EC Project 610829

A Decarbonisation Platform for Citizen Empowerment and Translating

Collective Awareness into Behavioural Change

D5.2: Energy Trial Application

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Version: 0.4

Version history

Version	Date	Author	Comments
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0.3	01/05/2015	Lara Piccolo	Various edits and suggestions.
0.4	01/05/2015	Rik Temmink	Incorporated Lara's feedback, final edits and additions.

Peer reviewed by: Harith Alani, The Open University, UK

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Executive Summary

This report is part of the deliverable D5.2 Energy Trial Application.

The Citizen Engagement Portal (CEP - portal.decarbonet.eu) is introduced as an application that aims at engaging people with energy savings and, consequently, with climate change issues. CEP raises awareness on usage of specific appliances as well as whole home energy usage, and creates a space for discussing and sharing personal experiences.

This personal and direct approach is a key enabling factor in the Portal's aim of delivering behaviour change. Other concepts behind the conception of the Citizen Engagement Platform are described, such as the association of specific features with stages of behaviour in a behaviour change process.

This conceptual design resulting from user-centric based research has led to the portal requirements. How this specification has been transformed into software components is presented in this report.

1. Introduction

Despite all the investments in technical innovations to reduce carbon emissions, behaviour change is still considered a central strategy for policy makers to mitigate climate change [1][2]. Promoting a behaviour change towards protecting the environment, though, is a complex mission, since individuals do not always respond rationally to favourable economic or more sustainable choices [2]. Different sociocultural forces (or barriers) such as personal values, incentives, formal support, peer pressure, among others, also influence behaviour. For dealing with this "emotionally neutral subject" that is promoting changes in behaviour [3], such forces must be taken into account.

In this context, technology can play different roles in the challenging task of leveraging behaviour change. In general terms, Oinas-Kukkonen [4] defined Behaviour Change Support System (BCSS) as a "*sociotechnical information system designed to form, alter or reinforce attitudes, behaviours or an act of complying without using coercion or deception*".

Providing feedback on an individual's actions to potentially raising awareness is an initial requirement for a BCSS. In-home displays for energy consumption feedback are examples of that. But just informing is not enough to guarantee a lasting behaviour change result [5] [6]. To actually have an influence in the way people interact with the environment and with other people it must be properly designed for that. Although there are many studies addressing the design and the analysis of impact of BCSSs, many questions continue to challenge researchers in terms of establishing a systematic approach [7], such as how people's awareness increases (e.g. of their own energy consumption), how they react to environmental messages, how changes in behaviour could be brought about and maintained, and how social media behaviour can be associated to pro-environmental behaviour and collective awareness are some examples of challenges that have been recently investigated.

Aggregating findings from user experiments and literature from different related research fields, i.e. design of energy consumption feedback, social media analysis, and strategies to communicate climate change, this report describes the conception and development of the *Citizen Engagement Portal* (CEP), a web application to raise awareness collectively, support the process of behaviour change, and engage people with energy conservation. Insights from monitoring online participation and behaviour patterns within this social technology may also help supporting strategic decisions regarding perception and awareness of environmental issues by policy makers and other environmental stakeholders.

Main design decisions leading to CEP architecture are described in next section.

2. The Citizen Engagement Platform conception

User studies and literature review together have driven this design research. Table 1 summarises the different sources of information applied to find answers to main research questions related to CEP design.

Table 1- Research questions addressed by user studies and literature review

Source of information	Research questions addressed
Communicating climate change literature [3]	How do people react to climate change messages? How to properly shape environmental messages?
Eco-feedback design [5][11]	How do people react to energy consumption feedback? How design can actually motivate savings?
Behaviour change theory [12]	How does behaviour change occur individually and colectivelly? How to effectivelly promote and sustain a change?
Online survey on perception and position towards climate change, energy saving and social media [13]	What is the current role of social media on informing on climate change and energy savings? What kind of information are people interested to get and share through social media?
User study on motivation and engagement with energy savings in the workplace [8]	What do motivate people to be engaged with energy savings? What are the roles of energy monitors and social media tools in engaging people?
Workshops with families on values x energy saving [9]	How to deal with barriers, such as personal values, that prevent people to change behaviour?

The knowledge built along the investigation process, has led to a set of design guidelines and features suggested for the development, described as follows.

2.1   Main design guidelines

Engaging citizens towards a social innovation in the context of DecarboNet means gathering people online and bridging aspects of their daily life with behaviour within their social network, leading to a behaviour change. With this purpose, a set of 7 main design recommendation summarising the projects' findings so far has been suggested to guide the design process:

1) Emotional involvement [9]. Promoting behaviour change cannot consider only users' rational choices, mostly driven by money or indirect or intangible benefits to the environment. It must inspire and engage directly and emotionally through commitment, lifestyle and feeling of responsibility. Instead of guilt, citizens must feel comfortable to evaluate the trade-off between more environmentally friendly choices and individual values, such as comfort.

2) Personal approach [9]. Instead of focusing only on disseminating climate change information, wider effects of energy wastage on a national or global scale, user-generated content sharing of personal experience on saving energy or protecting the environment must be encouraged, instigating then the interest on social media as a source of practical information.

3) Open space for discussion [8]. Exchanging experiences, ideas and freely expressing opinion about environment protection and energy saving are important ways to raise awareness collectively. The study in the workplace context evaluated online debate as a promising strategy to engage citizens [8]. The possibility of easily interacting with other people's contribution (voting for an opinion, for instance) was strategic to engage people with the discussion. It might be a motivation also to engage those who are not willing to change behaviour initially, but are interested in learning. The interest for learning and sharing hints identified in the survey fits the debate approach. Dilemmas can also be applied to trigger discussions.

4) Motivating engagement among citizens [8][9][14]. Protecting or improving the environment is rarely the primary motivation for people's pro-environmental behaviours, but may run concurrently. Desires to save money, promote health, avoid waste, be seen favourably by others, or by a sense of justice [14] are also in play. Inciting curiosity, and encouraging collective actions among groups to change behaviour were found as ways to motivate engagement, beyond promoting direct and indirect benefits to the citizens.

5) Sensors as learning tools [8]. The main interest in using energy monitors is for learning the consumption of individual devices and appliances. The knowledge extracted by using specific sensors can generate valuable discussions and arouse more interest than sharing and comparing general consumption data. For instance, a user can evaluate how high or low their appliance consumption is compared to other people, leading to immediate reflections on behaviour patterns and the need to replace the appliance for a more efficient one. The sensors can also be applied for learning how to configure appliances efficiently, quantifying benefits of shutting-down,

or unplugging daily-use devices, quantifying direct costs of daily actions, i.e. the annual cost of laundry in the house [15].

7) Association with Stages of Behaviour Change. The investigations on behaviour change theory suggested the hypothesis that people in a different stage of behaviour change can benefit from specific incentives (or interventions), in the form of CEP functionalities, to move to next stages.

The mapping between stages of behaviour and functionalities for CEP is described in the next section.

2.2   Stage of behaviour change and CEP functionalities

Focusing on providing appropriate interventions, the 5 Doors Theory of behaviour change [16] has been adapted and applied to inform the platform design. It consists on 5 necessary conditions (or stages) for people to try and keep the behaviour, as illustrated in Figure 1: 1) Desirability: consider people's desires and frustrations; 2) Enabling context: provide conditions for change, understanding; 3) Can do: improve people's self-efficacy; 4) Buzz: generate positive buzz, encorauge sharing; 5) Invitation: engaging more people.
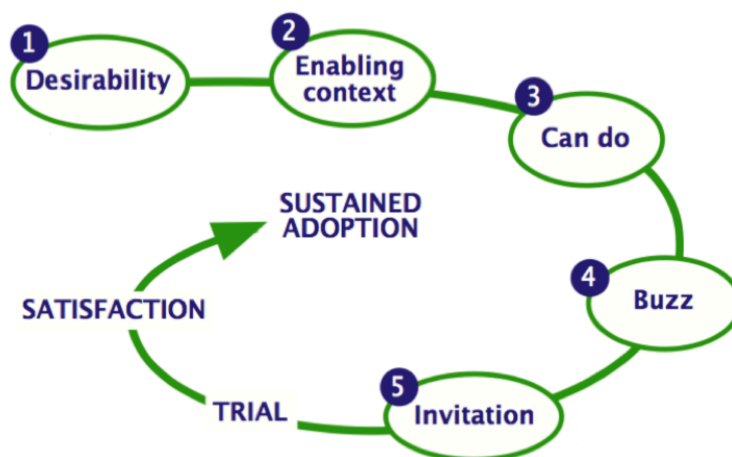

Figure 1 - 5 Doors Behaviour change model

Table 2 presents the association of functionalities suggested for the Citizen Engagement Platform according to the 5 stages of behaviour.

Table 2 - Stages of behaviour change and associated functionalities

Stage of behaviour change [16]	Functionalities
1. Desirability Dealing with frustrations, wants, showing the need of a change	*- Climate change discussions: to evidence the extent of the problem and impact. Ideally, the discussion should be presented in attractive way, as a game (quiz) for instance.* *- Dilemmas: difficult choice questions confronting pro-environmental behaviour x personal values to generate an online debate. The dilemmas can target specific behaviour, defining then a main theme. They have the purpose of attracting people to discussions.*
2. Enabling context Providing conditions, understanding how to change behaviour	*- Informing: links to additional informational content from dedicated portals or blogs on the main theme.* *- Monitoring consumption: energy monitors integrated as learning tools, informing on specific appliance consumption.*
3. Can do Improving self-efficacy	*- Challenge: users can challenge themselves to change behaviour (pledge), and apply for prizes and public rewards.* *Results can be self-reported or, ideally, integrated with sensors/monitors.* *Prizes can be defined in partnership with existing associations or NGOs, for instance, transformed into donations or trees planted.* *- Petitions: link to related petitions to be signed, empowering the user (association with NGOs).*
4. Buzz Encourage spreading successful stories	*- Challenge other people: users can challenge people within their social network to change behaviour, evoking social norms, and peer pressure.* *- Stories and Hints: Encourage users to post their successful stories of behaviour change and hints under the dilemma theme.* *- Headlines: Visualisation on what other people in their social networks are saying on social media (Facebook*

	and Twitter) related to that.
5. Invitation Engage more people	*- Visualising engagement: visual representations of how people are getting engaged with the portal, and their performance in the challenges.* *Visualisations also in terms of topics of discussions are interesting not only to foster engagement, but to inform policy makers too.*

2.3 Conceptual design

To illustrate the design proposal associating the stages of behaviour and functionalities, a mock-up was created by the end of Year 1 of DecarboNet project (Figure 2).

The five stages of behaviour are represented in the tree (right-top corner). The colours in the "branches" are also applied as the background of related functionalities. Some functionality is instantiated in the conceptual design as links to existing tools.
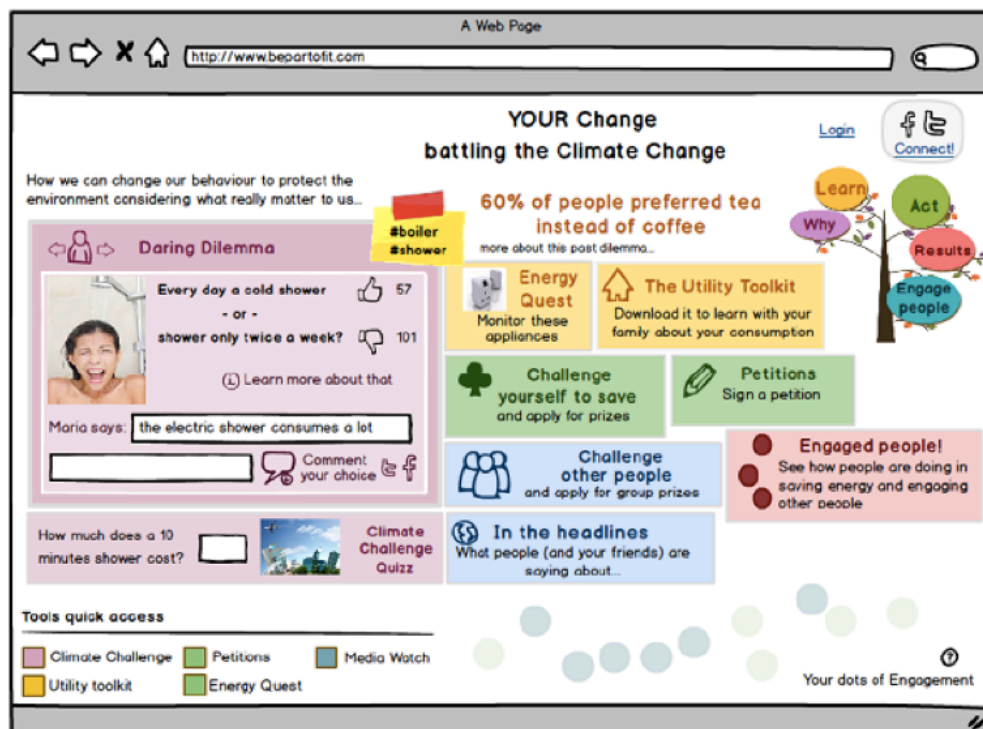

Figure 2 - CEP conceptual design

Dilemmas and the Climate Challenge (quiz) associating behaviour and climate change [17] are associated with the stage "Why". The Energy Quest [18], an online application for monitoring energy consumption and The Utility Toolkit [9], a game for learning and discussing home energy consumption are in the stage "Learn". The 3rd stage, "Act", connects Challenges and Petitions. Challenge other people and headlines are in the "Engage People" stage. Results is the 5th stage to visualise results of engagement. The dots of Engagement, right-bottom corner, represents users' level of engagement – activities done per stage, posts created, etc.

Implementation

The Citizen Engagement Platform development went full force in February 2015, based on the initial conceptual design. Although still preliminary, the first version was published for the Earth Hour campaign on the 28 of March.

The core technology chosen for the development of the platform is the Django open source content management system (http://www.django-cms.org/en/), hosted in the Amazon Web Services public cloud on a virtual machine running the Ubuntu Linux operating system.

The CEP implementation closely follow the initial conceptual design, offering users a single online experience that brings together a variety of learning tools, actions, and social media engagement tools related to climate change.

In order to make the content constantly attractive for users, the decision was made for the CEP to present periodic "themes" – a specific focus on relevant topics related to energy saving and climate change, such as the impact of old, energy-inefficient appliances on electricity consumption, or the use of hot water and its impact on gas consumption, or specific appliances consumption. In addition to making it easier for users to make sense and change behaviour related to these specific issues instead of dealing with the larger amorphous concept of "climate change", the benefit of periodically changing themes is that it keeps the CEP alive and interesting for returning users.

Different levels of interest and motivations on energy savings and climate change by the users are expected. Users can access the portal without registration to learn by accessing public content. Users who want to engage fully with the content can register and log on using their existing Facebook accounts, or they can set up a specific DecarboNet CEP account. Registered users have access to all functionality of the portal including activities with points-earning opportunities. Active users will be offered a free energy monitor device (subject to availability – the number of devices available for the DecarboNet project is 250), which will enable them to also participate in the specific "Energy Quest" activities which will be promoted through the CEP. Existing users of compatible GEO devices can also connect their device data to the CEP. By connecting their monitoring devices to the Portal, they can share experiences and learn about consumption based on their own data.

The aim of the CEP is to provide users in different stages of the 5 Doors model with the tools and incentives to improve their understanding of the topic of energy savings and increase their engagement. In order to support this, the CEP uses aspects of gamification, in particular the collection of "dots of engagement" for visiting the portal, accessing content and participating in forum discussions, pledges, challenges and polls.
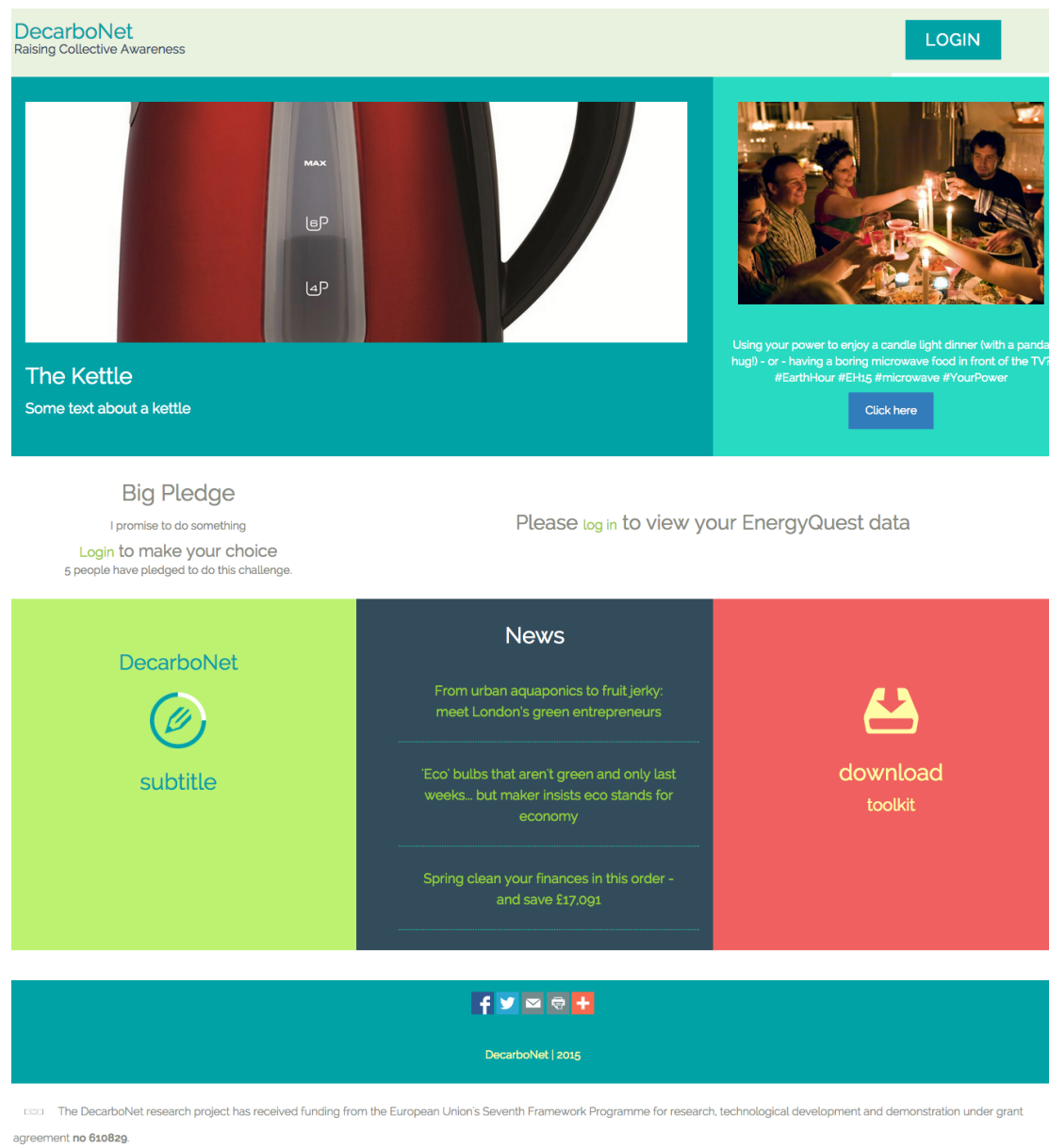
Figure 3 – screenshot of DecarboNet's Citizen Engagement Portal (CEP).
portal.decarbonet.eu

The components together create a dashboard (Figure 3). Their main roles are:

- Main module – The main theme module ("hero") is the largest of the home screen elements. Its main roles are to attract the user's attention and interest through a combination of a striking image and catchy headline, and to introduce the current theme of the CEP. The hero widget enables the user to click through to the blog section, which contains further informative content on the theme topic as well as the ability to interact with thought leaders (DecarboNet moderators and well as selected experts) as well as other regular CEP users.

- Blog – A blog section, based on the popular DISQUS platform, has been considered as a way to promote user participation and discussion as comments. The inclusion of the blog platform provides access to in-depth educational materials and specific instructions or guidance related to challenges (e.g. to support a theme focused on the reduction of energy wastage through old, inefficient appliances, there would be blog posts explaining the overall impact as well as specific guidance on how users can make a difference through their own personal behaviour and influence on others). It also encourages and provides users with the ability to provide feedback and interact with others.

- Daring Dilemmas – The CEP home page contains a prominent block that highlights a dilemma related to the current CEP theme, and encourages the user to click through to the Daring Dilemma Facebook page.

- Challenges – Each CEP theme implementation will include a relevant challenge, i.e. the opportunity for a user to state their intention to take a specific action to make a personal contribution to reducing their carbon footprint, e.g. switching off the lights when leaving a room for one week, or cycling to work instead of taking the car one day per week during the summer.

- Polls – Polls are an opportunity for a user to express their attitude to a particular issue while also being able to see how their personal position compares to other CEP users.

- Energy Quest – The home page Energy Quest component appears only for users who have a GEO energy monitor device. It will show one widget which is relevant to the then current theme – which could be focused on cost or consumption in kWh or carbon emissions. The user can click this module to go to a dedicated Energy Quest page which includes up to 6 widgets, providing a more holistic view of the user's energy usage.

- Toolkit Download – The home page of the CEP will contain a module with a link to downloadable materials for the Utility Toolkit, developed by WAAG in the context of the DecarboNet project as an engagement tool.

- MediaWatch for Climate Change Headlines – For each theme, one or more keywords will be determined to select and show relevant links to external content. These links will be shown in a module on the CEP home page.

In addition to regular moderation and evaluation of activities by users of the portal, GEO will periodically analyse the actual energy consumption data recorded by the energy monitor devices to establish whether the education and engagement provided and enabled by the portal leads to measurable changes in electricity consumption.

Such data analysis will also be carried out to provide participants with meaningful comparative data at an appliance level (as well as a whole home level): e.g. participants will be provided with data on typical consumption of an appliance such as a fridge (possibly for members of their peer group instead of simply a global average), enabling users to put their own usage into a more meaningful context.

Conclusions

The development of the Citizen Engagement Portal makes tangible ideas, tools and theorethical behaviour change research available to a wide range of stakeholders, from the general public to policy makers.

Through the CEP, the DecarboNet project will evaluate the behaviour of citizens and their attitudes to climate changes, and study the effectiveness of interventions aimed at changing these behaviours and attitudes, both at an individual level and in a larger, social network context.

Learning and insights will also be made available to other interested parties.

As the lead developer of the project, GEO will gain further insights into the impact of social interactions between people and communities on consumption of electricity in homes. Early learnings derived from this work have already been incorporated in a trial project part-funded by Innovate UK and with participation from EDF Energy, aimed at developing an engaging "virtual in-home display" product for monitoring electricity and gas consumption in UK homes.

Now that the core platform development activities are largely complete, the focus will shift on operating the platform, user acquisition and retention, as well as producing compelling themed content and capturing and interpreting usage patterns.

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
CEP	Citizen Engagement Platform
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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DecarboNet Consortium

The Open University
Walton Hall
Milton Keynes MK7 6AA
United Kingdom
Tel: +44 1908652907
Fax: +44 1908653169
Contact person: Jane Whild
E-mail: h.alani@open.ac.uk

Waag Society
Piet Heinkade 181A
1019HC Amsterdam
The Netherlands
Tel: +31 20 557 98 14
Fax: +31 20 557 98 80
Contact person: Tom Demeyer
E-mail: tom@waag.org

MODUL University Vienna
Am Kahlenberg 1
1190 Wien
Austria
Tel: +43 1320 3555 500
Fax: +43 1320 3555 903
Contact person: Arno Scharl
E-mail: scharl@modul.ac.at

WWF Schweiz
Hohlstrasse 110
8004 Zürich
Switzerland
+41 442972344
Contact person: Christoph Meili
E-mail: Christoph.Meili@wwf.ch

University of Sheffield
Department of Computer Science
Regent Court, 211 Portobello St.
Sheffield S1 4DP
United Kingdom
Tel: +44 114 222 1930
Fax: +44 114 222 1810
Contact person: Kalina Bontcheva
E-mail: K.Bontcheva@dcs.shef.ac.uk

Green Energy Options
Main Street, 3 St Mary's Crt
Hardwick CB23 7QS
United Kingdom
+44 1223850210
+44 1223 850 211
Contact person: Simon Anderson
E-mail: simon@greenenergyoptions.co.uk

Wirtschaftsuniversität Wien
Welthandelsplatz 1
1020 Wien
Austria
Tel: +43 31336 4756
Fax: +43 31336 774
Contact person: Kurt Hornik
E-mail: kurt.hornik@wu.ac.at