences (practices, knowledge, barriers they encounter). Thus a basis is formed for future contact and cooperation when a common goal is to be achieved.

Implementation, reflection and adaptation - Plenary part 2
With a presentation by each group about the outcomes of their work, the Livinggreen Lab was wrapped up. The presentations led to additional commitments and contacts between group members of the different groups. To give an example: one of the resident's associations was looking for the means to set up a play ground, which an association for playground developments may able to give.

Notes

1) Note on participatory budgetting: this should not be obligatory. The participatory nature of the measure requires initiatives to be put forward by citizens. Therefore the group suggested to fund and execute about 75% of all initiatives that were put forward by the year 2020.

2) A Dutch rating system of energy performance labels buildings, but for instance cars and washing machines as well, according to their energy consumption relative to peers within their segment. The scale runs from an 'A++'-label, being the most energy efficient within its segment down to 'G' for very inefficient.

Evaluation

By participants

The evaluation by participants was conducted by way of a survey. The survey consisted of three parts: changes in knowledge on resilience, changes in relationship with local network, motivation to act and the organisation of the Lab. Out of 17 participants, 9 responded. The participants were fairly unanimous in their responses.

Changes in knowledge of resilience
Most participants indicated that they already had good knowledge on the concept of resilience and that their knowledge increased a little. Noteworthy is that when asked in the sensitizer for their interpretation of resilience, few mentioned aspects relating directly to the definition presented during the Livinggreen Lab by the organisers.

Changes in relationship with local network
Most participants indicated a small increase in knowledge on the local network, and an increased willingness to cooperate with other local actors.

Motivation to act
Most participants indicated that they are willing to act upon the results of the Lab. Most participants are willing to join another Lab.

Organisation of the Lab
The participants share a common comment: the Livinggreen Lab would have been more interesting and useful if the topic of the Lab would have been more concrete, or rather the scope (i.e., one or two concrete cases to work on from the start).. The Lab would benefit from more local stakeholder input, especially concrete knowledge.

In general the Livinggreen Lab was received well, but there is room for improvement. The participants did indicate that the hosting partner (Witte Roos Foundation) would benefit from organising more similar workshops and is a good venue to do so.

By hosting partner
The host, the White Rose foundation (WRF) had mixed feelings about the Lab. Although the preparations promised a fruitful workshop, it didn't generate the expected results. This is mostly due to the fact that most of the content of the Livinggreen Lab was approached abstract. Similar to the participants, the WRF indicated that they had hoped the Lab would be more concrete; scenario or case based.
The WRF did see potential in the type and theme of the Lab. Provided a solid, concrete case would be the topic, the WRF would organise another Livinggreen Lab. Also, the WRF was pleased that the diversity of its network was reflected by the participants and that the Lab allowed its network partners to get to know each other (better).

By the organisers

Changes in knowledge of resilience
As mentioned before, it is noteworthy is that when asked in the sensitizer after their interpretation of resilience, few mentioned aspects relating directly to the definition used and presented during the Livinggreen Lab by the organisers. It is unclear why this is so. Nevertheless, the definition that was agreed upon during vision forming contained all elements of the organiser's definition, adapted to the participants' modifications.

Changes in relationship with local network
Many of the participants knew about each other before the workshop. Different networks of the WRF were present. But this has not led to a concrete commitment of tightening of the networks themselves. However, in the last stage of the workshop, two members of different networks committed to exchange information and work on concrete plans.

Motivation to act
Despite the relatively less concrete result than hoped for all survey respondents clearly stated that they want to get together with this group, to work on concrete cases.

Flow of the Lab
During the execution of the Livinggreen Lab energy levels were high in the discussions in the diverging stage, less so in the converging stage. This is attributed to two reasons. Firstly, the abstract subject was not translated to a concrete case in the Lab and this was hard to relate to for the participants. In group 1, the participants were actively looking for a concretisation of the subject. Endeavours by both the participants and the facilitator did not have the results that were aimed for by the organisers. In group 2 the abstractness was felt as a drawback by both the participants and the facilitators. The level of expert knowledge on the topic seemed to be lower, which led to a facilitational decision: the programme of the Lab was let go in this group, mainly to support the flow of discussions. Nevertheless, the discussions themselves were valued well by the participants.

Organisation of the Lab
The organisation of the Lab happened in a very short period of time. The workshop would have benefitted from a more in depth preparation, content wise. The sensitizer was very helpful in the preparation, but more elaboration on this part would have reduced the abstractness of the Lab.

Conclusion

On climate resilience
The awareness of the dynamic nature of the environment, both both natural and built, is very high in Delft. The discussions on resilience and sustainability were mainly held on a detailed level, indicating the high level of knowledge of the

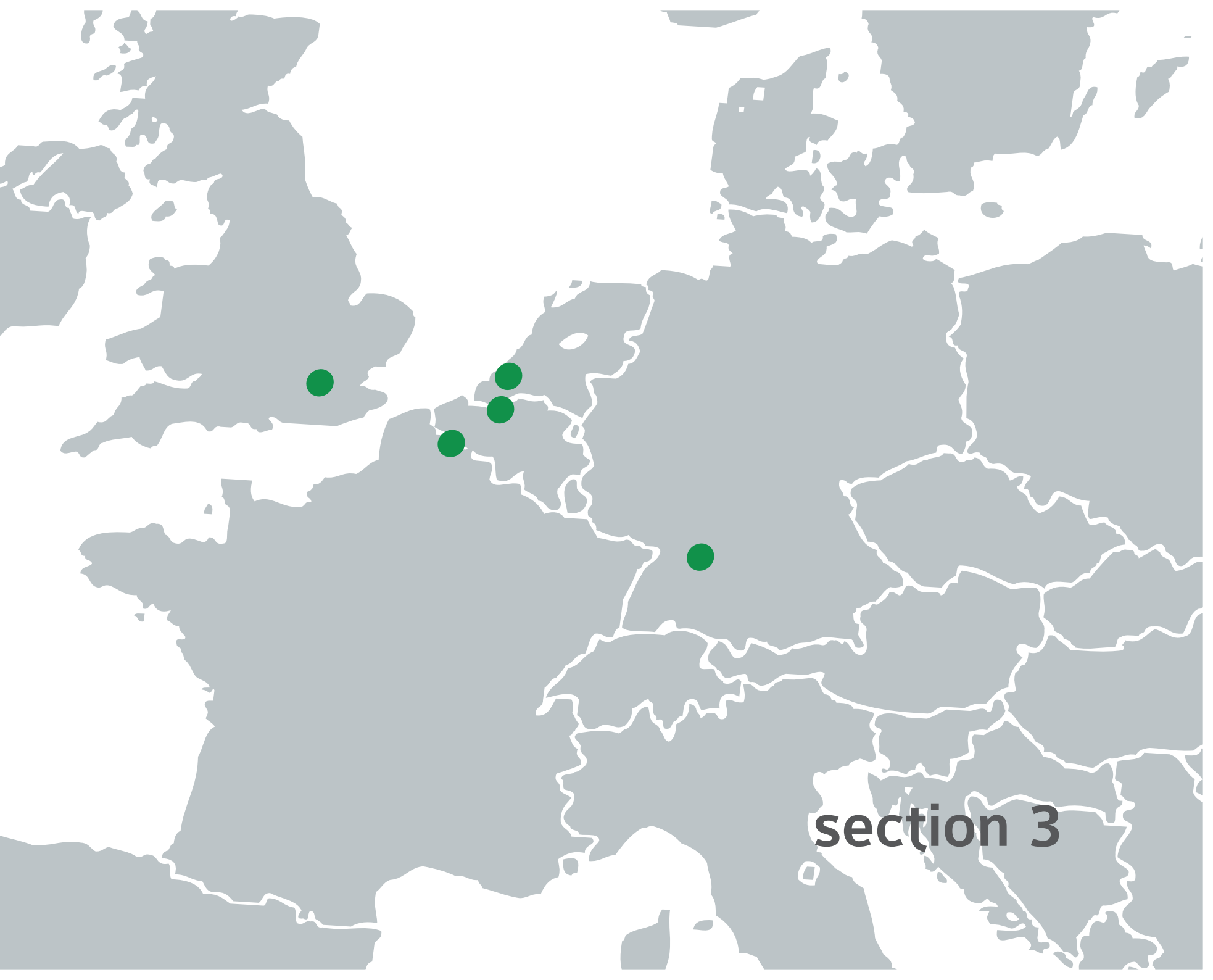
participants. The social network surrounding the White Rose Foundation is tightly knit and aware of each other. Concerning the improving of climate resilience through networks, the participants from both groups arrived at similar conclusions. A actor-quartet of government, citizens, businesses, and civil society are to work together in an equal matter on societal issues concerning climate resilience. The current role of government is retreating. Although one group found that local government could retreat more, the other group found that while doing so, no other actor was filling in the gap. Both groups agreed that co-ownership of both issues and solutions between the actor-quartet is necessary. In the final part of the workshop various actors indicated their willingness to act together more, some even committing to concrete actions following the Livinggreen Lab. All participants expressed that they would be willing to participate again in a Livinggreen Lab, organised by the White Rose Foundation on a concrete case with problem owner.

On the Livinggreen Lab method

The Livinggreen Lab on Climate Resilience showed much potential. The topic was interesting, many important stakeholders and local actors were present and are willing to attend similar workshops and thereby showed a willingness to act. The results however could be more rewarding if a number of improvements are made. Although the topic is interesting for the participants and hosting foundation, it is also very abstract. By applying it to a concrete case, born by one of the participants as stakeholder or problem owner, the results would be much more concrete. This would also give rise to more concrete commitment and motivation in taking the results of the workshop further on a particular case. With the White Rose Foundation as host for the Lab, a perfect location and setting was found and an extensive and diverse network was called on. This bears a promise for future Resilience Labs on this topic.

The Livinggreen Lab was setup to be organised and executed in one go. A logical next step, taking into account the evaluation, would be to split the event in two parts. In the first part, the local network would work on an abstract level to come to an understanding of what climate resilience is and continue to choose a concrete case. This case should then be prepared by the organiser, the problem owner of the case and the participants. In the second part, the case would be elaborated and a concrete plan of action can be drafted and committed to.

One of the goals of the Livinggreen Lab was to create a service that could be used by Sustainability Centres. From the evaluation it is clear that both host and participants agree that this type of workshop should be organised more by the host and that there is a willingness to organise and participate again. In line with the dynamic nature of climate resilience a long term service can be created by hosting a range of Climate Resilience Livinggreen Labs.


section 3

Epilogue

Now all Livinggreen Labs have been organised, we can use this experience to briefly reflect on the Why and the How of the Labs, and draw conclusions about their results and relevance for the future.

The starting point
User behaviour is a significant determinant of environmental impact, renovation practice can therefore benefit from engaging the people that actually live and work in a building or install the systems. The core of the Livinggreen Labs therefore was a user-centred design approach, which springs from the field of Industrial Design.

Evolution of the Livinggreen Lab method
The initial format of the Livinggreen Labs aimed for double dividend: inspire product- and service design and sensitise participants about the topic at hand.
The format of the Livinggreen Labs changed over time, because of lessons learned from the executed Labs as well as under influence of the different themes and the different settings in which they were to take place. The specific techniques and tools used therefore differed. The common element in the method is the design approach, which remained a central part of the Livinggreen Lab method.
Reflecting on this evolution, two types of Livinggreen Labs can be discerned: (1) aimed at product and service concepts as an outcome (Lab 1 and 2), (2) Aimed at creating awareness and skill/knowledge development Lab 3 – 6).

Reflecting on the main results
From the results of the evaluation of Lab 1 and 2 we have learned that the creative and open minded atmosphere and differentiated groups, contributed to the conception of inspiring and innovative ideas. Crucial point for the further use of the ideas seems to be their further elaboration, both in content and technical sense and to highlight the importance of a good presentation of the results.
The participants indicate to have learned a certain way of free thinking and to have gained specific knowledge on eco-renovation.
From the evaluation of Labs 4 and 5 we have learned that the Lab method does not yield clearly different results on the increase of knowledge, on average our control group scores a bit higher. The participants of the Labs however clearly indicate to be more inspired and inclined to act within the specific focus field of these Labs.
From the evaluation of Lab 6 it can be concluded that bringing together participants from different backgrounds was inspiring and the setting of the Lab useful to create a network of actors. Notably, a condition that several respondents mentioned would increase their intention to act, was the focus on a concrete project to work on together. In other words, if results are actionable and directly applicable to their own situation and behaviour, people are most inclined to act.

Appreciation of the Livinggreen Lab method by Livinggreen partners
From our evaluations we have learned that there is a difference in appreciation of the method by partners that are municipalities and those who are not. Municipalities see benefits from this kind of feedback gathering and are happy to be connected to students/laymen. The other partners thought it was an interesting way of working, but they could not directly apply the results of the labs because they don't

have the means to do so. This highlights the importance of having stakeholders present that can take action based on the results.
In comparison to the other commonly used methods by the partners, the Lab method was assessed as not very suitable for knowledge transfer. For knowledge transfer methods like personalised advice, exhibitions and lectures are rated better. The Lab method was rated rather effective specifically for idea and vision forming ('emerging knowledge creation') and as a very effective participatory setting.

Overall conclusions
The question whether the Livinggreen lab method a valuable addition to other methods to engage the audience has multiple layers. The findings suggest that the method as tested in the project can provide an attractive complementary way to sensitise people to the possibilities of sustainable renovation and sustainable lifestyles. The sessions showed high involvement of the participants. Peer-learning and exchanging perspectives between people with different backgrounds were highly appreciated.
Although participants do value the creative and participative methods as (another) valuable tool to transfer existing knowledge, the hosting partners see more value in its use as a method to involve people in developing ideas and a vision for local urban development programmes, i.e. stimulating environmental citizenship that goes beyond just direct personal benefit.
All in all, the overall conclusion about the value of the Livinggreen lab methods seems to be that through the process of co-design – independent of the exact contents and results - people become more aware of their own behaviour and show willingness to change. This has been observed in the group dynamics in several Labs.

Relevance for the Sustainability centres
The aim was to develop a Livinggreen Lab method that can be used independently by the Livinggreen partners (Sustainability Centres) after completion of the Livinggreen.eu project. Especially if the aim of a centre is to create new insights and use the diversity of its stakeholders to do so, the Livinggreen Lab method is suitable to use again. The two main conditions to do so are: 1) inclusion of a wide diversity of stakeholders, if possible including (small) companies, 2) presence of the stakeholder(s) that can actually proceed with the results. Under these conditions, the Centres can be an excellent catalyst for creating awareness and eventually concrete action regarding sustainable renovation.

Image References

Cover

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Livinggreen Centres

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Knowledge transfer and product development methods

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Water Lab

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Eco-Materials Lab I – Interacting with eco-materials

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Architectonic Values Lab

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Climate Resilience Lab

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