



EC Project 610829

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

D3.2.1: Collaboration and Knowledge Sharing Platform

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Version History

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Executive Summary

This document summarizes the output of the Tasks 3.2: Co-Creation and Visualisation of Knowledge and 3.3: System Integration. A new culture of participation and social innovation is driven by advances in Web technology and the proliferation of social media platforms. The mobile dashboard and document editing environment of T3.2 reflect this trend. They provide users with ubiquitous access to environmental resources, and enable them to collaboratively create and edit documents. In order to support this process, the system provides tailored information services in the form of content recommendations based on the evolving text of the co-authored documents. The context-sensitive editor is part of the real-time synchronization framework of the *Media Watch on Climate Change*, a public Web intelligence portal that provides a rich repository of environmental knowledge and a portfolio of visual components including tag clouds, keyword graphs and geographic projections.

The *Collective Awareness Platform* of DecarboNet aims to empower citizens, help translate awareness into behavioural change, and provide analytical and visual methods to understand the communication processes that underlie this behavioural change. The platform aims to engage various environmental stakeholders with a focus on carbon footprint reductions. Among the central components of DecarboNet is a document editor for managing environmental information in a cooperative manner, increasing awareness and providing citizens with a tool to manage evolving community knowledge. Observations and best practices can be shared, resulting in an iterative process of social innovation that is driven by active user participation. This process can help resolve conflicts among competing interests, build consensus, and improve the quality of decisions.

To promote this type of community interaction and translate environmental knowledge into collective action, the platform supports the following processes:

- aggregate information from multiple online sources,
- extract relevant knowledge and organize it into a contextualized information space,
- provide information search and visualization services,
- support knowledge co-creation through a collaborative document editor, and
- customize the platform's content and services.

Knowledge Repository

The *Media Watch on Climate Change* (MWCC) is a Web intelligence and online collaboration platform available at www.ecoresearch.net/climate. It compiles large archives of digital content from multiple sources, and provides a variety of visual analytics tools. Within DecarboNet, MWCC serves as the central knowledge repository. It integrates multilingual content from English, French and German online sources: social media including *Twitter*, *Facebook*, *Google+* and *YouTube*, and the Web sites of news organizations, companies, municipalities, and environmental NGOs. The data acquisition and information extraction services have been optimized for Web-scale applications in terms of throughput and scalability. The result is a comprehensive information space spanning geospatial, temporal and thematic dimensions.

A visual dashboard shows the dominant issues that are discussed in conjunction with a selected topic and displays them through interactive trend charts (see Figure 1). The results of a search are mapped on geographic and semantic maps to show the regional distribution of the coverage (e.g., places most talked about), as well as its semantic context (e.g., number of documents about related issues).

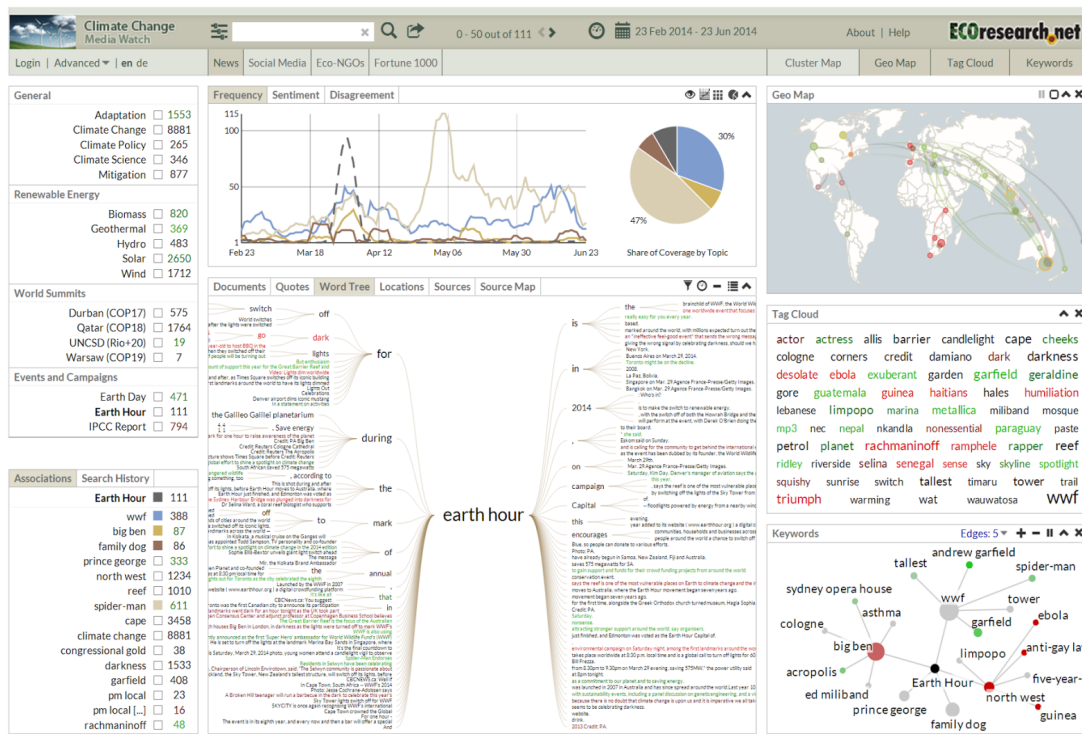


Figure 1. Screenshot of the Media Watch on Climate Change, showing Anglo-American news coverage about the WWF Earth Hour between February and June 2014

The search query for “Earth Hour” depicted in Figure 1, for example, lists *WWF* (initiator and organizer of the event) and *Big Ben* (landmark in London, which had switched off its lights) as the two top news media associations in the context of climate change between February and June 2014. *Earth Hour* as a large environmental campaign represents an ideal use case of DecarboNet.

Given its global impact, the event is a good opportunity to test the project's knowledge co-creation framework and apply its analytical methods – e.g., using advanced geospatial MWCC projections to create dynamic displays of user actions and geo-referenced information flows.

Knowledge Co-Creation

DecarboNet not only aims to collect data from external sources, but also to enable its users to co-create documents and participate in social innovation processes that promote sustainability and increase community resilience – e.g. by sharing opinions or best practices that they have identified to reduce their carbon footprints.

Traditional authoring models assume that users first investigate a topic (review the literature, scan the latest news media coverage, etc.) and communicate with their co-authors, and then start drafting and revising the manuscript in either an asynchronous or synchronous manner. The sequential character of these phases and fragmented workflow is not supportive of collective awareness. Therefore, DecarboNet aims to merge these distinct phases through automated content recommendations. While a user is editing a document (e.g., a press release or a scientific article) the system automatically recommends related content from a desired set of sources (news media, social media, archives of environmental reports, etc.), as well as appropriate tags to classify the document (geographic location, sentiment, keywords, etc.). These recommendations are made on the fly, while the user is typing. Edited documents become part of the knowledge repository and are processed together with content from the other online sources.

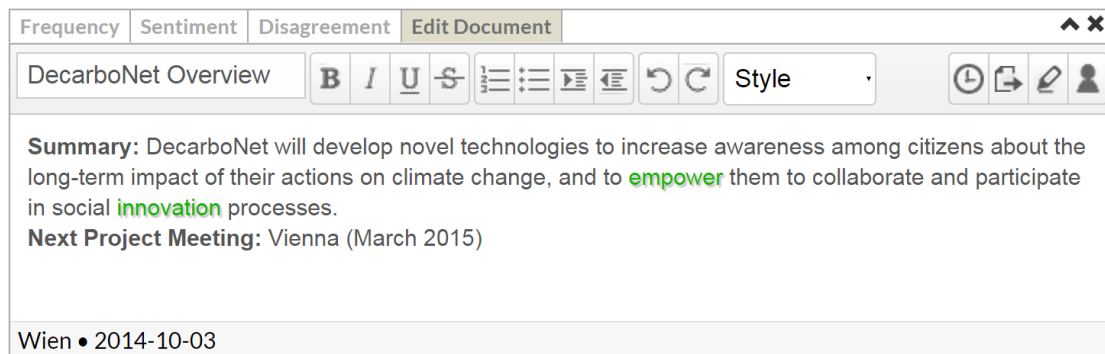


Figure 2. Screenshot of the Editor Prototype as of September 2014

The context-sensitive editor of T3.2 shown in Figure 2 supports concurrent edits by multiple users. Each minor change triggers knowledge extraction services that analyse the changed document, in order to suggest annotations, retrieve related documents from external sources, and visualize related trends and content patterns. The editor developed within DecarboNet is based on *Etherpad Lite*,¹ a Web-based collaborative word processor written in JavaScript and made available under an Apache open source license. The plug-in framework and modular structure of *Etherpad Lite* facilitate its integration into third-party solutions, with an Application Programming Interface (API) to manage documents and groups of users.

¹ www.github.com/ether/etherpad-lite

Recent development work in T3.2 and T3.3 has focused on the management and display of document-level metadata elements, as well as on improvements in the ranking of content recommendations.

Metadata Management

The editor continuously analyses the evolving content and parses the text for occurrences of words with positive or negative polarity from a sentiment lexicon. These words are highlighted through color-coding, using green for positive and red for negative terms. Further extensions planned for D3.2.2 will add mechanisms to highlight people, organizations and locations extracted via the named entity resolution component of D2.2, suggest keyword labels, and modify semantic annotations on both the term and document levels.

Ranking Strategy

As outlined above, the real-time content recommendations convey topical context and are a core part of the editing environment, distinguishing the co-creation framework from similar initiatives. We have extended the content recommendation component and revised the computation of the ranking score based on topical relevance and recency of the various content items. The assessment of topical relevance is based on vector space similarity, which only considers the content of documents, but does not reflect the interests of the user, or the specific context of the authoring process. To address this shortcoming, further improvements will leverage the new cross-platform user authentication framework of D3.1 and its ability to store context information to further enhance the MWCC ranking algorithm - e.g. to select not only the most relevant *documents* from a given source, but also the most relevant *sources* in a given context (e.g. news media versus social media).

Portal Integration of the Editor

When accessed via www.ecoresearch.net/climate, the default setting of the Media Watch on Climate Change is optimized for analytical tasks - trigger search queries, analyse trends, visualize semantic associations, etc. The topic management section in the left column provides easy access to frequently used search topics. Editing documents does not require such a list of pre-defined topics, but rather an overview of the own documents as well as those shared by other users. Therefore, the *document management* section replaces the *topic management* section on the left side of the dashboard (only accessible to registered MWCC users). It activates the editor and lists documents created by the user ("My Documents") as well as all documents shared with the user ("Documents Shared with Me"). Users can create their own personal view on the content space by assigning documents to specific categories (new categories can be added with the 'plus' button; documents can be moved between categories using drag-and-drop operations).

Creating and Editing Documents

Clicking either on the *New Document* icon or an existing item in the *Document List* activates the editor. Users can select from predefined templates when creating a new document. For existing documents, the system performs a check whether the user has the required editing rights. Once activated, the editor provides a set of formatting and document management tools. If multiple users request the same document, they can contribute and edit concurrently.

Sharing Documents

New documents are automatically added to the document management section. By default, they are not assigned to any category. The initial author is annotated as the *Creator* of the document. *Creators* can share documents with other users by providing their email addresses and specifying them as either (i) *Viewers* who only have read access, (ii) *Editors* who can modify the document, or (iii) *Owners* who can also share it with other users. Owners can also add or revoke public read-only access to a document.

If a provided email address is not connected to an existing user profile, the system will send an invitation via email with a link to the shared document. An icon next to the sharing button retrieves the list of contributors and viewers – i.e., all users with appropriate rights to access the active document (the *Creator* of the document is always listed first).

Showing Embedded Metadata

As shown by the screenshot in Figure 2, the system generates metadata about the document automatically, while the users are typing. The current implementation highlights *positive* and *negative sentiment terms*. The colour of the sentiment terms varies in saturation, depending on the degree of polarity – the more vivid the colour, the stronger the polarity.

Future work will extend the real-time annotation mechanism with the ability to pinpoint *people*, *organisations* and *locations* extracted with the *Recognyze* named entity recognition and resolution component (D2.2). Should the identification process return multiple matches - the acronym “WWF”, for example, could pertain to the *Worldwide Fund for Nature* or the *World Wrestling Federation* - the entity with the highest degree of confidence will be used.

Version History

The full history of a document is shown via the time slider of *Etherpad Lite*, which allows access to and retrieval of previous versions of the document. Each snapshot contains the document’s content, the specific date and time, and the co-author who modified the document.

Knowledge Visualisation

Visualization techniques help users to explore the lexical, geospatial and relational context of entities referenced in environmental online coverage. This includes selecting the most relevant subsets of the information space, and analysing the extracted information. Contextual information, especially when properly disambiguated (D2.2), plays a vital part in this exploration process. Understanding the context of communications is a vital element of collective awareness, helping citizens and stakeholders to better understand third-party perceptions and approaches.

Three new visualization components reveal contextual information in such online discussions – a *word tree* for lexical context, a *map projection* for geospatial context, and an *entity map* for relational context across organizations, persons and locations. The color coding of the diagrams reflects normalized document sentiment, ranging from green (positive) to grey (neutral) and red (negative). These visualization components have been conceptualized, implemented, integrated and evaluated in close collaboration with the uComp project (lexical context), as well as the PHEME project (geospatial and relational context).

Word Tree

The *word tree* module presents the concordance list of search results in a visual and more intuitive manner, summarizing the different contexts in which certain entities or topics are being discussed. Its graph-based display facilitates the rapid exploration of search results and conveys a better understanding of how language is being used surrounding a topic of interest.

Based on the popular keyword-in-context technique (Wattenberg and Viégas, 2008), our specific implementation of the *word tree* metaphor adopts a symmetrical approach (Muralidharan et al., 2013). The root of the tree is the search term. The left part of the tree displays all sentence parts that occur before the search term (prefix tree), and the right part those that follow the search term (suffix tree). These branches to the left and to the right help users to spot repetition in contextual phrases that precede or follow the search term.

Mouse-over highlights connected elements, allowing users to reconstruct entire sentences. Visual cues include different font sizes to indicate the frequency of phrases, and connecting lines to highlight typical sentence structures.

Figure 3 shows how the tree-like structure is built after searching for the term “Earth Hour”, and grouping identical phrases containing the term into nodes (e.g., “annual Earth Hour”). This grouping together of equal phrases into a connected tree structure sheds light on word usage within the selected source(s) in a given time interval.

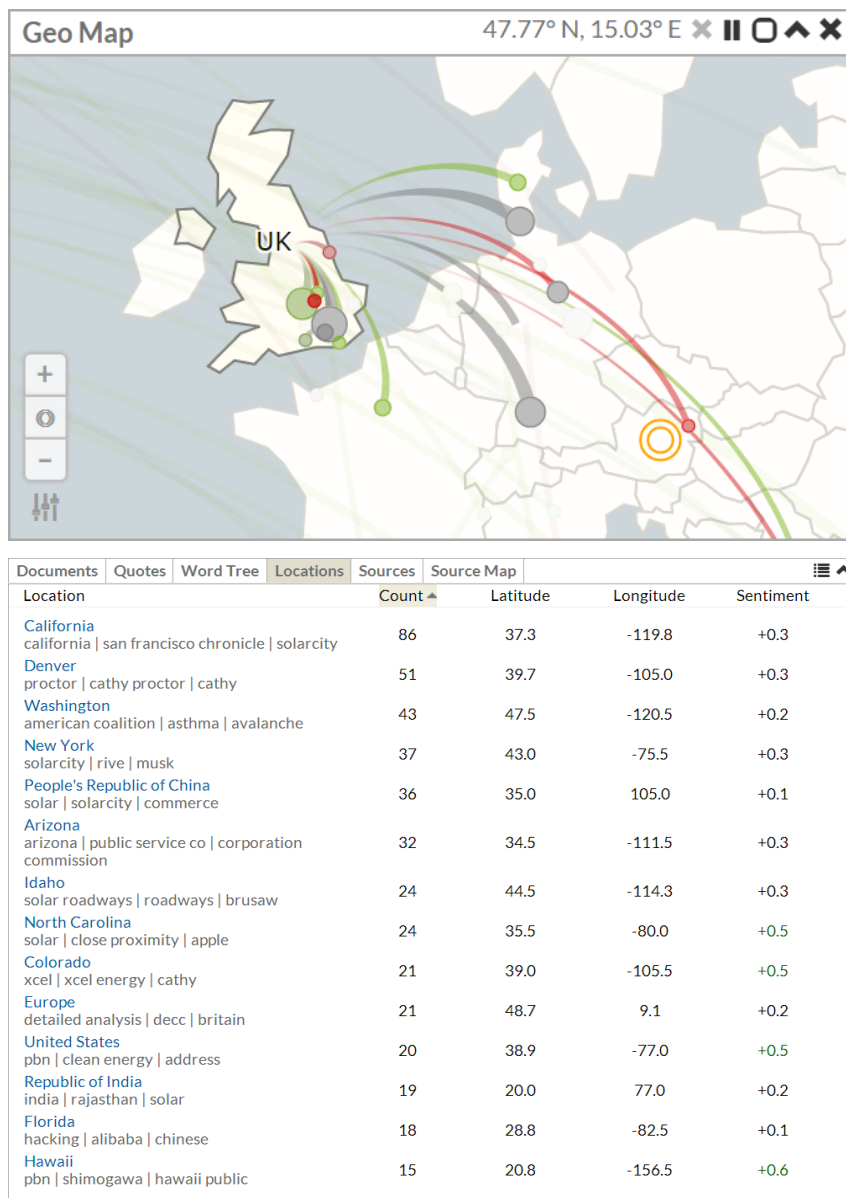


Figure 4. European map of UK media coverage and list of locations in global Anglo-American news media coverage (search term “solar energy”; 06-07/2014)

Entity Map

To identify opinion leaders and reveal key factors influencing social conversations and processes leading to collective awareness, the named entity recognition component of D2.2 detects not only locations, but also other named entities such as persons and organizations that have an impact on news and social media coverage. To develop a deeper understanding of this process, analysts must not only understand how these entities influence topics of interest, but also unravel the interconnected relations among the entities themselves. How did the public appearance of U.S.

From a technical perspective, the Entity Map component combines a line chart with a radial imposition, and a radial convergence diagram:

- Radial Convergence Diagram.** Located in the centre of the graph, the radial convergence diagram displays relations among different entities using ribbons. Entity names are displayed along a circle – their font size indicates the number of documents that mention the entity, their colour ranges from red to green depending on the average sentiment (in line with the sentiment colour coding of the word tree and the geographic map). The thickness of an arc represents the number of co-occurrences between an entity pair. On mouse-over, the opacity of arcs that connect the selected entity to other entities is increased. A slider element in the lower left corner controls the level of detail in the radial convergence diagram – i.e. it determines the threshold for showing relations among entities. The second slider element in the lower left corner adjusts the number of entities to be shown, between a minimum of three and a maximum of 50 entities.
- Line Chart.** Surrounding the radial convergence diagram in the centre, the data points in the line chart show the number of co-occurrences between an entity and the selected topics (using the same color-coding as the trend chart). To increase the readability of the display and facilitate comparisons across topics, the line chart uses a logarithmic scale.



Figure 5. Entity Map based on a search for “energy transition” between January and August 2014

Three small icons in the upper left corner control which entity types are displayed – persons, organizations and locations (of which at least one needs to be active). Clicking on an icon in the upper left corner causes the entities to be re-arranged by (i) en-

tity type, (ii) name, (iii) the number of documents which contain an instance of the entity’s name in descending order, or (iv) the average sentiment of the documents containing the entity, from positive to negative.

Ongoing Evaluation Efforts

Following an evolutionary systems development approach, rapid feedback cycles and agile software development have been instrumental in the conceptualization and implementation of the editor and other interface elements. MOD has incorporated feedback from WAAG and other consortium partners, as well as from the *Climate Program Office* of NOAA, the National Oceanic and Atmospheric Administration (www.climate.gov), an early adopter of the platform.

The synchronization of the editor with the other dashboard components is fundamental to its ability to provide context-specific recommendations. To gain insight into the user experience of the dashboard’s synchronization mechanism, usability evaluations were conducted in regular intervals. The aim of these evaluations was to determine strengths and weaknesses of the interaction design, distinguishing two types of assessment: (i) *heuristic evaluation*, where experts examined the interface and judged the extent to which it is compliant with established usability principles; (ii) *formative usability tests*, where users were observed while working on predefined tasks in realistic settings. Their gaze data was recorded with a *Tobii X60 Eye Tracker* to generate heat maps that show which elements of the dashboard were used to complete a given task, and in which sequence (see Figure 6).

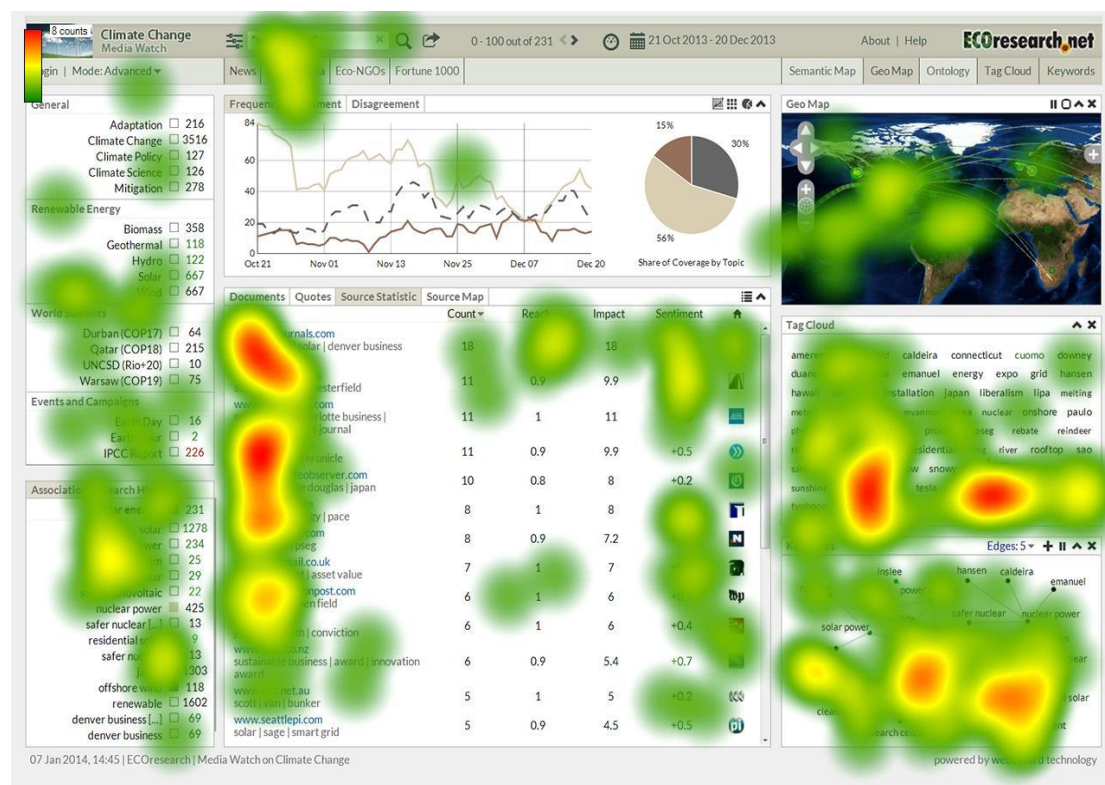


Figure 6. Heatmap of the MWCC dashboard based on a search for “solar energy”

The feedback showed that test users have little difficulty using the system after receiving proper training. They appreciate the synchronized views to keep track of the semantic and geospatial context of their current tasks. For untrained first-time users, however, the complexity of the dashboard can be overwhelming - which is not ideal given the importance of ubiquitous access to environmental knowledge for promoting collective awareness.

We have therefore followed the recommendations of WP1 and developed a mobile version of the dashboard, as outlined in the following section. Based on the feedback from WAAG, OU and NOAA, this streamlined version addresses the above mentioned shortcoming by providing an intuitive frontend that is better suited for first-time users who choose to use the platform without proper training and do not have the time to read the provided instructions.

Mobile Dashboard

The mobile dashboard view of MWCC provides a linear user experience that is specifically tailored to the requirements of tablets, smartphones and other mobile devices. Fully compliant with HTML 5 and other Web standards, the dashboard behaves like a native app³ on iPhone/iPad and Android devices. For desktop users, the mobile version provides a simple yet powerful alternative to the multiple coordinated views of the regular dashboard.

Hand-crafted icons at the bottom of the screen allow users to switch between eight different representations: (i) Documents, (ii) Quotes, (iii) Trend Chart, (iv) Pie Chart, (v) Tag Cloud, (vi) Keyword Graph, (vii) Cluster Map, and (viii) Geographic Map. Two additional icons in the upper left and upper right corner let users define queries to search the MWCC knowledge base:

- **Search.** The magnifying glass icon in the upper left corner opens a sidebar with a text box for full text queries with auto-complete functionality, which is particularly useful for mobile devices as it minimizes the input required. The auto-complete suggestions include keywords as well as people, organizations and locations identified by the named entity recognition component of D2.2. The clickable terms underneath the text box allow users to quickly access topics that were specified with the desktop version of the dashboard.
- **Source and Date Selection.** The settings icons in the upper right corner opens a sidebar to select and deselect the available sources (news, social media, etc.), and to limit the search results to a specific time interval.

While preserving fundamental design choices of MWCC, the mobile dashboard version aims to radically simplify the interaction, reduce the cognitive overhead of using the system, and focus the user's attention on one particular data representation. The dashboard is responsive and adjusts the layout to the size of the browser window, as

³ 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.

well as to its aspect ratio when switching between portrait and landscape mode on mobile devices. This flexibility ensures ubiquitous access to environmental information in a wide range of usage scenarios, for example as a secondary window while the user is working on other tasks.

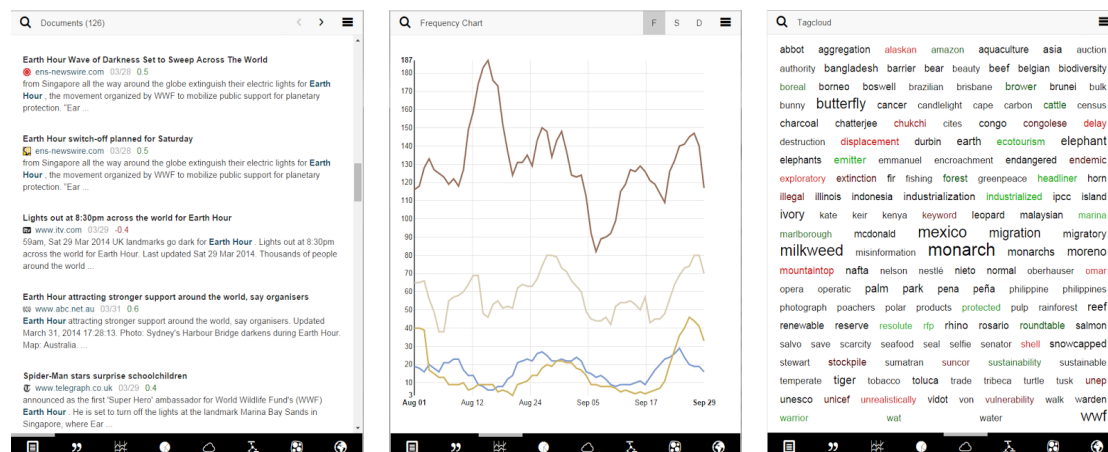


Figure 7. Screenshots of the mobile version of the MWCC dashboard showing the document view (left), the trend chart (middle) and the sentiment-colored tag cloud (right)

Following accepted user interface principles of mobile application design, the MWCC mobile dashboard supports direct manipulation using touch inputs that loosely correspond to real-world actions such as *swiping* to switch between the above mentioned representations, *pinching* and *reverse pinching* to zoom in and out on the geographic map, and *tapping* to trigger searches or to interact with visual elements. The highly optimized rendering algorithms of MWCC enable immediate processing of user input and provide users with a fluid multi-touch interface experience.

Summary and Outlook

The DecarboNet knowledge co-creation environment considers documents open, evolvable resources as part of a *knowledge commons*, rather than finished products. It builds on the *Media Watch on Climate Change* (MWCC), a Web portal available at www.ecoresearch.net/climate that aggregates environmental communication in order to investigate stakeholder perceptions and common framing strategies in the public discourse about climate change. WP3 activities in the first year of the DecarboNet project focused on the co-creation of documents and the analysis of communication patterns and shared repositories of user-generated content.

The DecarboNet editor promotes an alternative to traditional authoring models. It aims to integrate the typically fragmented workflow of (i) investigating a topic, (ii) communicating with co-authors, and (iii) drafting and revising the actual manuscript. It will be evaluated by consortium members, e.g. to co-author the carbon reduction recommendations of WP5. Real-time content recommendations are at the heart of this integration. Such recommendations require advanced knowledge extraction algorithms, scalable enough to analyse evolving documents in real time, while users type. Due to the complexity of the climate change domain and the diversity of unstructured content, optimizing such knowledge extraction algorithms represents a challenging

task that will be tackled in WP2. Ambiguity, varied language patterns, the colloquial and contextual nature of social media content, and the lack of co-reference information (unlike longer news articles, tweets often do not follow a conversation thread and appear in isolation from other tweets) all complicate the task.

Future work within WP3 and WP4 will leverage the algorithmic advances in WP2 and extend the analytical portfolio of MWCC to capture and visualize the complex phenomenon of collective awareness, processing information at several layers of abstraction – from inter-individual communication and threaded dialogs to large-scale community structures and information diffusion processes that serve as catalysts of collective awareness (T4.3). Once applied to the collective knowledge gathered from various online sources, the analytical portfolio will not only provide customized information services for citizens, but also important insights for policy makers, NGOs and other environmental stakeholders. The analytical portfolio will be applied and tested in conjunction with global Earth Hour 2015 campaign (WP6).

Visual tools help to understand the context of Web coverage by establishing connections between named entities (persons, organizations, and locations), based on references to these entities in the MWCC knowledge repository. The named entity recognition component of D2.2 identifies and resolves named entities, using structured external knowledge repositories such as DBpedia.org, Freebase.com and GeoNames.org to disambiguate these entities via confidence values that align entities with the items of the MWCC knowledge repository.

The ability to extracting and visualize contextual information transforms unstructured collections of environmental online resources into a structured repository of actionable knowledge. This repository benefits citizens and a range of other environmental stakeholders including science agencies, policy makers, non-government entities, companies, and news media outlets. Patterns and trends in shared online resources and the public dialogue about these resources reflect collective awareness. Knowledge about these patterns enables the mentioned stakeholders to develop better strategies for engaging audiences, guide their communication and public outreach campaigns, and increase the effectiveness of their decision making processes.

References

Aldred, J. (2014). Earth Hour: Millions to Switch off Lights around the World. *The Guardian*. 28-03-2014. www.theguardian.com/environment/2014/mar/28/earth-hour-lights-out-wwf.

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

Golovchinsky, G., Qvarfordt, P. and Pickens, J. (2009). "Collaborative Information Seeking", *IEEE Computer*, 42(3): 47-51.

Muralidharan, A., Hearst, M.A. and Fan, C. (2013). WordSeer: A Knowledge Synthesis Environment for Textual Data. *22nd ACM International Conference Information and Knowledge Management (CIKM-2013)*. San Francisco, USA: ACM: 2533-2536.

Pitt, J., Bourazeri, A., et al. (2013). "Transforming Big Data into Collective Awareness", *IEEE Computer*, 46(6): 40-45.

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

Scharl, A., Kamolov, R., Fischl, D., Rafelsberger, W. and Jones, A. (2014). Visualizing Contextual Information in Aggregated Web Content Repositories. *9th Latin American Web Congress (LA-WEB 2014)*. Ouro Preto, Brazil: Forthcoming.

Scharl, A., Reyes, C. and Hubmann-Haidvogel, A. (2014). Supporting the Collaborative Editing of Documents with Real-Time Content Recommendations. *13th Brazilian Symposium on Human Factors in Computer Systems (IHC-2014)*. Foz do Iguaçu, Brazil: Forthcoming (Accepted 17 Aug 2014).

Sison, M.D. (2013). "Creative Strategic Communications: A Case Study of Earth Hour", *International Journal of Strategic Communication*, 7(4): 227-240.

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

Weichselbraun, A., Gindl, S. and Scharl, A. (2013). "Extracting and Grounding Contextualized Sentiment Lexicons", *IEEE Intelligent Systems*, 28(2): 39-46.

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
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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