SEMANCO

SEMANTIC TOOLS FOR CARBON REDUCTION IN URBAN PLANNING

A research project co-funded by the FP7 "ICT systems for Energy Efficiency" program of the European Union, 2011/2014

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SEMANCO News

The SEMANCO project was presented at the ECTP/E2BA conference in Warsaw (October 2011) to stakeholders from the construction sector. In early May 2012 the project was introduced to industry, businesses and academics from the North East of England at Teesside University's TFI Annual Research Conference. Later in May, the project and its progress to date were presented to a wide policy audience at National Energy Actions' conference in London.

In June, SEMANCO was presented at the Eurekabuild2 Brokerage Event which took place in Madrid. Also, a poster was presented in the Erasmus Energy Forum, organized by the Erasmus University in Rotterdam.

SEMANCO will be presenting a research paper at the 9th European Conference on Product and Process Modelling in Reykjavik, Iceland between the 25th and 27th of July, 2012.

It is with great pleasure that I welcome you to the first SEMANCO Newsletter. The SEMANCO team are all delighted to be part of this exciting project and we are looking forward to keeping you updated on our journey.

As many of you will already know, SEMANCO – Semantic Tools for Carbon Reduction in Urban Panning – is a three year research project that began in September 2011 and which is co-funded by European Union's FP7 "ICT for Energy Efficiency" programme . SEMANCO will provide semantic tools to a variety of stakeholders involved in urban planning (for example, architects, engineers, building managers, local administrators, citizens and policy makers) to help them make informed decisions about how to reduce CO_2 emissions from cities.

This newsletter is intended to keep you up to date with the developments in the project, to make you aware of the capabilities of the tools we are developing and to highlight the utility of these tools in the three case studies in which we will be applying them.

I hope you will enjoy the newsletter, and through it, become interested in the research we are undertaking in this project.

Professor Leandro Madrazo, SEMANCO Project Coordinator

◼ SEMANCO introduction

Climate change is a significant threat at the European level and many cities have issued policies and set targets for CO_2 emissions reduction, but implementing these policies in urban planning remains a challenge. Individual member states implement EU CO_2 emission and urban planning policies and directives by different mechanisms and the data required by various actors is not standardised across Europe. This makes it difficult to compare performance, establish baselines and identify good practice.

The SEMANCO technology platform will take a semantic approach to the integration of open data from a wide variety of energy and energy–related databases. This underlying semantic framework will be used by specific software tools,

developed in the project, to provide information to a range of stakeholders for use in a variety of applications.

Presently, the SEMANCO project team is establishing three case studies, in Spain Denmark and UK, to analyse stakeholder requirements and define the scope and purpose of the methods and tools that the project will develop. These tools will integrate energy analysis, visualisation and optimisation through the application of automatic data analysis processes, providing verifiable and transparent methods of measuring energy performance. The three case studies will demonstrate the value and cost effectiveness of these decision support tools.

The tools are to form the basis of the SEMANCO decision support system, promoting collaboration between a wide range of actors in carbon reduction planning activities. The tool set will also allow assessment of a range of potential carbon reduction strategies and provide appropriate energy indicators and combined energy and socio-economic indicators to local authorities.

Key SEMANCO concepts

Central to the SEMANCO project is the **Ontology** concept which, within the information science context of this project, is a set of concepts and their relationships. Importantly, ontologies exist within particular (and often limited) domains, such as particular databases. At the core of an ontology are taxonomies: concepts related to each other by specialization or generalization. Usually, ontologies are formally specified using description logic formalisms and coded in machine-readable languages like OWL. In the context of the current level of development of the semantic web, ontologies make it possible to connect different views of the world fostered by different disciplines and domains which are embedded in the information structure of different data sources. More recently, the linked open data initiative has provided a new impulse towards the transformation of the web in a global knowledge base. Querying a variety of local ontologies—the structural framework of information within a data source—can be inefficient and difficult. This is a central issue in the SEMANCO project.

This issue is overcome by the centrepiece of the SEMANCO technological platform, the **Semantic Energy Information Framework (SEIF)**. This framework connects heterogeneous data sources, such as the energy performance of the building stock at different geographical scales, in order to embody the energy-related knowledge that planners need. The SEIF has three main goals: 1) storing semantic data which is presently off-line and/or heterogeneously structured; 2) providing a bridge between external and internal data sources to facilitate data analysis; and 3) gathering outputs of the data mining processes in order to improve the knowledge stored in it.

The language by which the interrelations between the different data sources may be understood and interpreted is referred to, within SEMANCO, as the **energy model**. The global ontology is the implementation of this energy model and embraces all the terms which the tools can use to gather semantic data from the SEIF.

To construct the SEIF, the project team are presently carrying out a process of **ontology mapping** to uncover the correspondences between concepts from the different local ontologies. To carry out this mapping, we have created specific tools which are described in the report "Environments for collaborative ontology mapping " available at the web portal. The various, distributed data sources are therefore undergoing a process of **semantic data integration** to facilitate their querying by means of a unified, global ontology.

Finally, aspects relevant to the energy analysis of a particular case will vary according to the scale of that case. Therefore, the scale of the energy analysis is an important consideration in the operation of the tools. For the SEMANCO project, we define three scales, as follows: Micro scale, at the level of individual buildings; Meso scale, at the level of the district, ward or neighbourhood; and Macro scale, beyond the city, e.g. at the scale of the municipality or province.

The SEMANCO case studies

The issues that we are addressing in the SEMANCO project are quite general. To make these more specific, and hence more soluble, we are conducting our work in the context of the three case studies.

- **North Harbour, Copenhagen**. This is an ambitious urban development project for the next 50 years to create a low CO_2 impact , energy efficient city space for 40,000 residents and 40,000 workers. District heating and cooling systems are to be developed, powered by solar thermal and wind systems initially and ultimately by geothermal and solar sources. Improvements in CO_2 emissions performance will be measured against a baseline of district hearting using CHP and conventional gas and electricity supplies.
- **Riverside Dene, Newcastle** is an economically deprived area with significant fuel poverty issues that is undergoing a series of re-development projects, including refurbishment and demolition of tower blocks. The redeveloped area is supplied by a biomass district heating system and will exhibit energy efficient buildings. The baseline is estimated from utility market data modelling for the neighbourhood and from the National Indicator set for the City level.
- **Manresa, Barcelona** is an urban area for which there is poor data relating to CO_2 performance below the macro

level. The baseline for this case study will be established by constructing typographical classifications for private and public buildings and applying measured and/or calculated emissions to these types. From here, scaling up will generate baseline data for the meso scale.

The "Report on the Case Study and Analysis", available at the web portal, describes the case studies in more detail, defines the policy frameworks within which the case studies operate and identifies the relevant actors in relation to each case study. The deliverable also outlines the expected outcomes of the tools the project will deliver and the requirements, availability and sources of data.

Cooperation with other research projects

SEMANCO participated in a meeting of six EU funded research projects organized by the Cassandra project team in June 2012 in Rotterdam.

Representatives of Cassandra, Wattalyst. Nobel, Citines, E-Price and SEMANCO presented their respective projects and participated in discussions to find synergies and lines of collaboration among the different projects. We identified common topics which will be further addressed in future encounters. Other meetings with on-going research projects are expected to take place in the future.

Visit the SEMANCO website for more details: www.semanco-project.eu
If you would like to become a member of the SEMANCO Dissemination Network, please contact Chris Ennis at c.ennis@tees.ac.uk

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