EC Project 610829

A Decarbonisation Platform for Citizen Empowerment and Translating

Collective Awareness into Behavioural Change

D5.1: Engagement Roadmap

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Version history

Version	Date	Author	Comments
0.1	27/03/2014	Simon Anderson	Initial version.
0.2	20/05/2014	Simon Anderson	Background research from **GEO**
0.3	23/05/2014	Lara Piccolo	Adaptation to the template; addition of the executive summary, introduction, context review, results of the KMi experiment, conclusion.
0.4	09/06/2014	Simon Anderson	Proof reading and minor edits

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Executive Summary

Engaging participants is a crucial step that determines the success or failure of online tools. In the context of DecarboNet, engaging people does not mean only attracting users to a social platform, but also getting them to use the platform and associated technologies to bring about improvements and social change with regard to energy consumption, and possibly wider applications too. Social dynamics such as competition or collaboration can also influence engagement in different ways according to the social group characteristics. Understanding what are the main factors associated with engagement is the main research challenge associated to the WP5.

The use case addressed in the WP5 is grounded on **GEO**'s background research and experience in engaging people with the energy conservation issue. Existing social groups will be selected as DecarboNet users and invited to use **GEO**'s smart monitor devices and a Web platform. The process of enrolling people, educating, engaging and encouraging them towards behaviour change will be then monitored and assessed.

This report briefly describes **GEO**'s experience in studying engagement and, based on that, outlines the use case associated to energy savings. A situated experiment using **GEO** smart devices by researchers in the Open University is also reported pointing out the importance of these monitoring artefacts as learning tools.

In its first version, this report also presents a macro view of the engagement roadmap, which involves the development of Energyquest, a web portal for energy savings, and the association with the Earth Hour campaign in 2015, part of WP6. The interaction with WP1 and WP4 for gathering social requirements, analysing and monitoring engagement are also predicted and described.

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1. Introduction

Engaging participants is a crucial step that determines the success or failure of online tools. Understanding **engagement** in the context of DecarboNet though requires a wider perspective than the definition provided by the dictionary, which is "*an arrangement to do something or go somewhere at a fixed time"* [1]. Other definitions complement this view in the online scenario, such as the one provided by Yates and Lalmas [2] that defines **user engagement** as "*the phenomena associated with wanting to use that application longer and frequently*", which can be mostly considered as a consequence of the application interaction design. Engagement can be also a measurement of participation within an online community relating, for example, the number of people a user interacts with, the time a user spends using a platform and how frequent he/she is connected. When targeting a social change, engagement can be associated to the participation in collective or collaborative activities, and to the **civic engagement**, as defined by APA [3] as "*individual and collective actions designed to identify and address issues of public concern*".

For DecarboNet, engaging users implies merging these definitions. It means gathering people through technology towards a social innovation. Considering that engaging people means bridging virtual communities with different aspects of users' everyday life, the challenge cannot be considered only a designers or community managers concern, it must be tackled by a set of stakeholders related to the conception, development, and dissemination of the collective awareness platform.

Technology may play different roles in engaging people, which may also differ when social dynamics are associated, like competition or work in collaboration among the social group. Understanding the impact of these different strategies and technologies in engaging people in different contexts is the main research challenge addressed by WP5. More specifically, in WP5 use case people will be invited to adopt smart monitor devices to reduce energy consumption, and then share experiences within their social group by means of online tools, promoting new social norms related to energy conservation. **GEO**'s experience in engaging users with energy has been applied to DecarboNet to select those users from existing social groups and to keep them active in promoting behaviour change towards carbon emission reduction.

In the next section, an overview of the background research developed by **GEO** is presented, followed by the use case outline. Then, results of a situated experiment related to energy monitoring is reported, followed by the roadmap defining further work.

2. Background research

GEO has been investigating engagement with energy savings since 2006. What motivates people towards energy conservation, the role smart monitoring devices plays, and how to make them more effective in terms of information presentation and look-and-feel are some of the topics analysed by **GEO** throughout field studies. In 2009 and 2010, three types of energy consumption displays were evaluated in 275 homes across East Anglia in the Visible Energy Trial [4][5]. In 2011, Project Volcan looked at how to engage users and help them to understand their heating system with the feedback from their smart meters. Beyond these projects, **GEO** has also supported over a dozen of energy trial across Europe. Main findings related to these experiences are further described in order to guide engagement strategies in the context of DecarboNet.

2.1 Interest in reducing energy consumption

The first study in 2006 involved 1000 consumers in the UK in an online survey plus 11 focus groups. It aimed to understand whether and how people would adopt energy management products. A key finding was the high levels of interest in reducing energy consumption both to save money (92%) and to reduce the impact on the environment (89%), as illustrated by the chart in Figure 1. Similar results were found in Germany in 2010, evidencing equally high levels of interest for saving money (94%) and reducing CO2 (90%).

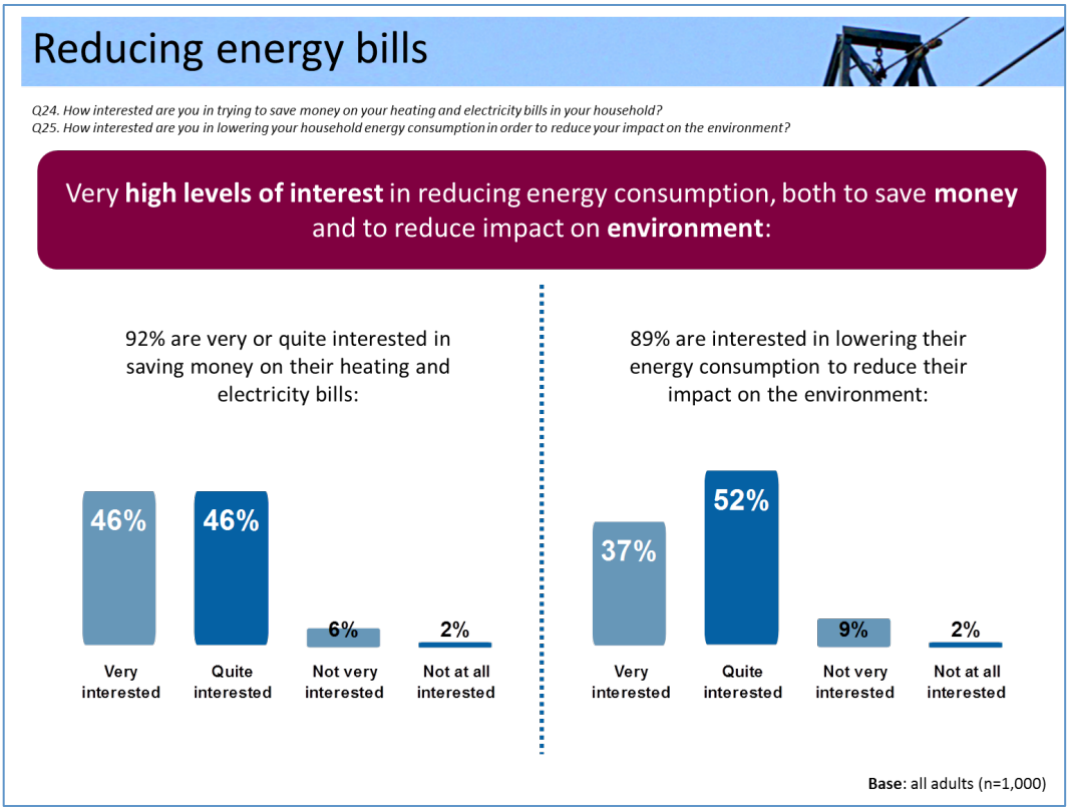

Figure 1 – Level of interest on saving energy reported

More recent routine focus groups conducted by **GEO** have suggested a change in peoples' attitude though. The importance of reducing CO_2 has decreased when compared to results of 4-5 years ago. Yet, further investigation is necessary to assess this perception quantitatively.

2.2 The role of the consumption feedback

The Visible Energy Trial [4] [5] evaluated the role of energy consumption feedback by involving 275 households in the UK for 18 months. The participants were divided into 4 groups: the control group, which had a monitoring system installed but no interactive display, while other groups used one of these displays each:

- The Solo - a simple electricity only IHD;
- The Duet – an intermediate IHD that includes direct feedback and control of up to 6 appliances using smart plugs. It also has simple feedback on temperature and boiler functions showing when the central heating and hot water systems were active.

- The Trio – an advanced system with disaggregated data for electrical circuits, control individual appliances, temperatures and boiler function, all on an advanced touch screen display that could also be viewed and controlled remotely.

A sample of 15 households among these groups was randomly selected for a set of interviews. The results reveal that the devices are used by households rather than individuals per-se. One of the reasons is that in shared homes individuals cannot make significant changes without first negotiating them with other household members.

Over time, the monitors show a tendency towards habituation. They become “backgrounded” within everyday life and, as such, gradually lose their ability to encourage reductions in energy use. Along the time, the displays were then seen as helping householders to identify and maintain a satisfactory level of energy use rather than to continually reduce it.

One purpose of an energy display is to help people cut out wastage by changing their behaviours. A second, and possibly more important purpose of an energy display is to trigger other actions that deliver significant and lasting improvements in energy efficiency. The feedback provided by the displays has triggered wide-reaching actions beyond simple behaviour change. Increased understanding and visibility of energy use led to users purchasing energy efficient lights and appliances, and also exploring other steps such as insulation and micro-generation:

- Almost all participants that did not have a full set of low energy light bulbs bought additional ones;
- 35% of respondents bought new low energy appliances as a consequence of the trial.
- 65% reported planning or considering buying a new low energy appliance to replace an old one.
- Approximately 25% of respondents reported considering installing insulation;
- Approximately 35% of respondents reported considering fitting solar panels.

One area that was not very successful in the trial, although much was learned, was the heating functions. People have even less understanding of heating than they do of electricity and there is a reluctance to engage. For

example, whilst only 15% of respondents said they had a good boiler, well over 50% were not even considering changing their system.

Technical constraints faced during the study evidenced the complexity of determining savings in kWH or CO_2. The lack of sufficient good quality data meant that many of the results found could not be shown to be statistically significant. Nevertheless, a significant drop in the energy usage for the groups provided with displays was found, but we are unable to confirm if this reduction was sustained and for how long. Arguably, the displays themselves do not reduce peoples' consumption – it is the actions that they take in response to real time feedback (e.g. buying energy efficient appliances) that impact consumption patterns.

2.3 How to present consumption information

The devices look-and-feel and how the consumption information is presented are also important factors for engagement. Taking that into account, the study also assessed how detailed the consumption information should be. Results evidenced that people have different levels of interest and different motivations to adopt technology, and found out the need of combining simple "at-a-glance" displays and more detailed analysis and comparison analyses viewed on a computer, as illustrated in Figure 2.

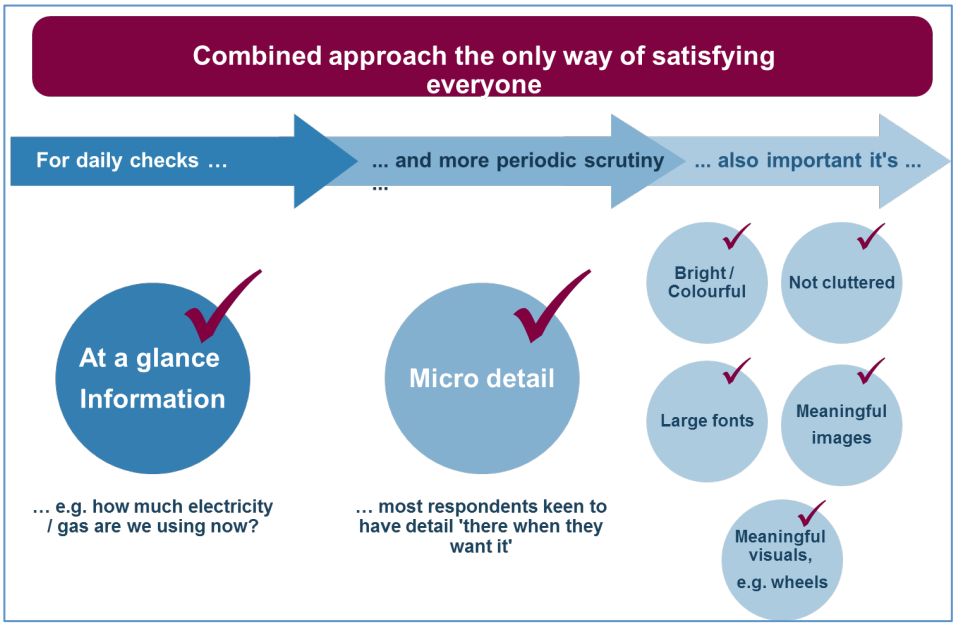

Figure 2 – Requirements for presenting consumption information

It was also found that **the more people are shown, the more they want**. In Figure 3 the participants' answers suggest that the more information people received the more engaged they became and wanted to extend their interest

to other topics. 71% of users of the most reach in features device (Trio) declared the interest to add more sensors or functionality to their display, 47% of Duet users and 38% of Solo users.

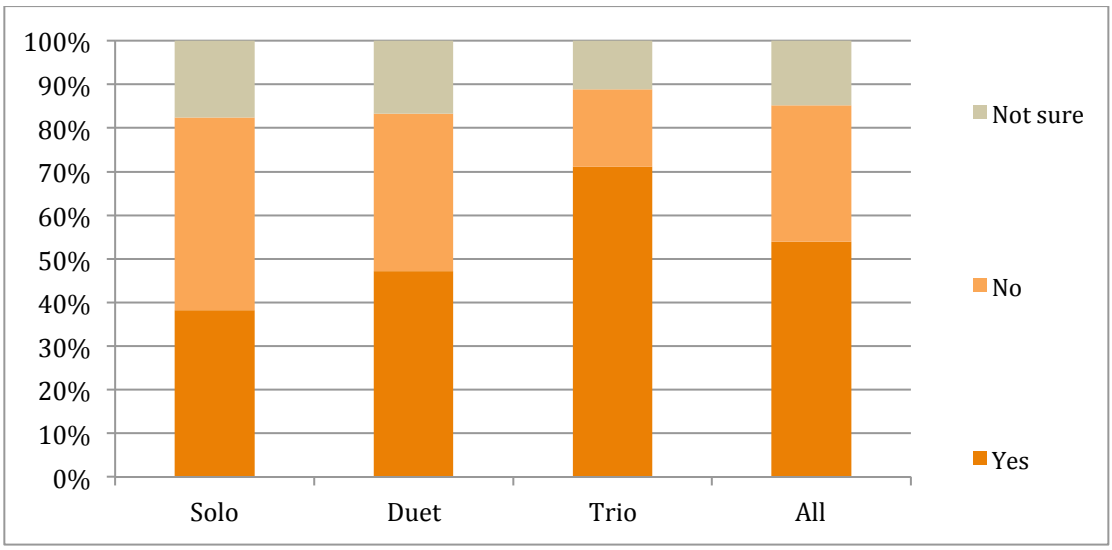

Figure 3 – Interest declared by users in adding new features

Constantly **GEO** conducts focus group to collect users' perception of their products. Regarding how information should be presented, were considered as crucial aspects for engagement:

- Simplicity and clarity: too much information too soon can scare people off – basic is a good starting point
- Context and meaning: users need help to make sense of the raw data and figures.

Another important result regarding engagement relies on users' confidence. 70% of interviewees reported an increase in their confidence to engage with energy matters by using the smart monitors, a necessary step to be effectively engaged with the issue.

3. WP5 Use Case Outline

Motivating engagement with home energy consumption has been proven to be a complex task [10] [11]. Energy is out of sight and out of mind and, therefore, is poorly understood. In addition, it is limited only by the user's ability to pay and political pressure is exerted on reducing the cost rather than curbing the use of energy. Consequently, there is little incentive for individuals

to improve energy efficiency and people continue to consume what they need, when they need it.

However, in general, people do not wish to be profligate and to waste energy: many *do* have a carbon conscience however latent. Social norms are accepted as being powerful drivers of human behaviour [12] and there is growing evidence that this can and is having an impact on energy consumption behaviour. Whilst home energy consumption is much more invisible and less binary than other goods, it is believed that creating a social norm around being more energy efficient offers one of the best routes to changing peoples' behaviour, and the collective awareness platform may play a crucial role in shortening this process.

The experience in the energy field over the last eight years has led **GEO** to develop a five part process model called "Times Five", which will guide DecarboNet strategies to generate a new social norm around energy efficiency activities in the home.

The reason for the title "Times Five" is to emphasise that missing out any one of the five parts will lead to eventual failure (reversion to previous behaviours) in the same way that multiplying anything by zero makes zero. The five parts are as follows.

1. Enrol: establishing the means to generate and spread interest (otherwise it will not become a social norm)

2. Educate: helping people to understand and gain confidence in their ability to manage their consumption – and to talk to, encourage and advise others

3. Engage: to take actions, form routines and embed practices

4. Encourage: to provide ongoing feedback and encouragement that in turn generates progress

5. Expand/enhance: to provide further steps and opportunities that build on early progress and creates momentum

It is proposed to use this model to plan and scope the engagement roadmap to ensure a successful and sustainable outcome.

3.1 Energy monitor tools

It is proposed to use two particular systems to engage users with the energy saving issue, a standard In-Home Display system and a Web portal called Energy**quest** for feedback from users and discussions among them.

As educational tools (part 2 of the model), helping people to learn about their energy consumption and concrete possibilities to change behaviour, two different types of monitor systems will be made available to DecarboNet users, as illustrated in Table 1. Both of them require access to electricity meter and can be connected by either a CT clamp or an LED reader.

Table 1 - energy monitoring tools available for DecarboNet users

Monitoring device	Features	
The Ensemble	Provide at-a-glance feedback on up to 6 individual appliances (using 16 W general smart plugs) as well as the overall home electricity consumption. It connects to the web using a wireless to IP bridge and historic consumption can be viewed on a web portal called Energy**note.**	
Solo II	This system uses a simpler display with individual appliance information being only capable of being seen on the web. It also uses a backlit colour display, which most feel is more attractive	

The monitoring units record usage data, which is then transferred to **GEO**'s servers for subsequent analysis by users on Energynote. They are individually assigned and can access the consumption data via Web or mobile, as illustrated in Figure 4.

Figure 4 – Energynote web and mobile visualization

Energyquest is a development of the Energynote web portal adding more engaging mechanisms, such as dialogue and step-by-step instructions about how to expand the monitoring system and take the most of it towards savings. As described in the following WP5 roadmap, Energyquest will be developed and enhanced in connection with other DecarboNet work packages, more specifically WP1 and WP6.

4. Situtated experiment

As a matter of evaluating how the smart monitor devices could be associated to raising energy awareness collectively in the DecarboNet context and how strategies to motivate engagement could be applied to the energy conservation issue, a preliminary study involving researchers from the Open University was conducted during October and November of 2013. The study involved a total of 33 participants and counted on 15 Ensemble kits from **GEO** consisting of a display, an electricity meter reader and up to 6 smart plugs each. In the next subsections we summarize the study and present results related to the use of energy monitor devices. The full experiment, including the impact of motivational strategies, is detailed in the Deliverable 1.1 [6] and results were also published in [7].

4.1 Methodology

The study happened at the Knowledge Media Institute (KMi) at the Open University. A collaborative knowledge-building tool called Evidence Hub [8] was applied as a space for raising awareness collectively in the form of online debate. The study was composed by 4 phases: 1) Online survey; 2) Two workshops on the debate tool; 3) Smart monitors trial; 4) Sample interview.

The online survey aimed at collecting preliminary ideas for populating the debate tool. It was composed by 3 topics: ideas to save energy in the

workplace, ideas for personal behaviour change, and problems related to the building or to the institution, splitting individual responsibilities from installation issues or working practices.

The Energy Tree, a public and tangible feedback device of engagement was connected to the debate tool during phases 2 and 3. In the workshops, attendees promoted and demoted Facts related to Consuming Energy, prioritized them by voting and discussed Issues. They also created new and voted for Ideas for Behaviour Change, and then provided pro and cons arguments for the ideas. The groups engaged in some face-to-face discussions, but most of the activities were done online, on the debate tool. Contributions created in the WS1 were not visible for the participants of WS2, and vice versa, to avoid influencing the creation of new content. Both workshops had the same dynamic, except for the presence of the Energy Tree in the WS2 placed in the centre of the room as a feedback mechanism by reflecting the number of new contributions submitted to the debate tool. It was expected that the Energy Tree would motivate a higher number of contributions to the debate tool in WS2.

In phase 3, volunteers of both workshops were asked to install the smart energy monitors at home or in the office for learning about their consumption, and sharing their findings in the debate tool during the following week. During that time, the Energy Tree was placed in a social area of the department as a feedback of engagement. Every 60 new contributions to the tool (new issues, ideas, arguments, facts, resources or votes) turned on a new branch of the tree. Results of each group were identified and kept alternating from time to time.

In phase 4, after the trial, a sample of participants, including the top and bottom contributors, was interviewed about their motivations, perception of the tree and the smart monitor as well as their overall experience with this study.

4.2 Results related to smart monitoring

The knowledge acquired by means of smart monitors constituted an important source to guide perception and led to an evaluation of possibilities of changes in behaviour. The short-term aspect of the study prevented an evaluation of smart plugs usage along the time, but was enough to evidence the importance of the devices as learning tools. In line with the investigation made by Schwartz [9] in a longer and broader term, answers to the final interview evidence how the smart devices were used for:

- Learning about the cost of determinate appliances consumption: "*I have calculated some basic costs of e.g. a washing cycle, a toast, one year of fridge*", reported a participant.

- Tracking the consumption along the day*: "I am usually monitoring consumption of specific devices over a period of a few days and using the general meter reading to pay attention to the energy intense usage periods during the day."*

- Comparing consumption appliances: *"I observed consumption while the laundry or pot is running: reasoned that pot even if it runs for a short period of time and such a small electrical device it actually consumes a lot of energy"*, and guiding choices: *"(…) it has changed the way we use quite a few things in our house. For example, we don't cook rice using the electric cooker or microwave because it consumes too much of energy. Instead we use a pressure cooker. We also stopped using the kettle to boil water*".

- Understanding cause-effect: "*I was using the smart devices at KMi. I was curious how much energy does my laptop and monitor use on daily basis and also whether the monitor keeps using energy while in standby mode. This was the reason why I now started switching the monitor completely off before going home every day*".

- Mapping consumption in the house: "*creating usage stats for the following items, so that I can then target high usage areas. Monitoring Fridge, Freezers, Dish Washer, Washing machine, Kettle, Two TV's, Home Server, Printers, PC, Lighting".*

Interestingly, one participant reported the preference for seeing the consumption online instead of by the IHD because of the need to plug it on.

Information related to monitoring consumption was not typically discussed in the online debate. Instead, it was observed that the discussions about the device installation and the findings obtained by using them happened among colleagues mostly during coffee breaks, lunchtime or around the tree installation, for instance. A possible reason is that personal information like "*the old one (fridge) is consuming twice as much as a new one would. Could half my energy costs for the fridge per year down to 25£ or so"* was considered of private interest, and not suitable to be shared trough a "formal" social tool. For WP5 is suggested then to investigate attractive and engaging ways to report successful stories of energy savings among a social group, in such way this identified "barrier" do no prevent people of sharing energy related experiences online.

4.3 Ideas for further development

The positive impact of the Energy Tree as a public feedback has generated discussions within the project members, leading to the idea of developing a "carbon tree" Web portal, where each branch of the tree is actually a

metaphor for particular type of carbon reduction. Gas, electricity, and microgeneration can be “branches” of the tree, which suppose also to connect different online tools, such as Facebook and Twitter beyond Energyquest, for engaging people online. These ideas will be discussed in the next project meeting in June.

5. WP5 roadmap

Engaging users with the technology provided by DecarboNet is the main target of WP5. Connecting them through Energyquest and the Earth Hour campaign in 2015 are some of the target approaches. Results of the social requirements elicitation and the co-creation methodology developed in WP1 [13] will be applied to select users, conduct workshops and activities to engage them in longer term as described as follows.

Four main stages are proposed leading up to the support of Earth Hour in March 2015.

1) **Planning (June – July ’14)**

   In order to identify what motivate people to enrol (Stage 1 of the Times Five methodology) and to progress to other stages, **GEO** and WAAG will conduct together two 2-day workshops in June and July of 2014. The purpose is to create a story line that:

   - Attracts users and encourages them to enrol others;
   - Creates a “look and feel” that can be leveraged over the course of the project
   - Integrates with the Utility Toolkit developed by WAAG and works out how to scale up engagement with the Toolkit;

   This activity will require approximately 8 additional man-days of effort per team to prepare and follow-up from the workshops.

2) **Small-scale pilots (Aug – Dec ’14)**

   Two small-scale engagement initiatives in the UK and Holland using the utility toolkits developed by WAAG and the monitoring systems donated by **GEO** will be conducted as pilots of the engagement strategies for DecarboNet.

   Is consists on iterative pilots with materials and interventions being developed progressively based on feedback and a series of co-creation activities. This focus on supporting materials that help users get the most out of the displays and that stimulate social dialogue and would implement the Times Five methodology so that all five parts of a successful.

Three different types of social groups will be considered for the activity:

- Local schools (subject to ethical clearance);
- Business environment: promote the opportunity to staff and employees of a business interested in supporting the research;
- Local communities;

3) **Develop and test a social conversation module (Sep – Feb '15)**
   Research (co-create), develop and integrate a "social conversation module" into **GEO**'s Energyquest platform in preparation for the 2015 Earth Hour campaign. This is expected to draw on the output from work packages 2 and 3.

4) **Earth Hour Campaign (Jan – Mar '15)**
   Develop and implement a campaign that uses Earth Hour 2015, as planned in the WP6, to promote Energyquest to a wide audience and thereby generate the crowd needed to deliver input to the project.

Upon completing the four stages (from April'15), the Energyquest platform will be in operation and updated quarterly, reacting to the feedback generated to hone and enhance the effectiveness of messaging using the Times Five methodology. The effect of the feedback on individual home consumption in terms of levels and patterns will also be monitored in association with the WP4.

6. Conclusions

This first version of D5.1 sheds light on the concept of engagement in the context of DecarboNet. **GEO**'s experience in engaging people with energy saving issue by means of smart monitor tools and web visualization were briefly described, subsidizing the planning of further activities.

A preliminary study with smart monitors associated to other motivational strategies in the Open University was also described, highlighting the importance of the smart monitors as learning tools, a basic step when pursuing behaviour change. Nevertheless, in the context of this experiment, participants were not keen to share information related to energy consumption in their households among the social group in the workplace, suggesting the need to identify attractive ways for people to overcome this barrier without impacting their sense of privacy.

Adding to this preliminary study, workshops conducted by **GEO** and WAAG will elicit the social requirements to enrol, educate, engage and encourage people with the collective awareness platform towards a pro-environmental behaviour. Considering these initial workshops, the use case of WP5 has been planned in a macro way to be executed in 4 stages, having the association with the Earth Hour campaign, object of WP6, as a final step. These activities, however, will be the object of discussion in the project meeting scheduled for June 2014. Definitions of the Web platform and the target audience are expected to be outcomes of the meeting, leading then to a refined version of this report.

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A. List of Figures

B. List of Tables

C. List of Abbreviations

Abbreviation	Explanation
CA	Consortium agreement
DoW	Decription of work, i.e. GA - Annex I
EC	European commission
GA	Grant agreement
IP	Intellectual property
IPR	Intellectual property rights
PC	Project coordinator
PMB	Project management board
SC	Scientific Coordinator
PO	Project officer
PSB	Project steering board
DM	Data Manager
AB	Advisory board
WP	Work package

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