EC Project 610829

A Decarbonisation Platform for Citizen Empowerment and Translating Collective Awareness into Behavioural Change

D1.1.2: Decarbonisation Methodology v2.0

9 June 2016

Version history

Version	Date	Author	Comments
0.5	02/12/2015	Meia Wippoo	outline, methodology set up, literature, context studies, recommendations, set up references
0.7	12/05/2016	Meia Wippoo, et al.	Case studies, improvements methodology, rewrites
0.8	28/05/2016	Harith Alani, Lara Piccoli	Assessment and deployment, additions to case studies
0.9	08/06/2016	Meia Wippoo	Final additions and rewrites, references, figures and tables, index
1.0	09/06/2016	Harith Alani	Formatting. Exec summary. Conclusions

Peer reviewed by: Harith Alani (OU)

Dissemination Level: PU – Public

This document is part of the DecarboNet research project, which receives funding from the European Union's 7th Framework Programme for research, technology development and demonstration (Grant Agreement No 610829; ICT-2013.5.5 CAPS Collective Awareness Platforms for Sustainability and Social Innovation).

Executive summary

In this deliverable, we present the latest version of the Decarbonisation Methodology, which offers guidance for designing tools and practices for engaging users with climate change awareness raising initiatives. The methodology is based on an in-depth review of relevant literature from multiple disciplines, as well as findings from project experiments and user engagement events (workshops). One of the main components of the methodology is a set of recommended interventions to increase user engagement and to encourage behaviour change.

In this document, we detail the list of primary interventions we identified, demonstrate how they were incorporated into some of the DecarboNet tools and techniques, and summarise current results and observations on the impact of those interventions on user engagement and behaviour.

Further experiments and evaluations are planned in the remaining months of DecarboNet, which will later feed into this Decarbonisation Methodology.

1 Introduction

1.1 Context

A lack of collective awareness negatively impacts perceived personal efficacy, which hampers efforts to address societal problems. DecarboNet is a multidisciplinary effort to tackle this problem by identifying determinants of collective awareness, translating awareness into behavioural change, and providing novel methods to analyse and visualise the underlying processes. The 'decarbonisation methodology' includes a set of techniques and definitions for influencing change in behaviour, tailored to fit the objectives of DecarboNet in terms of communities to engage and technologies to develop.

Looking for alternative energy sources or producing more energy-efficient technologies is a logical course of action. However, the challenge is not only to find these alternatives. A change in attitude is necessary so that people care about their environment and the future of the world. We want to make people aware of energy reduction, carbon footprints and climatic change in general. But, *knowing about a subject, and caring, is not the same as knowing how, or having the ability, to act* - even if you are willing to act.

It is common for people not to correlate their individual behaviour with global impact, and thus underestimating their power to influence climate change. In 2013 the European Environment Agency published a report [EEA 2013] on consumer behaviour and the consumption practices in relation to the use of energy. The main conclusions from that report, that are relevant to the DecarboNet project, are:

1. A large amount of the literature reviewed tends to consider the relationships between various actors (such as technological developments, economic situation, age, social norms, belief systems, cultural traits, marketing strategies) as static when they are not.
2. Energy infrastructure plays an important role in determining consumer behaviour.
3. Constraints, the ability of the consumer to deal with technology, cultural traits, level of education and convenience all play a part in the success of introduced measures.
4. Consumers need a frame of reference to get insight in their own consumption and behaviour, and whether or not that is excessive.
5. People's skills must be honed to enable them to stay informed and be assertive in taking advantage of opportunities to better manage their energy consumption.
6. Changing consumer behaviour and practices will not guarantee the full implementation of energy efficiency policies, because of the current structures of business models for the energy industries.
7. When smart meters are introduced, dynamic pricing schemes seem essential to take full advantage of the data offered by the meters. But not all consumers will respond in the same way.

1.2 Aim

The conclusions of the EEA report are great starting points but they are not citizen-centred. The knowledge acquired collectively can inspire governments and energy suppliers, but DecarboNet mainly focuses on the behaviour of the citizens themselves. Moreover, we can assume that when the end user is not an active participant in the process, change is difficult to achieve.

The reality is that everybody should do his or her part to create an environment in which change is possible. The suppliers of the infrastructure and the actual energy user need to be involved, as well as the people who prepare quarters for the issue. It requires a change in behaviour by governments, companies, and organisations, *and* by ordinary people: citizens. Therefore, in DecarboNet we look at the role of a *change agent,* a person or organisation who acts as a catalyst for change, and we focus on including the *end user*, the person actually having to change his behaviour in favour of the cause, in the design process of enabling environments for change. We try to answer the questions: How will people not only to share concerns, but also act upon them? How do we turn an ordinary citizen into a conscious and active citizen?

In this process of enabling change Waag Society's Users as Designers philosophy is leading [Djik et al 2011]. We want the *change agents on climate issues* to immerse themselves in the world of the user, and include the user in the process of designing these environments, to really understand what the needs and obstacles are, and what is a realistic ambition.

In order to help *change agents* reach and understand those *end users* we looked beyond the environmental studies done so far. In this report we compare, combine and explore various models and theories, from different fields of research, to construct a framework for a 'decarbonisation methodology' that could inspire behavioural change.

1.3 Scope

Understanding the mechanisms that govern behaviour with regard to energy use, and foster changes towards conservation, has been the topic of investigation in the domain of social and environmental psychology, in computing technology, and in interactive design. Understanding behaviour and its change in general is widely discussed in many studies in marketing and advertising. Disseminating ideas and engaging people via social media are also relevant to consider in this context. Therefore, this report combines tactics from recent and popular studies in marketing, communication and the use of social media with those from the environmental and technical studies mentioned above.

The goal of the methodology presented in this report is to provide handles to gage the levels of awareness, engagement, and willingness to change behaviour - and to influence these levels in favour of the cause by introducing strategies and tactics for interventions. We start by outlining the process of creating the methodology. Then we introduce the methodology for designing enabling environments itself; 'the decarbonisation methodology'. The following

chapters will be dedicated to abstracts of the three types of studies that we have performed in the project to help shape and validate this methodology:

1. The *literature study* helps gain insights on tested and tried methods to initiate behavioural change. We first dissect the working of awareness, engagement and behavioural change, on general topics. Next we present additional results of specific studies on intervention strategies aimed to change behaviour related to energy use.
2. We complement the literature study with *context studies* performed at Knowledge Media Institute of the Open University, Waag Society and WWF Schweiz. These were local and situated studies, involving actual users, in which perception of consumption and possibilities for behaviour change are being discussed.
3. The *case studies* are put in place to test and validate the insights following the literature and context studies to improve (tools related to) the methodology iteratively.

The construction of this report is visualised in the following diagram.

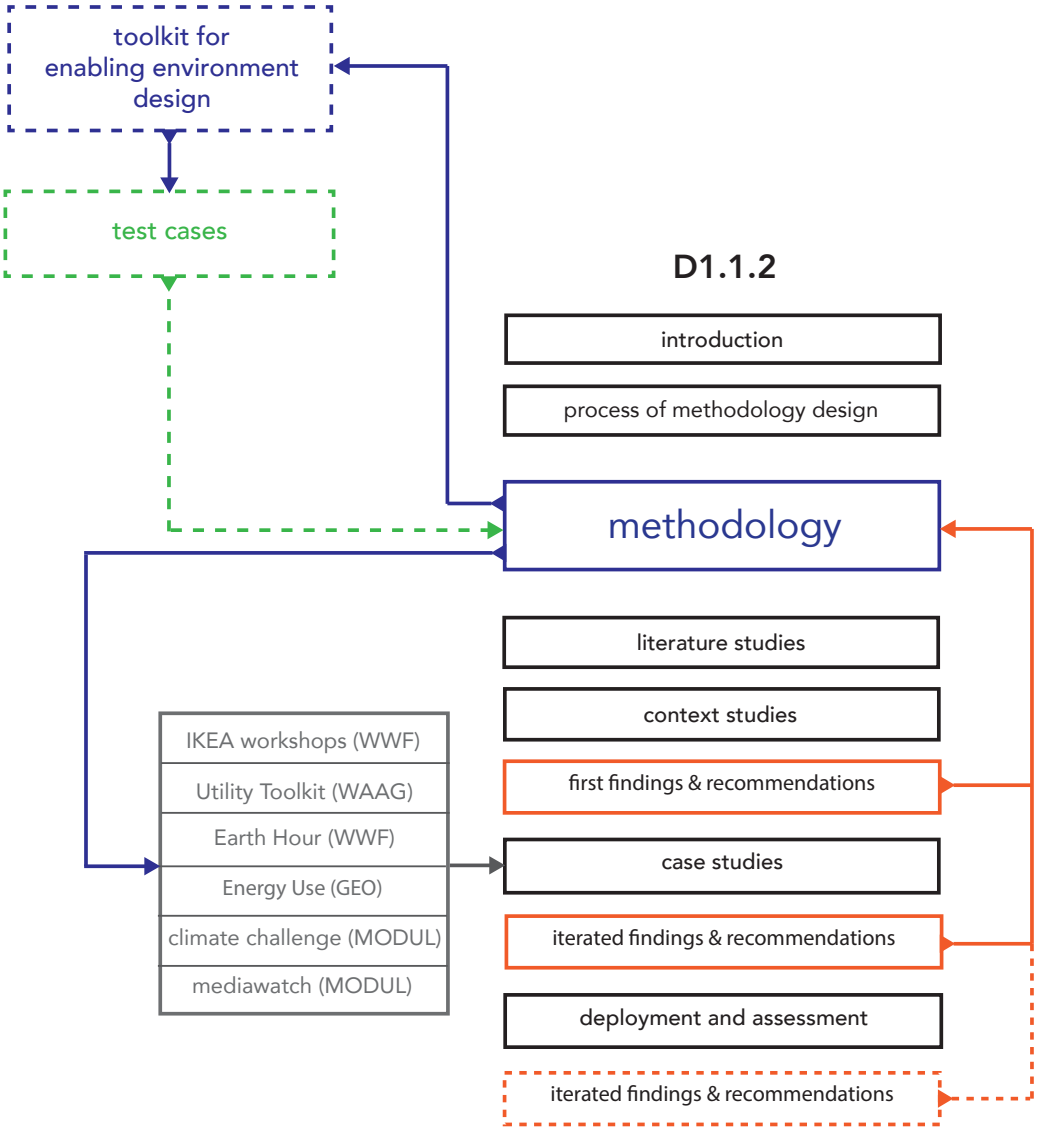

Figure 1: Report construction

2 Process of methodology design

At the start of the DecarboNet project it was stated that the research and experiments would lead to a 'decarbonisation methodology' that would be an evolving repository with techniques for influencing behaviour, and the strategies for applying and activating them to trigger behaviour change. It was also stated that this repository and methodology would be continuously evaluated and refined throughout the project.

Because of this iterative nature of methodology development, there is a significant difference between the D1.1.1 and D1.1.2 versions of the methodology. In between the two deliverables numerous experiments have been performed and various intermediate versions of the methodology have been shared among project partners to continue to improve and fine-tune the findings. At times literature research was leading; at other times the experiments and case studies took precedent. New experiments, research and experience resulted in updates, alterations and adaptations of the methodology. The version presented in this deliverable contains the latest insights.

We have attempted to develop a hands-on methodology that can help technical developers, stakeholders and change agents to design enabling environments for behavioural change for and with the end user (in mind). We have decided, following the experience of project partners and the findings in the research, that the general methodology should be supported by a set of tools and methods: a *toolbox for enabling environment design*. In the remaining time of the project this toolbox will take shape. We want to stress that, like the methodology, this toolbox continues to be open to improvement, even after the project ends.

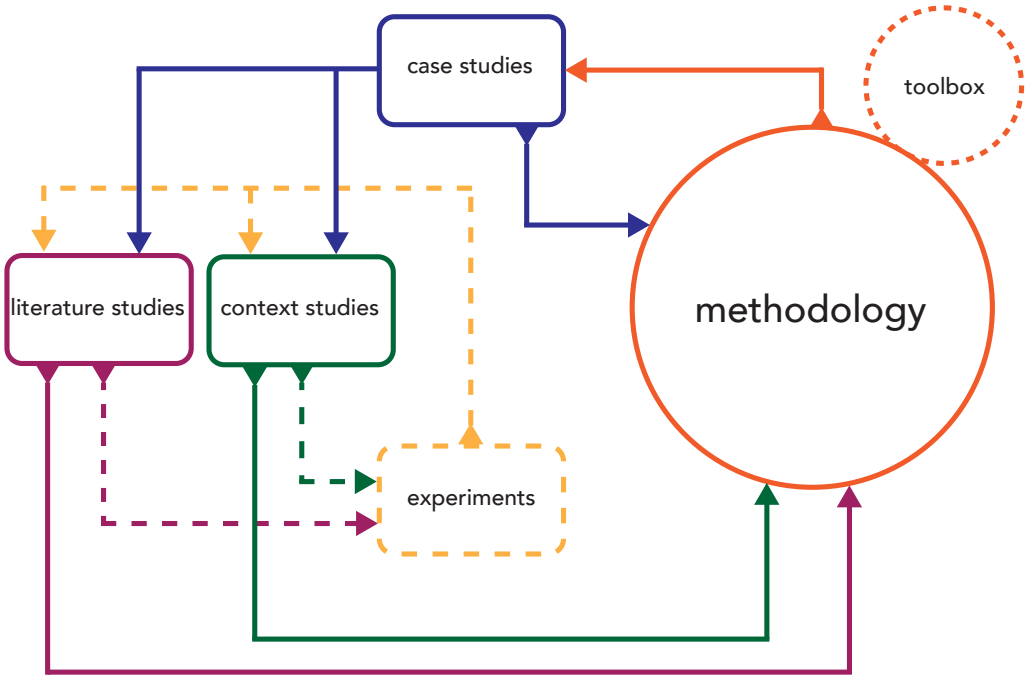

Figure 2: Methodology design

3 Methodology

Many researchers and experts have developed useful and smart models and tools to help understand the difficult task of changing behaviour. Some models overlap, some complement each other. Following our research in literature combined with our findings in the context and case studies we found that in most instances a combination of these models is most effective. Therefore, instead of creating yet another method, we have tried to create a general framework, based on the Users as Designers philosophy, where these existing methods fit together, and can be used complementing each other.

The parts of this framework have been tried and tested during the course of the project, in various iterated versions. As was stated in the previous chapter we now present the most recent insights for the methodology – which means that terms used in this current version might differ from the ones used further along in this report, when discussing the research leading up to where we are now. This framework continues to be improved during the remaining project period (and beyond that time) with results from experience with users, case studies and field research.

3.1 Creating enabling environments for change

'It's a delusion we can change peoples' behaviours. Instead, people change their own behaviours. Our role is to create an enabling environment and provide opportunities for people to become inspired by what their peers have achieved.' [Robinson 2011].

Les Robinson (The Guardian, 2011)

The *user* is always in charge of his or her own behaviour. This might be the person in need of behavioural change, and should therefore be heard. When it comes to changing behaviour, the *change agent*[1], a catalyst for change, is the second relevant party. We have noticed that in existing models, the perspective between these two parties often switches, in between stages. When *user* and *change agent* are the same person (which can happen), it shouldn't matter, but more often they are two separate parties. In lieu of clarity we tried to separate these journeys. And with that we developed a framework that can help *change agents* (or technical developers or stakeholders)…

… design enabling environments[2] for behaviour change for and with users.

As we present essentially a methodology for co-creation it requires a flexible and adaptive mind. No situation is same, and new tools and methods continue to surface every day. Improvisation and experimenting are at the core of it, and that takes practice.

[1] Change agent: a person or organisation with a message, with a solution to the 'problem' that is caused by human behaviour.

[2] 'Environment' in this context would include both physical and/or digital or non-physical environments. It is anything in the habitat of a user that could influence his or her behaviour.

We have purposely decided to describe a more general methodology that is not solely focussed on behavioural change in relation to energy use, to have a more durable application. However, the trails that have been performed thus far to support the methodology were mainly trials on energy use.

3.2 Three steps

The framework we have created contains three basic steps. Below we describe the *three steps* towards the design of enabling environments for behavioural change. Before embarking on these steps, it should go without saying that a general idea of a goal and subject (in relation to a change in behaviour) should be articulated. For example: '*We want households to reduce their energy consumption*'. Keep in mind that such a goal could represent a lot of different behaviour – that could be different for each target audience.

There is some linearity to these steps but we do encourage revisiting steps, as next steps could give new insights into the previous one.

Step 1: User journey to change behaviour

For any situation that involves behavioural change, there is a targeted audience. The focus can be on a (general) target audience or on a specific person/group. In either case, a better understanding of the intended user (group) is necessary to work on a strategy for the environment design for that particular user (group).

> An example of a defined user (group) might be '*young, low income families*' (general definition of a type of user) or '*the Hansen-family from Middelburg'* (a specific user).

Besides knowing the user, it is essential to know how much a user is inclined to change behaviour. Following the work of Les Robinson, the empirical research of project partner GEO and our field research we constructed a first model on which the state-of-mind of the targeted user can be mapped. It shows the level of susceptibility of the user to changing his behaviour in favour of the cause presented, on a very practical level. The user needs to have gone through all the stages of this model to successfully change his or her behaviour.

We have defined these stages as *learn, engage, situate, change* and *continue*. The first three stages are about getting ready for behavioural change the last two are about the actual change and continuation of that behaviour. The model is primary meant for mapping, for gaining insight on the user's position, and possible compare a 'before-and-after' in the behaviour (to see the effect of the designed engaging environment). It is not a tool for change in itself. It gives the first handles for an attainable strategy to change behaviour. It also provides insight into how many stages a user needs to go through before he would actually change (and maintain) his behaviour on a specific topic. This helps in the design of the environment and the focus of the interventions.

How to use: user journey to change behaviour

This model is meant to map users that have some relation to the topic (either forced or voluntary). These are the stages:

The first stage describes a user that knows about a cause and could develop a general interest. This user is able to ***learn*** in a very minimal way by registering information. This passive involvement with the cause, from the user's perspective.

When a user takes a more active position towards the cause he ***engages***; he is a little bit more involved. He knows what he can do about the cause more specifically, knows about specific behavioural changes and understands and communicates about the topic himself.

The moment a user is able to ***situate*** the cause to his own context, he knows what his abilities or limitations to making a change are, and what particular changes are achievable in his situation. He looks for opportunities that might fit his situation.

Once the user is fully prepared - has all the knowledge and prerequisites to act - he can ***change*** his behaviour; acting in favour of the cause. This would mean the user acts on the opportunities created for his situation.

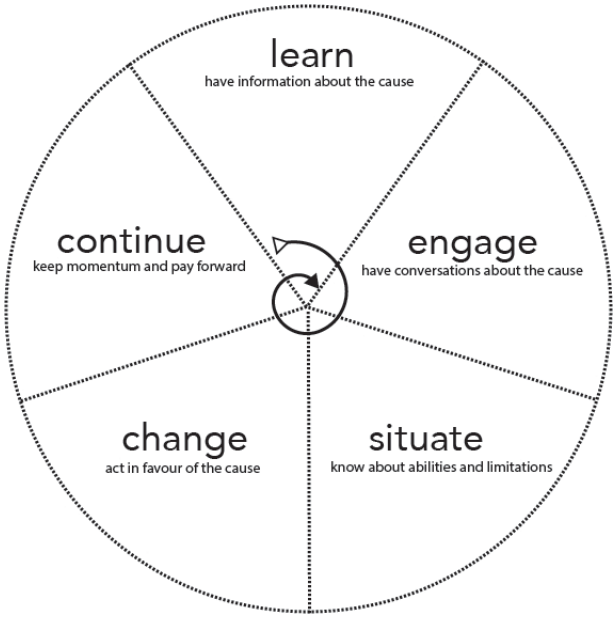

Figure 3: User journey

And finally, very important, the user not only needs to change his behaviour once, he needs to ***continue*** the change. Maintaining behaviour, making it a routine, is the most challenging part for a user. The environment needs to be in such a state that falling back to old behaviour is not possible, or at least difficult. This mean the user really needs to be dedicated to the cause.

Ideally a user will get to the ***changing*** behaviour stage, and then ***continues*** to ***learn*** more and inspire others to do the same, by which moment the cycle could repeat itself.

The young, low income families (or the Hansen-family) might not have any knowledge about energy reduction, how to go about it, why it is important, and most importantly; what it might mean for them. When a user is oblivious to the cause, he needs to be made aware of it first, then aware of what to do about it and situate it in his own reality. After that he could be stimulated to change his behaviour. The motivation for wanting to act on the change

Knowing at what stage a user is, helps to determine which environment(s) you need to (re)design to get to that change of behaviour. A person that is unaware of a topic will not respond to a call to change immediately, but maybe he will be inspired to learn more. Once a person is in the middle of change, he is not the most susceptible to new information on other topics, but is most likely open to suggestions for continuation of the change. It is all about

timing, and taking the right steps towards change at the right time. Once it is determined what a *user* needs to make a change in behaviour, it is up to the *change agent* to facilitate an environment where change is possible and inspiring, ideally with the help of the user.[3] For one user it might require more effort and steps than for the other.

To be able to say something conclusive about this position of the user, you need some tools and methods to properly extract this information. This can't be done based on assumptions.

Throughout the project we have been working with a variety of (co-creation and human centred design) tools like values trees, mapping tools, various interview techniques and design sessions[4] to get to know the target audiences for our trials. To share our experience with these tools, we will include them in the (upcoming) supportive *toolbox for engaging environments design*.

Step 2: Select intervention strategies

In the course of the project we have investigated and tested various intervention strategies that could stimulate behavioural change, particularly on energy use, when introduced under the right circumstances. These are still very broad strategies that can be executed in various ways. The most effective introduction of these strategies is a combination of multiply strategies, presented in a custom designed environment.

When there is a clear idea of the state-of-mind of the user, both in his susceptibility to change, and in his interest in the subject, it is easier to determine what type of intervention strategy should form the basis of the enabling environment design.

Our Hansen-family in Middelburg seem to know about climate change, believe that it is real, and are willing to act upon it. Since their budget is limited, they fear that the changes that they could make, are minimal, and therefore barely contributing to the cause. They are not home-owners so they are dependent on the surroundings their landlord provides them. They talk with friends and family about climate change and ask people about their actions – but so far they seem to think that all suggestions are not relevant for their situation. They know some of their limitations, but they are not aware of their opportunities. Looking at the user journey model you could place them in an advanced stage of 'engage'. This would mean that they should be stimulated, by using the intervention strategies, to move to the

[3] We describe the change agent as a separate entity from the user because of the role in the process of behavioural change. However, a user can be a change agent too.

[4] These tools have been discussed in various previous deliverables, and are in, in short, also mentioned in the research further along this report.

Below we present the list of thirteen intervention strategies that we have compiled following the research and findings in context and case studies.

Table 1: Selected interventions

strategy	**description**
information	The first step into getting people aware and acting upon a cause is to have information about the subject ready. The way the information on a subject/cause is presented and provided is an important factor: it needs to be easy to understand, easy to remember, attractive, and presented at the right place and time.
public commitment or pledging	Facilitating a public pledge or promise to do something helps people commit to a cause. This is usually associated with a specific target (of reduction). Both the type of commitment and the person or group to whom the commitment is made, are factors that impact behaviour. Pledging, next to declaring 'public commitment', could bring a set of individuals together to act toward a common goal. Making actions public and visible gives people reason to imitate - and with that comes social currency (people want to be part of something).
Goal-setting	Goals can be established by users or by third parties (like utility companies) to keep a cause on top of mind. It is person-based instead of focused on the social environment. These are practical and attainable solutions. A more challenging goal is usually more effective, however, a goal should remain feasible otherwise people will easily abandon their commitment.
Triggering discussions	Exchanging ideas and freely expressing opinion are important ways to raise awareness collectively. Debating (online) is a promising strategy for engagement. Intriguing dilemmas may trigger discussions.
Informative feedback & tangible insights	Factual feedback could include different levels of information (e.g., immediate feedback, consumption over time periods, the possibility to navigate through aggregated periods, etc.) and could come in multiple shapes and flavours including personalised energy bills, smart meters, in-home displays, web, mobile for interactive TV applications, etc. Tangible insights, concrete results or physical representation make feedback more relatable.
Social feedback	Social feedback covers all types of social context for comparison and discussion among peers. It is about giving people reason to showcase or elevate their social status, and interact in a playful way. Both offline and online social contexts can be considered.
Collaboration & collective motivation	Collaboration between users aims at aggregating efforts to reach a bigger achievement. Interaction also improves social currency, since it creates a sense of belonging. When a group commits to something

	the social pressure supports the motivation of each individual in the collective.
Competition	Competition could inspire people to want to do better than others and work harder on their change. People like to compare themselves with others, to determine their place in a social context. The competition needs to be between parties that respect one and other in some way. Without that, a user is not interested in comparison. Playful (gaming) elements prove to be great motivators for continuation of change.
(Variable) rewards	Rewards provide extrinsic motivations, usually with the intent to promote short-term behaviour change. Making rewards variable improves the willingness of a user to continue behaviour. People have different reasons to want to change their behaviour. Rewards should be in line with these reasons. The reward needs to satisfy the users but also leave them wanting.
Incentives	Incentives are less concrete rewards, mostly aimed at starting and continuing behaviour. These could be long-term rewards, particularly associated with the cause itself, or for the 'greater good'. Acknowledgements of positive behaviour may already promote the behaviour.
Personalisation	Personalisation is based on studying (the consumption of) individual users and households and providing them with tailored recommendations that fit their own patterns. Also, the more an approach is based on the values and interests of a user, the more effective it is. Their reason to act might be different than a change agent might think (or want).
Emotional involvement	Promoting behaviour change cannot solely consider rational choices driven by for example financial situations or benefits for the environment. People need to feel comfortable to evaluate and discuss the trade-off between cause choices (in this case environmentally friendly) and individual values, such as comfort, security, and so on. This can inspire commitment through emotional engagement.
(Technological) learning tools	The help users get insight in their own behaviour, (technical) learning tools can prove to be supportive. For energy use, monitoring tools can help people understand their own situation and can give them handles to act in favour of the cause.

Following the research in step 1, the Hansen-family in Middelburg seem to be in need of insights into their own situation, there use of energy, and how they live with in their given surroundings. And they need to get these insights without much interventions that would cost them money. 'Learning tools', that provide informative, personalised feedback could be an approach – as long as these tools are provided without their own investment. Providing 'information' on similar households could suffice, as long as it is somewhat 'personalised', or 'triggering discussions' between similar households could give new insights.

Additionally, they need to know in what ways they are limited, but also in what way they have influence on their surroundings, and with that opportunities to change. They need to know and feel that they can make a difference. The strategies that could be employed in this instance could be improving the 'emotional involvement' and introduce 'rewards' or 'incentives'.

Once the family has travelled from 'engage' to 'situate', strategies like 'competition' and

Choosing combinations of intervention strategies are encouraged.

Step 3: Design enabling environments for behavioural change

As we have stated earlier, there is no one-size-fits-all solution for enabling change, since there are so many variables in each new context. Even when intervention strategies are selected, there are still a thousand ways to implement these strategies into an environment to facilitate change. Up until now we have discussed a more abstract (and analytical) approach, that we have been able to try and test in the course of the project, in various iterations.

This last step is our proposal to go beyond the analytical approach and help change agents transform the abstract strategies into concrete tactics. This follows the expertise of project partner Waag Society on *human centred design* and *design thinking*, the literature studies and the small insights gained during the trials within in the project.

This third step helps to determine the hands-on tools that can help design the actual environment of the user that needs change. These tools eventually will be brought together in the supportive (upcoming) *toolbox for enabling environment design*.

For guidance in this stage we have developed the mnemonic PIE, which stands for *position, identify* and *expand*. Again, it is not a tool for change itself, but an aid to design *engaging environments.* It brings attention to the specific areas that, according to our research and experience, need to be covered in the design process. In some cases, it might overlap with the work done in the previous two steps, but reviewing choices made earlier is a good exercise anyway.

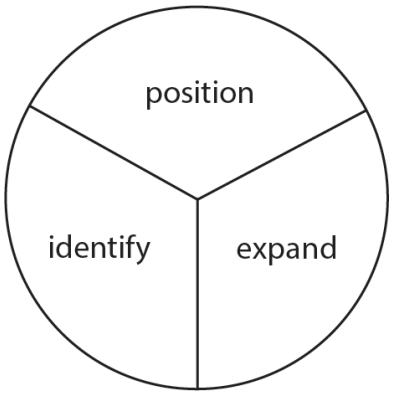

Figure 4: PIE-model

3.3 Toolbox for enabling environment design

Our ambition is to develop, during the remainder of the project, a toolbox that includes various aids for this design process, covering the three areas of PIE. These tools and methods will be presented as suggestions, not strict guidelines, as we believe that there is no one-size-fits-all solution when it comes to changing behaviour.

The tools and methods that will be included stem from a wide range of sources that we found effective and useful through the course of this project - all of them are validated by measure of effective use in past contexts. In most cases the tools and methods are supported by scientific research as well. The toolbox will also include tools and methods that have been developed within the DecarboNet project. All tools and methods that are included in the toolbox will be provided with a short instruction on how to use them, and when available, with examples of the use in context.

This toolbox continues to be open to additions and improvement, even after the project ends.

How to use: PIE and the toolbox for engaging environment design

With a user (group) in mind (or active) and intervention strategies ready, PIE will help develop concrete tactics, specifically designed for the selected user (group) and context.

The PIE model consists of three basic areas: *position, identify* and *expand* that all help define a 'story'.

There is no set starting point on this model since all areas need to be covered. However, one area can influence the content of the others, so you might need to reiterate the process a few times to get the design right.

To design an *enabling environment*, defining the ***position*** of the change agent and the cause is essential. You need to have a clear sense of what it is you want to achieve, what story you want to tell, and what type of investments are needed to get to that goal. Also having a clear sense of influencers and reach is essential in the success of the design.

Various tools and methods mentioned in the *toolbox for engaging environment design* could help shine a light on these topics, including a list of questions, which we provided in *Appendix 1* as an illustration. Answering these questions might also lead to insights on missing parts that need to be handled first, before getting to the implementation of the design. For example: if the selected intervention strategies are 'competition' and 'social feedback' but there is no connection yet between the cause and the targeted community, the first step should be establishing that connection, rather than pushing an agenda.

The second area that needs attention is ***identify,*** and with that we mean identifying the users, but also identifying *with* the users. Pinpointing the specific behaviour that needs to change is essential, but also pinpointing the specific user that has this behaviour - and what it would take to get the user to that point of change. Ideally, a general idea of this should already have been established in the first step (knowing where the user stands in relation to the cause and change), but during the actual design of the enabling environment it is good to revisit the initial findings, reflect, maybe adapt, and again include the user in the process.

Identifying the *user* includes identifying his existing environment. It means knowing about his values and his circumstances, and what ability he has to implement change. What prevents him from changing and what motivates him to act? What compels him to take responsibility for the change? The more often you work with users, the sooner you understand what type of users need what type of nudging to share information about their life and circumstances. Revisiting the *user journey model* could be helpful, but also using some of the suggested tools and methods in the upcoming *toolbox for engaging environment design* (for example the values tree, creating persona's, co-creation sessions, etc.), as well as answering some of the questions in Appendix 1. This identifying process might also give new insights on the position of the change agent or the cause. A clearer sense of the user might mean that you can specify the goal more. You can always re-*position*.

The final area, ***expand***, is about the continuation of the behaviour, and creating the circumstances to do so. The goal is that the newly adopted behaviour is sustainable. This means the user should be continuing the change; preventing himself from falling back into old habits, and also continuing in the sense that he could inspire others to change. This needs to be part of the enabling environment from the start, not added later as an afterthought. An enabling environment is only that, when it continues to be enabling. Since humans are beasts of habit, the only way to beat the habit is by paying constant attention to the circumstances of the change. This means an adaptable design of the environment might be necessary to keep it relevant with incentives, rewards and storylines.

At same time it is important to realise that a user who has changed his or her behaviour becomes a new type of user - who might need to be addressed differently. Incidentally this user could also be a medium to inspire the behaviour in others as well. So what could be done to continue the behaviour with the existing user, and how could this user be transformed into a new change agent, ambassador or inspiration? Questions that can help, can again be found in Appendix 1. Expanding the change could prove to be the most difficult task, and it is often overlooked. Particularly tools focussing on storytelling, can help with the design of an environment that has consideration for the future of the behaviour.

The three steps summarised:

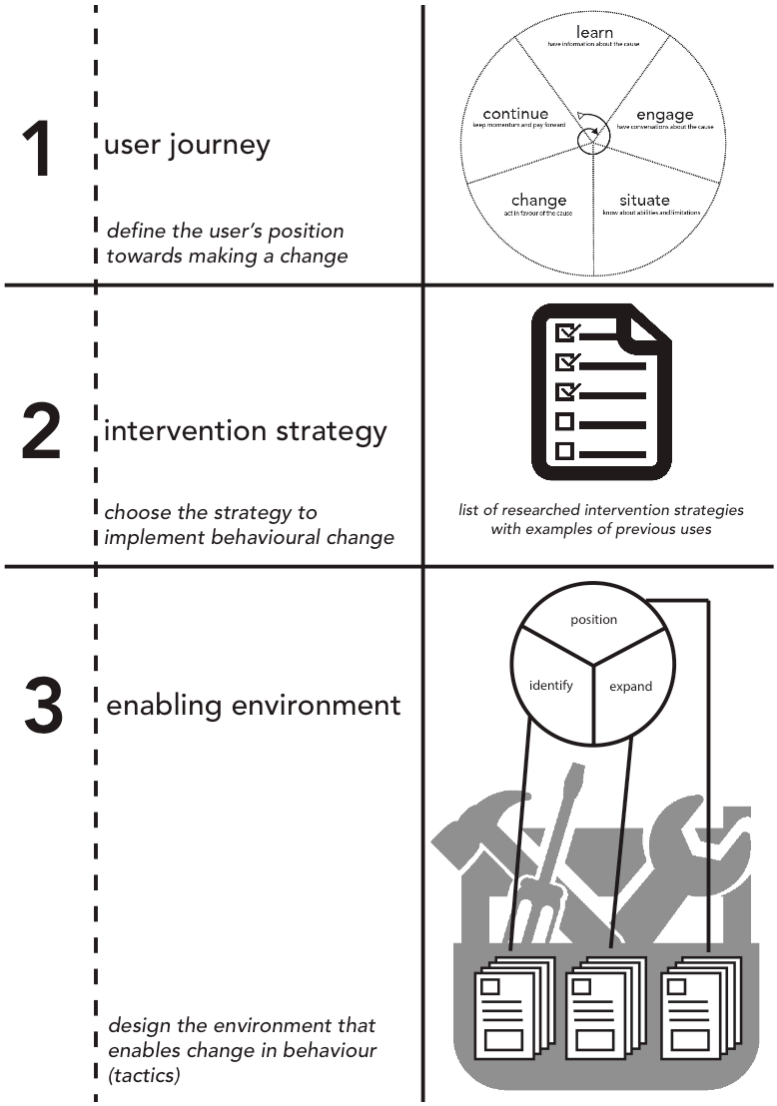

Figure 5: 3 steps summarised

4 Literature studies

This chapter covers two areas; first we focus on theory related to behavioural change in *general*. Second we highlight the findings from research on behavioural change specifically related to *energy use*.

To investigate the universal obstacles one might face while trying to achieve behavioural change on energy use, we needed consider 'social epidemics' in general; *instances where products, ideas, and behaviours diffuse through a population* [Berger 2013], with or without the use of (social) media. What we wanted to know is why some ideas 'caught on' and eventually, why people changed their behaviour in favour of that idea. This chapter is constructed following that though process. Earlier research on behavioural change [Ajzen 2016] and the original project description guided us towards five general areas of attention:

- people need to have the knowledge and tools *(awareness*) to act differently than before,

- feel motivated to change (*engagement*),

- are aware of their existing behaviour (*habits),*

- create new routines (*change behaviour*) and,

- stick to those routines (*continue behaviour*).

All are depending on some form of communication that gets people motivated to act. We investigated the journey through these stages of campaigning, storytelling and inspiration.

In this, we assumed that social media have great potential in providing information, awareness, and reaching wide audiences. We do want to disclaim that since social media are quite dependent on rapidly developing technologies, recommendations and findings might be out-dated quickly.

4.1 Towards behavioural change

Investigating behavioural change theory, we found two main approaches: models of behaviour and theories of change. Models of behaviour can be applied to understand specific behaviour and identify factors of influence, mainly at the individual level. Theories of changes, instead, explain the behavioural change process through social science lenses, being particularly helpful to develop interventions leading to a desired behaviour change. Theories are more generic, usually not taking into account contexts, perceptions and needs of a particular group of people. In the following paragraphs we will look into a few of the more concrete way to enable those environments.

For climate change as a cause (like most non-profit causes) there are often no, or limited, marketing budgets allocated. That is why we tried to look beyond the methods and theories that money could buy, and explore the forms of communication that are available to any person or organisation with a story to share, regardless of budgets.

Considering his achievements and experience in developing storylines for environmental causes, we started investigating Les Robinson's 5 Doors Factors.[5] He developed a generic theory that already aggregates elements from many others theories.[6] It focuses on the users' environment, and lists five conditions that need to be present in that environment for change in behaviour to be possible (see figure below).

[5] first introduced in D.4.2

[6] Robinson lists 'Diffusion of Innovations', 'Self-efficacy', 'Social learning theory', Social influence theory', Self-discrepancy theory', Self-determination theory and 'Risk perception theories' as his inspiration.

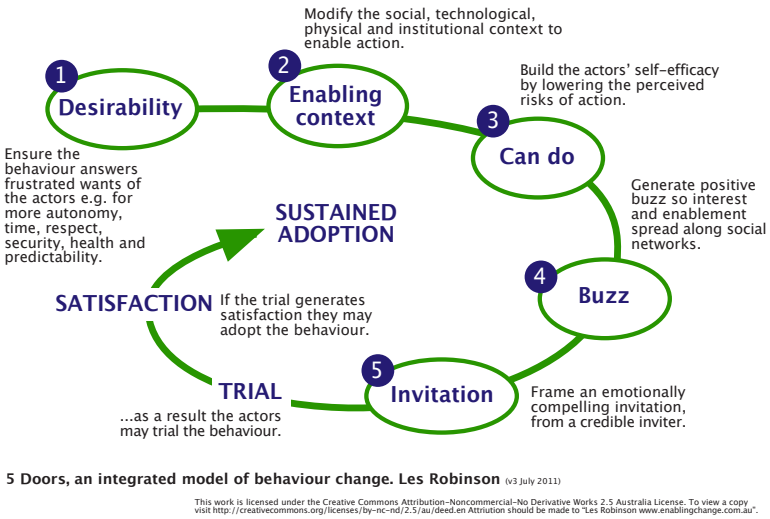

Figure 6: Robinson's stages of behavioural change

Instead of focusing on changing peoples' knowledge, beliefs or attitudes, the 5 Doors Theory focuses on 'enabling relationships between people and modifying technological and social contexts' [Robinson 2012]. It looks at 'what it takes for new practices or products to be adopted by groups of people' [Robinson 2012].

This theory shows that knowing about the existing environment of the user is crucial for the introduction of new behaviour. A more elaborate discussion of the theory itself can be found in Appendix 2. The 5 Doors Factors also have been applied in two of our analytical works.[7] In the paragraphs below we will expand the research by introducing some other theories and models.

4.1.1 Awareness

We found that *awareness* is a prerequisite for behavioural change. We do need to be mindful of the meaning of that term. Even when a person knows about a subject and has the tools to deal with it, there is no way of knowing for sure whether that person will change his or her behaviour related to that subject. A person not only needs to be aware of the subject and the related options, he also needs to know about and understand his own behaviour and options. Only then he can act appropriately.

'Knowledge is about tomorrow. In the now, we're driven by the environment we currently live in. […] environment determines our behavior to a large degree, and to a larger degree than we intuitively predict.' [Ariely et al 2014].

Considering this in the context of the DecarboNet project, *awareness* is defined as the ability a person has to access all the knowledge, tools and information about a subject, the context of a subject *and* their own context in relation to that subject. The difficulty with a subject like

[7] Case study in D 4.2 and D 4.1

climate change is that it is broad and represents a lot of smaller stories, connected to multiple behavioural actions. Like *children's rights* or *wildlife preservation*, it has a clear theme, and most people '*know* about it'. But it is not necessary clear what specific behaviour is associated to it, and what people can '*do* about it'. For behaviour to change a user not only needs to be aware of the subject, he also needs to be aware of the various stories and the options, and then feel the urge to act upon them. To have impact a clear story is essential. And there needs to be a very concrete action connected to the story.

'Your story isn't powerful enough if all it does is lead the horse to water; it has to inspire the horse to drink, too.' [Vaynerchuk 2013]

When it comes to a behaviour change story, two things are important that seem similar, but are slightly different, and therefore easy to overlook [Ariely et al 2014]:

1. *Think about the behaviour instead of the outcome.* Even though the end goal might be energy conservation, the specific behaviour is more in line of 'switch off the lights when you leave a room'.
2. *Think about the details instead of the big picture.* If you communicate the end goal on the horizon, you still need to be specific about how someone could get there.

4.1.2 Social transmission: word of mouth & social influence

Marketing professor at The Wharton School (University of Pennsylvania) Jonah Berger, claims that focussing solely on *quality, price* and *advertising* won't make something catch on per se. They do make most ideas or product more popular than others, but they don't explain the whole story or even always influence the story. Berger illustrates this by considering the popularity of baby names - an occurrence in which (similar to viral videos and non-profit causes) none of the three aspects have a particular stake. Yet, somehow, some names are more popular than others. According to Berger [Berger 2013], the missing link in this is 'social transmission': social influence and *word of mouth*.[8]

'The things others tell us, e-mail us, and text us have a significant impact on what we think, read, buy, and do. […] Consequently, social influence had a huge impact on whether products, ideas, and behaviours catch on.' [Berger 2013]

Peers are inherently part of the user's environment and therefore an important motivator or inspiration for behaviour. Offline *word of mouth* (WOM), includes face-to-face and phone conversations, online *word of mouth* (eWOM), includes blogs, user forums and social media. We go further into detail about the workings of Word of Mouth in Appendix 3.

When it comes to decisions on a purchase (which is a behavioural action) 20 to 50 percent of the time *word of mouth* has been the primary factor [Berger 2013]. Not only is word of mouth *more persuasive* than traditional advertising (people tend to trust their peers' opinions over advertisers) but it is also *more targeted.* Information is naturally directed toward an interested

[8] 'Word of mouth' (in the context of the report): the things people 'talk' about with their (trusted) peers

audience [Berger 2013]. *Word of mouth* is available to everyone. People just need to *talk* about an *idea*. However, *getting* people to talk is not easy.

4.1.3 Social media

For the last few years, many campaigns have been divided into three categories: traditional, digital and social media [Vaynerchuk 2013]. The latter is still rather difficult to master because it requires a significant amount of time and effort. The value of online word of mouth (eWOM), which includes but is not limited to social media, is often overestimated. It is easy to see and measure, yet only 7 percent of *word of mouth* happens online, and that number is even declining. *Offline word of mouth* is not only more powerful; it is also more present in the direct environment of users, and therefore has more impact on behaviour [Meuter et al 2013]. When we do want to utilise this 7 percent of *word of mouth*, we need to consider both the social media algorithms and the story on display.

All social media function on the principle of 'sharing' (a thought, a photo, a link, etc.), but each medium has a different way of displaying a story. An easy mistake to make is to adopt the same tone of voice on every social media platform [Vaynerchuk 2013].

A storyline needs to be present at all times to have some visibility, since social media are present twenty-four seven. The user has the power, not the 'advertiser'. So it is not enough to have clear content. Context (which platform? what is happening in the world?), timing (what are the circumstances?) and most of all the audience (who are they? when are they active online? what are they talking about? how are they called to action? etc.) need to be considered when using social media to the most advantage [Vaynerchuk 2013].

Each platform has a different way of showcasing content and has its own algorithms, like Facebook has EdgeRank. In this an 'edge' is every interaction a user has with the platform. EdgeRank takes into account which edges are most interesting to the most number of people, and it considers the type of engagement a person has with specific types of content produced by other users or 'brands'.

'The numbers on this are frightening. […] only about *0.2% of eligible stories make it into a user's newsfeed*. That means that your status update is competing with 499 other stories for a single slot in a user's newsfeed.'[9]

People's behaviour in the offline world (making a purchase, donating money, turning the lights off, etc.) is not something these algorithms can measure, but the various social media try to achieve that anyway, by constantly tweaking the algorithms [Vaynerchuk 2013]. This means that content that is visible today, might not be considered the same way tomorrow. An 'advertiser' therefore constantly has to pay attention and adapt to the specific factors that determine value on that platform.

[9] EdgeRank.net

There is no fixed blueprint to be given for storytelling on social media since they are in constant flux. Social media expert Gary Vaynerchuk did however summarised six rules for what he calls 'outstanding social media content'. Although these 'rules' are aimed at brands that most likely have a well-financed advertising department they could also serve as a starting point for non-profit campaigning. An overview of these rules can be found in Appendix 4.

The main message here is that social media are at their core technologies, or tools, not strategies. Word-of-mouth marketing is effective only if, following a story, people have actual conversations, and have to think about what they are talking about [Berger 2013, 12].

4.1.4 Catching on

Whether word of mouth is happening online or offline, 'contagious content' is a requirement - content that is so inherently viral that it spreads regardless of whom is doing the talking [Berger 2013, 14]. Berger claims that virality isn't born, it's made [Berger 2013, 18]. With that he means that there are many factors in a story that you can manipulate to enhance the possibility of something getting viral.[10] This does not mean, however, that it is easy to get it right. It is not sheer luck that makes a video, an idea or campaign catch on, but is not simply done either.

Berger and his colleagues at The Wharton School of the University of Pennsylvania, analyzed many viral campaigns, messages, products and ideas, and concluded that, for the most part, six principles of contagiousness (likely to spread) via *word of mouth* and social influence could be defined:

1) social currency (effects of social status, looking good in the eyes of others),

2) triggers (stimuli that prompt people to think about related things),

3) emotion (making use of the feelings users have),

4) public (visibility makes it easier to imitate),

5) practical value (sharing something useful) *and*

6) stories (vessels to stowaway information in, like Trojan horses).

These principles would be applicable to any type of content (news, information, products, ideas, etc.). When one or more of these six key STEPPS (abrv.) are present in a campaign, it increases the likelihood that it will be talked about, shared, and imitated. In Appendix 5 we elaborate on these STEPPS. Underneath all this lays the motivation of a user to participate. Why is a user willing to do what you want them to do?

[10] 'Viral', in this context, is something that is more likely to spread from one person to another, regardless of whether it eventually generates a long chain or "infects" an entire population. Berger, J. 2013. Footnote p6

4.1.5 Situate

Human behaviour is often lead by old habits, deeply engraved in the unconscious mind. They are difficult to adjust, even when the 'new' habits show a significant improvement in, for example, comfort, efficiency or even pleasure.

'Even when we change our routines, neural pathways remain etched in our brains, ready to be reactivated when we lose focus.' [Eyal and Ryan, 2014, 26 - referring to Duhigg, Ch, 20].

The most recently added habits will fade away the soonest. This part of human nature is precisely what makes it difficult to change, and maintain that change, even though people have the information and ability to act differently. For new behaviour to take hold securely, there is essentially only one rule: repeat, repeat, repeat.

Habits also instigate loyalty to a product or to a way of living. Eyal and Ryan [2014] presents the example of a Google-user changing to a Bing-interface. In order for this user to make the change, he needs to tap into his cognitive abilities to adjust to the small differences between Google and Bing. This process of adjustment, and consequently (temporarily) slowing down, will make the user feel that the new environment is inferior - even though the technology is essentially the same or maybe even better. This is relevant for all human behaviour, also in the non-technology instances. Perceived reality will influence behaviour more than the actual reality.

When the specific behaviour that needs change is selected, two factors need to be considered:

1) Frequency: how often does this behaviour occur?
2) Perceived utility: the usefulness or rewarding nature of the behaviour, compared to other solutions.

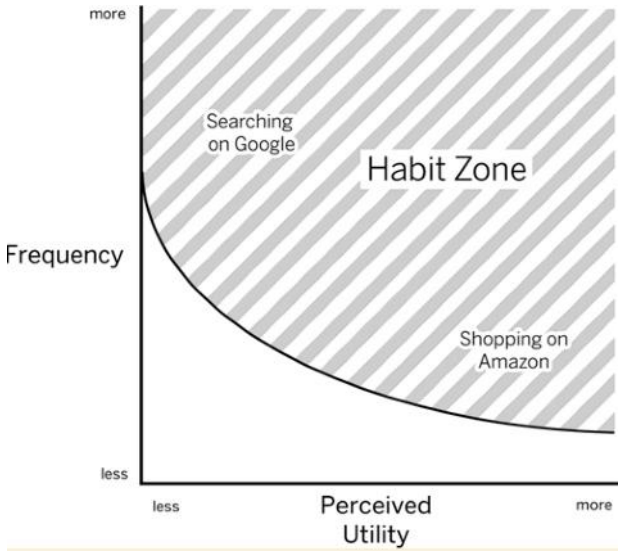

Figure 7: Habit Zone [Eyal and Ryan 2014]

If certain behaviour will occur often enough, and is perceived as useful, it could end up in the 'habit zone' [Eyal and ryan 2014], which is illustrated in the figure next. When behaviour is in the 'habit zone' it is more likely to become standard behaviour. Note that the curve in the figure never touches the bottom axis. Some behaviour will never be habit, simply because it doesn't occur often enough. On the other hand, behaviour with zero perceived utility could still become habit, if it happened frequently enough. It depends on the type of behaviour that needs changing how long it takes to shape the new behaviour, and have it take hold. Both the

complexity of the behaviour and the importance of the behaviour to the user are influencing factors for the new routines to be learned and adopted.[11]

4.1.6 Barriers to change

As mentioned in the beginning of this chapter 'knowing about' a subject is often not the main problem. But 'knowing what to do about it' is also not enough to get people to change their behaviour. People know that eating sugar and fat results in weight gain, and they know that taking the stairs instead of the elevator will keep you fit. Yet, people rarely change their behaviour for the good.

'In every area of our lives, there is a gap between what we know we should be doing and what we actually end up doing. And rarely is knowledge the limiting factor. It's something else. So what is it?' [Ariely et al 2014].

Knowing what it is that *prevents* people from acting improves the change to actually change the behaviour. Dan Ariely and his colleagues of Irrational Labs[12] study what they call Behavioural Economics: the science of why we do what we do. They admit that they don't have the definitive answer on how to influence behaviour since *there is no framework that works every time when it comes to the human mind* [Ariely et al 2014]. But they do give useful guidelines, based on their experience and extensive research in social and behavioural science.

Ariely and his colleagues actually used the case of global warming as an example, and used the sub-behaviour 'reducing energy consumption at home', for their systematic approach following the question: *How can we make people act as if they care about the future of the planet?*[13]

There are four scientifically proven barriers that prevent people from taking action.

1. *There is friction.* Changing behaviour, however small, always meets resistance. It is always easier to keep doing what you are doing.
2. *The pain of acting now overshadows delayed benefits.* People are short sighted when it comes to their actions. Immediate pleasure or comfort almost always wins from the positive results in an undefined future.
3. *We don't think about the benefits at the right time.* People forget that small decisions might add up to big results.
4. *People don't agree it is a good idea.* A lot of improvements for good meet some controversy at first.

Ariely et al. identified various small obstacles such as adjusting the thermostat for a time of day, season and temperature and remembering at the right time to do just that. These things

[11] Interpretation Eyal in 'Hooked' (31) following Lally, van Jaarsveld, Potts, and Wardle.

[12] http://irrationallabs.org/

[13] Summarisation of Ariely, D, J. Hrera and K. Berman. 2014. 1: 8 - 12

were considered a burden, which *causes friction*. The friction in here is identified as knowing when to adjust the thermostat, remembering to do it, and actually doing it. The environment that needs to be created should reduce the friction - which might mean introducing a software-based thermostat for example. Additionally, global warming is considered a vague, abstract problem, and people feel that the consequences of it are still very far off. They brush their inaction off thinking that one person's action can't make too much impact in this issue. *The pain of acting now overshadows delayed benefits* [Ariely et al 2014]. As mentioned before; knowing about it, and knowing what to do about it, are beneficial to the cause, but it is actually knowing when to act that makes all the difference.

'For our global warming problem, this means we should work on making the benefits clear at the moment of the decision rather than hope that people will remember at the right (or later) time.' [Ariely et al 2014]

And unfortunately there are still people that won't believe the cause is real. That means that you might have to change your tactic, depending on what the goal is you want to achieve.

'If people don't believe that global warming is real, then we'll need to find other benefits to tie to the desired behaviour. This is called reward substitution. By creating a new benefit and removing the focus from the behaviour itself, people are more likely to perform the desired behaviour.' [Ariely et al 2014]

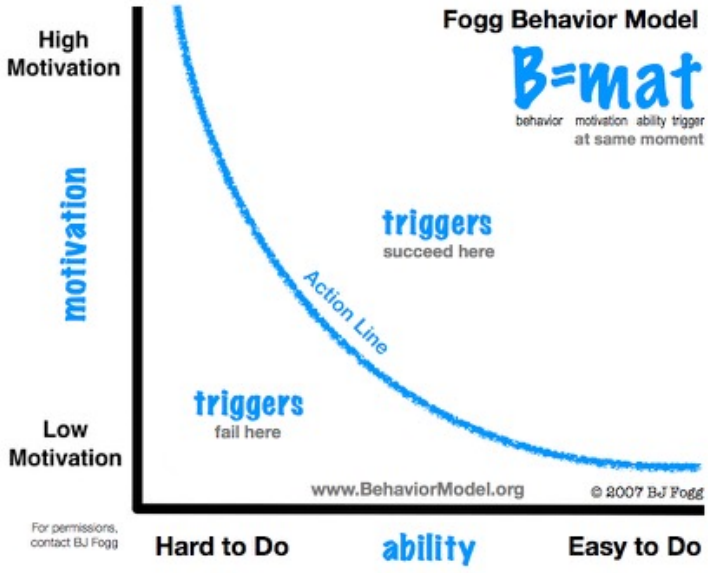

Figure 8: Fogg's Behavioural Model

4.1.7 Change and sustain

To change behaviour personal values and motivation factor as much as knowing the issue and having the ability and tools to act. Following earlier models like the ELM[14] and the Theory of Planned Behaviour [Ajzen 1985] B.J. Fogg (Persuasive Tech Lab, Stanford University) created a model in which these requirements are brought together.

[14] Elaboration Likelihood Model – [Petty & Cacioppo 1986]

The model is based on the presence of three factors[15]:

1) sufficient motivation,
2) sufficient ability and
3) an effective trigger.

If one of these factors is lacking, there is no change in behaviour.

According to Fogg every human being is motivated to strive for pleasure, hope and social acceptance and avoid pain, fear and rejection. Fogg defines three core motivators: *sensation* (pleasure or pain), *anticipation* (hope or fear), and *belonging* (social rejection or acceptance). When something increases the chance of the positive, and/or decreases the chance of the negative then there is *sufficient motivation.*

The *level of ability* is determined by elements of simplicity. To increase a person's ability to act, ideas have to be simple. Fogg defines six elements of simplicity that all relate to each other. If a single one is defined too complicated, there is no ability. These elements are:

1) *time* (how long will an action take),

2) money (what are the financial consequences),

3) physical effort,

4) brain cycles (the mental exertions necessary),

5) *social deviance* (the amount of acceptance in the social environment) and

6) *routine* (how much an action fits in or disrupts an existing routine).

Simplicity differs per person: it is a function of a person's scarcest resource at the moment behaviour is triggered. That particular resource needs the most attention.

Triggers are there to kick-start behaviour. A user needs to be reminded of the behaviour (or the change of it) in order to act. Fogg lists three types of triggers that are most effective to use, depending on the targeted user's context: *facilitator* (the user is highly motivated, but has little ability), *spark* (the user has little motivation, but a high ability) and *signal* (both highly motivated and able).

Nir Eyal researched the stages users go through in order to change their behaviour in favour of a product. His research, based on Fogg's requirements, resulted in one of the most used models in Silicon Valley for the development and communication of behavioural changing technology; the Hook Model. It describes four stages of changing behaviour: *trigger*, *action*, *variable reward* and *investment*.

The *trigger* is similar to Fogg's description, yet Eyal makes the distinction between internal and external triggers. The latter are ones that a change agent can use to alert people to its presence in their environment. Internal triggers manifest automatically in a person's mind.

[15] BJ Fogg's Behavior Model. Consulted August 12th 2015.

These are the ones active when a habit is formed. The trigger should lead to an *action*. And for that to happen it must be easier to do than to think.

Figure 9: Hook Model [Eyal & Ryan 2014]

'Influencing behavior by reducing the effort required to perform an action is more effective that increasing someone's desire to do it.' [Eyal and Ryan 2014].

The mental shortcuts people take to make decisions and form opinions should not be underestimated. People often make decisions based on limited amounts of information, or limited access to information. Berger also mentioned this; when it comes to the psychology of decision-making people actually don't reference things in absolute terms. For example, the (illusion of) scarcity, unexpected contexts, (the suggestion of) discounts, or (a semblance of) progress, could all be employed to help users take action.

In the stage of *variable reward*, the change agent rewards users by solving a problem. This reinforces their motivation for the action taken in the previous stage. Variety in rewards holds the user's attention, by introducing an on-going degree of novelty. Eyal describes three types of rewards: *the tribe* (social rewards, driven by the connection with other people), *the hunt (*the search for resources and information) and *the self* (intrinsic motivation). The reward needs to satisfy the users but also leave them wanting.

And finally *investment* increases the likelihood of users returning to or continuing behaviour. Investments are about the anticipation of long-term rewards, not immediate gratification and it is not (only) about financial input. It implies an action that improves the experience the next time a trigger comes around. These actions in turn can make the behaviour more engaging, easier to assimilate and more rewarding. In this context the following principles apply:

- People tend to irrationally value their own efforts higher than others'. So when people actively improve something themselves, it is more likely they appreciate the change.
- Previous behaviour influences current behaviour. Big changes are not easy, but when a small change is made, people are more likely to adopt a bigger change (in the same context) later on, than when people are asked to make a big change at once.
- People have a tendency to change preferences to avoid *cognitive dissonance;* the irrational manipulation of the way one sees the world - like actively conditioning yourself to like beer or coffee.

'Altering behavior requires not only an understanding of how to persuade people to act […] but also necessitates getting them to repeat behaviors for long periods, ideally for the rest of their lives.' [Eyal and Ryan 2014].

Many of the resources we've consulted stress the importance of introducing ways of sustaining and maintaining behaviour. Yet still it proves to be one of the most difficult tasks to tackle.

4.2 Intervention strategies and technologies

Following the research of the different studies in the literature that aimed at promoting behaviour change towards energy conservation specifically, our aim is to provide a summary of intervention strategies that have been applied to motivate behaviour change in different sociocultural contexts (suitable to the DecarboNet main objectives) considering actions at individual and collective levels.

Some studies were included due to the wide scope of their field of study. In the social and environmental psychology domain, Abrahamse and colleagues [Abrahamse et al 2005] evaluated 34 interventions according to which factors determine an intervention success or failure. Most of the studies covered by that survey were before the era of digital and interactive feedback devices. Although the studies do not provide sufficient detail of what information has been presented and how, their findings could point to directions for designing new intervention methods and strategies.

Froehlich et al [2010] and Pierce and Paulos [2012] present a panorama of studies related to energy consumption from the human computing interaction (HCI) perspective. Paulos identifies some gaps: the vast majority of previous works were focused on the behaviour of individuals, irrespective of the recognised influence of external forces on that behaviour, and the dynamics of social change. That study also highlights that social groups have not been properly engaged, and neither public policy nor legislations were properly considered as part of those research scenarios. This literature review brings to light a number of new approaches to design eco-feedback or to engage people, such as creating artworks or proposing family games, for instance, but very few studies quantify results in terms of savings or behaviour change.

Considering that studies frequently combine interventions, it is not possible to establish what the contributions were of each intervention separately. The context of the study (type of tool or environment in which it was applied), and also the target audience are important to be considered when analysing the possibility to reproduce results.[16]

Abrahamse's findings also resulted into some points of advice for *designing* and *evaluating* interventions, specifically for energy use:

- To evaluate the effectiveness of an intervention, it is necessary to consider both *behaviour change* and *reduction of energy use* (some projects reported energy-saving behaviour but not reduction).
- Combining strategies for interventions has better results.
- Effectiveness of interventions and possible determinants of behaviour should be examined together. For example: a campaign may fail if the target group is already familiar with the information provided.
- The more frequent the feedback is given, the more effective it is.
- Campaigns and strategies might have different effects on high and low consumers. Low consumers may increase their consumption instead of reducing when they realise it is lower than others', for instance.

[16] A more elaborate discussion of this research can be found in D1.1.1.

- Experiments with small groups tend to concentrate on highly motivated people, so the results cannot be easily generalized.
- Little is known about the long-term effects of interventions for energy use. It is unclear whether behavioural changes were maintained and whether new energy saving habits were formed, or if energy usage returned to the baseline.
- Self-reported behaviour tends to be influenced by social desirability. In other words, people usually report the expected behaviour instead of the real one.
- Rewards have a positive effect on energy savings, but the effect is rather short-lived.
- Commitment and goal setting are successful especially when combined with other interventions.
- Tailoring (or personalisation) leads to energy savings.
- To design effective interventions:
    - Identify behaviours that significantly contribute to environmental problems.
    - Examine factors that make the sustainable behaviours patterns (un)attractive, such as motivational factors (e.g. attitudes), opportunities, and perceived abilities.
    - Interventions must address possible barriers to behavioural change.

5 Context studies

Initiating reflections about energy use in people's daily routines either in domestic or work environment is a challenge. Energy use is rather invisible and behaviour is guided by habits and by the environment. Additionally, in order to achieve social impact, in this instance on decarbonisation and climate change, in-depth insight into the profiles, life-styles, needs, concerns, and motivations of the general public with regards to energy awareness is important information. To get better insights into the actual users and in what way they could be part of the design of the enabling environments we employed human centred design approaches.

At the beginning of the project we initiated two studies, in two different settings, that would explore the energy use topic by sharing experiences within a social group. Both studies have been documented in previous deliverables.[17] A third study has been conducted half-way through the project, following the initial results of the first two studies, some experiments in combination with the preliminary literature studies in the first and second year of the project. This study focussed on awareness and actively sharing stories about climate change and energy use on social media. We summarise the three studies below.

5.1 Households workshops[18]

The first experiment focuses on the family and household setting. Both Waag Society and WWF Schweiz organised a series of co-creation workshops to elicit the general public position on the subject of decarbonisation and climate change, and to experiment with tools and methods to change behaviour in a small setting. These sessions took place in Amsterdam, Utrecht and Zurich.

The process set out to identify and address the factors that define current social behaviour with regards to energy usage and awareness. These included personal and family values and responsibility, and social and economic pressure. In addition, they addressed those aspects which impact and support behavioural change, such as information availability and format, personal motivation and empowerment, feedback mechanisms, and usability.

For the workshop sessions 'families' were selected as the primary target group because:

- The family and the home are often at the centre of social behaviour and identity.
- The family unit represents an ideal model for the observation of interactive group dynamics.
- Families are generally composed of both adult professionals and children, providing an easier basis for rollout to further target groups in the professional and classroom space.

In addition, the selected families were digitally literate, educated and already 'sensitized' with regards to the energy issue:

- Project partner WWF has already been working with 'sensitized' families.

[17] D1.1.1 & D1.2

[18] The full workshop-description can be found in D.1.2 Social Requirements Specifications 10 - 25

- Project partner GEO targets the provision of SMART energy appliances for family households, who are considered early adopters of this technology.

In total the workshops were performed with 28 participants.

5.1.1 Approach

If the process of behavioural change is to succeed, the user needs to feel personally addressed, involved, empowered and active in issue solving [Dijk et al 2011]. To this end, two related philosophies were used for the co-creation workshops: *Users as Designers* and *Cultural Mapping*. The first implies that real users should be the ones to define design requirements. The philosophy behind 'Users as Designers' relies strongly on empathy, subjectivity of interpretation, personal intuition, human interaction and trust, with research integrated in the development process and development being the focus of its research. Cultural Mapping is an empirically based and iterative process, containing The Cultural Mapping Tool Kit[19] and a combination of workshop formats, creative and participative processes and methods. It relies heavily on narrative techniques, focusses on engagement and empowerment by highlighting personal experiences, and allows participants to create their own frame of reference.

5.1.2 The co-creation workshops

The workshops focussed on the daily life-style and behaviour of the participants with regards to energy usage. The challenge was then:

- To capture the factors with the potential to instigate awareness, engagement and consequently changed behaviour towards the energy issue.
- To define the related factors, which are required to motivate, consolidate and sustain this changed awareness and behaviour.

During the course of three workshop sessions, a variety of families playfully experimented with their own use of energy in their house and in their direct environment. The families worked together and learned from each other, and tried to analyse and alter their habits.

The first workshop was designed to map the current situation, and the related emotions and values, in households in relation to energy use. During the second workshop the families could reflect on the first experience and changes, which might have been made in the households, following the first workshop and the use of the toolkit. In the third workshop the families could test various existing tools (WWF Carbon Footprint meter, Geo tools, etc.) that might support awareness and behavioural change. Following the previous workshops and testing of these tools, the families worked on a concrete solution for their own situation, specific for their households, that would generate an active and motivated attitude towards decarbonisation / sustainability, and could subsequently be shared with others in their community.

[19] originally created by Janine Huizenga in 2008-2010

Figure 10: Family Value Tree

5.1.3 Results

Observations and feedback from the participants have delivered the following clear results:

- Direct personal, emotional, ethical and physical involvement within the family unit in their immediate environment was an effective means to create awareness and instigate behavioural change in energy issues.
- Creating a trusted environment for 'open' discussion within the family community was positive in building and reinforcing common action without conflict.
- On the basis of open discussion and shared values, family 'rituals' and 'narratives' around energy usage can be quickly established, and can act as key factor in sustaining awareness and action on a day-to-day basis.
- The acceptance of 'joint ownership', with consequent individual and joint responsibilities, within the family community, reinforced by self-imposed peer pressure and 'self-regulation' constitutes a strong force in maintaining engagement.
- The 'playful' element within the family actions is a strong force in maintaining awareness and engagement, particularly among the children.
- The availability of self-monitoring tools is widely seen as being necessary to maintain self-awareness and commitment.
- There is a clear indication that the provision of easily accessible, relevant and accurate digital information is essential in maintaining engagement and commitment. This need particularly refers to comparative information with:
  (1) individual and community achievement with regard to past behaviour,
  (2) comparison with other neighbourhoods,
  (3) comparison with the national average.
  In this context, there is also a strong demand for ongoing tips, tricks and reminders.
- The positive experience of awareness and change through direct personal, emotional, ethical and physical involvement within the family unit is an excellent basis from which to enlighten and inspire others in the same way in the wider social community, whether friends, neighbours work colleagues or school-mates. In this context, it is important not to 'preach' but rather inspire and engage directly and emotionally through commitment, lifestyle and feeling of responsibility.

- This direct and personal approach can also be extended further to wider social groupings and communities.

5.2 Workspace workshops[20]

This second study addresses energy awareness in the *workplace*, where people usually bring different experiences with energy consumption, and where the individuals' perception, control and autonomy to act are rather diverse. This study, performed by KMi of Open University, collected participants' perception about energy consumption and possibilities for changing behaviour, evaluated the interaction with a debate tool and the adoption of consumption feedback devices, and also brought into discussion the effectiveness of collaboration and competition as motivational strategies among this social group.

The objectives of the study were:

- To evaluate the role different technologies may play in the awareness/behaviour change process.
- To understand how people relate to energy in the workplace regarding their perception of consumption, empowerment for changing behaviour, and motivations for being engaged with the energy saving issue.

Participants generated content in the online debate tool, in order to characterise the interest for specific information. The study relied on self-assessment and interviews to evaluate how different technologies contributed to engage people with the energy issue in the workplace environment. To scavenge the fact that introducing a new tool alongside other daily obligations is a challenge that requires a certain level of motivation to adopt the tool alone, the study took place in the Knowledge Media Institute (KMi) of the Open University. The 33 participants were mostly researchers or PhD students not associated with the DecarboNet Project.

5.2.1 Approach

The activities in the experiment relied on the potential of peer-to-peer learning, dialogue and argumentation to build contextualised knowledge about energy use and possibilities to change behaviour. An online debate tool, *the evidence hub* [De Liddo et al 2013], was applied to raise awareness collectively as a first step towards fostering longer-term behaviour change. Users could create *issues* and propose *ideas* to overcome those issues. These could be supported or challenged by *arguments*, promoted by *votes for* and demoted by *votes against*. Users could also add *facts* or *web resources* to enrich the debate. Ideas, issues,

Figure 11: The Energy Tree

[20] The full workshop-description can be found in D.1.1.1, 12 - 26

facts, arguments were all connected by themes or by tags.

The Energy Tree was connected to the Evidence Hub database to provide a public visual feedback of new contributions. It was applied as feedback of engagement to reflect contributions to the debate tool. *Smart Energy Monitors* were offered to participants as a tool to overcome the lack of information on energy consumption.

5.2.2 The workspace workshop

The workshop started with the distribution of an online survey, aimed at collecting initial perceptions about energy consumption in the lab and preliminary ideas for behaviour change. The online survey was composed of three topics: ideas to save energy in the workplace, ideas for personal behavioural change, and problems related to the building or to the institution, splitting individual responsibilities from installation issues or working practices.

Two workshops (WS1 and WS2) were organized to promote the online debate. The two workshops had the same dynamic, except for the presence of the Energy Tree in WS2, making it possible to compare results and infer about effects of the Energy Tree on engagement. Each workshop lasted 2 hours and was run in a meeting room. The Energy Tree was centrally located as a feedback mechanism during WS2 by reflecting the number of new submitted contributions to the debate tool.

Participants were asked to create, promote or demote *facts*, *arguments*, *issues,* and *ideas* online. The groups engaged in some face-to-face discussions, but most of the activities were done online, on the debate tool. The content generated in WS1 was not visible for the participants of WS2 to avoid influence. It was expected that the Energy Tree motivated a higher number of contributions to the debate tool in WS2. Volunteers of both workshops were asked to install the smart monitors at home or in the office to learn about their consumption, and sharing their findings in the debate tool during the following 10 days. During that time, the Energy Tree was placed in a social area of the department as a feedback of engagement.

To understand what motivated participation, perceptions, as well as the overall experience towards this study, a sample of participants, including the top and bottom contributors, were interviewed about their motivations, perception of the tree and the smart monitor as well as their overall experience with this study.

5.2.3 Results

The Energy Tree worked as a symbol, as a reminder of the ongoing activity, as illustrated by this post: "*It looks like thanks to the tree we started switching off the lights during the day*". The comparison (and consequent competition) between groups, however, caused a guilty feeling for the group that was not doing well. Initial results suggest

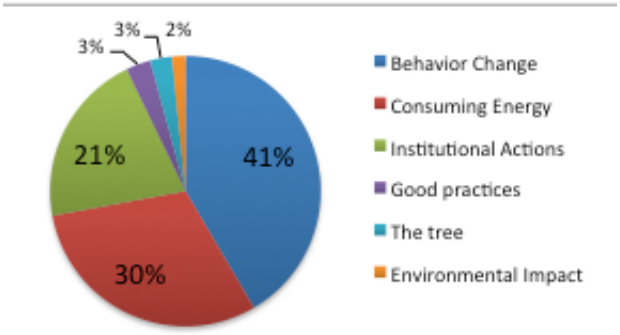

Figure 12: Distribution of contributions' themes

that the Energy Tree had a positive impact on participation when it was available and visible for the groups.

Discussions about possible Behaviour Change engaged users more than the other themes representing 41% of issues, ideas, arguments, facts and votes.

Only 2% of the contributions within the debate tool referred to data collected from the monitoring devices or shared experiences about the usage / installation.[21]

Participants were also asked to score from 1 to 5 the level of attention they gave the tree during WS2 and during the time it was installed in the public area. The average score of attention in the workshop was 3.5, while in the public space was 3.9.

Most participants took the energy monitoring kit to their homes. Smart monitors were used:

- For learning about the cost of appliance energy use.
- For tracking daily energy use.
- For comparing consumption of appliances.
- For understanding cause-effect.
- For mapping consumption in the house.

Information related to monitoring consumption was not typically discussed in the online debate. Instead, we observed that the discussions about the device installation and the findings obtained by using them happened among colleagues mostly informally, during coffee breaks, lunchtime or around the energy tree installation, for instance.

The number of arguments and votes suggests that *the evidence hub* was effective in promoting the debate. The software was, however, mostly perceived as a working tool. People did express themselves in an informal conversation style. They did not restrict their answers to possible behaviour change. The tool also attracted other people to join the discussion, eventhough they did not participate in the workshops of this study. The debate tool was rarely accessed to post domestic consumption data.

5.3 Social Media Survey

The way people perceive climate change and act, coping or not with that, is influenced by a number of sociocultural factors and players. Media (TV, newspapers, magazines, etc.), for instance, have an important role in forming public opinion. Inspirations by friends, eventual actions promoted by local communities or schools may also influence people's perceptions and actions towards the issue.

To develop a general picture on how people perceive climate change and energy savings on social media, an online survey was carried out in September and October of 2014 [Piccolo and

[21] This was partly due to the setup of this study, which did not mandate the use of those devices, to demonstrate that energy debates and ideas for changing behaviour are not necessarily tied to the usage of smart meters, although they could be enriched and informed by such devices.

Alani 2015], targeting Internet users in communities or workplaces surrounding our project members, people potentially reached by social technologies associated to this study. Les Robinson's 5 Door Factors were used as a guideline for this experiment.

5.3.1 Approach

The online survey had 15 questions addressing:

- Participants' current position towards tackling climate change and energy conversations. How do they perceive the problem and what pro-environmental behaviour do they already have or are keen to adopt?
- Preferred channels of information on climate change. Whether and how they use social media for that, and what sort of topics they would like to see or share on social media when compared to personal conversations, broadcasted media, etc.
- Their eventual interest on using smart energy monitors.

The 5 Door Factors by Les Robinson inspired us to assume the hypothesis that people not only need different types of stories to change behaviour according to their stage, but, especially on social media, would also generate different types of content. To get an initial confirmation of this hypothesis, we asked people in this survey to position themselves in a dominant stage and also produced a tweet-like message about energy savings.

The survey was promoted through social networks and Intranets. The sample then did not intend to represent geographical areas or specific demographic groups. The 212 respondents were mostly concentrated in Europe (83%), but also attracted people from North and South America (7% and 9%, respectively), and Asia (1%). The large majority of participants (72%) aged between 25-44 years old; 22% from 45-64, 3% from 18 to 24 and other 3% older than 65 years old. 64.6% of the participants were Facebook users that create new posts at least every few weeks. 28.2% were Twitter users.

5.3.2 Results

Social media were not (yet) considered strong channels of information on climate change. 'Friends on social networks' and 'Following non-governmental organisations (NGOs)' or research groups on Twitter or Facebook were only in the 5th and 6th positions in the raking of preferences, chosen by 26,9% and 22.2% of the respondents. People prefer to be informed on climate change through the news (i.e. TV, newspapers, etc.), followed by 'Listening to enthusiastic people (watching it online, at talks, or conversations...)'. Dedicated portals or blogs and scientific publications were also more selected than social media. These choices all could be labeled as 'trusted peers'.

In general, participants expressed high levels of concern on climate change and recognised energy saving as an important aspect of the battle. The more environmentally-concerned people were, the higher is their interest in learning about the consumption of individual appliances, while the interest for comparing consumption with other people is higher among less concerned people.

Seeing hints both to guide their behaviour towards protecting the environment and to save energy was interesting to the participants. Energy saving campaigns were pointed out as more attractive than the general pro-environmental ones. On average, 40% of the participants chose Facebook as interesting medium to both environmental and energy saving campaigns, suggesting social media can play a role in disseminating that.

People were happy to share good news and facts. However, to instigate the interest on social media as a source of practical information, user-generated content must be also compete with general media. 38% of participants considered it interesting to read about personal experiences on energy savings and somehow protecting the environment on Facebook. And 35% is keen to share such data. Another 40% would also share energy saving advices. The restriction to share personal consumption data though, is clear – 75% would not share details of energy consumption.

Preliminary results indicated a moderate relationship between the type of user-generated content and 5 Door Factors.

6 First findings and recommendations

Below we summarize the main findings in literature and context studies and the recommendations leading to the methodology.

6.1 Users and their environment

The vast majority of previous works on behavioural change on energy use were focused on the behaviour of individuals, without considering the influence of external forces on that behaviour, and the dynamics of social change (social groups, legislation, public policy, etc.). We found that, following the research on general behavioural studies, instead of trying to change the individual; we need to focus on changing the users' environment. Context and timing are essential in this instance. When en where the user is introduced to the subject determines whether or not someone is willing to engage with it.

When it comes to awareness, a user not only needs to know about a subject. In order for people to act, they also need to know about the various stories and the options they have. To have impact a clear story with a concrete action connected to it is essential.

Peers are inherently part of the user's environment and therefore an important motivator or inspiration for behaviour. Using this principle (word of mouth) is not only *more persuasive* than traditional advertising (people tend to trust their peers' opinions over advertisers) but information is naturally directed toward an interested audience.

While social media could have a part in this process of informing others and sharing stories, they are at their core technologies, or tools, not strategies. The goal is for people to start talking and discussing a subject. Social media might help in that process, but are, by far, not the only tools (tactics) to get these conversations going.

6.2 Habits and triggers

It is always difficult for people to change, and to sustain change because habits are persistent. Last one in is first one out. They also instigate loyalty to a product or to a way of living. This will distort the reality. However, perceived reality will influence behaviour more than the actual reality. Making it real for the user's reality is essential since people often make decisions based on limited amounts of, or limited access to information.

People need to want to change. No other person can decide that for them. It depends on the type of behaviour that needs changing (complexity and importance to the user) how long it takes to shape the new behaviour, and have it take hold. For that to happen a user needs to be able to change. Reducing effort has a bigger effect that increasing motivation. But a user also needs to be reminded of the new behaviour. The trigger should lead to an *action* that is in the now (not some abstract future). It must be easier to do than to think. Timing is everything.

External triggers (alerts in the user's environment) can be used to nudge a user towards the new behaviour. Internal triggers - the ones that manifest automatically in a person's mind - are the ones active when a habit is formed.

6.3 Motivation and values

A person needs to have a reason to change. A tangible representation of that reason will both remind the user of, and incentivise the behavioural change. A combination of long-term and short-term rewards is ideal. Investments are about the anticipation of long-term rewards, not immediate gratification. For that, a user needs to know that the investment is worth the effort.

People are not in the same way involved with a topic, so need to be approach differently depending on the stage a person is towards making change. A person in a specific stage of preparation for behaviour change could jump a stage when approached with the right incentives, tools, or type of information for that particular mindset. *Change agents* can use this knowledge about the users to make sure that social campaigns are covering also the preperational stages for change, and not just cover the change itself. Take little steps towards the behavioural change: big changes are not easy. But when first a small change is made, people are more likely to adopt a bigger change (in the same context) later on.

The change also needs to be important to the user. If there is no (physical) obstacle to change behaviour, but a person doesn't care about it, it will never be part of his new routines. You need to be there, where the user is, and value the things that the user values.

6.3.1 Recommendations and intervention strategies

Even though

"…there is no framework that works every time when it comes to the human mind." [Ariely et al 2014]

We've tried to build upon and expanded from previous studies (Abrahamse & Froehlich). The list below summarises intervention strategies aligned with DecarboNet objectives:

Information

When it comes to awareness, lack of information about how to effectively change behaviour is a great obstacle. The way the information is presented (whether it is easy to understand, to be remembered, attractive, and presented at the right place and time) also needs to be considered.

Public commitment (pledging) & goal-setting

By publicly pledging or promising to do something to change behaviour you can commit to the cause. This is usually associated with a specific target of reduction. Both the type of commitment and the person or group to whom the commitment is made, are factors that impact behaviour. Goals can be established by users or by third parties (like the utility

companies). A more challenging goal was evaluated as more effective.[22] However, a goal should remain feasible.

Triggering discussions

Exchanging ideas and freely expressing opinion are important ways to raise awareness collectively. Debating (online) was evaluated as a promising strategy for engagement. Proposing intriguing dilemmas may actually trigger discussions.

Informative feedback & tangible insights

Feedback, in this context, is about providing personalised information about energy use. For Froehlich, effective feedback interfaces should present different levels of information (e.g., immediate feedback, consumption over time periods and the possibility to navigate through aggregated periods, etc.). Feedback, alone or in combination with other factors (especially advice), seems to be the most promising single intervention type.[23] Feedback comes in multiple shapes and flavours including: energy bills, smart meters, in-home displays, web, mobile for interactive TV applications, etc.

The tools[24] developed for the household co-creating workshops made the discussion about behaviour change in families tangible, mediating the process to find solutions and assigning authority and reponsibilities among the family. Beyond that, it revelead eventual barriers, such as personal values that may prevent people to change behaviour.

Social feedback

Social feedback covers all types of social context for comparison and discussion among peers. It includes comparative of energy use across users and dialog among individuals about their energy use needs and habits. We include in this category 'immediate feedback' as well as 'over time feedback'. The strategy has been widely applied in the last few years via social media applications such as Welectricity[25] or Opower[26].

[22] Gary S. Becker. The Economic Approach to Human Behavior. University of Chicago Press.1976

[23] For almost all projects involved in the research direct feedback produced savings of 5% or more. EEA, 2013.

[24] The Utility Toolkit consisted of various tools like the Values Tree, Mapping chips and Utility tags.

[25] http://welectricity.com/

[26] http://opower.com/

Collaboration & Competition

Collaboration aims at aggregating efforts to reach a bigger achievement. Competition and collaboration can be applied together in different levels, such as teams collaborating internally and competing against each other. *Pledging*, next to declaring 'public commitment', could bring a set of individuals together to act toward a common goal.

The effectiveness of competition proved sometimes controversial in the studies performed by Froehlich and Abrahamse, with some positive, and not so evident results in terms of behavioural change, despite the interest of participants in the competition itself [Johnson et al 2012]. However, following the previously discussed research and the findings of i.a. Jonah Berger, gaming elements prove to be great motivators for continuation of change.

Interest in competition might be somewhat influenced by cultural context. Social networks are promising environments for stimulating competition.

Collective motivation

The study on engagement in the workplace brough into discussion factors that motivate people to be engaged with energy savings, and suggested how energy consumption monitors and social media can be applied together to engage people and raise awareness collectively.

Rewards & incentives

Rewards provide extrinsic motivations, usually with the intent to promote short-term behaviour change. Examples of rewards are saving in energy bills or competitions to win prices like the San Diego Energy Challenge.[27] Incentives are less concrete rewards, mostly aimed at starting and continuing behaviour. Acknowledgements of positive behaviour may already promote the behaviour.

Personalisation

Personalisation strategies towards energy use are less common in the researched projects in the literature compared to other strategies. However, even though houses may have the same characteristics, a house may have different sets of individuals living in it, and not all of these individuals have the same type of energy needs. Personalisation is based on studying the consumption of individual users and households and providing them with tailored recommendations that fit their own energy patterns and seemed rather effective. Opower, for example, used this type of intervention.

Instead of disseminating general climate change information or wider effects of energy wastage, user-generated content sharing personal experiences and stories related to savings must be encouraged, instigating then the interest both online (including social media) and offline as a source of information provided by people in similar sociocultural contexts.

[27] https://www.sdenergychallenge.com/

Emotional involvement

Promoting behaviour change cannot solely consider rational choices driven by for example financial situations or benefits for the environment. People need to feel comfortable to evaluate and discuss the trade-off between environmentally friendly choices and individual values, such as comfort, security, and so on. This can inspire commitment through emotional engagement. Guilt should not be a factor.

(Technological) learning tools

Beyond monitoring overall consumption, the main interest for using sensors is learning the consumption of individual equipment. Evaluating how an appliance is compared to other peoples' leads to reflections on behaviour patterns.

7 Case studies

In this chapter we will discuss the use cases, and the way the parts of the 'methodology-in-the-making' were implemented. We look at the trials performed in the use cases presented by the project partners WWF Schweiz, GEO, Waag Society and MODULE. We now present the summaries of these trials, but full reports can be found in previous deliverables[28]. We conclude this chapter again with a summary of lessons learned, and findings feeding into the methodology.

7.1. Use Cases

Project partners WWF and GEO led the work packages in which the use cases that could be monitored during the project period were selected. Earth Hour was specifically chosen to serve as an event that could be monitored by the diagnostic tools that were developed during the DecarboNet project. Other cases and applications served as testing grounds for the other aspects of the methodology design. Considering the iterative approach of the project, alterations to the cases were made during the running period.

7.1.1 Earth Hour

Every last Saturday in March between 8:30 and 9:30 p.m., Earth Hour celebrates the symbolic 'lights off' hour. It has grown from a 'one-city-initiative' to a mass global event involving more

[28] D1.1.1, D 4.2, D5.1, D5.2, D6.2.1, D6.2.2, D2.2.1, D2.2.2, D2.3.1

than 172 countries with over 620.000 actions taken to change climate change.[29] The movement is collectively supported by millions of individuals, organisations and governments.

Research in DecarboNet started with Earth Hour 2014 continued in 2015 and the analysis ended in 2016. WWF, MODUL, USFD and OU worked together to collect and analyse great amounts of data. The analysis of the data was divided in three parts: engagement, topic and behavioural analysis.

Engagement Analysis

To study the characteristics of Twitter messages (with high attention levels), we performed a two-stage analysis process (considering retweets as the strongest engagement action). We:

- identified the characteristics of those tweets that were followed by an engagement action (retweet)
- identified the characteristics of those tweets that were followed by a high level of engagement (high number of retweets)

Topic Analysis

We performed a topic analysis over the Earth Hour campaigns of 2014 and 2015 to understand the key themes that emerged from the social media conversations posted during the campaign periods, and how these topics managed to engage the public.

- We analysed the hashtags[30] contained within the tweets.
- We used semantic annotators to process the text of the tweet and to identify the key entities that appear in the tweets.
- We used Latent Dirichlet Allocation (LDA) to analyse which topics were discussed by analysing the distributions of words within the post collection.

Behaviour Analysis

A strong indication towards behavioural change is the communication of increased engagement with energy or environment related applications and campaigns. Therefore we tried to study behaviour change over the participants of the Earth Hour 2015 campaign based on their communication on Twitter[31].

[29] http://www.earthhour.org/sites/default/files/Earth-Hour-2015-Global-Stats-Report.pdf, online, 17.08.2015

[30] Hashtags are keywords preceded by the # symbol that users include in the tweets to express their main themes.

[31] The full report on the analysis can be found in D 4.2

We have applied this method to analyse 20,847 twitter users who participated in the Earth Hour 2015 campaign in Twitter. To perform this analysis we collected more than 56 million posts from the users' timelines and extracted relevant features to categorise behaviour. In particular, sentiment, emotions and language directives have been used as key linguistic features to identify behavioural stages in Twitter.[32]

7.1.2 MediaWatch

Only a small percentage of citizens take action to reduce their carbon footprint [Bowman 2008]. Among the reasons for this discrepancy are

(i) lack of *collective awareness,* the widespread perception of climate change as a risk that predominantly impacts geographically and temporally distant places, and

(ii) lack of *personal efficacy*, the belief that the own actions will not make a difference.

Effective decision making by citizens requires accurate and actionable knowledge, but meaningful access to such knowledge is often hampered not only by the sheer volume and inconsistency of available resources, but also by increasing diversity in terms of user needs and access scenarios. Therefore, many stakeholders including policy makers and environmental NGOs seek novel methods to analyse the public dialog, and to better understand mechanisms that support collective awareness.

The *Media Watch on Climate Change* (MWCC) is a web-application that analyses the public dialogue on climate change. Rather than relying on simple statistical representations, MWCC supports the real-time synchronization of multiple coordinated views to convey context information along various semantic dimensions.

MWCC acquires, analyses and visualises three types of context information:

- *lexical context* – specific vocabulary and sequence of words that precede or follow a statement [Fischl & Scharl 2014; Wattenberg et al 2008];
- *geospatial context* – the author's location and the geospatial references contained in a document [Niepold et al 2008; Scharl, A. & Tochtermann 2007];
- *relational context* – frequency distribution of named entities in the content repository, and co-occurrence patterns among these entities [Derczynski et al., 2015].

MWCC aggregates environmental knowledge across these context dimensions and provides a visual analytics platform publicly available at www.ecoresearch.net/climate [Hubmann-Haidvogel et al., 2009; Scharl et al., 2013]. Its interactive dashboard provides access to large archives of Web content from various online sources. The system integrates multilingual content from English, French and German online sources: social media including *Twitter,*

[32] To extract these linguistic features the Natural Language Processing (NLP) tools developed by WP2 were used.

Facebook, *Google+* and *YouTube*, and the Web sites of news channels, Fortune 1000 companies, municipalities, and environmental NGOs.

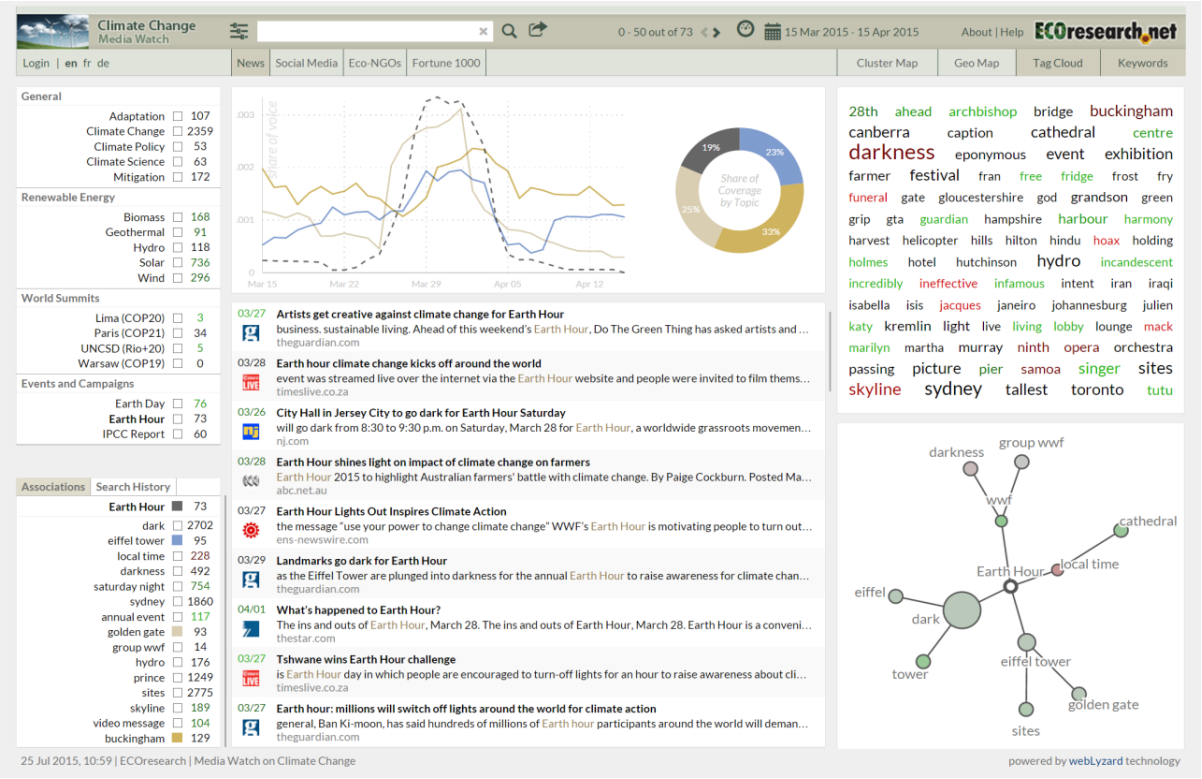

Figure 13: Screenshot of the multilingual Media Watch on Climate Change (MWCC), showing the results of a query for "Earth Hour" based on Anglo-American 03-04/2015 news media coverage

Automated document enrichment services then transform the gathered information into a contextualized information space spanning geospatial, temporal and social dimensions. Analysing this information space sheds light on stakeholder perceptions, reveals information flows, and provides indicators for assessing the impact of environmental campaigns and public outreach activities.

A mobile version of the dashboard was developed to provide a more linear user experience, reducing complexity for inexperienced users.

7.1.3 Utility Toolkit

Figure 14: Utility toolkit

User reaction to the hands-on workshops performed in the context studies has been very positive, with enthusiastic participation and interaction. The tools proved effective and it was assumed that even without the support of a facilitator, these tools would help users give insights into their lifestyle, and their life choices, in relation to energy use. For that purpose downloadable versions of the toolkit used in the workshops and the instruction how to use it were provided online at the beginning of the second project year.[33]

The Utility Toolkit is a non-technical set of tools meant for social groups, living or working in the same surroundings that are interested in improving their energy conservation, but are in early stages of their involvement. The toolkit contains a value tree, mood tokens, an energy diary, utility labels and personal utility stickers, each to be used in a different moment in time.

It starts with setting a baseline of family values, common goals and the status quo of the house hold situation. Both the values tree and the mapping exercise stimulate discussion. Journaling in the energy diary and the game-element of the utility labels and stickers were meant to reflect on findings, continue the awareness and introduce small changes.

[33] https://www.waag.org/sites/waag/files/public/media/publicaties/decarbonet-utility-toolkit.pdf

https://www.waag.org/sites/waag/files/public/media/publicaties/decarbonet-toolkit-manual.pdf

The Toolkit helps develop personalised solutions, and counts on the emotional involvement of users. It stimulated (self-imposed) peer pressure, and actions take place in the immediate environment.

7.1.4 Living the Change (IKEA)

As part of its global IKEA Sustainability strategy, IKEA Switzerland works on a multi-year project promising 'sustainable living for everyone'. WWF Switzerland was able to accompany this project together with one of its supported Start-up's called WeAct[34]. In this cooperation WWF tested an adapted version of the Utility Toolkit used in the context studies[35].

26 Families were recruited by IKEA Switzerland. The families were chosen from 700 applications according to their positive attitude. Factors like motivation, greenness level, activity on social media, type of dwelling, type of heating regulation and the number and kind of appliances were then considered. The project ran for six months (11-2014 - 04-2015), and started with a Kick-Off-Event in October 2014.

The focus was to create attractive stories on how to achieve a more sustainable life at home. In order to create such real life stories, permanent behavioural change in different fields of daily life would be required. The playfulness of the setup and the equitable involvement of family members induced a high degree of motivation and self-imposed peer pressure.

Goals of the study:

- Introduce a more sustainable life at home to IKEA customers and inspire them to live a more sustainable life at home.
- Enable participants to save water, energy or reduce waste with IKEA products and solutions in their homes.
- Encourage participants and customers to share and report back on their findings and experiences.
- Test insights of the developing 'decarbonisation methodology' with a broader community.
- Test externalised storytelling as a way to inspire more people for the adaptation of a more sustainable life at home.

IKEA, WWF and WeAct created a playful 4-month challenge including a game that the families 'play' together in their everyday lives. A game board was installed, goals specified, smiley-points noted and a reward for the entire family defined.

[34] http://www.weact.ch, online 28.08.2015

[35] Described in D1.2. Chapter 3

During and after the kick-off the families were left to their own devices to define areas of action in their homes by using a game board provided by the organizer. The event included 3 presentations about the environmental impact of individual actions and a hands-on workshop. In a second step IKEA and WeAct conducted home-visits with each family. During these home-visits each family was supplied with the 'gamification kit'. With the help of the experts the families developed the strategy by detecting potential improvements, deciding on key actions, and installing helpful appliances. The experts assisted also in monitoring the progress and giving additional knowledge. During the following weeks and months, in the actual phase of the challenge, the families were asked to continually blog about their experiences. The project was finalized by a final home visit to get feedback on what worked well and what did not.

7.1.5 Energy Use

EnergyUse was built in WP5 to act as a collective platform for raising awareness on climate change, by enabling users to view and compare the actual energy consumption of various appliances, and to share and discuss energy conservation tips in an open and social environment. The platform collects data from GEO smart plugs, and exports appliance consumption information and community generated energy tips as linked data.

The 2015 Paris Agreement on climate change emphasized the importance of raising public awareness and participation to address climate change [O'Neill et al 2009]. Although most citizens are aware of the general threats of climate change, they tend to be less aware of the concrete actions that they can take to reduce carbon emissions in their homes, to more actively participate in the global fight against climate change [EEA 2013; Stem et al 1999].

In the time that Green Energy Options (GEO) has been active in introducing smart meters, monitoring tools, etc. to the public they have noticed, empirically, a certain pattern of behaviour in their users. GEO dubbed this the 5E approach (aka. Times Five) which highlights five stages that the user goes through before adopting a new type of behaviour or introducing a new device in their house hold. These stages are Enrol, Educate, Engage, Encourage, and Expand. This 5E approach is somewhat similar to the 5 Door Factors of Les Robinson and is explained further in D5.3.1.

GEO and OU designed a continuing Energy Trial using the 5E approach, and early findings (in literature and in context studies) in the project. The aim of the trial was to explore how *In House Devices* (IHD) and social tools could be used to collectively build knowledge around energy saving, considering individuals' context and personal values.

The trials started with the following assumptions:

- Taking consumers through a more constructivist approach to learning, starting with education and increasingly building engagement should achieve better and more enduring results.
- Expanding feedback channels beyond IHD devices by including web-based user interfaces and social media tools should have a positive impact on energy consumption reduction.

Around 400 people applied to join the trial, which was promoted among environmental-related associations and some project partners' networks. A total of 150 people were selected to receive a free ensemble monitoring kit offered by GEO, composed by:

- Sensor and transmitter (measure the consumption at the household meter)
- IHD
- Smart Plug (measure the consumption of individual appliances)
- Web pack (to view the consumption history and control appliances online on '*energynote*')

Participants were invited to register with the social platform provided by DecarboNet: the EnergyUse.eu web portal.[36]

EnergyUse.eu, initially referred to as Citizen Engagement Platform for DecarboNet, consists of a social platform for people to analyse their own electricity consumption by means of interactive visualisations and exchange experiences with other people. Users can explore the smart plugs as learning tools and share experiences related to everyday life, such as preparing tea or coffee, doing their laundry, etc. User-generated tags such as appliance names (e.g. dishwasher, router), or more general themes index the content as cooking, working in the office, etc.

The platform also addresses thematic campaigns, including for example Earth Hour. The Climate Challenge has been featured with special tasks for the trial-participants.

Analysis on participants' behaviour online and patterns of energy consumption has been performed to better understand the process of behaviour change. Additional to the 150 trial-participants, over 810 other users of energy monitors by GEO have been providing the data to enrich the energy consumption patterns analysis.

7.1.6 Climate Challenge

The *Climate Challenge* is a platform-independent social media application that engages citizens with a competition in the tradition of games with a purpose [Ahn and Dabbish 2008; Rafelsberger and Scharl, 2009].[37]

[36] EnergyUse is further described in D5.3.1

[37] www.ecoresearch.net/climate-challenge

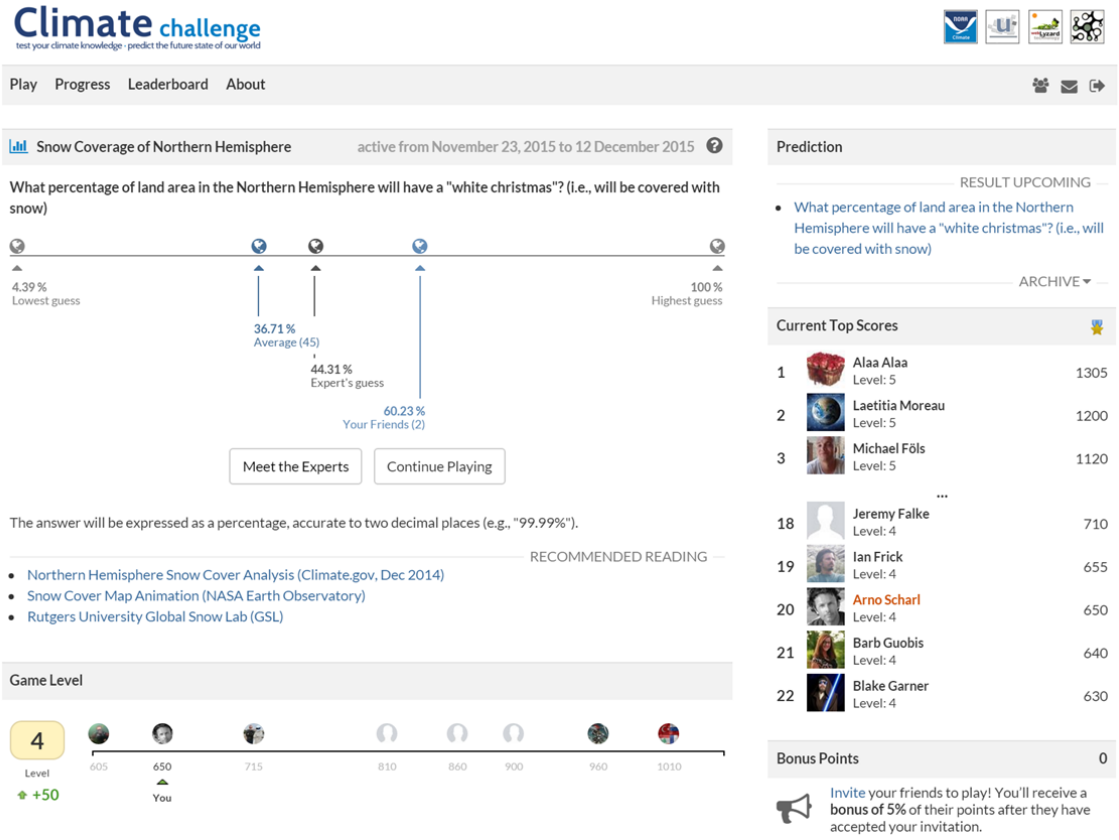

Figure 15: Screenshot of the Climate Challenge (MWCC), showing the 12-2015 monthly prediction task

The application motivates participants through a gamification strategy. It differs from existing studies by engaging a more diverse population, taking place over a longer period of time, and measuring not only changes in (reported) energy conservation habits, but also capturing evolution of environmental knowledge and attitudes which are at the foundation of sustainable changes in behaviour.

The *Climate Challenge* offers 12 monthly game rounds per year, where players accumulate points by solving various game tasks. Each round combines one prediction question about future climate conditions with a range of additional tasks to earn game points throughout the month. Using real-time updates whenever possible, the strategy to engage *Climate Challenge* participants and sustain the competition among them includes regular content updates and the unlocking of new task types. To harness the player's intrinsic motivation various tasks are being offered – avoiding repetition and resulting in a richer dataset to analyse. Built-in notification systems and real-time progress statistics help engage users and leverage the wisdom of the crowds for scientific purposes.

The prototype of the *Climate Challenge* has been completed as of September 2014. After several rounds of beta testing and evaluation between October 2014 and February 2015, the application was released in March 2015 – in conjunction with the Earth Hour 2015 event.[38]

A flexible task management and prioritization system, together with the ability to directly link to specific task types, enables the system to personalise content:

1. *Testing Climate and Energy Knowledge.* In the early phase of the game, the Climate Challenge provides trivia questions to find out about the users' climate change knowledge. The difficulty of the questions gradually increases over time.
2. *Pledging System.* Inspired by the WWF *Environmental Recommendations Database* (www.wwf.ch/tipps). The task presents citizen-centred information and allows sharing specific recommendations via e-mail or social networking platforms.
3. *Predicting Future Climate Conditions.* This task compares individual guesses about future events to the average estimates provided by a user's friends, the entire pool of game participants ("the crowd"), and a selected group of experts. In a later phase of the game, the actual real-world observations are being revealed to determine whether the wisdom of crowds is a reliable indicator when it comes to predicting future climate conditions.
4. *Polarity Assessment.* This task aims to determine whether users perceive specific keywords from climate-related media coverage as positive, neutral or negative.[39]

To attract players to the *Climate Challenge*, we use a combination of general and task-specific promotional activities. Built-in incentive mechanisms include a levelling system with the opportunity to unlock additional games features, the comparison of players' performance vis-à-vis their network of online friends, progress statistics for each task, and the leader board with aggregate monthly scores. The game statistics of a user's online friends who also play *Climate Challenge* are available via the status display.

Extensions were launched in the beginning of 2016 that introduces specific energy consumption tasks among users with energy monitoring devices.

[38] www.earthhour.org

[39] To compile the list of climate change-related keywords from Anglo-American news media coverage between January and December 2014, we used an aggregated representation of document keywords from the *Media Watch on Climate Change* (Scharl et al., 2013).

7.2 Summary and recommendations

Below we summarise the findings following the trials performed in the use cases. These findings, and connected recommendations, fed again into the general methodology presented in the beginning of this report.

7.2.1 Earth Hour

During the campaign period, the following of the recommended intervention strategies were introduced:

Providing *information* on the topic of energy conservation was part of the campaign. By participating in the campaign, people *pledged* (sometimes publicly) to switch off their lights during the set timeframe of the Earth Hour. The campaign facilitated, in the period leading up to the event, for people to organise (and pledge to) other (public) initiatives to conserve energy. Social media engagement was encouraged, which gave the opportunity to for *discussions* to exist on the topic. Seeing the lights off in public monuments, etc. gave a tangible insight into the effect of the campaign, and it was something that people 'created' together (*collaboration).* The campaign used the strategy of *collective motivation* by making people want to be part of a global action. The social currency is also an *incentive* to participate. The campaign was designed in a way that people could report on how they have spent the hour in the dark which made it a *personal* approach. The stories used in the period leading up to the event were charged with *emotional* messages involving animals, children, etc.

Posts (Twitter) generating higher attention levels are slightly longer, easier to read, have positive sentiment. They tend to repeat terms existing in other posts and mention other users.

For post campaign messages, analysis suggests:

(i) to produce clear, easy and positive messages to involve users and
(ii) to retweet messages from users, or to mention them and their ideas, to make them feel that their contributions matter.

Additionally, it is advisable to complement the text with media items (images) in the posts in order to attract attention. These images should be funny/original and go in consonance with the textual message. In addition, the popularity of the user (i.e., the number of followers of the user who originates the message) is also a key factor to generate high attention levels.

While the main activities and themes of the 2014 campaign (super hero, the panda, etc.) did drive most of the social media conversations, the users participating in the campaign did not necessary engage with climate change and sustainability issues. This effect was not observed for Earth Hour 2015 campaign. Around Earth Hour 2015 users engaged in the campaign were not discussing parallel or irrelevant topics, but were mostly discussing and propagating information about climate change and sustainability. In 2015 the campaign was also used by political activists in Maldives to request the liberation of president Nasheed, globally known for his advocacy against climate change. Studying the temporal evolution of these topics we also observed that, while users decrease their engagement towards the topic of the campaign after it finished, these topics still remained in their conversations one month later.

We can carefully say that it proved possible to identify the different stages in which users are, based on their generated content and interactions. Sentiment, emotions and language directives have emerged as key features. This research is only an initial step within a complex research area and further investigations need to be conducted to understand the different factors that influence the overtime progression/regression into different behavioural stages. Understanding the factors that drive such changes can help us to determine the most favourable intervention strategies to apply at each stage of behaviour in order to successfully drive a complete change.

7.2.2 Media Watch on Climate Change

As an intervention strategy, providing *information* has been the main focus in the development of the Media Watch on Climate Change.

Most users appreciate the synchronized views of the MWCC to keep track of the lexical, semantic and geospatial context of their current search tasks. For untrained first-time users, however, the complexity of the dashboard can be overwhelming.

The context of online media coverage is important when aiming to investigate and better understand the processes that shape opinions and foster collective awareness in the online social sphere. The MWCC as a visual tool can help to understand the context of Web coverage by revealing connections between named entities (persons, organizations, and locations), based on references to these entities in aggregated content from news and social media sources such as Twitter, Facebook, Google+ and YouTube.

Extracting and visualizing context information transforms unstructured collections of crawled Web content into structured repositories of actionable environmental knowledge that reflect and support collective awareness. Uncovering patterns and trends in online media coverage can help stakeholders to understand their context and their users', and in that way help develop better strategies for engaging audiences, promoting collective awareness, and maximizing the impact of communication and public outreach campaigns.

7.2.3 Utility Toolkit & Living the Change

Since a (adapted) version of the Utility Toolkit was used in the Living the Change trial we have combined the lessons learned of both trials below.

In the kick-off meeting, via energy experts and on the shared webspace basic *information* was provided to the families. Every household got to define their own *goals*, and IKEA provided the right appliances fitted to that goal. During the introducing workshops *discussions* among family were triggered, as well as on the blog, also towards the world outside of the selected families. Energy experts and energy monitors provided the families with (personalised) *feedback*. The artefacts produced by the participants, like the families diary, were *tangible insights* given. Families *collaborated* among themselves, including collaboration between adults and children. By sharing stories, the intermediate meetings, mapping the rooms in the house, and allocated roles for each member improved the *collective motivation*.

Sustainable living was the *incentivised* objective, but participants were financially *rewarded* as well by the awarding of appliances that improve sustainable living. The entire approach was focussed on the families' own situation, which made it both a *personal* and *emotional* experience for the participants. People were responsible for their own improvement.

Both non-technological *tools* and energy monitors were introduced to help the participants *learn* about their own consumption. By the provision of coaches people didn't have to think about solutions themselves. The products IKEA provided made it easier for the users to adapt their lifestyle. This took away a great deal of *obstacles* for the participants.

The findings compiled by WWF and IKEA[40]:

1) Visualization is key. Those able to monitor their water or energy consumption were more prone to detect high-consumption sources and were more motivated to reduce the use. Families found it very useful to interest their children in the topic.

2) Main motivator: children. In Switzerland, the main trigger for living a more sustainable life is leaving a better world for future generations. Financial savings are also an important motivator, particularly for young families.

3) Motivation dwindles over time. The motivation levels of most participants decreased over the 4-month test period. Effective motivational tools to increase engagement are:

- Interaction with other participants, especially face-to-face meetings.
- The use of game elements in the form of a points system (or similar) that allows keeping track of and measuring improvement.
- Providing constant relevant information to complement the products and solutions received by the participants.

4) Small actions preferred to bigger steps. Most participants chose to focus on 2 or 3 small actions every month (corresponding to the monthly focus area), which they then could continue doing in the future.

5) It was possible to engage children. Thanks to close monitoring, reminders from the parents and the gamification tool, most families reported their children (5 and up) had taken on a habit or action.

6) Continue new behaviours. All participants reported the intention to continue the behaviours they started as a result of the project. Many were happy to see that these new tasks were already part of their routine and no longer represent an effort – they've become automatic.

[40] Quantitative results of the living the change project were described in D6.3.1 chapter 2.2.2.

Many also reported to want to encourage friends and family to take on similar little steps to live more sustainably.

7) Partnering with experts is beneficial. In countries where sustainability awareness is high, it is recommendable to foster partnerships with experts in other areas of sustainability (like the partnership between WWF and IKEA).

8) Energy is the area with the highest potential. Saving water proved more challenging in terms of finding versatile, yet effective solutions and also in measuring the impact.

9) Timing is important for measuring. Due to the unusual routines surrounding the Christmas holidays, December may not be the best month for measuring the baseline. If the goal is to obtain reliable quantitative results, measuring a baseline and ensuring comparable data from the previous year is available is key.

7.2.4 Energy Use

Goal of EnergyUse[41] is to bring the issue of climate change to a *personal* level, by focusing on the actual energy usage of participants. Participants can view the consumption levels of their plugged appliances, and compare this consumption to the overall average from the community. One of the emphases of EnergyUse is on *discussions*, where users are encouraged to share tips, best practices, and to debate and vote each other's contributions.

Participants accumulate points and votes as *awards*. Top earners are flagged on the main page to acknowledge their contributions. Currently, participants are equipped with GEO devices, where the data read by the devices are passed automatically to EnergyUse via the GEO servers. In this context, the GEO devices are regarded as *learning tools*, to help users to better understand their actual consumption of energy, and to experiment with different settings and usage patterns to decrease this consumption.

7.2.5 Climate Challenge

Climate Challenge[42] introduced the following intervention strategies:

By testing the knowledge about climate change, *information* was indirectly provided (*feedback*) on questions that users did not know the answer to. (Public) Pledging is an explicit part of the challenge as well as the competition: Climate Challenge is a game.

[41] D5.2, D5.3.1

[42] D3.1, D6.3.1

By contributing to the wisdom of the crowd question, users *collaborated* indirectly. By inviting friends to the challenge, you can complete with each other, but also inspire each other to do better. In this sense Climate Challenge stimulated *collective motivation*. Very concrete *rewards* for the participation were provided in the shape of points and prices like a stuffed panda.

In conjunction with data streams from the *Media Watch on Climate Change*,[43] the *Climate Challenge* provides valuable data for longitudinal engagement monitoring. The combination of general and task-specific dissemination activities will help to ensure an active user base, connecting and mobilizing different online communities around energy and climate issues.

7.2.6 Overview of adoption of interventions

In this section we summarise the type of interventions used in each of the applications developed in DecarboNet.

Table 2: Adoption of intervention strategy by DecarboNet tools

Application	Strategy	How strategy is implemented
Earth Hour	Information	Campaigns involves the dissemination of various information on climate change
	Incentives	Being part of the movement to save the planet is a constant incentive offered by the campaigns
	Collaboration	All participants are to take an action at the same time during the dedicated Earth Hour. Participants are therefore collaborating in making the symbolic stand against climate change.
	Triggering Discussions	Discussions are encouraged and initiated on social media, blogs, forums, as well as on traditional media
	Emotional Involvement	Emotionally charged messages are broadcasted by WWF, such as images involving children, animals, melting ice caps, etc.
	Personal approach	Participants report their stories (how they spent the hour in the dark), donate their Facebook timeline, etc.
	Collective motivation	Being part of a global action is a primary motivation.
	Pledges	Switching off the light is a pledge offered by EH.
	Tangible insights	Seeing the lights turned off on public monuments.

[43] www.ecoresearch.net/climate

MWCC	Information	Provides a wealth of information for policy makers and analysts, to track in real-time web coverage of climate related topics, events, and campaigns.
Utility Toolkit	Collaboration	Households work together on the toolkit.
	Goal setting	Households set their own targets for saving energy.
	Incentives	Utility toolkit labels.
	Collective motivation	Mapping rooms in the house, where each household member assumes a dedicated role.
	Tangible insights	Tool is tangible by nature. Households maintain a diary.
	Triggering discussions	Households discuss goals, plans, and progress.
	Personal approach	Household oriented, individual responsibilities, study energy use of own devices in own rooms.
	Emotional involvement	Emphasise values and their roles in this context.
IKEA workshops	Personal approach	Household focused, where they study own actual energy use
	Triggering discussions	Participants author and share blogs, attend discussions meetings.
	Collective motivation	Sharing stories, experiences, findings.
	Tangible insights	Extended the Utility Toolkit as a game, participants produce artefacts (eg, upcycling paper waste).
	Energy monitors	Used to measure and monitor actual consumption of various appliances.
	Collaboration	Collaboration among participating household members to reduce energy use.
	Information	Energy experts provide information in meetings and leaflets.
	Feedback	Experts provide participants with feedback on their approaches and achievements in saving energy.
	Goal-setting	Goals are defined for every household, who are equipped with an IKEA appliance to help meeting that goal.
	Incentives	Sustainable-living.
	Reward	Monetary award in the form of energy-efficient appliances.
EnergyUse	Personal approach	Participants share own findings and experiences. See

		and experiment with own energy usage of personal appliances and devices.
	Feedback	Participants can see the consumption of their plugs and the average of the community. Also get feedback from other participants.
	Information	Tips provided by other users.
	Collaboration	Users provide answers to each other's questions or work together to find answers.
	Triggering discussions	EnergyUse is a forum, hence its main idea is to trigger discussions.
	Energy monitors	Users learn their own consumption and share this knowledge.
	Rewards	Badges are awarded to users to reflect their contribution and engagement levels.
	Incentives	Top contributors are acknowledged. Votes for contributions are given by the community.
Climate Challenge	Competition	Gamification is the bases of this tool, where users compete on getting the right answer to questions, and on climbing the ranking ladder.
	Rewards	Points are awarded for contributions. Winners receive WWF pandas.
	Information	Questions offer knowledge about climate change.
	Pledges	Various behaviour change pledges are offered.
	Incentives	Participation in research. Gamification is fun for users. Learning new facts about climate change.
	Collaboration	Contribution to the wisdom of the crowd questions.
	Feedback	Users are shown whether their answers are right or wrong.
	Collective motivation	Users see their social network friends in the ranking.

8 Deployment and assessment

In this section, we summarise our initial results on the impact of incorporating a selection of the interventions described earlier in this deliverable into some of the DecarboNet applications.

8.1 Analysis of Climate Challenge (CC)

As described earlier CC is a game with a purpose application aimed at raising awareness on climate change. As shown in **Error! Reference source not found.**, CC incorporates several of the interventions recommended in the DecarboNet methodology, such as *competition*, *pledges*, *rewards*, *collective motivation*, *collaboration*, etc.

To better understand the effect of some of these interventions on engagement and behaviour, we categorised the behaviour of CC users in accordance with the behaviour change stages Robinson has defined: *desirability*, *enabling context*, *can do*, *positive buzz* and *invitation* (which served as an inspiration for the user journey of the methodology), and measured the association of certain intervention elements with each behaviour stage. Aim of this analysis was to identify which intervention is associated with user engagement, and with which stage of behaviour. Here we will summarise the results of this analysis[44].

Table 3 below describes the analysis features used in this study, and how these features correspond (strongly or loosely) to the list of interventions of the methodology. Not all the interventions used by CC can be assessed with regards to their impact on engagement or behaviour. This is mainly due to the lack of specific quantitatively measurable features that can reflect certain intervention strategies. Other type of assessments can be used to enrich our analysis, such as user questionnaires and interviews.

Table 3: Climate Challenge analysis features

Strategy	Analysis Feature	Relation to strategy
rewards	Total points acquired	Points are awarded by CC to users
pledges	Number of pledges answered	Reflects the overall position of a user from pledged.
	Number of pledged accepted	Shows how many pledges the user is doing already.
	Number of pledged refused	Shows how many pledges the user has rejected.
collaboration	Number of predictions (guessing answers)	Shows the number of times the user collaborated with the other participants,

[44] An earlier version of this work was reported in D4.2

		by submitting a prediction.
information	Number of multiple choice questions answered	Proxy of the amount of information the user read and learnt.
incentives	Number of sentiment questions answered	"Support our research" is the incentive offered here, and reflected by this feature.
feedback	Ratio of right/wrong answered	Users are told which of their answers were correct or incorrect. This could be regarded as a type of feedback.
collective motivation	Whether or not the user signed up via a social networking account (social logging)	Could be regarded as a sign that the user is motivated by the social element of the application.

We applied our assessment to 288 CC users who interacted with all CC tasks. Using a linear regression model, we calculated the coefficients of the model to observe how each feature would impact the likelihood of the user to return to the game. Significant interventions according to the model are: Number of pledges answered (**pledges**), Number of multiple-choice questions answered (**information**), answers to sentiment questions (**incentives**) and points acquired (**rewards**). In other words, these interventions had a positive impact on user return.

Next we applied an unsupervised algorithm to mine patterns from the data using the features above. We used a clustering approach to get an automatic categorisation of users into groups. We performed the clustering analysis using K-means (K=5), in correspondence to the 5 stages of behaviour change of Robinson. The size of the produced clusters ranged from 24 to 111.

Results showed that users with the highest number of rejected pledges (**pledge** interventions), are still at the very early stage of behaviour change (**desirability** stage). 24 users were found at this stage. Users with a good correct answering ratio (**feedback**), but have the lowest participation in pledges, were at the second behaviour stage; **enabling context** (111 users). At the third behaviour stage; the **can do** stage, where users with the second highest level of participation in pledges, but with a low number of points (**rewards**). Out of 288, 38 users were regarded to be at this stage of behaviour. 101 users where at the **buzz** stage of behaviour, with a relatively high participation in pledges (0.64%) and a relatively good knowledge about the environment (8.5 points per visit). The final stage; the **invitation** stage (14 users), consisted of the ones who accepted the majority of the pledges presented to them (70%), and acquired the highest number of points. All users at this final stage also signed using a social media account (**collective motivation**).

In summary, this simple assessment shows that there is a good impact of **pledges**, **awards**, **feedback**, and **collective motivation**, on behaviour change stages. Further studies will be

required to better understand the possible dependencies between such interventions, and their long-term impact.

8.2 Analysis of Earth Hour (EH)

Various analyses of EH were done in DecarboNet, some of which was reported in D6.2.1, D6.2.2, and D6.3.1. Although the design and deployment of EH campaigns were out of the control of DecarboNet, the project was still able to analyse the impact of these campaigns, to understand the influence of various parameters and interventions on user engagement and behaviour.

The analysis was focused on (a) determining the patterns of EH tweets that generated heightened attention, and (b) understanding the behaviour stages (Robinson's) of EH participants. For the former, 15 user and content features were calculated and used to build a model to predict the engagement level generated by EH tweets. The *user features* were focused on the characteristics of the participant (eg., her number of followers, followed, and number and rate of posting), whereas the *content features* described the EH tweets themselves. Most of the used features can be mapped to a good degree to intervention strategy recommended by the Decarbonisation methodology:

Table 4: Earth Hour analysis features

Strategy	Analysis Feature	Relation to strategy
information	Complexity, length, informativeness, and readability of tweets. URL count.	Reflects whether or not the information provided in the tweets were easy to read and novel in relation to what was tweeted already. URLs in tweets (referral count) point users to further information.
emotional involvement	Polarity of tweets. Media.	Sentiment of tweets portray different emotional directions (negative, positive, neutral. Including images or videos in tweets is a way to emotionally charge the message.
triggering discussions	Post count, post rate	Number and rate of posting can reflect how often users initiate or contribute to discussions.

The results obtained from analyzing the 2014 and 2015 EH posts showed that, posts generating higher attention levels are slightly longer, easier to read, and tend to repeat terms existing in other posts (**information**). Results also showed that positive sentiment increases the level of engagement (**emotional involvement**). It was also found that incorporating media into the tweets has a positive impact on user engagement with the campaign (**emotional**

involvement). Number and rate of posting appeared to have a moderate impact, although it must be noted that these feature are of the participants, and not of the campaigners (**triggering discussions**).

In addition to the above, we also analysed the behaviour categorisation of EH participants, as reported in D4.2. Sentiment, emotions (emotional involvement) and language directives (information) were used as key linguistic features to identify (Robinson's) behavioural stages in Twitter of over 20 thousand participants. The results of the performed analysis showed that it is possible to identify the different behavioural stages in which users are, based on their generated content and interactions. In particular, sentiment, emotions and language directives have emerged as key features in both supervised and unsupervised approaches to identify and categorise behaviour.

Table 5: Earth Hour analysis features, with behavioural stages

Strategy	Analysis Feature	Relation to strategy
Information	Content quality. Focus dispersion	Measures level of expertise in the topics of EH, and distribution of user activity across forums and sub-communities.
Emotional Involvement	Sentiment. Emotion.	Sentiment and emotion portrayed in tweets.
Triggering discussions	Initiation. Contribution.	Number of times the users instigated a discussion, asked questions, replied to threads.
Collaboration	Engagement	Measures the level to which the users interacted with the community.

We used these features to categorise the EH participants in the various behaviour stages of Robinson mentioned earlier in this report. Results showed that most participants were at the early **desirability** stage, where they show signs of the desire to change, but unsure how. This demonstrates the need for EH campaigns to offer very concrete suggestions on climate change actions that could be taken by individual participants. Only a few users were found in the advanced **invitation** stage, which shows that the campaigners ought to involve such active users and other community leaders to share their stories and provide feedback to inspire others.

Although many tweets were posted, most were one-way communications, rather than multi-way discussions. One recommendation is for EH to engage participants in discussions and provide them with direct feedback to increase their engagement and behaviour change.

9 Conclusions

Designing a Decarbonisation Methodology requires intensive studies of existing literature and hand on experimentation. In this report we described main components of the Methodology, and the set of general and concrete interventions we identified to be suitable for the type of tools and applications developed and deployed in DecarboNet. Decisions on which intervention to implement in which DecarboNet application and tool were driven by various constrains, such as context requirements and time and effort availability.

We also reported our current results of evaluations of the impact of incorporating such interventions on user engagement and behaviour categorisations. These results provide insights into the potential influence of such interventions, which we hope to guide future design and developments of similar applications.

The Decarbonisation Methodology is a living documents, and will continue to evolve during and beyond the lifetime of DecarboNet.

10 List of figures and tables

11 References

Ajzen, Icek: The Theory of Planned behaviour". Boston University School of Public Health. 2016. Web. 3 Feb. 2016.

Abrahamse, W., L. Steg, Ch. Vlek, & T. Rothengatter. 'A review of intervention studies aimed at household energy conservation.' Journal of Environmental Psychology 25 (2005) 273 - 291

Ahn, L.v. and Dabbish, L. (2008). "Designing Games with a Purpose", Communications of the ACM, 51(8): 58-67.

Ajzen, I.. From intentions to actions: A theory of planned behavior. In J. Kuhl & J. Beckmann (Eds.), *Action control: From cognition to behavior*. Berlin, Heidelber, New York: Springer-Verlag. 1985

Ariely, D., J. Hrera and K. Berman. 2014. Hacking Human Nature for Good. Web. http://irrationallabs.org/the-workbooks/

Berger, J. Contagious. New York: Simon & Schuster, 2013. Print.

BJ Fogg's Behavior Model. Web. 12 Aug. 2015. http://www.behaviormodel.org

Bowman, T. Summary Report: A Meeting to Assess Public Attitudes about Climate Change. Silver Springs: National Oceanic and Atmospheric Administration (NOAA), George Mason University Center for Climate Change Communications. 2008

Cleary, I. 26 Social Media Monitoring Tools, Reference Guide. Razor Social. 03 Mar 2015: www.razorsocial.com/social-media-monitoring. 2015.

De Liddo, A., Buckingham Shum, S. 2013. The Evidence Hub: harnessing the collective intelligence of communities to build evidence-based knowledge. Large Scale Ideation and Deliberation Workshop, 6th Intl. Conf. on Communities and Technologies (C&T2013), Munich, Germany

Derczynski, L., Maynard, D., et al. "Analysis of Named Entity Recognition and Linking for Tweets", Information Processing and Management. 2015. 51: 32-49.

Diakopoulos, N., Naaman, M. and Kivran-Swaine, F. Diamonds in the Rough: Social Media Visual Analytics for Journalistic Inquiry. IEEE Symposium on Visual Analytics Science and Technology (VAST-2010). Salt Lake City, USA: IEEE: 2010. 115-122

Dijk, D. Van, et al. User as Designers. A hands-on approach to Creative Research. Web. 2011. http://waag.org/sites/waag/files/public/Publicaties/Users_as_Designers.pdf

Duhigg, Charles. The Power of Habit: Why We Do What We Do in Life and Business. NY: Random House, 2012.

EEA (European Environment Agency). 2013. Achieving energy efficiency through behaviour change: what does it that? Technical Report N5/2013.

Eyal, Nir and Ryan Hoover. Hooked. How to Build Habit-Forming Products. London: Penguin Books Ltd, 2014.

Fischl, D. and Scharl, A. Metadata Enriched Visualization of Keywords in Context. 6th ACM SIGCHI Symposium on Engineering Interactive Computing Systems (EICS-2014). Italy, Rome: ACM Press. 2014. 193-196.

Froehlich, J., et al. 'The Design and Evaluation of Prototype Eco-Feedback Displays for Fixture-Level Water Usage Data'. Computer Science and Engineering, The Information School DUB Institute, University of Washington. 2012

Froehlich, J., L. Findlater & J. Landay. 'The Design of Eco-Feedback Technology.' Computer Science and Engineering, The Information School DUB Institute, University of Washington. 2010

Heath, C. and D. Made to Stick. New York: DoubleDay Broadway. 2010

Hoang, T.-A., Cohen, W.W., et al. Politics, Sharing and Emotion in Microblogs. IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining. Niagara Falls, Canada: ACM Press. 2013. 282-289.

House of Commons. Science and Technology Committee. Communicating Climate Change. Eighth Report of Session 2013-2014.

Hubmann-Haidvogel, A., Scharl, A. and Weichselbraun, A. (2009). "Multiple Coordinated Views for Searching and Navigating Web Content Repositories", Information Sciences, 179(12): 1813-1821.

Johnson, P.M., Y. Xu, R.S. Brewer, G.E. Lee, M. Katchuck, and C.A. Moore (2012). Beyond kWh: Myths and Fixes for Energy Competition Game Design. Meaningful Play Conference. East Lansing, USA.

Lally, Phillippa, Cornelia H.M. van Jaarsveld, Henry W.W. Potts, and Jane Wardle. "How Are Habits Formed: Modelling Habit Formation in the Real World," European Journal of Social Psychology 40, no. 6 2010. 998 - 1009. doi:10.1002/ejsp.674

Lovett, M., Peres, R., & Shacher, R. On brands and word-of-mouth. Journal of Marketing Research. 2013

Mangaravite, V., Assis, G.T.d. and Ferreira, A.A. Improving the Efficiency of a Genre-aware Approach to Focused Crawling Based on Link Context. Eighth Latin American Web Congress (LA-WEB 2012). Cartagena de Indias, Colombia: IEEE CPS. 2012. 17-23.

Marcus, A., Bernstein, M.S., et al. Twitinfo: Aggregating and Visualizing Microblogs for Event Exploration. 2011 Annual Conference on Human Factors in Computing Systems (CHI-11). Vancouver, Canada: ACM. 2011. 227-236.

Meuter, M.L., D. Brown McCabe & J.M. Curran. Electronic Word-of-Mouth Versus Interpersonal Word-of-Mouth: Are All Forms of Word-of-Mouth Equally Influential?, Services Marketing Quarterly, 34 (3), 2013. 240-256

Moser, S. C., Dilling, L. (eds.) Creating a climate for change: Communicating climate change and facilitating social change. Cambridge: Cambridge University Press. 2007

Niepold, F., Herring, D. and McConville, D. "The Role of Narrative and Geospatial Visualization in Fostering Climate Literate Citizens", Physical Geography, 29(6). 2008. 529-544.

O'Donnell, Brian. Campaign Strategy. Tools for Grassroots Activists. Patagonia, 2016

O'Neill, S and S. Nicholson-Cole. Fear won't do it: Promoting positive engagement with climate change through visual and iconic representations. Science Communication, 30(3). 2009

Petty, Richard E. and John T. Cacioppo. "From Communication and persuasion: Central and peripheral routes to attitude change", New York: Springer-Verlag. 1986.

Piccolo, L. and Alani, H. Perception and behaviour towards climate change and energy saving, 29th International Conference on Informatics for Environmental Protection (EnviroInfo), Building the Knowledge Base for Environmental Action and Sustainability, Copenhagen, Denmark. 2015.

Piccolo, L., et al. Motivating online engagement and debates on energy consumption, ACM Web Science 2014, Bloomington, US, 2014. 109-118, ACM

Pierce, J., Paulos, E. (2012) Beyond energy monitors: interaction, energy, and emerging energy systems. Proceedings of CHI '12. ACM, 665-674

Rafelsberger, W. and Scharl, A. Games with a Purpose for Social Networking Platforms. 20th ACM Conference on Hypertext and Hypermedia. C. Cattuto et al. Torino, Italy: Association for Computing Machinery. 2009. 193-197.

Robinson, L. Enabling Change. Web. www.enablingchange.com.au/tools.php 2012

Robinson, L. How the science of behavioural change can help with sustainability. The Guardian. Web. 2011. - http://www.theguardian.com/sustainable-business/behaviour-change-sustainability-tips

Scharl, A. and Tochtermann, K., Eds. The Geospatial Web - How Geo-Browsers, Social Software and the Web 2.0 are Shaping the Network Society. London: Springer. 2007

Scharl, A., Hubmann-Haidvogel, A., et al. "From Web Intelligence to Knowledge Co-Creation – A Platform to Analyze and Support Stakeholder Communication", IEEE Internet Computing, 17(5). 2013. 21-29.

Shamma, D.A., Kennedy, L. and Churchill, E.F. Tweetgeist: Can the Twitter Timeline Reveal the Structure of Broadcast Events? ACM Conference on Computer Supported Cooperative Work (CSCW-2010). Savannah, USA. 2010.

Sipos, R., Ghosh, A. and Joachims, T. Was this Review Helpful to You?: It Depends! Context and Voting Patterns in Online Content. 23rd International World Wide Web Conference (WWW-2014). Seoul, Korea: World Wide Web Consortium. 2014. 337-347.

Stern, P.C, T. Dietz, T. Abel, G. A. Guagnano, and L. Kalof. A value belief norm theory of support for social movements: The case of environmental concern. Human Ecology Review, 6(8), 1999

Vaynerchuk, G. Jab, Jab, Jab, Right Hook. New York: HarperCollins Publishers Inc. 2013

Wattenberg, M. and Viégas, F.B. (2008). "The Word Tree, an Interactive Visual Concordance", IEEE Transactions on Visualization and Computer Graphics, 14(6): 1221-1228.

Appendix 1: Questions for PIE

To get an idea of what needs covering in the ***position*** area, the following are some examples of questions that could help guide that process.

- What is the general cause?
- What is the specific goal for this environment design?
- What is the desired new situation?
- Who is the change agent?
- What does the person, organisation, or movement (change agent) stand for?
- What is the (social/societal) reach of the change agent?
- Who are influencers on this cause/topic?
- What is the relationship between the change agent and the user?
- What is the position of the cause/organisation compared to others?
- Which mediums (digital and/or non-digital) are available to the change agent?
- What is the intended storyline?
- What is the timeframe in which the change needs to happen?

Questions to ask, to get insight in the **identify** area.

- Who are the users? (Specify homo/heterogeneous, small/large group, state-of-mind, etc.)
- What are the user's values and interests?
- What is the change that the user needs to make?
- Where are the users in the process of change (see *user journey model*)?
- Where do users share and interact with others?
- How do users relate to the cause?
- What is the socio-political/economical context?
- What are the current physical circumstances?
- What knowledge do users have?
- What abilities do users have?
- What are the obstacles or limitations?
- What change in behaviour is possible for this user?

Questions that help you in the **expand** area.

- Who profits from the change?
- What is the role of the users?
- What is in it for the user?
- In what way does the change alter the environment of the user?
- What are the triggers for the changed behaviour?
- What factors could instigate a relapse to old habits?
- Has the new environment a sufficient amount of triggers to remind of the behaviour?
- What could be variable rewards for continuing?
- What are incentives to continue or even pay-it-forward?
- What stories do the users create and share?

Appendix 2: Robinson's Five Door Factors

1. Desirability.

When a target audience is defined there are two things a sender should know:

- What is the user unhappy about/what does the user want to change?
- What frustrations could the behaviour or product help reduce'? [Robinson 2012]

For this to catch on you need to have a simple statement that reflects this desirability. The statement can't be 'spin' - it really needs to represent the change of behaviour for it to be sustainable.

2. Enabling context.

The surroundings of user have great influence on their behaviour. There are three ways in which environments influences behaviour: convenience, familiarity and social norms. When the right environment for change is created, working around these factors, it is more likely change will happen. Research into these environments is therefore essential for change to succeed.

> 'Use your brains trust to brainstorm enabling factors and prioritise those they believe should be modified. The enabling factors they decide to modify become your program objectives.' [Robinson 2012]

3. Can do.

A user should at least have the belief in his or her capacity to get results from anticipated change without embarrassment, humiliation, loss or injury. This is called *self-efficacy*. Tactics for increasing that feeling are increasing familiarity, autonomy, social proof, being part of a group, clear goals, regular feedback, generous personal interactions, commitments and enjoyment. The more these tactics are implemented the more likely it is a user will adopt the change.

4. Positive buzz.

(Positive) peer reviews are the strongest way of getting your story across and catching on. A positive experience makes it more likely that it is talked about. The following three rules apply:

- A story needs to be remarkable.
- 'Down buzz' needs to be turned into 'up buzz' (if it is not 'up' already).
- Change happens in networks.

'Keep in mind that buzz is made of stories about people, so it's vital that your project tells a buzz-worthy human story about the benefits of the behaviour.' [Robinson 2012]

While providing a human story, concrete tools/tips/advice on how to change the behaviour need to be given and opportunities need to be created for people to come together and talk about the subject, share experiences and be influenced by people whom already successfully adopted the behaviour.

5. Invitation.

Even when users are willing to change their behaviour they still need to be reminded and invited to act upon that desire. Find the right inviter for this.

'Have them share an emotionally engaging story. Make sure you clearly communicate a crisp snapshot of the behaviour itself so the actors can mentally rehearse the behaviour (building self-efficacy). Let them know the extent of their commitment (lowering fears) and what the agency is offering (mobilising reciprocity). Finish with a clear call to action so people know exactly how to get started on their new path.' [Robinson 2012, p12]

Appendix 3: On Word of Mouth

It is said that there are three main drivers for a *user* to engage in *word of mouth*: social, functional and emotional. In an effort to understand the underlying mechanisms of *word of mouth* Lovett et al. researched various studies done both by academics and marketing practitioners and found a common ground with these drivers.

'The functional driver is related to the need to obtain information, and the tendency to provide information; the social driver relates to social signalling: expressing uniqueness, self-enhancement, and a desire to socialize or belong; the emotional driver is related to emotion sharing.' [Lovett et al 2013, p5]

Additional to these drivers, academics in marketing defined eight motives that in some ways overlap with the drivers: 'information demand' and 'information supply' (functional driver); 'expressing uniqueness', 'self-enhancement', and 'the desire to converse' (social driver); and 'expressing emotions' (emotional driver). Motives like 'risk reduction' and 'involvement' could be fitted with more than one driver (functional and emotional) [Lovett et al 2013, p9]. Even though these motives and drivers are valid for *word of mouth* in general, they do present themselves differently. Social and functional drivers are usually more important for eWOM, while the emotional driver is most prevalent in offline WOM [Lovett et al 2013, p7].

Appendix 4: Vaynerchuk's rules for outstanding social media content

1. *It's native.* When a story ignores the context of the platform, it can fall flat. A sender might be there (i.e. on social media) to 'sell' something, but de users are there for value, and they have the great ability to ignore content that is not appealing. Therefore, the most effective *jabs* are subtle:

   'They are thrown with "native" content, which seamlessly blends in with the platform's offerings and tells stories that engage the consumer at an emotional level.' [Vaynerchuk et al 2013, p18]

   When done right a user would interact with the content of a sender (almost) the same way he would with content from a friend or acquaintance.

2. *It doesn't interrupt.* People tend to have little patience with interrupting ads, no matter how well crafted, and skip them as soon as possible.

   'If we want to talk to people while they consume their entertainment, we have to actually be their entertainment, melding seamlessly into the entertainment experience. […] Whatever experience people are seeking on their preferred platforms, that's what marketers should attempt to replicate.' [Vaynerchuk et al 2013, p21]

3. *It doesn't make demands. Often.* Even though the end game is to get people to act a sender should be generous first, and about what is valuable to the user, not to the sender. A sender needs goodwill. Essentially it is: give often and ask as little as possible.

   'Because when you jab, you're not selling anything. You're not asking your consumer for commitment. You're just sharing a moment together […] Skillful, native storytelling increases the likelihood that a person will share your content with a friend […]' [Vaynerchuk et al 2013, p23]

4. *It leverages pop culture.* Vaynerchuk claims that generations are defined by their pop culture. The sender should tailor the content to the world of his users. That way a sender can interact with the users on their own level and terms.

5. *It's micro.* Content should be seen as just small bits of information, that are funny, inspirational or just commentary - but always aware of its place in time, its culture and current events. This is why a sender always needs to pay attention, and ready to respond to any occurrence twenty-four seven.

6. *It's consistent & self-aware.* No matter how many platforms a sender wants to cover, he still needs to have a core story, and that needs to be constant. But a sender also needs to have a constant personality and identity.

> 'When you are self-aware, you know your message. When you know your message, it's easy to keep it consistent in every setting.' [Vaynerchuk et al 2013, p28]

Appendix 5: Berger's STEPPS for Contagious Content

1. *Social Currency* is about (social) status. Senders need to give users a way to make themselves look good while promoting a products or idea. There are three ways to do that:

I. *Find inner remarkability* - things that are defined as unusual, extraordinary, worthy of notice or attention, and most importantly: worthy of remark.

> 'Remarkable things provide social currency because they make the people who talk about them seem, well, more remarkable. […] the desire for social approval is a fundamental human motivation.' [Berger 2013, p39]

II. *Leverage game mechanics.* Good game mechanics keep people engaged, motivated and always waiting for more. They can work on an internal level: achieving a goal makes you feel good. But on an interpersonal level it encouraging social comparison. People care about how they are doing in relation to others. Leveraging game mechanics well also means helping people to publicise their achievements and broadcast their status.

III. *Make people feel like insiders*. When you know something that someone else doesn't know, or when you have exclusive access to something it most likely makes you feel powerful. Exclusivity and scarcity raise social status, and immediately make people feel like insiders, and the 'product' more desirable. Both are about availability. Scarcity is about how much of something is offered. Exclusivity is about the access to something, which is not always about money or fame, but can also be about knowledge.

2. *Triggers*[45] are stimuli that prompt people to think about related things. There needs to be a relation between a story and prevalent cues in the environment for people to think about the story, so that 'top of mind leads to tip of tongue'.

Once a user knows about his behaviour, has the knowledge about a subject and knows what to do about it, he still needs to be reminded about the new behaviour, at the right time, to actually act upon it. This is relevant for the physical environment, but also for the platform that is used to communicate on. Vaynerchuk described it as '*content is king, but context is God*'. [Vaynerchuk et al 2013].

[45] 'Trigger' is a regularly used term with for the most part a common understanding of the word. However, there are slight variations or subversions used throughout the different literature. Berger uses the term in the broadest sense.

'Public heath campaigns would also benefit from considering context. Take messages that encourage collage students to drink responsibly. While the message might be really clever and convincing, they are posted at the campus health center, far away from the frat houses or other places where students actually drink. So while students may agree with the message when they read it, unless they are triggered to think about it when they are actually drinking, the message is unlikely to change behavior.' [Berger 2013, p80]

People naturally talk about products, brands, and organisations in their day-to-day life.

'Every day, the average American engages in more than sixteen word-of-mouth episodes, separate conversation where they say something positive or negative about an organization, brand, product, or service. […] This kind of social talk is almost like breathing. It's so basic and frequent that we don't even realize we're doing it.' [Berger 2013, p64]

There is a distinction between immediate word of mouth and ongoing word of mouth.

The first is when someone shares new information, soon after it has been acquired. The latter covers the conversations people have in the weeks and months that follow. Both types are valuable but the value is dependant on the type of product. Interesting and novel things receive more immediate word of mouth, yet they do not get more ongoing word of mouth than boring things.

'Market research often focuses on consumers' immediate reaction to an advertising message or campaign. […] in most cases, people hear an ad one day and then go to the store days or weeks later. If they're not triggered to think about it, how will they remember that ad when they're at the store?' [Berger 2013, p80]

The key is to use the immediate environment to trigger a conversation on the desired topic. Products and ideas have sets of triggers that cause people to think about them. Some things are natural triggers for one another (or at least through historical connections) like reggae music to Jamaica, to weed and to Rastafarians, or like massages to saunas, to swimming pools and to wellness. But you can create new links to stimuli in the environment by 'forcing' a connection through a campaign between two seemingly unrelated subjects. You could even hi-jack a competitor or brand to tell your story, which is called a 'poison parasite'.

'A famous antismoking campaign […] spoofed Marlboro's iconic ads by captioning a picture of one Marlboro cowboy talking to another with the words: "Bob, I've got emphysema." So now when people see a Marlboro ad, it triggers them to think about the antismoking message.' [Berger 2013, p85]

We also need to consider frequency of possibilities to mention or trigger the subject. Even though Disney World could be widely considered a more interesting subject than Cheerios (breakfast cereal) the latter gets far more word of mouth.[46] This is because every day

[46] Berger, J. Contagious. 2013. 62

hundreds of thousands of people eat Cheerios for breakfast and people don't go to Disney World that often, and there are few triggers that remind people about that experience in a day-to-day life.

'The more something is triggered, the more it will be top of mind, and the more successful it will become.' [Berger 2013, p91]

3. *Emotion.* Feeling is a much bigger motivator to act than function. However, when it comes to sharing, some emotions increase sharing, while others actually decrease it. It is often believed that positive messages get shared better than negative ones. But there is a slight nuance to that. It turns out that messages that are positive and contain activation or physiological arousal (awe, excitement, amusement), and negative messages that have high arousal levels like anger or anxiety usually call to action - and thus get shared. Messages with low arousal (positive or negative) like contentment or sadness actually stifle action.

Negative emotions, provided with high arousal, can be powerful drivers for discussion. When it comes to physiological arousal, any of it due to the situation itself (rather than content) can boost transmission. So if you are able to physically activate users, and get them physiologically aroused, it is easier to get them to share.

Sharing emotions also helps to connect.

'Emotion sharing is thus a bit like social glue, maintaining and strengthening relationships. Even if we're not in the same place, the fact that we both feel the same way bonds us together.' [Berger 2013, p105]

A sender should not only focus on providing information on a subject and adding practicalities on how to 'fix' a situation. He also needs to focus on feelings; the underlying emotions that motivate people to action. Humanize a message. That's what brings out emotion. Chip and Dan Heath, marketing researchers and writers of *Made to Stick* [Heath et al 2010], made use of the "three why's" to find the emotional core of an idea. It start with writing down why you think people are doing something - and then ask 'Why is this important' three times in a row.

'Want people to talk about global warming and rally to change it? Don't just point out how big the problem is or list key statistics. Figure out how to make them care.' [Berger 2013, p116]

4. *Public.* People are almost hard-wired to imitate others, so a driving factor to let things catch on is *public visibility.* When things are visible and public it's easier to imitate, which makes them more likely to become popular. If it is hard to see what others are doing, it is hard to copy that behaviour.

Behaviour is public. Thoughts, however, are private. For example: people often have no questions after a confusing presentation. This does not mean that everybody understood what was going on. More likely, people copied the behaviour of the others in the room. 'Nobody asked a question, nor should I'.

> 'If there are no public signals that others were confused too, everybody keeps their doubts to him- or herself […] People can imitate only when they can see what others are doing.' [Berger 2013, p134]

Often a sender wants people to act in a private setting - yet there is little opportunity to reach people in that environment. Somehow, the private needs to be made visible; be made public. The campaign of Movember, growing a moustache in November to raise awareness for prostate cancer, did just that. It transformed, quite successfully, an abstract cause to something everybody could see.

> Key is to find a way for a product, idea or behaviour to advertise itself - and this happens when people consume it. If people do not already do that you might achieve that by creating *behavioural residue: the physical traces or remnants that most actions or behaviours leave in their wake* [Berger 2013, p147]. Great examples of this are the yellow Livestrong wristbands, worn during an awareness event on cancer (a bike ride with Lance Armstrong). Yet they remained visible long after the event, and with that the message on cancer-awareness continued to live on. Similar are the 'I voted' stickers for the people that just cast their ballot or sturdy shopping bags with logos of stores on them. Al these things remind us of past behaviour (of others) and might inspire people to act themselves.
>
> So, if you want people to do something you need to make it visible. But it also works the other way around: if you want people to *not* do something, don't tell them that a lot of their peers are doing it. This is why antidrug campaigns are so very difficult to master; you want to inform people about the risks, but then you also have to tell them about the things that are available in order for people to stay away from them. The focus should be on what *should* be done, rather than on what shouldn't.

5. *Practical Value.* People like to share practical information. Sharing something useful is a quick and easy way to help others, even if they are far away.

> 'If Social Currency is about information senders and how sharing makes them look, Practical Value is mostly about the information receiver. It's about saving people time or money, or helping them have good experiences.' [Berger 2013, p159]

But for something to be shareable, we need to see the practical value in the information. Often this has to do with the financial value like getting a good deal, but other types of value, like comfort, ease, etc. are also considered.

> When it comes to the psychology of decision-making people actually don't reference things in absolute terms. They evaluate them relative to a comparison standard, or

'reference point'. People have different reference points to begin with. So when you know what that is for your audience, you can advise them accordingly.[47]

Another factor in this decision making process, and willingness to share value, is 'diminishing sensitivity' which *reflects the idea that the same change has smaller impact the farther it is from the reference point* [Berger 2013, p167]. In different contexts, different aspects carry value. Saving 5 euro, by switching of one light, on a energy bill that is normally 20 euro might seem like a good deal. You reduce your energy cost with 25%. Saving the same amount on a bill that is normally 120 euro (6 % reduction) might not be worth the effort. Ease wins from financial gain.

In this light 'the rule of 100' is relevant. Promotions, be it pricing for a product or reduction of costs by changing behaviour, often rely on presenting discounts. The way to phrase this is either in actual money, or in percentages. But which way is more effective? 'The rule of 100' is as follows: if the product's price is less than $100 percentage discounts will seem larger. If the product's price is more than $100, numerical discounts seem larger.

However, not every practical value is money related. Useful information, like recipes and reviews, has practical value - and therefore are sharable stories. Similar to what is relevant for social media, is relevant for any story: depending on where you share your story, you need to adapt it to its surroundings. Also similar to your content on specific social media, you need to know whom you are addressing. It is not a given that when you focus on broader audiences, a story gets shared more.

The problem with this assumption […] is that just because people can share with more people doesn't mean they will. In fact, narrower content may actually be more likely to be shared because it reminds people of a specific friend or family member and makes them feel compelled to pass it along.' [Berger 2013]

False information can also spread quickly.

6. *Stories.* Stories are of great value to virality. Information can be taken as a stowaway and be effective when it presents itself at right time during that story. Stories are like Trojan Horses, carrying morals and lessons, and information travels along - even though it sometimes seems like just chitchat.

'We need to make our message so integral to the narrative that people can't tell the story without it.' [Berger 2013, p24]

[47] Following the 'prospect theory' developed by Nobel Price for Economy winners Daniel Kahneman and Amos Tversky.

> People think in terms of narratives, not information. Narratives are far more appealing; they have a beginning, middle and end - and when people get sucked in half way - they will stay for the closure. While people tend to focus on the story itself, information comes along for the ride.
>
> 'Stories are an important source of cultural learning that help us make sense of the world. At a high level, this learning can be about the rules and standards of a group or society.' [Berger 2013, p186]
>
> Alternative ways for people to get their information, via trial-and-error, direct observation or advertisements are all less effective and efficient than telling a great story. People acquire lots of knowledge in a vivid and engaging fashion. But in the end, people respond to a story or message if they feel it is genuine and sincere.
>
> 'People are also less likely to argue against stories than against advertising claims. […] it's hard to disagree with a specific thing that happened to a specific person. […] we are so caught up in the drama of what happened to so-and-so that we don't have the cognitive resources to disagree.' [Berger 2013, p189]

But telling stories, for the sake of getting people to talk is not enough. A sender can build a great 'Trojan Horse' but if there is no solid content, it is no use. People need to talk about the cause, product or behaviour. Viral stories that are valuable to the sender are *valuable virality* [Berger 2013, p196]. This means that a sender needs to pay attention on how the story is constructed and highlight those parts that are valuable to the sender, for the user to know and remember. Like the story of the Trojan Horse - most people know the gist of it, but not the detailed story in full. 'The gist' needs to contains the vital information people need to remember and act upon.