

SUMMARY REPORT - URBAN LAB

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EVENT TITLE:	Advanced Local Energy Planning and Underground Space utilizations: suitable and feasible solutions for future sustainable and resilient cities
VENUE:	Belvedere di S. Leucio, Room 5
DATE:	15 October 2014
TIME:	14:00 – 16:00
Names of Organizing Institution(s):	LAME Lab., Politecnico di Torino ACUUS, Association Research Centers for the Urban Underground Space
Approximate number of participants attending:	15

Background

In 2050, it is expected that more than two-third of global population will be living in cities. The expansion of urban areas together with the growing expectations for better quality services/infrastructures will drive demand for smart city solutions. Energy planning is an effective solution towards these goals: instruments to support decision makers in understanding how existing and planned policies influence energy consumptions are fundamental.

For a municipality, an Advanced Local Energy Planning approach is able to assess, in a mid-long term, the optimum mix of measures for minimizing energy consumptions/environmental impacts/ economical expenses by analyzing meaningful scenarios.

For better representing the local situation, both above and underground space must be considered. Constructions in underground have a central role in the development of the city structure. Underground infrastructures allow to preserve land for human activities; moreover, additional resources can be added into a Master Plan: the underground space itself, geothermal sources etc.

The 3D urbanism could play an essential role in developing sustainable urban solutions.

The covered topics are:

- * Underground Space as a Resource for Metropolitan Areas
- * Integrated Master Plans for Above- and Under-Ground
- * Local Energy Planning for Low-Carbon Cities: tools and examples
- * Web based open sources tools for citizens: projects and examples in the city of Turin

Outline of the session

1. Introduction & Agenda
2. LAME, ACUUS & MoU Presentation
3. Main topics:
 - Underground Space as a Resource for Metropolitan Areas (slide presentation)
 - Integrate Master Plans for Above/Underground (slide presentation)
 - Questions and debate
 - Local Energy Planning for Low-Carbon Cities: tools and examples (slide presentation)

- Web based open sources tools for citizens: projects and examples in the city of Turin (slide presentation)
 - Questions and debate
4. The city we need inputs

Emerging issues

The Urban Lab. Session started by introducing the recently signed MoU (Memorandum of Understanding) between UN- Human Settlements Program and Associated Research Centers for the Urban Underground Space (ACUUS) to raise awareness of best practices of the sustainable uses of underground space for urban development dedicated to decision makers and local authorities as well as UN-Habitat staff.

The target of the session was to find solution regarding the urgent question: “How can we improve the resilience of cities and regions to environmental, social, and economic pressures of today and the future?”

One of the possible key strategies is represented by the *rational use of underground space*, as a resource for cities, through different below-ground interest utilizations:

- infrastructure for traffic and transport (tunnel for trains, cars, bicycles and pedestrian)
- infrastructure for utilities and communications (electricity, water, natural gas, sewers, TLC, etc.)
- underground storage of materials (oil or NG, industrials materials and wastes) and
- subsurface buildings.

In fact, many advantages are linked to the underground space such as: limited visual impact, preservation of surface’s open space, efficient land use (compact city), energy use reduction, protection from natural disasters, isolation from noise and vibration, lower maintenance requirements and higher durability.

The debate focused instead on the main criticalities related to this resource (limited natural light, negative psychological reactions, water and geological problems, increased construction costs, safety etc.) and on possible solutions to overcome barriers.

Reference research centers

ACUUS, Associated Research Centers for the Urban Underground Space, www.acuus.org

UN- Human Settlements Program

LAME, Laboratory of Energy Model Analysis, DENERG, Polito. www.polito.it/lame

The second part of the Urban Lab. Session was focused on the tools able to foresight sustainable pathways towards resilient, inclusive and livable cities in a world context. In particular, the attention was concentrated to enhance the role of *bottom-up optimization models* for energy demand projection and scenarios analysis by presenting the tool developed by the Laboratory of Energy Model Analysis (LAME) of Politecnico di Torino and its applications. The first important step in order to implement these kinds of procedures is to set up a data collection approach to make data available, reliable and accessible, by creating a GIS-based database representative of the reference energy system of the city. Some example applications and main results applied on the city of Turin and on the city of Beijing have been presented. The debate on this topic has been focused on the necessity of a multidisciplinary and integrate approach.

Reference research centers

LAME, Laboratory of Energy Model Analysis, DENERG, Polito. www.polito.it/lame

TEBE, Technology Energy Building Environment, DENERG, Polito. www.polito.it/ricerca/tebe

DIST, Interuniversity Department of Regional and Urban studies and planning, www.dist.polito.it

Reference projects

IEA Annex 22-EBC, IEA Annex 33-EBC, EC2-Europe China Clean energy Centre, POCACITO, REACCESS, MILESECURE

The last part of the session was devoted to explain the developed procedures of building stock characterization and renewable energy sources potential estimation at a local scale and on how to make the analysis accessible to all citizens by *web open source platforms*. The topic has been of great interest, especially for the possibility to be scaled up to a higher level and standardized.

Before the final discussion, some important and meaningful examples implemented in Turin have been presented: a thermal model for the energy savings estimation of the whole city, two open source tools by which each citizen can select a building and evaluate possible retrofit actions and their effects and, in addition, estimate the surface of the roof and evaluate the PV potential and investment cost.

The debate has been focused on the criticalities of research results' dissemination.

Reference research centers

LAME, Laboratory of Energy Model Analysis, DENERG, Polito. www.polito.it/lame

TEBE, Technology Energy Building Environment, DENERG, Polito. www.polito.it/ricerca/tebe

DIST, Interuniversity Department of Regional and Urban studies and planning, www.dist.polito.it

BERC, Building Energy Research Centre, Tsinghua University, China

Reference projects

CITIES ON POWER, TABULA

Recommendations

By considering the emerging issues, the Urban Lab. Session pointed out the following.

Underground Space as a Resource for Metropolitan Areas and Integrated Master Plans for Above- and Under-Ground.

- The underground space, as well as other resources, is not renewable and its use should be made in a sustainable manner through a specific planning approach;
- The urban underground space is not so well known (lack of accurate and updated information), often poorly perceived by the population (safety, disorientation,...), generally undervalued (not visible) and too often poorly planned and regulated.
- The need to outline a common and global definition of underground space;
- The need to find the best way to improve the quality of the underground space;
- The need to find the best way to improve the use of the underground space;

From the above considerations:

“The underground space has a specific role to play in The City We Need and can provide specific contribution for planning purpose. For that reason:

- *A suitable integrated planning approach of the surface and subsurface space assessment and use is essential.*
- *To find mechanism and tools to include also the underground space in urban planning approach are necessary.*
- *To map and describe in a new and innovative way the underground space is useful and required in order to release appropriate regulatory standards in order to solve disadvantages of going belowground and to change the underground psychological connotation from negative to positive.*
- *Anyway, make the underground spaces' users feeling comfortable and safe should be the priority number one.”*

Local Energy Planning for Low-Carbon Cities and web based open sources tools for citizens

- The planning process should integrate different disciplines and the two different approaches (bottom-up and top-down).
- Just with a realistic quantitative description of the urban complexity is possible to develop optimization procedures helpful for the transformation of principles into concrete actions.
- The standardization of data collection methodologies and their use for the description of the reference energy system is an important step to scale up and adopt local testing methodologies to a national level.
- The comparison and analysis of different lifestyle conditions, consumption patterns and their corresponding energy costs and carbon emissions help to provide proper development approaches and policy recommendations for the dissimilar places and climate conditions.
- Including citizens in the decision process and raise the awareness on sustainable topics is fundamental for enhance the responsibility of people and consequently the quality of both lifestyle and environment.

From the above considerations:

“ Develop a comprehensive methodology - involving both sides of land use (over and underground) - for a strategic energy planning is fundamental for assisting decision maker/city stakeholders to achieve environmental/sustainability targets and to reduce GHG.

Some recommendation for further researches could be:

- *Overcome the difficulties on dissemination and application of research results*
- *Strengthen the communication capacity of research results to the local authorities*
- *Strengthen the cooperation between different stakeholders*
- *Providing web open data source in which is possible to estimate the building stock energy saving potential*
- *Providing web open data source in which is possible to estimate the renewable energy sources potential*
- *Include non-only technical aspects, but also social/ economical/ environmental /morphological aspects in all the planning processes.”*

Other

For further and more detailed information please contact chiara.delmastro@polito.it, laura.schranz@polito.it to be added into a Dropbox folder where all the material is shared between participants.

The contributors to the Urban Lab. Session are:

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