EC Project 610829

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

D3.1: Social Media Application

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Version History

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0.2	25/09/2014	A. Scharl	First Major Revision
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Peer reviewed by C. Meili

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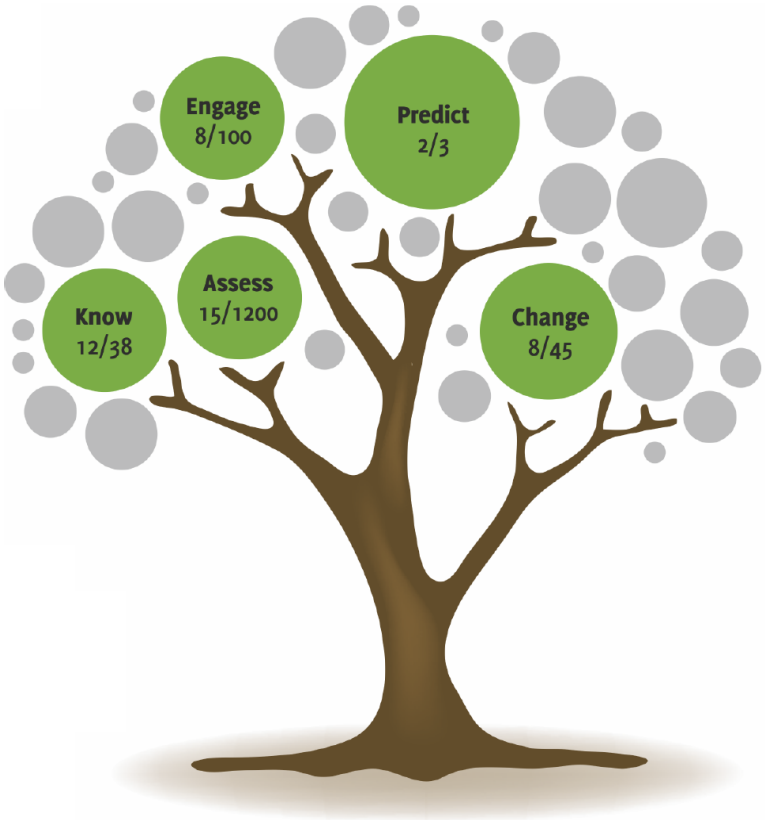

1 Executive Summary

The Climate Challenge developed in T3.1 aims to provide an engaging way to help people learn more about Earth's climate, test their climate knowledge against others', and promote the adoption of sustainable lifestyle choices. Measuring the distribution of opinions among citizens in a monthly prediction task, for example, will shed light on collective awareness processes and represents a first step in harnessing and focusing the wisdom of the crowd in ways that benefit society - such as when making tough choices in the face of a high degree of uncertainty.

Going beyond informing citizens and focusing on triggering environmental action and behavioural change, the Climate Challenge as a platform-independent social media application will engage citizens with a competition in the tradition of games with a purpose (Ahn and Dabbish, 2008; Rafelsberger and Scharl, 2009). The application aims to motivate a wide range of people through a gamification strategy, in which individuals are immersed in a cultural context that favours play and healthy rivalry within a growing online community. This competition-based approach is intended to overcome the perceived lack of personal efficacy. It differs from existing studies by (i) engaging a far more diverse population, (ii) taking place over a longer period of time than the usual two weeks - DecarboNet aims to run the Climate Challenge for 18+ months, and (iii) measuring not only changes in energy conservation habits, but also capturing evolution of environmental knowledge and attitudes which are at the foundation of sustainable changes in behaviour.

DecarboNet will leverage the networks of its core and associate partners as well as the significant potential of social networking platforms and their viral mechanisms to promote the Climate Challenge and engage a large number of citizens. Advantages of embracing social networking platforms include a large number of potential participants, intrinsic motivation in an environmental context, and effective mechanisms for games with a purpose to detect and combat attempts of cheating or manipulating results. Viral mechanisms will trigger behavioural change, track the pursuit of common goals and induce competitive behaviour. Using real-time updates whenever possible, the strategy to engage Climate Challenge participants and sustain the competition among them includes regular content updates and the unlocking of new task types.

To ensure compatibility with a wide range of platforms, T3.1 has chosen a generic HTML5 approach to address desktop and mobile users alike. The game uses a flexible authentication framework that supports a direct user registration or logins via existing Facebook, Twitter or Google accounts.

The prototype has been completed as of September 2014. After a final round of beta testing and fine-tuning planned for the fourth quarter of 2014, we currently aim to release the application in January 2015 - in time for Earth Hour 2015 (see WP6).

2 Introduction

Climate Challenge is designed to appeal to a wide range of citizens and leverage their interest in the domain as an additional motivational factor in conjunction with the entertainment value. Publicly available at www.ecoresearch.net/climate-challenge, the application shown in Figure 1 aims to motivate users to learn about changes in Earth's climate system, and how to adopt a more sustainable lifestyle.

To harness the player's intrinsic motivation, to keep them interested in the game and to encourage them to invite their friends, a variety of tasks is being offered - avoiding repetition and resulting in a richer dataset to analyse. Built-in notification systems and real-time progress statistics help engage users and leverage the wisdom of the crowds for scientific purposes. A differentiating feature of Climate Challenge compared to other knowledge acquisition games is its pronounced educational goal, a feature resembling virtual citizen science projects.

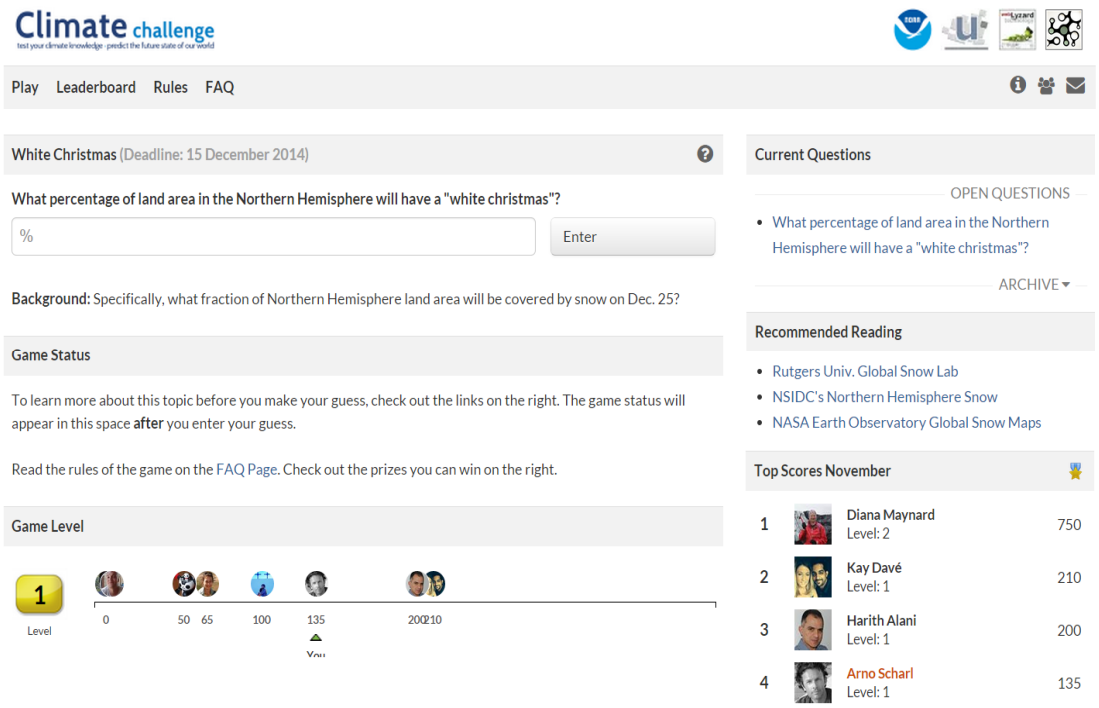

Figure 1. Main Interface Elements of the Climate Challenge

3 Task Types

The Climate Challenge will officially be launched in January 2015 and offers 12 rounds per year, where players accumulate points by solving various game tasks. Each round combines one prediction question about future climate conditions with a range of additional tasks to earn game points throughout the month. Currently, there are five different tasks built into the game:

- **Awareness** | Test your climate change knowledge
- **Prediction** | Correctly guess the future state of our world

- **Change** | Reduce your carbon footprint and adopt a more sustainable lifestyle
- **Sentiment** | Assess keywords in news media coverage about climate change
- **Engagement** | Invite and share with your friends

The bar chart visualization shown in Figure 2 is available on demand, which increases transparency by presenting an overview of the overall game structure. It also lets users track their progress for each task type, and informs them about the total number of available questions.

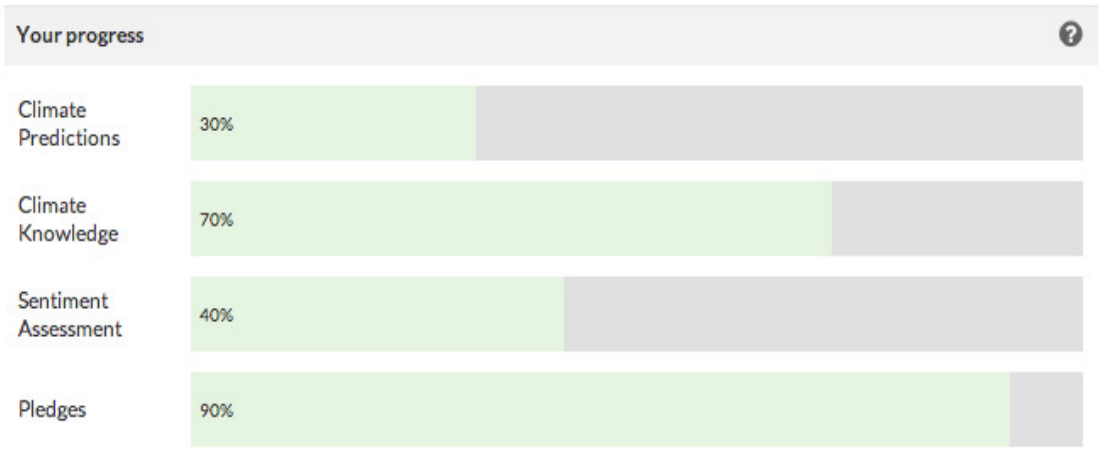

Figure 2. Progress Bar to Track Task Completion by Task Type

A flexible task management and prioritization system, together with the ability to directly link to specific task types,[1] will not only enable the system to personalise content, but also support the targeted dissemination activities outlined in Section 6 (Launch and Engagement Strategy).

The personalisation process considers the user's current stage of behaviour change according to the "Times Five" model developed and adopted in WP4 and WP5 (enrol > educate > engage > encourage > enhance). Users in the first stage "Enrol", for example, will be initially assigned awareness and prediction tasks to underscore the urgent need for climate change mitigation and adaptation. Users in the "Educate" stage will be guided to questions about concrete possibilities to change behaviour towards carbon footprint reductions. In the same way, users in the last stage of "Enhance" will receive an extra incentive to invite more people. Another way to personalise the provided content is to relate it to "*Daring Dilemmas"*, an engagement approach that is currently being evaluated in WP5 to attract users following an unconventional and entertaining approach. This will allow establishing a connection between the proposed dilemma and the impact of individual and collective choices.

3.1 Testing Climate and Energy Knowledge

In the early phase of the game, the Climate Challenge provides trivia questions such as the one shown in Figure 3 to find out about the users' climate change knowledge.

[1] e.g. www.ecoresearch.net/climate-challenge/change

The difficulty of the questions gradually increases over time. The questions cover a variety of topics, from climate and energy facts and private consumption patterns to climate science and policy issues.

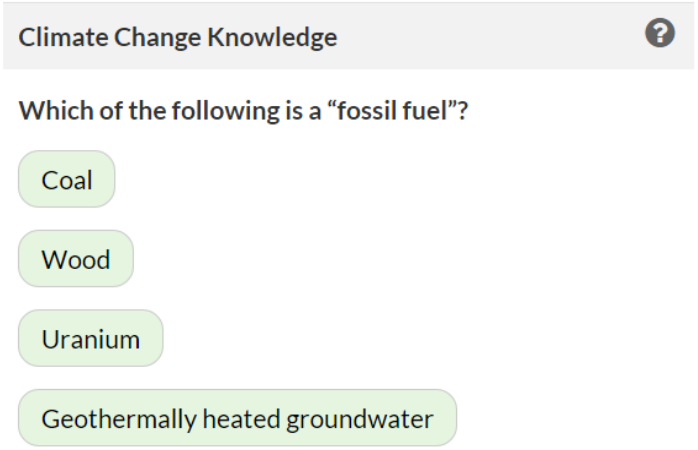

Figure 3. Example of Task in the Category "Awareness"

Quiz questions apply a multiple choice format with a predefined correct answer. Easy, intermediate and hard quiz questions are included to ensure good differentiation between respondents. Wherever feasible, item wordings are identical or closely similar to other international surveys to gain the opportunity for later comparisons with these data sets - e.g., Eurobarometer,[2] International Social Survey Programme[3] or the Six Americas Project (Roser-Renouf et al. 2015).[4]

Scoring Mechanisms

- +25 points per correct answer
- -25 points per incorrect answer

Players gain points for answering correctly, and lose points for wrong responses. The total score from the multiple choice questions serves as an overall assessment of the user's climate change knowledge. The DecarboNet consortium plans to analyse the acquired data from this task type in collaboration with the *Wegener Center for Climate and Global Change* of *Graz University*. For WP4, the data will be important as a segmentation variable when assessing behavioural patterns.

3.2 Predicting Future Climate Conditions

This task compares individual guesses about the future events to the average estimates provided by a user's friends, the entire pool of game participants ("the crowd"), and a selected group of experts. In a later phase of the game, the actual real-world observations are being revealed to determine whether the wisdom of crowds is a reliable indicator when it comes to predicting future climate conditions.

[2] ec.europa.eu/public_opinion/index_en.htm
[3] www.issp.org
[4] environment.yale.edu/climate-communication

Users can just guess at answers, or take time to gather more information from a set of recommended links. Users can only enter one guess per question (it cannot be changed after being submitted), and it must be entered before the stated deadline.

After users provide an answer, the system renders a diagram to show how their estimate compares to the average of all participants ("the crowd"), the experts' predictions, and the highest and lowest guesses (see Figure 4). Once the real-world answer is known, all players can assess how well they did compared to the actual numbers, to the crowd, to the experts, and to their own circle of friends.

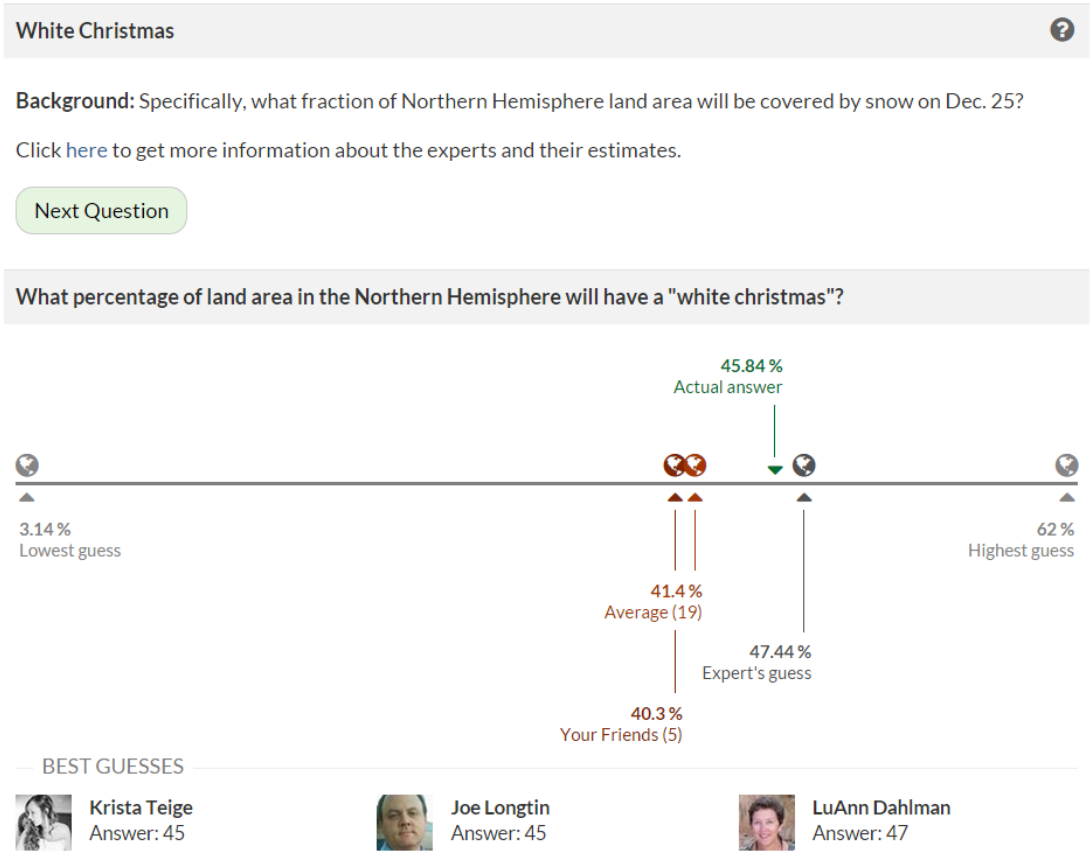

Figure 4. Example of Task in the Category "Prediction"

The Climate.gov team will serve as an associate partner and identify an authoritative source of the answer at the time a question is first published. Different questions may have different authoritative sources. For the purposes of the game, whatever answer is published by the source will be considered the "real-world answer." Once an answer is published and a game round's winner is announced, the result of that round will be considered final.

Scoring Mechanism

- 2500 points - Closest guess to real-world answer
- 1000 points - Players in the top 5% of crowd performers
- 500 points - Players in the top 10% of crowd performers
- 100 points - Players in the top 25% of crowd performers
- 25 points - Everyone who makes a guess

3.3 Pledging System

Inspired by the WWF Environmental Recommendations Database,[5] the pledging task of the Climate Challenge shown in Figure 5 asks for user feedback on practical recommendations for reducing the personal energy consumption and making more sustainable lifestyle choices.

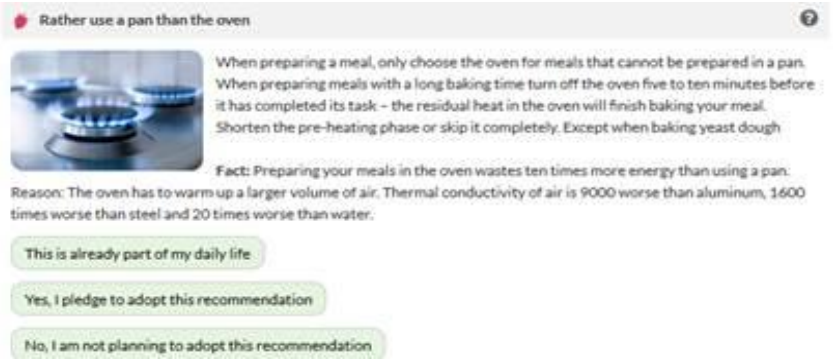

Figure 5. Example of Task in the Category "Change"

The application (i) presents citizen-centred information on household energy consumption, (ii) promotes the adoption of sustainable lifestyle choices, and (iii) allows sharing specific recommendations - by e-mail or via social networking platforms.

Scoring Mechanism

- +25 points for providing feedback
- +50 points for sharing a recommendation with your friends

3.4 Assessing the Perceived Polarity of Climate Change Terms

This task aims to determine whether users perceive specific keywords from climate-related news media coverage as positive, neutral or negative (see Figure 6). They receive points based on how closely their rating matches the average rating by other players. These points are tallied and added to your total score once per week.

Earning Points

- +50 points when your assessment exactly matches the majority opinion
- +25 points when your assessment has the same polarity
- -25 points when your assessment has the opposite polarity

To compile the list of climate change-related keywords (multi-word units of meaning) from Anglo-American news media coverage between January and December 2013, we used an aggregated representation of document keywords from the Media Watch on Climate Change. Previous crowdsourcing projects (Sabou et al., 2013) showed that the inclusion of named entities yields unsatisfactory results, since their perception is highly context-dependent. Therefore CrowdFlower.com platform was used to classify all candidate terms and exclude references to people, organizations and location. More than 1,900 terms remained and have been integrated into the game.

[5] www.wwf.ch/tipps

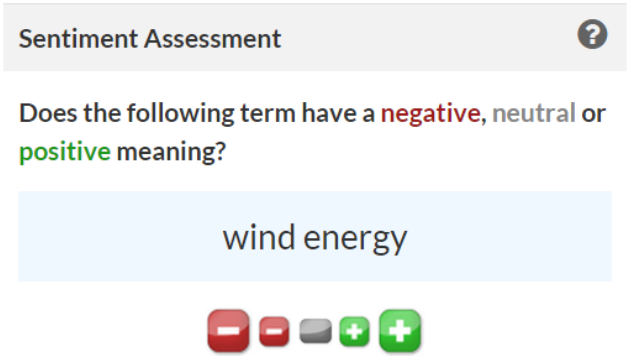

Figure 6. Example of Task in the Category "Sentiment"

Participants earn one point for each matching answers, but can also lose points if their opinion differs from the majority of players. If in doubt, the system awards a point to nor discourage players – if the first user selects a positive polarity, for example, and the second user selects a negative polarity, both receive a point since a majority solution has yet to be determined. If the first two players have agreed on a polarity, however, the answer of a third player who does not agree with them is considered wrong. Participants are given immediate feedback about the percentage of players who agreed or disagreed with their decision. This feedback constitutes a continuous training mechanism through the game, and increases transparency by explaining how the points are provided. To obtain the final result for each term, we initially use five-fold cross validation and plan to increase this extend this quality control process to ten-fold cross validation in cases of high standard deviation (i.e. where players tend to disagree) once all the term combination have been tagged.

The DecarboNet consortium expects insights not only in terms of sentiment analysis (i.e. extracting n-grams that indicate positive or negative polarity), but also in terms of understanding stakeholder perceptions (i.e. how the assessments differ by region, community membership, or demographics, or level of engagement).

4 Application Development

The Climate Challenge was implemented in PHP and JavaScript using the jQuery Framework[6] and Bootstrap[7] for the responsive design elements. Fully compliant with HTML 5 and other Web standards, the system has been designed to perform well on all current browser platforms across various operating systems, and to behave like a native app[8] on iPhone/iPad and Android devices.

A custom login framework is used to authenticate users (see following section). For a flexible and comprehensive inclusion of social logins, the third-party login APIs of Facebook, Google and Twitter are used to extract selected profile attributes (with the

[6] www.jquery.com
[7] www.getbootstrap.com
[8] For the best user experience and easy access to the application on Android devices, users can click on the "more" icon (three vertical dots) in Chrome and select "Add to Home Screen"; on iOS devices the procedure is similar, the icon is located left of the URL bar in Safari.

explicit consent of the user). Together with game statistics, this profile attributes not only shed light on engagement levels and behavioural impact of certain tasks, they also help create a richer and more personal experience for the user - e.g., by showing the scores of the user's friends. Climate Challenge uses a Model-View-Controller (MVC) design pattern to allow easy maintenance and extensibility. The data generated by playing the game and basic user profiles are stored in a PostgreSQL database.

The different task types within the game are handled through a game class, which decides which type of task is given to the user, which specific task will be used, and it is also used to generate the basic HTML outline for the given task. JavaScript is used for interactive game elements. JavaScript events trigger a communication with certain PHP hooks, which further process the request and are used to store answers and handle the navigation on the site.

On the backend side, custom PHP scripts are used to allow the import of new tasks by means of CSV files, and the export of usage statistics. In addition, a cronjob triggers the push notification script every week, which determines if new solutions (for certain task types) are available, and if certain players need to be informed through a push notification - e.g. bonus points, award of a monthly prize, etc.

5 User Authentication

The authentication framework of the Climate Challenge uses the OAuth2.0 protocol.[9] To increase the flexibility of the system, a custom module has been developed to support logins through popular third-party social media platforms including Twitter, Facebook and Google+ (see Figure 7).

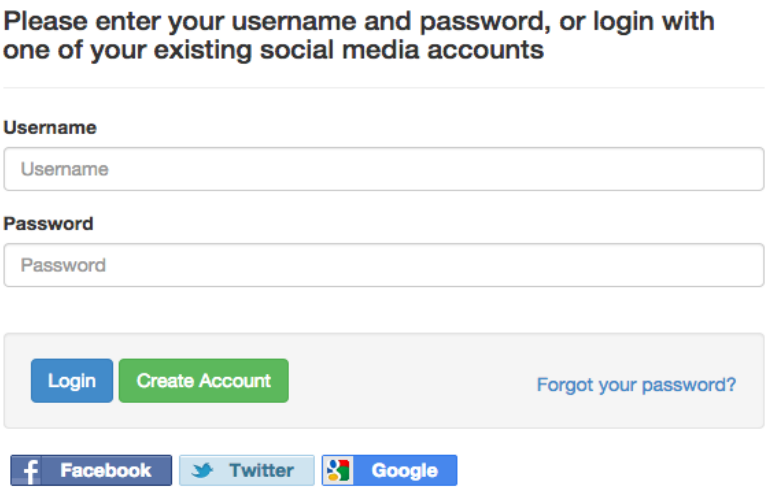

Figure 7. OAuth2.0 User Authentication

The module allows users to connect via these services and match their profiles to a unified user account that distinguishes users based on the provided e-mail address. The framework enforces the user to be authenticated in applications that are not written in PHP. The stored user profiles contain selected attributes from the semantic

[9] www.oauth.net

models of T4.1 (Dynamic User and Context Modelling), together with application-specific details such as the number of invitations and solved tasks in the Climate Challenge, or the access rights and ownership status of documents created with the context-sensitive document editor of T3.2.

6 Launch and Engagement Strategy

In the fast-growing market of casual Web and social media games, it is generally difficult for applications with a sustainability focus to become widely accepted. To attract a large number of players, we aim to use a combination of general and task-specific promotional activities as outlined below. To maintain and grow the community of players, built-in incentive mechanisms include a levelling system with the opportunity to unlock additional games features, the comparison of a player's performance vis-à-vis the network of online friends, detailed progress statistics for each of the tasks, and the leaderboard with aggregate monthly scores shown in Figure 8.

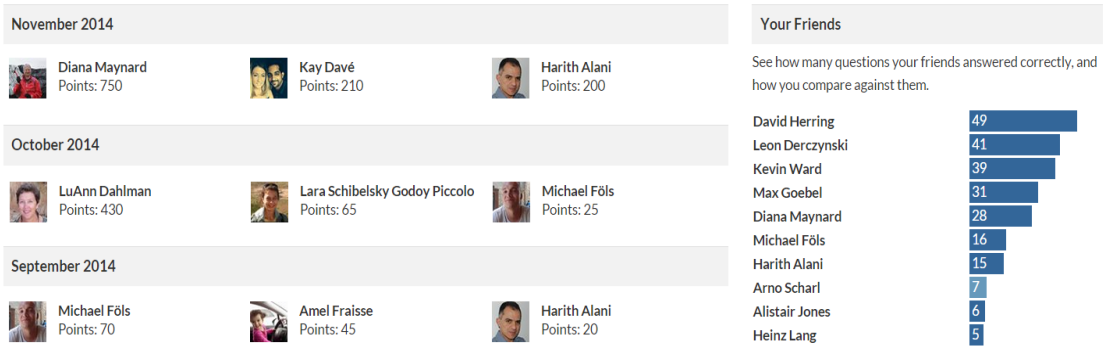

Figure 8. Climate Challenge Leaderboard from September to November 2014

To engage players, the statistics of a user's online friends who also play Climate Challenge will show up in the game status display. Thereby, a user can keep track of these friends' scores, and see who has earned the most points in the current month. Spreading the word awards bonus points - If a user invites others to play Climate Challenge, they will get a bonus of 5% of her or his friend's points, as well as +2.5% of their friends' points.

The prototype of the Climate Challenge has been completed as of September 2014. After a round of beta testing during Q4/2014, we currently aim to release the application as in January 2015 - in time for Earth Hour 2015 (see WP6) - and foresee the following dissemination and public outreach activities to accompany the launch:

- **General promotion** will include press a release in conjunction with social media postings, presentations at events and personal networking activities.
- **Targeted promotion per task type** will leverage existing communities and the contacts of DecarboNet core and associate partners - e.g., social media activities around the presented carbon reduction strategies by employees of *WWF Switzerland*, an official endorsement and promotion of the prediction tasks by the *Climate Program Office* of the *National Oceanic and Atmospheric Administration* (NOAA), introducing specific energy consumption tasks (to be

added in Y2) among users of GEO devices, and the dissemination of language-specific tasks to assess keyword sentiment by means of the user community of USFD's *General Architecture for Text Engineering* (GATE).

The combination of general and task-specific dissemination activities will help to achieve a critical mass, connecting and mobilizing different online communities around a common topic.

7 Summary and Outlook

Climate Challenge is a social media application in the tradition of games with a purpose (Ahn and Dabbish, 2008; Rafelsberger and Scharl, 2009). It is a stand-alone application, but can be accessed with existing logins for popular social media platforms such as Facebook, Twitter, and Google+. The application was created to provide an engaging way to help people learn more about Earth's climate, test their climate knowledge against others', and promote the adoption of sustainable lifestyle choices. Measuring the distribution of opinions among citizens in a monthly prediction task, for example, sheds light on collective awareness processes and represents a first step in harnessing and focusing the crowd's wisdom in ways that benefit society - such as when making tough choices in the face of a high degree of uncertainty.

In conjunction with the data streams gathered in T2.1, the Climate Challenge will provide longitudinal data to support the analytical processes of WP4 including user modelling, engagement monitoring and predictive analyses. By introducing new game elements, we hope to continuously engage players and achieve a critical mass of interactions to analyse. Possible extensions in Year 2 might include energy-related tasks co-designed in WP5 or game tasks to be solved in cooperation, which would strengthen player identification and viral distribution in social networking platforms.

8 References

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Project Management Acronyms

Acronym	Description
CA	Consortium Agreement
DoW	Description 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

Technical Acronyms

Acronym	Description
API	Application Programming Interface
CSV	Comma-Separated Values
FOAF	Friends of a Friend
EWRT	Extensible Web Retrieval Toolkit
GATE	General Architecture for Text Engineering
HTML	Hypertext Markup Language
ICT	Information and Communication Technology
JSON	JavaScript Object Notation
LOD	Linked Open Data
MVC	Model-View-Controller
NLP	Natural Language Processing
PHP	PHP Hypertext Preprocessor
REST	Representational State Transfer
RSS	Rich Site Summary
SIOC	Semantically Interlinked Online Communities
SKOS	Simple Knowledge Organization System
SPARQL	SPARQL Protocol and RDF Query Language
SPIN	SPARQL Inference Notation
SQL	Structured Query Language
URI	Uniform Resource Identifier
URL	Uniform Resource Locator
XML	Extensible Markup Language

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