Words matter:

Using language and technology to better inform the climate change adaptation and disaster risk reduction communities

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The sheer volume and richness of information and knowledge about climate change adaptation (CCA) and disaster risk reduction (DRR) are astounding. However, this knowledge is useful only if people can find the information they need – and if they can find information when they need it.

Significant knowledge gaps that remain do not necessarily represent a lack of knowledge, but a lack of the ability to find "relevant" knowledge. This situation impedes collaboration, creates redundancies, and leaves many people unsure about who is working where, and on what.

The Information Age transformed the potential for knowledge-sharing. Nevertheless, in practice, knowledge languishes across many Internet locations (e.g., research databases, institutional websites), waiting to be discovered. What can rectify this?

We argue the answers lie in how we communicate with one another, and how we use the technologies now at our disposal to connect work on these important issues. To that end, this brief advances the case for more considered knowledge-sharing practices, so that the information we have can be used to its full potential. This philosophy underpins two PLACARD outputs: the extension of the Climate Tagger[1] thesaurus, to support knowledge sharing across the two communities; and the development of the PLACARD Connectivity Hub, which will link knowledge across key CCA and DRR platforms in a robust way.

We believe that knowledge gaps can be addressed by:

- **Using language more effectively**. Harmonised language and shared terminology are crucial in moving forward. Within CCA and DRR fields, the same word can mean different things. Recognising this, and finding a way to enhance understanding of how different terms are used and will strengthen knowledge management within different organisations, improve the uptake of climate information, and increase opportunities for collaboration.

- **Using technology to connect data more effectively**. Semantic tagging and linked, open data provide key ways to lead people to the information they are looking for.

Used together, these approaches have the potential to transform how the CCA and DRR communities communicate, how they share knowledge, and how they access online information.

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Knowledge & information challenges faced by stakeholders

Conversations with stakeholders at PLACARD-hosted workshops in Brussels (23-27 October 2017) revealed significant and varied challenges key actors face in accessing relevant information needed for decision-making and planning. Their feedback emphasised the need for greater clarity on language (how terms are used/intended and why), and greater searchability and discoverability, particularly:

- The ability to search for people. (What experts are working on CCA/DRR in my country?)

- The ability to find and cluster key knowledge. (What projects in my region have focused on flooding in the past 10 years? What have they learned?)

- The ability to find more broadly relevant information. (What good practices, solutions and plans exist for wildfire management in Europe?)

Semantic tagging offers significant potential for meeting these challenges.

What is semantic tagging?

"Tagging'" means attributing key identifying and descriptive information to online content (e.g., projects, publications, case studies, datasets, and the websites of organisations and individuals). These "metadata" (see Box 1), support automatic cataloguing of content, thus allowing information to be selected and filtered according to given attributes, or "tags."

"Semantic" tagging employs an additional layer of information about how the metadata tags relate to each other (Figure 1). "Knowledge graphs" offer a way to visualise the relationships between tags. For example, a graph shows that that "Latvia" is a "Country," in "Europe," and that it borders "Belarus," "Estonia," "Lithuania," and "Russia" (Figure 2).

Examples of metadata

- **Descriptive (e.g., size, colour, short description)**

- **Structural (e.g., format of digital objects)**

- **Administrative (e.g,. date created, data changed/edited, by whom)**

- **Rights management (e.g., author, administrator)**

For example, for a journal article, the descriptive metadata may include: the journal title, subtopic, volume, and issue; publication dates (online and paper issue); article title; authors and their affiliations; the number of pages; the document format; and relevant keywords (e.g., Latvia; climate change; flood risk; vulnerability analysis; infrastructure; nature-based solutions) that serve as metadata tags.
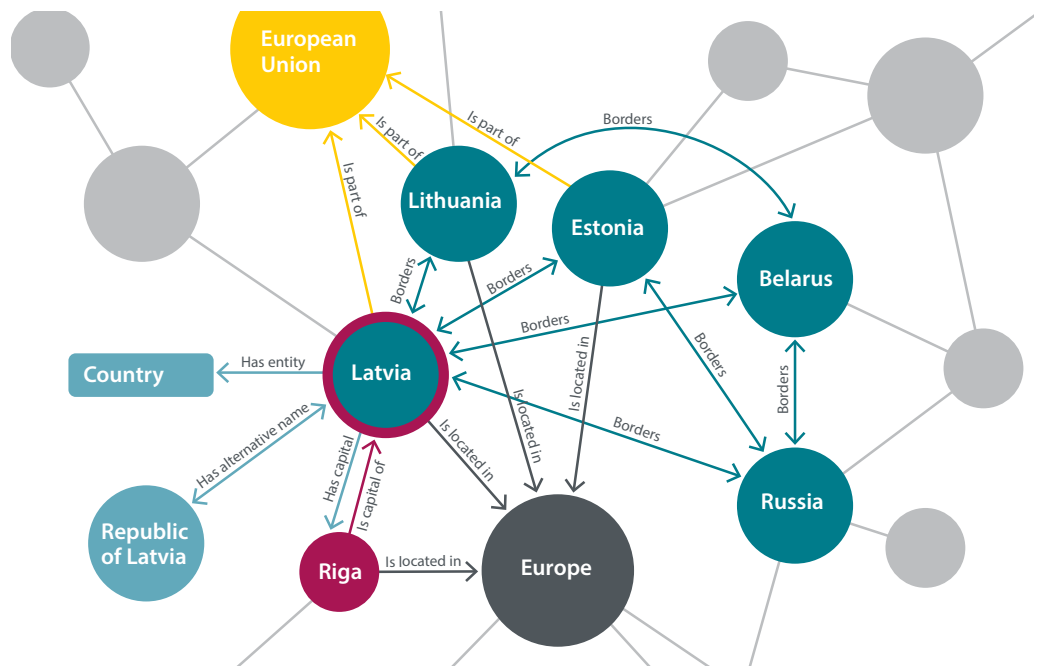
Figure 1: Shown here are the layers within an Information and Knowledge Management system supported by semantic tagging. Diverse types of content are tagged with metadata, the attributes that describe the content. A semantic layer defines the relationships between the tags. It provides an additional level of interconnectivity between content. This layer makes analysing trends and hidden patterns in data possible. It also helps dynamic online knowledge platforms to bring additional relevant content to users.
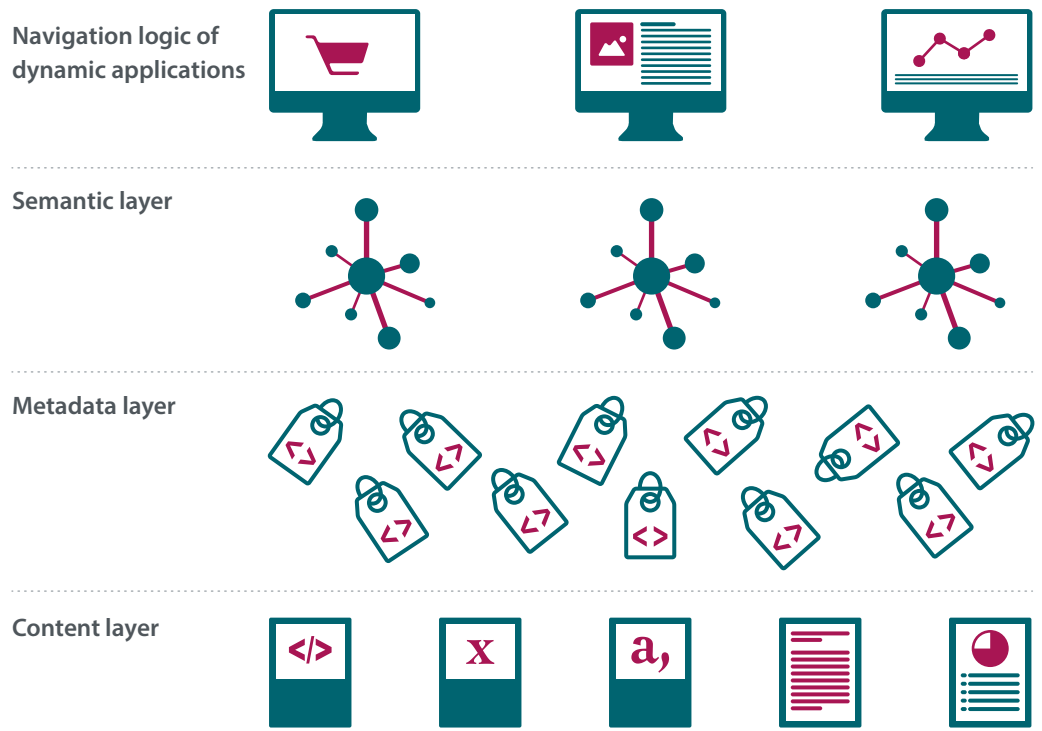
Navigation logic of dynamic applications

Semantic layer

Metadata layer

Content layer

Figure 2: Example of a basic "knowledge graph" with a focus on Latvia. Tags (or "concepts") are represented as circles. Rectangles are categories (or "schema") for tags. Lines show the relationships (or "predicates") between the tags. Image redrawn from PoolParty training module by Nika Mizerski and Timea Turdean.

How semantic tagging and linked open data can support CCA and DRR

Tagging improves content searching and discovery, both within and across websites. Where a shared tagging system is used by a community, tagging allows information and knowledge to be interlinked with other relevant content in a standardised way. This allows content to be pulled together from multiple websites based on searches using the same tags. For example, a search can retrieve all the content tagged with "ecosystem service."[2] Currently, for example, some content may be missed if instead tagged with a slight variation on this: "ecosystem-based service." This illustrates why good knowledge management guidelines and practices are important for closing gaps.

Tagging can support detailed, faceted searches. That is, results can be filtered according to multiple attributes (based on the use of multiple tags). For example, content (e.g., people, projects) specific to a region, hazard, approach and context can be readily retrieved. Tagging also supports analysis of the information and understanding of the knowledge landscape, including the tracking of trends, and new tools and approaches. For example, the use of tags can be used to track the adoption of new approaches and terms, such as "nature-based solutions" instead of "ecosystem-based solutions," and how these are being used (based on the tags they are clustered with).

Semantic tagging allows implicitly relevant content to be suggested based on the tags applied in the search, supporting a user's learning. For example, a basic search for "urban adaptation" may suggest "urbanisation," "urban ecosystems," "urban heat island effect," etc. This ability to suggest other "related terms" can help users discover and explore issues, solutions and approaches not previously considered. For example, semantic tagging can be used in interactive decision-support tools to support stakeholders to access the different knowledge they might need for certain decisions, based on their user profile, or the implicit and explicit results of their queries and interaction with the system (where they have clicked, keywords they have used, questions they have answered).

Through this enhancement of information and knowledge discovery, searchability, interconnectivity and analysis, semantic tagging helps to promote learning ensuring knowledge is more "relevant" to the user.

Such tagging systems can also be used to display the source of a term and its synonyms to increase understanding of how a term is being used. The term "vulnerability" provides a good example. "Vulnerability" in the CCA community is more context-led (focussing on systemic and long-term vulnerability reduction, e.g. through capacity building); in the DRR community it is more outcome oriented (focussing on reducing vulnerability to the effects of extremes and disasters). A lack of understanding about differing interpretations of this term can impact the quality of collaboration and communication.

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2   An example of this is Climate Search, which allows you to find climate-relevant information from portals included in the Knowledge Navigator, powered by the Climate Tagger tagging system and run by organisations in the Climate Knowledge Brokers network.

Towards new standards for Information and Knowledge Management

A shared tagging system requires the use of a "controlled vocabulary" – a widely accepted and utilised set of terms for describing content in CCA and DRR – as standard practice. To be most effective, international standards also need to be developed to ensure consistent content tagging[3]. Such standards would represent a step towards Linked Open Data and the Semantic Web, which promote common protocols to allow the interconnection and structuring of relevant data across the World Wide Web. This concept holds huge potential for enhancing access to knowledge and identifying true knowledge gaps.

PLACARD is working to meet these challenges through the development of new IKM tools and guidelines.

We are building the technological infrastructure for CCA and DRR to support the broad adoption of a set of terms for use in information and knowledge management. These "taxonomies," as they are called, also contain information on term definitions, usage, synonyms and relationships between terms, thereby not only supporting information and knowledge management, but also facilitating understanding and communication within and between the CCA and DRR communities. These taxonomies are being developed in a transparent process that uses software to analyse key CCA and DRR texts. Importantly, this process allows the taxonomies to evolve as new terms, global reports and international agreements emerge.

Get involved

The initial outputs, including the knowledge graphs, will be further refined through expert consultation on various topics and subtopics. This process will be recorded, and the results will be used to support the development of the Climate Tagger[4] semantic tagging system to support knowledge sharing across platforms and within the PLACARD Connectivity Hub, which will link key CCA and DRR platforms. Work related to the Climate Tagger is being undertaken in collaboration with the Renewable Energy and Energy Efficiency Partnership (REEEP) and the Semantic Web Company.

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3   As led by the open-ended intergovernmental expert working group on indicators and terminology relating to disaster risk reduction established by the UN General Assembly, which is developing a set of indicators to measure global progress in the implementation of the Sendai Framework for Disaster Risk Reduction 2015–2030.

4   Developed by REEEP and the Semantic Web Company: http://www.climatetagger.net/