EC Project 610829

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

D 6.3.1 Use Case 2 Evaluation Report v1

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Executive Summary

DecarboNet Use case 2 is focused on large scale sustainability-awareness campaigns, such as the Earth Hour (EH) annual campaign organised by WWF. The project's work around WP6 and the Earth Hour campaign is covered in multiple deliverables. In D4.2, we report further detail on the behaviour analysis that was applied to EH data, as well as to data from the Climate Challenge application described in this report, and in D6.2.1 and 6.2.2, we report on analysis of EH 2014 and 2015.

This is the first of two deliverables aimed at reporting the work and outcome of WP6. This deliverable summarises the impact of the project in terms of users researched, active collaborations with stakeholders and observed behavioural changes related to the goals of DecarboNet and the themes of the EH campaign. We report in this deliverable the different events in which users and communities have been engaged face to face as well as the series of experiments in which user behaviour and engagement have been studied in the context of the EH campaign.

More specifically, in this report, we provide a description of the outcomes of multiple public facing events that we co-organised, including the IKEA led workshops. We also report on the deployment of the Media Watch for Climate Change application, and the Climate Challenge application, which were developed in WP3 to support this use case, and received over 13 thousand users in this reporting period (1st Oct 2014 – 30th Sept 2015). Additionally, this report also describes the user sets and analysis around EH14 and EH15.

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1. Introduction

In year 1 of DecarboNet, work was focused on designing and developing collective awareness applications, running small focused group experiments, and collecting and executing initial analysis of EH data. This work was carried over in year 2, and extended to launching the applications, conducting more extensive engagement and behaviour analysis, and participating in larger public group campaigns.

This deliverable summarises the impact of the project in terms of users researched, active collaborations with stakeholders and observed behavioural changes related to the goals of DecarboNet and the themes of the Earth Hour (EH) campaign, which is core to the WP6 use case.

We report in this deliverable the different events in which users and communities have been engaged face to face as well as the series of experiments in which user behaviour and engagement has been studied in the context of the EH campaigns.

Much of DecarboNet's work and analysis is centred around EH, and hence some further detail can be found in other deliverables, such as D4.2 which is focused on the analysis of behaviour of the EH user set, and D6.2.2 which details the analysis of tweets on EH campaign.

2. User Engagement Workshops

DecarboNet continues to engage the public in focused sustainability awareness campaigns, to word-spread the goals of the project, to expand its potential end-user base, and to enrich the Decarbonisation Methodology (D1.1.1, and D1.1.2 due M30). In year 1, WAAG introduced and tested a co-creation workshop format and tools (the Energy Toolkit - D1.2). We did some small adjustments in the methodology as described in the following subchapters 2.1 and 2.2. With these adjusted workshops we were able to gain additional insights that will feed, together with all the other results and recommendations from other research into the Decarbonisation methodology (D1.12).

2.1. Reduce your own footprint - experience and reflection on environmental psychological interventions

In October 2014, two trained co-creation workshop leaders and a psychologist from WWF Switzerland tested the WAAG workshop format at a congress on eco-sufficiency in Zurich, organized by IPU Schweiz.[1] A total of 25 people with special interest in environmental psychology, male and female, aged 22 to 63 participate in the workshop.

The participants were asked to adopt a more ecofriendly lifestyle by changing their individual behaviour to achieve a higher environmental impact. Although most participants already considered themselves to be ecofriendly, they found many possibilities to improve their green lifestyle even further.

Goal of the workshop was to find ways to overcome the so called rebound effect. In the workshops done in year 1, people tended to give themselves high psychological credits/rewards for small actions that are easy, but have a very modest environmental impact to justify for themselves some actions with high environmental impact.

Example of an action with low environmental impact:

- Unplug the phone-charger after use to reduce standby-consumption. If every person on the Planet would leave the Smartphone-Charger plugged in during the year, we would need **0.03%**[2] more of the resources the ecosystem Earth provides to deliver the raw material for power generation and neutralizing the emissions of the power plants.

Example of an action with high environmental impact:

- Enjoy holidays at home instead of taking a flight from Europe to New Zealand. If every person on the Planet would take a flight of the distance London - New Zealand each year, we would need **200.00%**[3] more of the resources the ecosystem Earth provides to deliver the raw material for power generation and neutralizing the emissions of the power plants.

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[1] IPU Schweiz, Initiative Psychologie im Umweltschutz, http://www.umwelt-psychologie.ch/rueckblick-6-ipu-kongress-zu-suffizienz/ , Online 07.10.2015

[2] Christoph Meili did calculations with numbers used for www.wwf.ch/footprint, provided by www.ESU-Services.ch in 2012.

[3] Christoph Meili did calculations with numbers used for www.wwf.ch/footprint, provided by www.ESU-Services.ch in 2012.

During the workshop, a mix of environmental psychological interventions for sustainable behaviour change was presented and tested by the participants. Starting point was the participants' own environmentally relevant value concepts: What is really important for them? Linked to that: Do they act according to these values? What are barriers in everyday life? By addressing directly the actions with the highest environmental impact and the rebound effect, the participants were able to readjust their individual actions.

Example of individual success stories that came out of the workshop:

- A Meat-Lover committed to test alternative nutrition and to reduce his weekly meat consumption by half.
- Another participant decided to do holidays on the bike with the whole family instead of flying to the sea.
- A third participant did not want to change his meat consumption but decided to change the meat type which would reduce the environment cost by half.

2.2. IKEA Workshops

Starting November 2014, WWF Switzerland had the opportunity to test an adapted version of the co-creation workshop format developed with WAAG Society, described in D1.2: Social Requirement Specifications, Chapter 3. IKEA Switzerland recruited 26 Swiss families who were willing to adopt a more sustainable lifestyle. WWF Switzerland was able to accompany this project together with one of its supported Start-up's called WeAct.[4] To create a further reach, the families were asked to create attractive stories on how to achieve a more sustainable life at home. The outcome of this workshop series will be integrated into the second version of the Decarbonisation Methodology which will be reported in D1.1.2 due M30.

2.2.1. Goals
Goals of IKEA:

- Introduce a more sustainable life at home to their customers and inspire them to live a more sustainable life at home -reached
- Enable participants to save water, energy or reduce waste with IKEA products and solutions in their homes -reached
- Encourage participants and customers to share and report back on their findings and experiences -reached
- Raise customers' and co-workers' awareness about IKEA's

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

environmental engagement and thus impact Brand Capital and also Voice. –ongoing

Goals of WWF & DecarboNet:

- Test the decarbonisation methodology with a broader community. -reached
- Test externalised storytelling as a way to inspire more people to adopt a more sustainable life at home. -reached
- Engage the public to increase impact of the project and to disseminate its goals further. –reached

2.2.2. Results

Blogging

Aiming at motivating others to change to a more sustainable lifestyle, the families were encouraged to blog twice a month between January and April 2015 on a sustainability-related topic of their choice, on good ways in which change worked in practice. To this end, a blogging tool was provided that is accessible via the IKEA Homepage: http://lifeathome.ch/en/living-the-change/ (Figure 1).

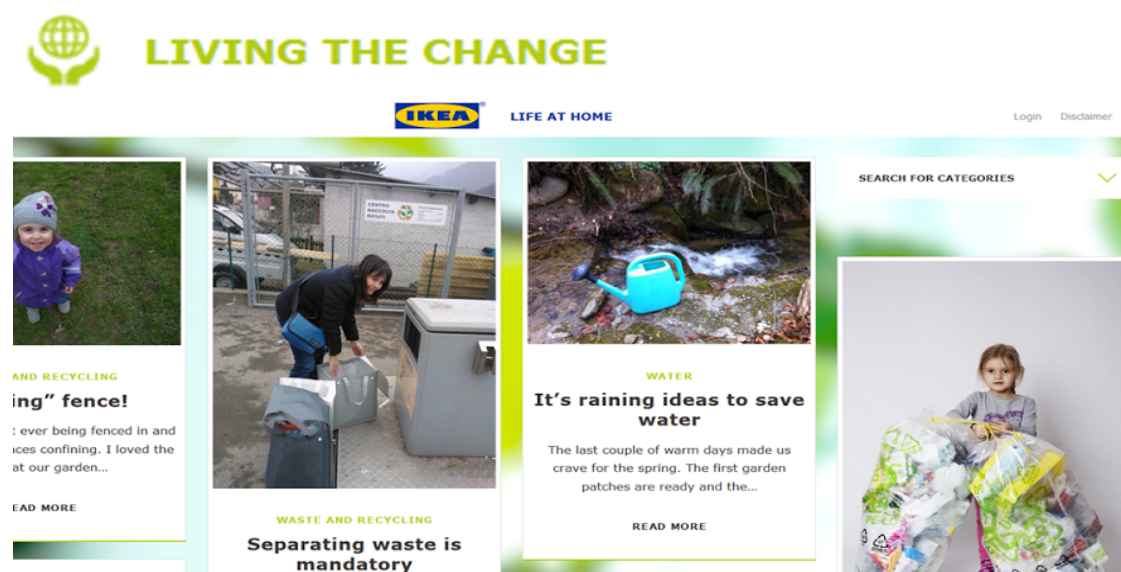**Figure 1: Family blog on www.lifeathome.ch/en/living-the-change**

Parallel to the Family-Blog, a WWF -Expert provided examples of blogs on topics with especially high relevance to the environment in the "green lifestyle" section of the website (http://lifeathome.ch/de/green-lifestyle/) (cf. Figure 2).
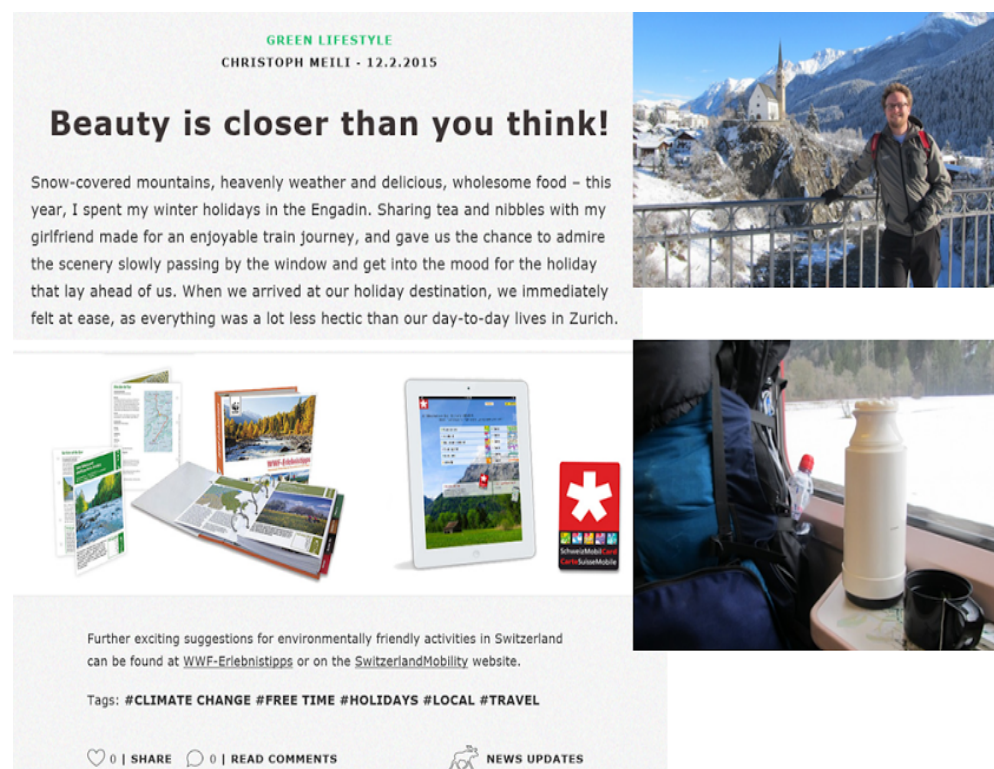

Figure 2: Collage of an IKEA - Green Lifestyle Blog on how to reduce CO2-Emission for holidays (= promotion of local holidays)

Reach

Project and resulting blog-articles were spread through several channels and reached many of Switzerland's 8 Million inhabitants (Table 1).

Table 1: Reach of sustainability-related IKEA-communication in Switzerland

SocialMedia / Web	Other online channels	IKEA FAMILY media	Face-to-face reach	PR
Facebook (Sept14-May15) 10 posts(in all languages) Impressions: 143,238 Clicks: 2,614	CodeCheck.info (April, 2 weeks) Impressions: 41,739 Views: 5,528	HEJ (3x) Reach: 650,000 members	Presentations Reach: 800 people	Articles in several local newspapers Reach: 300,000 readers

Lifeathome.ch Blog (Jan-April) Page views: 22,367	Familienleben.ch (Jan-May) Impressions: 1,007,488 Clicks: 4,558	E-Newsletter (2x integrated modules, 1x dedicated MSL@H eNL) Reach: 250,000 members	IKEA SustainableEvent June 6 2015 Store visits: 45,289 people
IKEA.ch/nachhaltigkeit (Sept-April) Page views: 9,355	Paid online advertising (April, 2 weeks) Impressions: 2,137,126 Clicks: 5'291		
	External posts (incl. Article in Bluewin.ch) Impressions: 34,000 Visits: 12,000		

Achievements

In this section the reader can find some examples illustrating the effect of the project on the daily environmental impact in certain households.
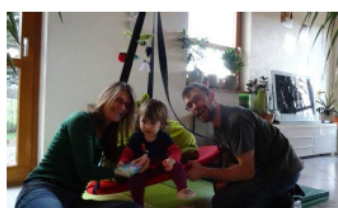
New appliances = -50% energy

"As of late, we've been using the new, energy efficient kitchen devices from IKEA. Since then, **our power consumption has halved. Cooking is now lightning quick** thanks to the induction hob and the dishwasher runs a lot less frequently because we're able to load it much more efficiently."

The Schenker family, Aargau

Installed LED = -60% energy

"I turned on all of the lights in my house, first with conventional light bulbs, then with LED bulbs. **Consumption fell by two thirds, from 460 W to 150 W – which is a surprising amount.** I'm therefore not only protecting the environment, but am saving over 100 francs in electricity costs per year."

Sara, Geneva

LED & KOPPLA = -30% energy

"We installed new LED light bulbs throughout the house. **The result is unbelievable: our power consumption fell by 20 percent immediately.** Using KOPPLA, it fell an additional 15 percent. We're therefore saving 200 francs a year."

The Granert family, Basel

Figure 3: Examples of achieved savings regarding energy use


New dishwasher = -1,100 l water

"Washing up by hand is a thing of the past in our house. **We save 1,100 litres every month with our dishwasher, that's almost 6 bathtubs full.** And that's not all: We have regained two hours of time that we previously needed to wash by hand."

Sandrine and Jérémie, Basel

New dishwasher = -1,600 l water

"Unbelievable: we're protecting resources by not washing up by hand. **Instead of 7 litres of water per minute, the dishwasher only uses 7.5 litres for the whole wash.** That amounts to a monthly difference of over 1,600 litres - that's equivalent to 8 full baths."

The Stäger family, Graubünden

New taps = 40% less water
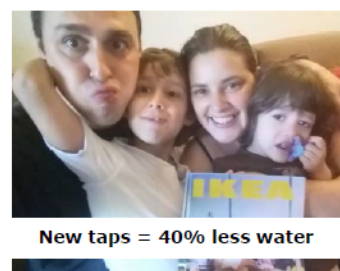
"The new water-saving mixed taps are **nicer, easier to use** and help us save 40% water without even noticing."

The Sousa family, Basel

Figure 4: Examples of achieved savings regarding water consumption

Recycling = -83% waste

"I'm incredibly proud of my family! Thanks to skilful waste sorting, **we've reduced our rubbish from more than four 60-litre bags to a single 35-litre bag.** We're therefore saving 70 francs a month and creating 1,060 litres less rubbish."

The Formaz family, Vaud

More recycling = -75% waste

"After making just a few small changes, **we now only need one rubbish bag per week instead of four.** We now also separate aluminium, plastic and coffee capsules. That adds up to a monthly saving of 35 francs and 420 litres less rubbish – it's simpler than you think. "

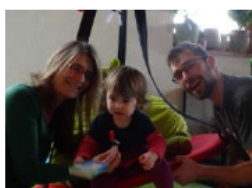*The Zurkinden family, Aargau*

Clever shopping= -50% waste

"The 35-liter waste bag we used to fill every week **is now too big for us.** We have switched to 17-liter bags."

Tanja & Urs, Basel

Figure 5: Examples of achieved waste reduction through recycling

<u>Feedback on the project</u>

In this section we present some of the relevant quotes that users reported as feedback on the project

"Yes, it has impacted well-being. We now are more practical and cook more efficiently. We also have more space in the kitchen, which is fantastic. **Even my husband thinks it's much better**, and he wasn't thrilled about the project at first."
The Schenker family, Aargau

"The project **changed our way of thinking**. We're more aware now. We're proud of the fact that we have participated and **accomplished so much**."
The Travé family, Solothurn

"Now the concept of sustainability is more present in our minds, we have more knowledge.
Some behaviours are now routines; we now scold friends and family for not closing the tap!"
The Formaz family, Vaud

"It's not a project, **it's a lifestyle**. These ideas will stay for the future and we'll adapt them as the children grow up. We want to **involve family and neighbours too**!"
The Ortiz family, Zurich

"I'd **recommend it to everyone**! This project has helped us improve our childrens' education and lifestyle."
The Pace family, Tessin

"It is the small things that help us change the world.
The project made it easier than just having done it on our own, it kept us motivated and was a constant reminder."
The Granert family, Basel

"**I cannot picture myself** giving up my new habits (like closing the water tap, separating organic waste)."
Sara, Geneva

3. The Media Watch on Climate Change

As described in D6.2.2, this year, a specific installation of The Media Watch on Climate Change[5] (MWCC - Figure 5) was created to provide run-time analysis of the EH15 event. MWCC is a publicly accessible news and social media aggregator on climate change and related environmental issues. 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, including: social media (Twitter, Facebook, Google+ and YouTube) and the websites of news channels, Fortune 1000 companies, municipalities and environmental NGOs. The full description of MWCC can be found in D3.2.1, which was reported in year 1 of the project.

Figure 6: Screenshot of the Media Watch on Climate Change Earth Hour Installation

To gain insight into the user experience of the MWCC dashboard, usability evaluations were conducted in regular intervals. These evaluations involved 5 employees of the World Wide Fund for Nature Switzerland, 18 domain experts from the National Oceanic and Atmospheric Administration (NOAA), and more than 100 users from the Austrian Federal Chamber of Commerce.   The feedback from these users not only led to the development of a mobile

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[5] www.ecoresearch.net/climate

version adopting a responsive design approach (see D3.2.1 of DecarboNet), but also triggered numerous optimizations to the desktop interface of the MWCC that are currently being implemented. The outcome is a more lightweight look and feel of dashboard elements, which reduces complexity and highlights the actual content - i.e. the results of an analysis, and the corresponding visualizations. At the same time, the new version supports a much richer set of analytic functions and is easier to extend since it is not limited by the previous tab structure and icon-based interface options. The redesigned system will be released in time for COP21.

The explicit feedback from these evaluations was complemented by implicit feedback from monitoring user activities (the 2014 access log files of the Media Watch on Climate Change, for example, indicate that about 19,200 visitors performed more than 130,000 search queries during the 2014 year). The following figure presents the number of page views acquired by the specific installation of MWCC created for the EH 2015 campaign. As we can see in Figure 7, the number of users of MWCC started to significantly increase from EH15 onwards, totalling over 10 thousand unique visitors in the second year of DecarboNet (1st Oct 2014 – 30th Sept 2015).
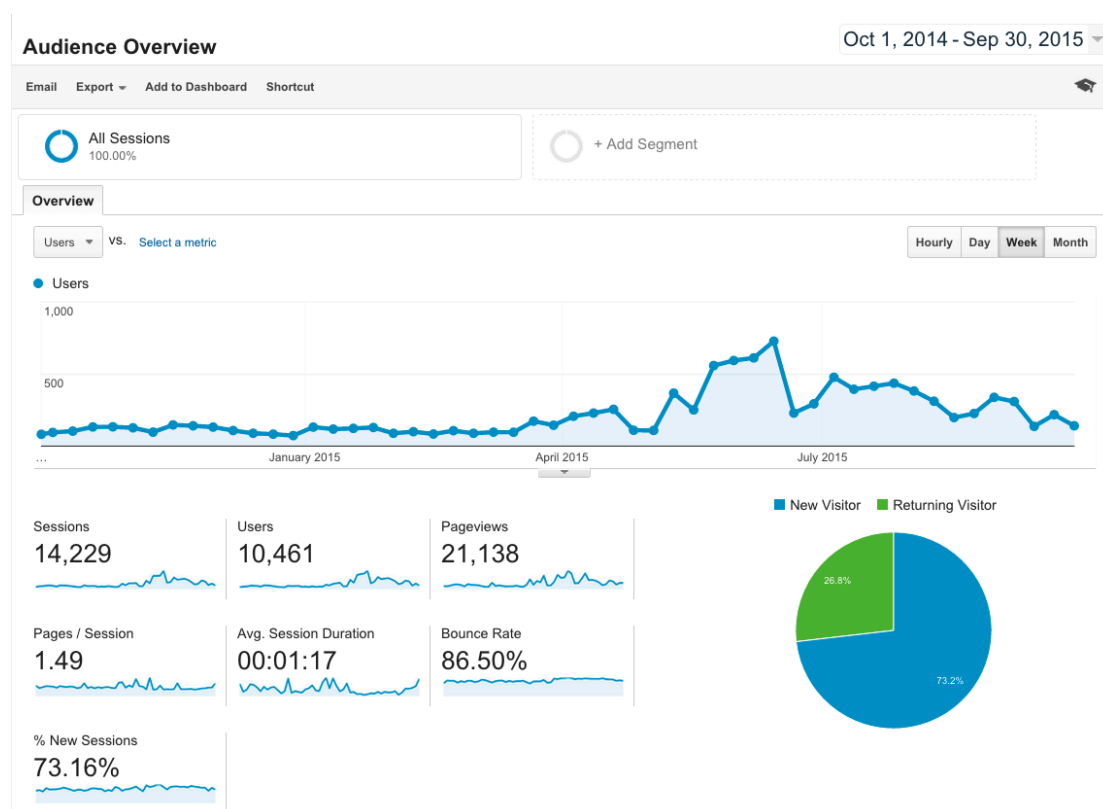

Figure 7: Page Views for the EH installation of MWCC between 15/03-15/04 2015

4. The Climate Challenge

In addition to the specific installation of MWCC prepared for the EH 2015 campaign, Climate Challenge was launched in preparation for EH. The Climate Challenge is a game with a purpose, which provides an engaging way to help people learn more about Earth's climate, assess climate knowledge, and promote the adoption of sustainable lifestyle choices. Description of this application was reported in D3.1 in year 1 of DecarboNet. The Climate Challenge was launched in March 2015 to coincide with EH 2015, offers 12 monthly game rounds per year where users accumulate points by solving game tasks, which can be related to:

- *Awareness*: Test your climate change knowledge

- *Prediction*: Correctly guess the future state of our planet, in terms of both global and regional indicators

- *Change*: Reduce your carbon footprint and adopt a more sustainable lifestyle

- *Sentiment*: Assess keywords in news media coverage about climate change

The multiple pledges offered in this game, and in particular the ones that encourage users to adopt a more sustainable lifestyle, were prepared by experts from WWF. An example of such a pledge is reported below.

Table 2: Example of a pledge prepared by WWF experts for the Climate Challenge

Title	Only use lights with energy efficiency class A or better
Recommendation	Around 14 % of the Swiss power consumption is caused by lighting. Since 2012 only light bulbs with at least energy efficiency C are allowed to be sold in stores. But there are still major differences in power consumption of the different kinds of permitted light bulbs. According to www.topten.eu efficient LED bulbs with a power consumption of about 10 watts achieve the same brightness as a 70-watt bulb or a 40 watt eco halogen bulb. Hence the light yield per watt of an LED bulb is 4 to 7 times better. The light yield of energy saving bulbs and florescent lamps are equally good.
Fact	Replace your bulbs and halogen spots as soon as possible with LED products, even when the old lights are still working. By doing this you help to protect the environment whilst saving money.

The statistics of the use of Climate Challenge during the days of the EH campaign can be seen in Figure 8. As we can observe in this figure, the game

gathered a high number of attention when launched the days prior to the EH 2015 campaign. In particular, peak activity was acquired during the week of EH 2015 (March 22-28) with 1,313 unique users. Since its launch, the Climate Challenge application attracted 2749 unique users.

Figure 8: Page Views for the Climate Challenge between 24/03-15/04 2015
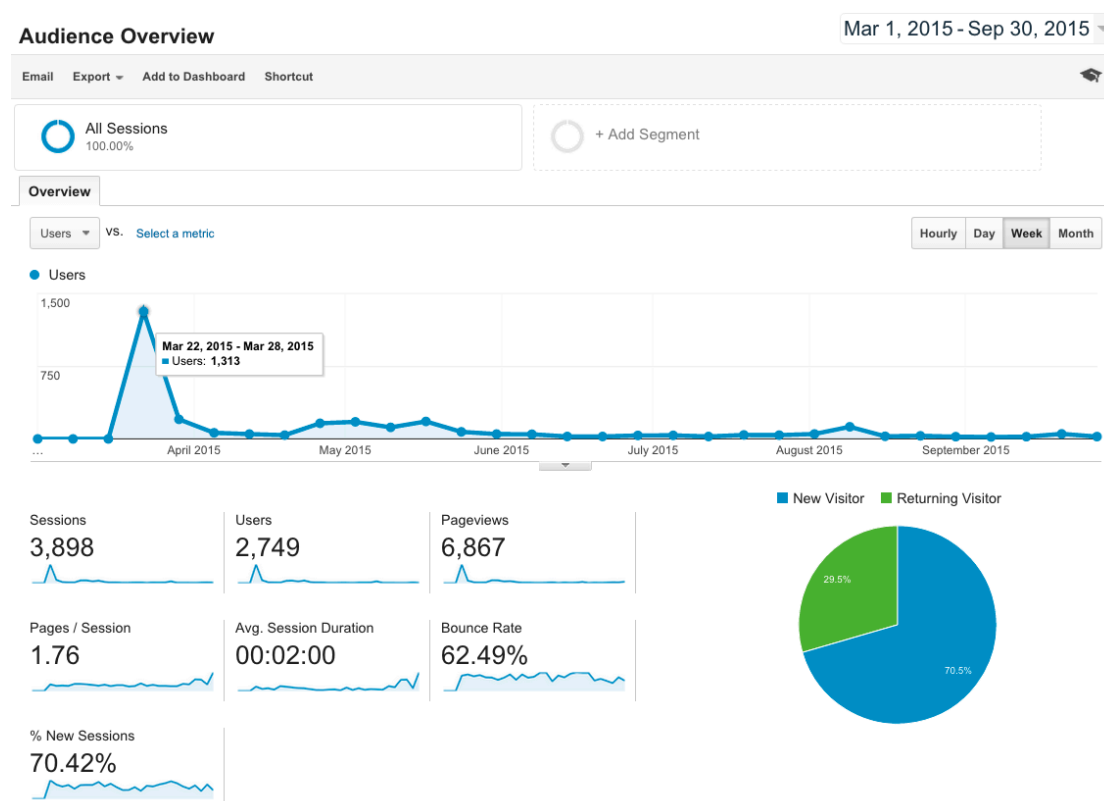
5. The Citizen Engagement Platform

Another application that was made available during EH15 is the Citizen Engagement Platform developed in WP5. This application aims at drawing the attention of citizens to the topic of energy-savings, and enabling them to share information and tips, as well as to learn about the goals of DecarboNet and some of the tools developed within the project.

In March 2015, we released an early and basic prototype of the application to evaluate its design and functionality. The application received 101 unique visitors in the period March-September 2015, with just fewer than 400 page views. The evaluation of the application revealed numerous improvements required in the design and user experience, and hence a completely new version was designed and developed, and due for a first release late October

2015 in preparation for COP21.

Full detail of the Citizen Engagement platform application, the outcome of its evaluation, and the new version design, is reported in D5.3.1.

6. EH2014 & EH2015 engagement statistics

Web-based communication and engagement channels such as social media play important roles in shaping public opinion. Large science organizations such as WWF benefit from a thorough understanding of who uses these media channels, and how do they engage, specially as an effect of global large-scale campaigns such as Earth Hour.

In this section we summarise the findings of analysing the EH campaign for two consecutive years (EH2014 and EH2015). We studied engagement towards the 2014 and 2015 EH campaigns on Twitter by analysing more than 35K posts around the campaign in 2014, and more than 90K posts in 2015, with the final goal of assessing how the messages and themes around the EH campaigns were influencing the public. By performing these analysis, we: (i) discovered some of the key characteristics of the Twitter messages that gathered high attention levels during both campaigns and (ii) we identified the key themes that emerged during the EH14 and EH15 campaigns and analyse the user adaptability of those themes on Twitter. Specific details of the analytics performed for both of these campaigns can be found in the D6.2.1[6] and D6.2.2 reports respectively. In D6.2.1, our engagement analysis was done on 35K twitter posts about EH14, whereas in D6.2.2 the analysis was performed on 90K twitter posts on EH15.

In this deliverable, we report on the similarities and differences in user engagement observed in these two campaigns.

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[6] http://www.decarbonet.eu/wp-content/uploads/sites/23/2014/10/D6.2.1-KMi-v7b.pdf

6.1. Earth Hour Engagement Analysis

To study the characteristics of Twitter messages that were gathering high attention levels, we performed a two stage analysis process in which, 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)

To study these characteristics we first performed a feature extraction process over the users and the content of the tweets in order to represent them. These features are summarised in the following table:

Table 3: User and content features used in Earth Hour engagement analysis on Twitter

User Features	
In-degree	Number of incoming connections to the user
Out-degree	Number of outgoing connections from the user
Post Count	Number of posts that the user has made over her account life in Twitter
User Age	Length of time that the user has been a member of Twitter
Post Rate	Number of posts made by the user per day
Content Features	
Post length	Number of terms in the post
Complexity	Concentration of language and its dispersion across different terms. This feature aims to study whether posts receiving high attention levels contain many terms which are not repeated often or rather repeat terms from a limited vocabulary. Specific details of this metric can be found in [Fernandez et al., 2014].
Readability	This feature gauges how hard the post is to parse by humans. To measure readability we use the Gunning Fox Index.[7]
Referral Count	Number of hyperlinks (URLs) present in the posts
Mentions	Number of mentions to other users within the posts

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[7] http://en.wikipedia.org/wiki/Gunning_fog_index

Informativeness	The novelty of the post's terms with respect to the other posts. We derive this measure using the Term Frequency-Inverse Document Frequency (TF-IDF) measure. Specific details of this metric can be found in [Fernandez et al., 2014].
Polarity	Average polarity (sentiment) of the post. We are computing sentiment by using SentiStrength,[8] a state of the art method for analysing sentiment in social media data. For specific details of how sentiment is computed for each particular tweet, the author is referred to the list of scientific publications behind this library.[9]
Time of the day	Time when the tweet was posted (e.g., 20:00)
Media	Whether the post contains a media item (picture) or not
Tags	Whether the post contains at least one hashtag or not

The 2015 EH analysis extended the 2014 EH analysis not only by adding a new large Twitter dataset for EH15, but also adding new features, such as the last two features. In particular, this year we investigated whether incorporating media elements within the social media posts does indeed help to increase attention.

The results obtained by analysing the 2014 EH posts showed that, posts generating higher attention levels are slightly longer, easier to read, have positive sentiment, tend to repeat terms existing in other posts and mention other users. The recommendations extracted from this analysis to create post campaign messages included: (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. The results obtained by analysing the EH15 campaign complemented the results obtained from 2014 by showing that, in addition to the previous recommendations it is also 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 (manual investigation of the images is provided in D6.2.2). 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.

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[8] http://sentistrength.wlv.ac.uk/
[9] http://sentistrength.wlv.ac.uk/#About

6.2. EH Topic Analysis

In addition to the previously described engagement analysis, we performed a topic analysis over both EH campaigns to understand the key themes that emerged from the social media conversations posted during the campaign, and how these topics managed to engage the public. To perform topic analysis for the EH14 and EH15 campaigns we followed three approaches:

- The first approach aims to analyse the hashtags contained within the tweets. Hashtags are keywords preceded by the # symbol that users include in the tweets to express their main themes.
- The second approach uses semantic annotators to process the text of the tweet and to identify the key entities (places / products / companies, etc.) that appear in the tweets under analysis.
- The third approach uses Latent Dirichlet Allocation (LDA) to analyse which topics are discussed by analysing the distributions of words within the post collection.

The results of these analyses for the EH14 campaign showed that, while the main activities and themes of the 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. The same effect was not observed for the EH15 campaign. Conversations around EH15 focused mainly on climate change and sustainability, which are the main messages that EH aims to convey. In this sense, the EH15 campaign managed to propagate the right message. Users engaged in the campaign were not discussing parallel or irrelevant topics, but were mostly discussing and propagating information about climate change and sustainability. A relevant finding that emerged by analysing the topics of the EH15 campaign is that, not only commercial entities aim to align themselves with the campaign (as it was observed also in EH14). This year 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.

Table 4: Key hashtags emerging within the EH14 and EH 15 campaigns

Top Hashtags around the EH14 campaign (#earthhour was eliminated for better visualisation)

Top Hashtags around the EH15 campaign (#earthhour and #earthhour2015 were eliminated for better visualisation)

6.3. EH Behaviour Analysis

One of the goals of DecarboNet is to understand and encourage behaviour change with regards to energy consumption. One strong indication, or catalyst, of change in behaviour is an increased engagement with energy or environment related applications and campaigns. In addition to the engagement and topic analysis performed for the EH14 and the EH15 campaigns, we studied behaviour change over the participants of the EH15 campaign on Twitter. A complete analysis of this behaviour change study is reported in D4.2, but a brief summary indicating the users that were analysed and the methodology created for the analysis is reported here.

The behaviour analysis models we developed are grounded on the 5-door theory of behaviour change [Robinson, 2011]. This theory states that, in a cycle of behaviour change, users pass through 5 main stages: (i) *desirability*, when users start being aware of the problem, (ii) *enabling context*, when users modify the social and technological context to enable action, (iii) *can do*, when the user starts acting and changing his/her behaviour, (iv) *buzz*, when the user generates positive buzz about his/her actions and (v) *invitation*, when users are engaged with the cause and invite others to follow their steps and change their behaviour.

We have proposed a general methodology to automatically identify the user's behavioural stages towards the environment from their use of social technology based on the 5-door theory of behavioural change [Robinson, 2011]. Our methodology is based on three main steps: (i) a manual inspection of the data to identify the actions and interactions that can be gathered from the usage of the technology, (ii) a feature-engineering process, in which the actions, interactions and contributions of the users are transformed into numerical, categorical and semantic features, which can be automatically extracted and processed and, (iii) the application of supervised and unsupervised Machine Learning (ML) algorithms to mine patterns from the data based on those features.

We have applied this methodology to analyse 20,847 twitter users who participated in the EH15 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. To extract these linguistic features, our models made use of the Natural Language Processing (NLP) tools developed by WP2. These novel sets of features have also been incorporated into our

semantic models (see D4.1)[10] to provide a more fine-grained representation of the users and their context.

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 an unsupervised approaches to identify and categorise behaviour. 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.

6.4. Plans for EH 2016 in collaboration with EH Global

EH16 is the 10th Earth Hour and plans are already underway to design it strongly around climate once again as we look at the 'Road through Paris' – EH 2016 will be a few months after Paris and could serve as an important tactical element in the mass mobilization efforts around climate especially in the urban context of cities.

The DecarboNet project is currently in communication with EH Global to design this campaign and the analytics that the project will provide for it. A Decarbonet - EH Global teleconference was held at the end of September where members of EH Global presented the idea of the EH16 campaign to the project. Specific feedback was provided by members of the project about the campaign, its symbolism and its planned heavy use of social media.

In addition, a plan was presented from DecarboNet to EH Global with a summary of the analytics that are being prepared for EH16. These analytics, currently under discussion include:

1. *Analysing the longevity of impact*: The goal of this analysis is to understand for how long do people discuss EH topics in social media before and after the event and which factors may drive a longer lasting impact.
2. A*nalysing engagement patterns*: During EH14 and EH15 we observed that tweets with certain characteristics generated more engagement than others (see Section 5.1). This year we aim to

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[10]   http://www.decarbonet.eu/2014/09/23/d4-1-models-and-services-for-representing-user-activities-and-context/

extend this analysis by incorporating the linguistic features extracted by WP2, in particular emotions (joy, anger, fear, etc.) and linguistic directives (questions, conditionals, imperatives, etc.). The complete set of features provided by WP2 and what we aim to incorporate in this analysis is listed in D4.2.

3. *Analysing the communication types of different communities.* Different environmental organisations use different strategies with the aim of increasing awareness, engagement and trigger behavioural change. For example, Greenpeace tends to adopt a more aggressive style of campaigns than WWF. With this study we aim to understand which communication strategy is more effective for a particular target group.

4. *Analysing EH evolution*: This analysis aims to understand the evolution across three EH campaigns (EH14, EH15 and EH16). In particular we aim to focus on users and those that kept their engagement towards the subsequent campaigns vs. those that did not. Understanding the factors that kept users engaged may help EH Global to prepare campaigns with longer lasting effects.

7. Conclusions

In this report we described the project's activities around Earth Hour 2014 and 2015, and its plans for Earth Hour 2016. Further detail to some of the content in this report can be found in D6.2.2 and D4.2.

We co-organised several public workshops, with families as well as with environmentalists, to disseminate the goals and activities of the project, and to engage the participants in collective awareness exercises, to share tips and stories with respect to increasing their environment-friendly behaviour.

During Earth Hour 2015, we launched three applications, the Media Watch for Climate Change, the Climate Challenge, and the Citizen Engagement platform. Over 10K users visited these applications and valuable feedback was collected from a number of user-based evaluations. New versions of these applications are currently in development in response to this feedback.

We collected a large dataset of Twitter data on Earth Hour 2014 and 2015 campaign and analysed it to better evaluate the engagement levels, and to extract engagement patterns, across the two Earth Hour events. We described the analysis process and highlighted the patterns that were mostly associated with highly engaging tweets. Additionally, using topic analysis, we showed that users during EH 2015 continued to post about environment related topics well beyond users of EH 2014. This is mainly due to the design of the EH campaign in 2014, which brought in additional non-environment related figures to the campaign, which apparently diluted the message on Twitter.

In this report we also described our plans for EH16, which will consist of further analysis and comparison with EH14, EH15, and EH16, as well as a comparison of the communication style of WWF and Greenpeace. Behaviour of EH16 campaign participants will be further analysed, focusing on studying the evolution of behaviour of those who participated in all three Earth Hour campaigns under investigation.

A. List of Figures

B. List of Tables

C. List of Abbreviations

Acronym	Description
COP21	21th Conference of the Parties to the United Nations Framework Convention on Climate Change
EC	European Commission
EH	Earth Hour
GEO	Green Energy Options
IPU	Initiative Psychologie im Umweltschutz
LDA	Latent Dirichlet Allocation
ML	Machine Learning
MWCC	Media Watch on Climate Change
NGO	Non-governmental organization
NLP	Natural Language Processing
NOAA	National Oceanic and Atmospheric Administration
RT	Retweet
TF-IDF	Term Frequency-Inverse Document Frequency
WP	Work Package
WWF	World Wide Fund for Nature, National Office Switzerland
NGO	Non-Governmental Organisation / Non-Profit Organisation

D. References

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[Fernandez et al., 2014] Fernández, Miriam, et al. "Analysing engagement towards the 2014 Earth Hour Campaign in Twitter." (2015).

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