TeMA

Journal of
Land Use, Mobility and Environment

There are a number of different future-city visions being developed around the world at the moment: one of them is Smart Cities: ICT and big data availability may contribute to better understand and plan the city, improving efficiency, equity and quality of life. But these visions of utopia need an urgent reality check: this is one of the future challenges that Smart Cities have to face.

Tema is the Journal of Land use, Mobility and Environment and offers papers with a unified approach to planning and mobility. TeMA Journal has also received the Sparc Europe Seal of Open Access Journals released by Scholarly Publishing and Academic Resources Coalition (SPARC Europe) and the Directory of Open Access Journals (DOAJ).

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Editorial correspondence
Laboratory of Land Use Mobility and Environment
DICEA - Department of Civil, Architectural and Environmental Engineering
University of Naples "Federico II"
Piazzale Tecchio, 80
80125 Naples
web: www.tema.unina.it
e-mail: redazione.tema@unina.it

Cover image: The ZCB Zero Carbon Building, designed by Ronald Lu & Partners, conceived to promote a low carbon emission lifestyle and to be a showcase of technologies to initiate a cultural change.

TeMA. Journal of Land Use, Mobility and Environment offers researches, applications and contributions with a unified approach to planning and mobility and publishes original inter-disciplinary papers on the interaction of transport, land use and environment. Domains include: engineering, planning, modeling, behavior, economics, geography, regional science, sociology, architecture and design, network science and complex systems.

The Italian *National Agency for the Evaluation of Universities and Research Institutes* (ANVUR) classified TeMA as scientific journal in the Area 08. TeMA has also received the *Sparc Europe Seal* for Open Access Journals released by *Scholarly Publishing and Academic Resources Coalition* (SPARC Europe) and the *Directory of Open Access Journals* (DOAJ). TeMA is published under a Creative Commons Attribution 3.0 License and is blind peer reviewed at least by two referees selected among high-profile scientists. TeMA has been published since 2007 and is indexed in the main bibliographical databases and it is present in the catalogues of hundreds of academic and research libraries worldwide.

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Contents

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REVIEW PAGES

CITIES, ENERGY AND BUILT ENVIRONMENT

Starting from the relationship between urban planning and mobility management, TeMA has gradually expanded the view of the covered topics, always remaining in the groove of rigorous scientific in-depth analysis. During the last two years a particular attention has been paid on the Smart Cities theme and on the different meanings that come with it. The last section of the journal is formed by the Review Pages. They have different aims: to inform on the problems, trends and evolutionary processes; to investigate on the paths by highlighting the advanced relationships among apparently distant disciplinary fields; to explore the interaction's areas, experiences and potential applications; to underline interactions, disciplinary developments but also, if present, defeats and setbacks. Inside the journal the Review Pages have the task of stimulating as much as possible the circulation of ideas and the discovery of new points of view. For this reason the section is founded on a series of basic's references, required for the identification of new and more advanced interactions. These references are the research, the planning acts, the actions and the applications, analysed and investigated both for their ability to give a systematic response to questions concerning the urban and territorial planning, and for their attention to aspects such as the environmental sustainability and the innovation in the practices. For this purpose the Review Pages are formed by five sections (Web Resources; Books; Laws; Urban Practices; News and Events), each of which examines a specific aspect of the broader information storage of interest for TeMA.

01_WEB RESOURCES
The web report offers the readers web pages which are directly connected with the issue theme.

author: Raffaella Niglio
TeMALab - Università Federico II di Napoli, Italy
e-mail: raffaella.niglio@unina.it

02_BOOKS
The books review suggests brand new publications related with the theme of the journal number.

author: Gerardo Carpentieri
TeMALab - Università Federico II di Napoli, Italy
e-mail: gerardo.carpentieri@unina.it

03_LAWS
The law section proposes a critical synthesis of the normative aspect of the issue theme.

author: Laura Russo
TeMALab - Università Federico II di Napoli, Italy
e-mail: laura.russo@unina.it

04_URBAN PRACTICES
Urban practices describes the most innovative application in practice of the journal theme.

author: Gennaro Angiello
TeMALab - Università Federico II di Napoli, Italy
e-mail: gennaro.angiello@unina.it

05_NEWS & EVENTS
News and events section keeps the readers up-to-date on congresses, events and exhibition related to the journal theme.

author: Andrea Tulisi
TeMALab - Università Federico II di Napoli, Italy
e-mail: andrea.tulisi@unina.it

TeMA
有关土地使用、交通和环境的杂志

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评述页

城市、能源和建築環境

TeMA从城市规划和流动性管理之间的关系入手，将涉及的论题逐步展开，并始终保持科学严谨的态度进行深入分析。在过去两年中，智能城市课题和随之而来的不同含义一直受到特别关注。学报的最后部分是评述页 这些评述页具有不同的目的：表明问题、趋势和演进过程；通过突出貌似不相关的学科领域之间的深度关系对途径进行调查；探索交互作用的领域、经验和潜在应用；强调交互作用、学科发展、同时还包括失败和挫折（如果存在的话）。评述页在学报中的任务是，尽可能地促进观点的不断传播并激发新视角。因此，该部分主要是一些基本参考文献，这些是鉴别新的和更加深入的交互作用所必需的。这些参考文献包括研究、规划法规、行动和应用，它们均已经过分析和探讨，能够对与城市和国土规划有关的问题作出有系统的响应，同时还对诸如环境可持续性和在实践中创新等方面有所注重。因此，评述页由五个部分组成（网络资源、书籍、法律、城市实务、新闻和事件），每个部分负责核查TeMA所关心的海量信息存储的一个具体方面。

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e-mail: andrea.tulisi@unina.it

01

CITIES, ENERGY AND BUILT ENVIRONMENT

REVIEW PAGES: WEB RESOURCES

RAFFAELLA NIGLIO
TeMALab – Università degli Studi di Napoli Federico II, Italy
e-mail: raffaella.niglio@unina.it

In this number
TOWARDS ENERGY EFFICIENCY OF BUILT ENVIRONMENT

The world is becoming increasingly urbanized. In 1950, only 30% of the world's population lived in urban areas; currently the proportion is almost 50% and by 2030, it will reach 70%.
Moreover, net population growth of the next few decades will nearly all accrue in the urban centers of developing countries. With urban and industrial development comes growing demands for energy and rising expectations of material goods.
The built environment is where most human activity takes place, where most energy services are used, and where many of the advantages and disadvantages of energy use arise. It includes the buildings in which people live and work, and the spaces and infrastructure in cities, towns, and villages (Wilkinson et al., 2007).
Managing built environment and its complex and interconnected systems requires an understanding of technology, financial planning, and even human behavior to create solutions that conserve resources, reduce energy and waste, save money and satisfy users. Many programs dealing with human behavior are being implemented all over the world in the form of pilots, because they rely on the assumption that humans act rationally and that they are willing to change their consumption habits (Salvati et al., 2013).
Implementing more building efficiency requires overcoming some critical barriers: lack of information and awareness for more efficiency; lack of technical knowledge to evaluate different options; uncertainty about how to measure or understand the energy efficiency performance; an inability to meet financial criteria (return on investment rates) (http://www.wri.org/).
In this issue, three websites are presented; they provide practical resources to help cities succeed with policies, technologies, and innovative investment strategies to deliver better buildings, cleaner air, and more efficient urban development.
The first website analyzed is the Sustainable Facility Tool: an online resource helps users understand and select environmentally preferable solutions for renovations, alterations and leases.
The second website proposed is that of Institute for Building Efficiency (IBE). It provides research on policies, high performance buildings and smart energy systems around the world.
In the end, the third and last website indicated is that of the Center for the Built Environment (CBE) of the University of California, Berkeley. CBE's mission is to improve the design, operation, and environmental quality of buildings by providing timely, unbiased information on building technologies and design techniques.

SUSTAINABLE FACILITIES TOOL
https://sftool.gov/

U.S. government officials and industry executives are under pressure to reduce energy consumption in an effort to save money and preserve the environment. For this reason, the U.S. General Services Administration (GSA) created in 2011 the GSA Sustainable Facilities Tool (SF Tool), a free web-based application that empowers any government or private sector user to identify and prioritize cost-effective green building and procurement strategies to improve environmental performance. The Sustainable Facilities Tool can be used for small projects or for larger remodels. The homepage of Sustainable Facilities Tool website provides an overview of all the opportunities offered by the tool, including green building best practices, guidelines to select sustainable materials, training materials, case studies, references and regulations. Thanks to a clear graphics, homepage takes users straight to the topics that interest them the most. The website consists of six sections: *learn*, *plan*, *explore*, *procure*, *practice*, *share* and by checking out summaries of each section users can start exploring.

Beyond a brief and general presentation about the sustainability topic and building CO2 emissions, the *learn* section offers a list of quick links to learn about the most relevant sustainability topics, from water efficiency to energy management systems. Users can click through annotated legislation, like Executive Order 13653, and understand the impact of policy on sustainability. Moreover, for each topic a related case study is described and the opportunity of sharing examples of successes and struggles is offered to user community. The *plan* section features strategies for building green or turning an existing space into a healthier environment. Users can choose among three groups of strategies: 1) Overall Strategies, 2) Project Types and 3) Plan for the Future. In the first one you can learn key strategies applicable to all planning activities, such as Integrative Design Process and Lifecycle Approach. In the second one, you can review strategies for specific project types through information about sustainable materials, furniture, space reconfiguration projects, building systems upgrades and building operations and maintenance. In the third one, you can learn strategies related to Net Zero Energy and Climate Adaptation topics. Many key references/resources are provided at the bottom of each page. In *explore* section users can explore interior office workspaces and learn about sustainable design best practices by comparing materials. For any room of the office: some green tips and design strategies, the opportunity to compare furniture/Furnishings options and some legal requirements are provided. In this way users can see how their role helps a team reduce costs and increase environmental sustainability. In *procure* section there is a list of all the products and services described into the website and for each of them a fact sheet, reporting the related legal requirements, principals and guidance, is given. The *practice* section features the “Green the Building” game that exposes the complex world of sustainable design, construction, and operations in a succinct and simplified context that allows you to grasp the whole system, learn technical concepts, and try out building strategies in a risk-free environment. It places user in the role of Team Lead, charged with greening buildings through strategic energy, waste, water, and occupant satisfaction improvements given a limited budget. The aim is to encourage moving beyond professional minimum compliance standards towards discovery of actions you can take to improve performance and address challenges.

Finally, the *share* page includes the social content tied to green building best practices. Here users can interact with us on Twitter, Facebook and Pinterest and can discover relevant sustainability news. SF Tool has a very easy to navigate user interface and it is currently being used by facility managers, real estate professionals, project managers from government agencies and private sector developers.

INSTITUTE FOR BUILDING EFFICIENCY
http://www.institutebe.com/

The Institute for Building Efficiency is an initiative of Johnson Controls and World Resources Institute. The first one is a global leader in providing building efficiency solutions while the second one is an excellence research organization in the field of sustainable natural resource management. In October 2014 they joined into a partnership for the launch of a Building Efficiency Initiative.

The goal of IBE is to provide information and analysis of technologies, policies and practices for efficient, high performing buildings and smart energy systems around the world.

Moreover, its aim is to build market awareness and action on:

- local benchmarking and sustainable building certification and labeling approaches;
- innovative financing to support efficiency investments;
- distributed energy systems at the building and community scale.

Seven are the main sections of the website. In *Building Energy Retrofits* users can find more than fifteen articles about energy saving and energy performance contracting. Indeed the IBE comprehensive approach enables building owners to implement whole building retrofits and significantly lower energy consumption and operating costs. Moreover, this section provides also videos, recordings, academic papers, fact sheets and presentations focused on building efficiency.

Energy Efficiency Indicator section is dedicated to a survey about attitudes, priorities and concerns of people at the front lines of energy management in commercial buildings throughout the world. Here the results of the annual Energy Efficiency Indicator (EEI) global studies are presented. The surveys analyze energy efficiency and renewable energy plans, practices and investments among executive-level decision-makers responsible for energy and facility management in buildings.

The third section, *Building Performance Management*, addresses the opportunity to bring people and technology together to improve building performance. Effectively, a number of best practices and case studies to inspire, engage and promote energy efficiency are listed.

In *Smart Grids & Smart Buildings* users can find resources about energy grids, energy districts, intelligent buildings and demand response programs.

The *Clean Energy Finance* section includes many practical reports and documents that investigate the topic of Property Assessed Clean Energy (PACE) financing as a tool to add value to commercial buildings, in rental premiums, higher occupancy and lower operating cost.

Energy & Climate Policy section represents an important source of articles about three interlinked policy approaches: 1) energy policy that favors energy efficiency and distributed renewable energy sources, 2) climate policy that recognizes and internalizes the cost of carbon pollution; and 3) standards and performance criteria for the building envelope and the building components.

The last section of the website offers a series of issue briefs on net zero energy buildings covering definitions and case studies, opportunity and drivers, net zero for existing buildings, and net zero communities. Furthermore, some reports underline the benefits of building efficiency renovation projects on real market traction, particularly for Europe's economy recover.

In general, a collection of key resources and tools from a variety of sources can be found in IBE website. These videos, issue briefs, presentations, and tools shine the spotlight on need-to-know issues, provide big-picture perspective, and offer advice on how to develop winning strategies for establishing clean energy building systems and cutting carbon emissions.

CENTER FOR THE BUILT ENVIRONMENT
http://www.cbe.berkeley.edu/

The Center for the Built Environment was founded in 1997 under the National Science Foundation (NSF) Industry/University Cooperative Research Center (I/UCRC) program. Their mission is to improve the environmental quality and energy efficiency of buildings by providing timely, unbiased information on building technologies and design and operation techniques. Two are the broad program areas:

- tools for improving building performance, designed to serve those who manage buildings, as well as assist those who plan and design buildings;
- new technologies that make buildings more environmentally friendly, more productive to work in, and more economical to operate. These technologies are designed to help develop and target new product offerings, and allow facility management and designers to select and apply state of the art technologies effectively.

Both program areas are supported by fundamental research into human physiology, indoor airflow, thermal performance of building systems, and an extensive occupant-survey program. They participate in standards and guides for ASHRAE and USGBC in order to remove barriers to effective building technologies, and to speed their implementation. They also develop software for design, operation, and research.

CBE website has four main sections: *About us*; *Research*; *Membership*; *What's new*. But in the homepage users can get also quick links to some relevant information such as their industry partners, research staff, research portfolio, publications and membership information. Moreover, a guided browsing based on the user's profile (prospective partners, prospective students, visiting scholars, job seekers) is available. In *About us* section primary objectives and organizational structure are described. *Research* section shows an overview of research programs divided into five general topics: indoor environmental quality (IEQ), building HVAC systems, building envelope systems, human interactions, sustainability, whole building energy, and other topics. For each general topic you can get a link to a page including a list of all the research projects related to the topic. Hence, by picking one of the research project titles you will find a summary page in which the objective, the significance to industry, the research approach, the related publications and some project resources, such as the status of implementation, the funding sources and the primary contacts, are provided. In this collection there are 372 publications, published between 1980 and 2015. In *Membership* section you will find information on how you can get involved with CBE. *What's new* section includes up to date events about like new joint CBE partners, news about recently awarded grants and about the periodical issue of "centerline", the CBE semi-annual magazine focused on their research activity. The Center aims at being a place where a holistic and far-sighted research on buildings is addressed.

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Salvati, L., Gargiulo Morelli, V., Weijnen, M., van Bueren, E., Wenzler, I., & De Reuver, M. (2013). Towards Intelligently - Sustainable Cities? *Tema. Journal Of Land Use, Mobility And Environment*, 6(1), 73-86. doi: 10.6092/1970-9870/1496

IMAGE SOURCES

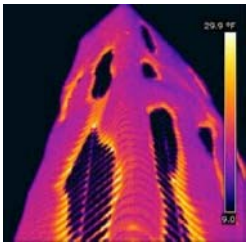
The images are from: https://sftool.gov/; http://www.institutebe.com/; http://www.cbe.berkeley.edu/.

02

CITIES, ENERGY AND BUILT ENVIRONMENT

REVIEW PAGES: BOOKS

GERARDO CARPENTIERI
TeMALab – Università degli Studi di Napoli Federico II, Italy
e-mail: gerardo.carpentieri@unina.it



In this number
ENERGY EFFICIENCY AND LOW CARBON TECHNOLOGIES

The crisis of the model of development without limits, that characterized the western societies in the last two centuries of the last millennium, has forced to reconsider the principles underlying of the model closely dependent on the use of fossil fuels. This cultural evolution of the development model based less on fossil fuels, it is an aspect to the base of the new concept of "smart city". This has been achieved also through the action of the European Community, which defined the new terms for the access at the funding to 2020 (EC, 2011). So EU puts at the center of European policies the city "smart" with actions on the urban environment and the containment of consumption energy (Gargiulo et al., 2013).

This focus on cities is certainly due to the awareness that large urban areas are complex organisms with a high degree of entropy. Therefore, the urban areas are among the most responsible for the greenhouse effect, or the warming of the atmosphere, caused by the excessive release of the carbon dioxide (EP, 2011).

The first results of these initiatives have been the competition between cities for nomination as Smart City, with membership of the Covenant of Mayors that sustains and supports the efforts of the local authorities of the European Union, and the subsequent drafting and implementation of the Action Plans Sustainable Energy (PAES), tools with which the city defines the goals of reducing emissions and how to reach them (Barresi and Pultrone, 2013). The energy efficiency presents a huge growth potential, but its characteristics and the market structure require the introduction of new business models – together with adequate policies and the development of new skills and competences – in order to achieve the impending targets.

The civilian sector was characterized by continuous growth of energy consumption in past decades. Buildings account for about 40% of total final energy consumption and around 55% of electricity consumption in the EU-28 in 2012. Buildings are the largest end-use sector, followed by transport (32%), industry (26%) and agriculture (2%).

For this reason there are interesting opportunities to improve energy use and control demand. Despite this, several barriers have played a part in delaying the dissemination of energy-efficiency measures: the lack of resources for public buildings, the relatively low energy expenses in the services sector (if compared with total expenses), the minimal awareness and knowledge of the problem in the residential sector and in general. According to these brief considerations, this section proposes three documents that help to better understand the issue of this number: The Guidelines for the government of urban transformation and reducing energy consumption; The Energy Efficiency Trends and Policies in the Household and Tertiary Sectors; The Energy Efficiency in the building sector: skills, business models and public private partnerships.

Title: Governo delle trasformazioni urbane e riduzione dei consumi energetici
Linee Guida
Author/editor: Giovanni Dispoto, Carmela Gargiulo
Publisher: CLEAN Edizioni
Download: http://smartenergymaster.unina.it/disseminazione/disseminazione/strumenti/linee-guida/download-linee-guida/
Publication year: 2015
ISBN code: 978-88-8497-523-2

The Smart Energy Master (SEM) Project for the energy management of the territory funded within the integrated action for sustainable development “Energy Efficiency and Low Carbon Technologies” PON the Smart Cities and Communities 04a2_E proposes best practices and governance solutions oriented towards energy savings that connect the characteristics of the city, the activities that take place and the behavior of the inhabitants. Among the main results of the project: the definition and dissemination of guidelines for the reduction of energy consumption by adapting behaviors of the different categories of users and improve efficiency energy efficiency of public facilities, infrastructure and networks of the city.

In this volume are collected the best practices of some European cities that are implementing projects on "smart building", sustainable mobility and smart grids with considerable EU and national funding. To make a city "smart", it means organizing through a coordinated set of interventions. That aim to make them more sustainable in terms of energy and environmental efficiency, the services offered to citizens.

These guidelines aimed to reduce energy consumption, contain the leanings and action criteria, to improve both the legal and technical instruments, at national and regional level, and the administrative and regulatory instruments, at the urban scale and/or neighbourhood.

The Guidelines identify a number of "leanings" that are particularly significant for sustainable urban planning at various levels (urban scale and / or neighbourhood) and the correct application of which the instruments of government of land use. That can increase the integration between the urban planning and the energy planning, through the introduction of energy aspects in the urban planning tools and the urban planning aspects in the energy instruments.

The "leanings" are divided into "action criteria", which starting from the general address, allow to apply concrete actions for reducing energy consumption, at different planning tools. For every "action criteria" is proposed a table, identified by an ID, which illustrates for each action criteria the possible measures that can be implemented at the different reference scales.

The collection and analysis of case studies, consisting in experience of planning and design made in Europe and ascribed to the category of so-called smart city. These case studies formed the starting point to define leanings and action criteria useful for preparing Guidelines. These are examples of the urban sustainability of the best practices, expression of the urban culture and territorial government, are aware of the limited natural resources of the planet.

To help the reading and understanding of the terms used, there is a synthetic glossary. It's useful to explore some issues if the user deems it necessary, complete the guidelines constitute an additional tool facilitating.

The guidelines may be used, for example, to help the technical designers in the selection at the reference scale of the design and the type of planning instrument to improve the energy efficiency. The technical can find a range of predefined leanings, easy to read, calibrated relative to the scale and type of instrument considered.

Thanks to the identification of leanings and action criteria, was built a matrix based on the instrumentation and technical regulations in force at national and regional level. So to frame and report the addresses and criteria defined in relation to instruments of government land at different scales. The matrix shows the scale of reference, the instrument of government of urban transformation in question, the guidelines and the action criteria concerned instrument.

Title: Energy Efficiency Trends and Policies in the Household and Tertiary Sectors
Author/editor: ODYSSEE-MURE project
Publisher: EU
Download: http://www.odyssee-mure.eu/publications/br/energy-efficiency-in-buildings.html
Publication year: 2015
ISBN code: n.d.

This study analyses energy efficiency in the household and tertiary sectors. The report summarises recent policies implemented to promote energy efficiency and renewable energy in buildings and pinpoints the most successful measures. The EU Member States have submitted their third National Energy Efficiency Action Plans (NEEAPs) in April 2014 and measures reported in them discussed.

The report analyses the trends since 2000 in energy use and energy efficiency and the use of renewable energy in buildings based on ODYSSEE data, with a separate analysis for residential buildings and non-residential buildings.

The ODYSSEE database contains data on energy efficiency indicators, energy consumption, activity indicators and energy-related CO2 emissions. It includes the following types of indicators in buildings: Specific energy consumption; Energy efficiency index to evaluate energy efficiency progress at sector level; Energy savings measuring the energy saved through energy efficiency improvements; Adjusted indicators to improve the comparisons of indicators across countries; Diffusion indicators to monitor the market penetration of energy-efficient technologies. Currently, energy efficiency data are available from the year 1990 to 2012.

This report analyses the theme of renewable energy in buildings. In particular, the Renewable Energy Directive establishes numerous requirements concerning the use of renewable energy buildings. However, there is still a need for national initiatives to promote local energy production and to remove the barriers to their large diffusion, which remain considerable.

In addition, to renewable energy policy, the report discusses some other specific themes such as behavioural change of consumers, the role of the public sector, city planning and co-benefits of energy efficiency and renewable energy. Some other policies and measures touched upon, but not with such a specific focus, are the use of smart meters and feedback programmes and resilience policies.

Consumer behaviour and measures addressing it get special attention. In addition to the traditional campaigns and energy advice, new energy services are empowering consumers.

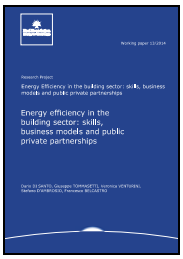
The exemplary role of the public sector receives some extra focus in the report. Its role is underpinned by EU legislation but there are also various voluntary measures and networks supporting sustainable development, particularly in the municipalities.

Good spatial planning is in the foundation of sustainability, including energy efficiency and use of renewable energies. This is also linked to growing digitalization, which, however, is not yet very visible in the measures loaded to the MURE (Mesures d'Utilisation Rationnelle de l'Energie) database.

The MURE database provides information on energy efficiency policies and measures that have been carried out in the EU Member States. The database is structured by end-use sector (household, tertiary, transport, industry) and allows browsing energy efficiency measures by sector. The database also contains information on general energy efficiency programmes and on general cross-cutting measures.

Recently, the co-benefits of energy efficiency have raised increasing attention, partly driven by recent work by the International Energy Agency on multiple benefits. The energy efficiency and renewable energy measures in the MURE database have been scanned for direct references to co-benefits.

In the report are collected many case studies from various countries are given based on information from the MURE database.



Title: Energy Efficiency in the building sector:
skills,business models and public private partnerships
Author/editor: Dario Di Santo, Giuseppe Tommasetti, Veronica Venturini,
Stefano D'ambrosio and Francesco Belcastro
Publisher: Enel Foundation Working
Download: http://www.enel.com/it-IT/enel_foundation/library/working_papers/2014
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The Enel Foundation periodically publishes reports, working papers and articles with the objective to exploit and disseminate the results of own research projects.

This working paper is the 13th of the 2014 and was published with the support of Italian Federation for the Rational use of Energy (FIRE).

The FIRE, in recent years, has collaborated with most associations that bear interest in energy efficiency at the Italian level and has conducted numerous studies regarding end-use energy efficiency, including incentive policies, existing barriers, the building sector, ESCOs, and third- party financing.

This study has aims to analyse innovative solutions, business models, and public support to promote energy efficiency in the public building sector, linking up with the development of an industrial policy in line with the Green Growth Strategy, also through the development of the energy service company model. In particular, the analyses concentrates on the Italian situation and is presented as a study structured in ten chapters, gathering interesting suggestions and solutions, even from major European countries.

The degree of integration of available technologies, the skills asked for and the skills necessary to manage this integration, and the interaction between the various players and the public and private parties concerned. The financial, administrative and legal barriers that are obstacles to the massive dissemination of efficient construction-industry technologies on a larger scale, and that impede an integrated and holistic approach. The actual implementation of innovative and successful business models to improve energy efficiency in the public building.

Based on experiences and analyses acquired from the above activities, the study proposes a series of recommendations for political decision makers and certain market operators, also suggesting possible solutions to accelerate and simplify the existing dynamics. The study also illustrates the best experiences and best practices with the public and private parties concerned and sets out to provide solutions to promote networking, associations, and partnerships for energy efficiency among the parties concerned n the building sector.

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03

CITIES, ENERGY AND BUILT ENVIRONMENT

REVIEW PAGES: LAWS

LAURA RUSSO
TeMALab - Università degli Studi di Napoli Federico II, Italy
e-mail: laura.russo@unina.it

In this issue

EUROPEAN AND ITALIAN STRATEGY FOR ENERGY EFFICIENCY IN THE BUILT ENVIRONMENT

Two possible solutions can effectively make the use of energy more sustainable: saving energy or using it more efficiently. Both solutions can be developed in the three economic sectors – buildings, transportation, industry – in order to achieve positive results, but the buildings sector, which is the largest end-use energy consumer in the industrialized countries (IEA, 2010), has the highest potentials for energy savings (Fig. 2).
Some data can help illustrating the phenomenon: the primary energy consumption of buildings on the global scale is almost 19 millions barrels of oil per day as much as the total OPEC production for a day (Santamouris, 2011) and 21% of greenhouse gas emissions come from this sector. The European Commission has calculated that by improving the energy efficiency of buildings it is possible to reduce total EU energy consumption by 5% to 6% and lower CO_2 emission by about 5%, as well as decreasing gas imports by 2.6% for every 1% improvement in energy efficiency.
For these reasons, in the last ten years, the European Commission has focus its attention on this issue and has promoted the reduction of energy consumption of buildings by adopting two fundamental Directives: the 2010 Energy Performance of Buildings Directive (2010/31/EU) and the 2012 Energy Efficiency Directive (2012/27/EU). These two documents are described in the following pages, together with the description of the Italian adoption texts. Indeed, each EU country has implemented the two Directives based on its social, economic and geographical context.

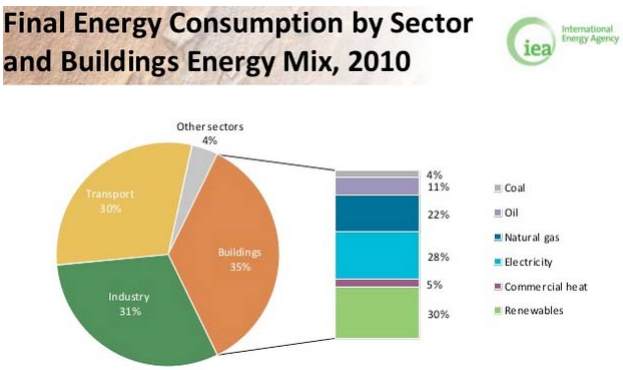


Fig. 2 Final Energy Consumption by sector (IEA, 2010)

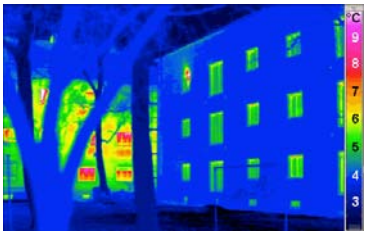
Moreover, the EU Commission has introduced several practical support initiatives – Concerted Action EPDB, BUILD UP Skills, BUILD UP Portal – in order to help EU Member States properly adopt both Directives. These policies aim to achieve the energy efficiency targets the EU has set itself for 2020 (-20%) and 2030 (-27%). Although last year it was calculated that the EU will miss the 2020 target by 1-2%, the implementation of all the measures contained in the legislation on energy efficiency could guarantee the achievement of these goals without additional actions.

The European commitment has already generated several important advantages in the last decades (www.ec.europa.eu/energy):

- the energy consumption of new buildings has decreased by about 50% compared to the 80s;
- in 1995 the number of A classes and above refrigerators was lower than 5%, while in 2010 was higher than 90%;
- EU countries have committed themselves to rolling out close to 200 million smart meters for electricity and 45 million for gas by 2020, leading to greater substantial benefits for consumers.

The great efforts all European Member States are making in order to develop a more sustainable urban environment represent an important commitment towards future generations because they have positive impacts on the ability of the urban system to adapt to climate change (Galderisi, 2012), and at the same time, they also represent an opportunity of economic growth: by investing in energy efficiency, indeed, it is possible to provide business opportunities for constructions firms and manufacturers of energy-using equipment, as well as encourage the creation of new jobs in several sectors that invest in energy efficiency.

In this context, Italy is doing its best even though it is lagging behind the best performing countries.



NEARLY-ZERO ENERGY BUILDINGS – EUROPEAN AND ITALIAN FRAMEWORK

The promotion of energy efficiency in the built environment represents one of the most important key strategies the EU Agenda is promoting because of the saving opportunities achievable in this sector as it accounts for a great amount of energy consumption.

Both existing and new buildings are the priorities of 2010/31/EU Directive, which "promotes the improvement of the energy performance of buildings within the Union, taking into account outdoor climatic and local conditions, as well as indoor climate requirement and cost-effectiveness".

According to 2010/31/EU Directive, all new public body's buildings have to be nearly zero-energy buildings (NZEB) by 31 December 2018, as well as all new buildings have to be NZEB by 31 December 2020. The definition of zero-energy buildings is provided within Article n.2: "nearly zero-energy buildings means a building that has a very high energy performance. The nearly zero or very low amount of energy required should be covered to a very significant extent by energy from renewable sources, including energy from renewable sources produced on-site or nearby".

Furthermore, the Directive has also introduced the energy performance certificate (EPC) – "a certificate recognised by a Member State or by a legal person designed by it, which indicates the energy performance of a building or building unit" – that must be included in all advertisements for selling or renting a building unit, and the *cost-optimal methodology* for calculating the minimum energy performance requirement for new buildings, the major renovation of buildings and for the replacement or retrofit of building elements. This calculation takes into account the benefits and costs of energy efficiency initiatives during the building's

expected life-cycle with the goal of stressing the importance of balancing the investment involved and the energy costs saved.

At national level, EU Member States have transposed and implemented the Directive based on their specific context. In Italy, 2010/31/EU has been adopted with 2013/90 Law that sets the new criteria for achieving the EU targets in a nearly energy-zero building perspective. The very high number of buildings in Italy – more than thirteen millions, 51.000 of which school buildings – certifies the importance of investing in the efficiency of this sector (Mazzeo, 2014), which accounts for more than 36% of national energy demand and in recent years it has recorded a constant increase in consumption, as reported by the National Energy Balance 2011.

In numbers, Italy's goal is to save 20 Mtep of primary energy and 15 Mtep of final energy per year by 2020, with a reduction of CO_2 emissions of 55 million tonnes.

These ambitious targets can represent a profit-making opportunities for both the country and individual consumers because the promotion of energy efficiency can positively affect production and employment and it can be a driver of innovation and research in the medium and long term, which in turn has a positive impact on growth.

COM(2012) 27 – DIRECTIVE 2012/27/EU FOR ENERGY EFFICIENCY AND THE ITALIAN ADOPTION

The 2012/27/EU Directive has established a common framework of measures for the promotion of energy efficiency within the EU in order to achieve the 20% energy efficiency target in 2020 and to inspire further energy efficiency improvements beyond that date.

Although the EU Directive emphasizes the critical role of the public bodies' buildings, which can represent the leading factor to encourage the transformation towards more efficient constructions, also the private sectors – industry and services – have been included within the actions provided for by Directive 2012/27.

These leanings significantly emerge also in the Italian adoption Decree, adopted in 2014, which has introduced important innovations, especially regarding the government's buildings sector. Strategies for the renovation of national public administration's building stocks have been developed, in agreement with the EU Directive which states that "each Member State shall ensure that, as from 1 January 2014, 3 % of the total floor area of heated and/or cooled buildings owned and occupied by its central government is renovated each year to meet at least the minimum energy performance requirements that it has set in application of Article 4 of Directive 2010/31/EU". The Ministry of Economic Development has signed a memorandum of understanding with the State Property Agency whose first objective will be the drafting of an inventory of buildings occupied by the central government, including floor area and energy data, a key step towards developing a comprehensive strategy for the upgrading of public buildings.

Moreover, the restriction for public bodies to purchase products and services with high energy efficiency standard has been consolidated.

The main measure regarding the industrial sector establishes that, as from 5 December 2015, large corporations and energy intensive businesses will be obliged to regularly carry out energy audits, which are useful for identifying the most effective interventions to reduce energy consumption. Moreover, in order to promote the development of energy efficiency projects based on the results of those audits, the Decree includes a further strengthening of the role of *white certificates*, also known as "Energy Efficiency

Securities", which certify the achievement of end-use energy saving through energy efficiency improvements initiatives and projects. Companies wishing to build new plants for the production of electricity or thermal energy, with power exceeding 20 MW, as well as new district heating grids, will have to perform a cost benefit analysis. At the same time, an analysis on the national territory to choose the best areas for the development of district heating will be carried out in order to better invest and simplify authorization procedures. Amongst the tools promoted by the EU Directive and also adopted by the Italian government, the "National Fund for Energy Efficiency" is one of the most innovative; it represents an important financial support system for the rehabilitation of public bodies' buildings and for the reduction of energy consumption in industry and services. A specific section of the Fund will support investment in district heating and cooling. The Italian Fund will be supplied with approximately 70 million euro per year in the period 2014-2020.

Further actions have been formulated in favor of energy end-users to raise their awareness of energy consumption through the promotion of individual measurement systems and more accurate billing, based on real consumption.

New important standards for the dissemination of information, as well as for the training of companies, public administrations, citizens and students have also been introduced by the Decree: a three-year program for training and information will be launched soon, counting on a sum up to one million euro per year.

The total financial resources for the implementation of the measures amount to over 800 million euro.

The 2012/27/EU Directive and its Italian adoption Decree formalize the exemplary role of energy efficiency to face a great number of challenges our planet has to deal with, such as the reduction of greenhouse gas emissions, the consequences of climate change, the need to boost economic growth and create new jobs. In this context, the construction industry represents a critical area of interest, especially that of public bodies'.

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04

CITIES, ENERGY AND BUILT ENVIRONMENT

REVIEW PAGES: URBAN PRACTICES

GENNARO ANGIELLO
TeMALab – Università degli Studi di Napoli Federico II, Italy
e-mail: gennaro.angiello@unina.it

In this number

SUSTAINABLE ENERGY ACTION PLANS: THREE CASE STUDIES

The challenges imposed by the changing climate and the energy-driven development have been traditionally addressed from international and national initiatives such as the United Nations Framework Convention on Climate Change and the Kyoto Protocol. However, in the last decade, there has been a considerable effort to reframe this debate towards the local scale and focus on local causes of climate change and local strategies to reduce C02 emission and energy consumption.

Indeed, since the growing recognition of the contribution of municipal areas to global environmental change (Santamouris, 2013), important initiatives and programs for the reallocation of planning actions from the global to the local scale took place, following the principle of "think globally and act locally" highlighted by the Agenda 21, the Global Action Plan for Sustainable Development for the 21st Century.

In the EU, the Covenant of Mayors represents the most important initiative in this direction. It is the mainstream European movement involving local and regional authorities, voluntarily committing to increasing energy efficiency and the use of renewable energy sources on their territories in order to reduce C02 emission and contribute to the achievement of energy and climate targets set at the European scale. By signing the Covenant of Mayors, local authorities engage to reach - or even exceed - the EU 20% CO2 reduction objective. Covenant of Mayors Signatories pledge to submit a Sustainable Energy Action Plan (SEAP) outlining how they will reach their targets.

The Covenant of Mayors now includes 6.450 signatory cities, which benefit from the help of numerous Covenant Coordinators, Supporters and Associated Partners. Through SEAPs cities can implement measures in a structured and integrated way, allowing them to systematically monitor their efforts in going beyond national legislation in these fields. A SEAP is also an instrument for cities to communicate to stakeholders – both locally and beyond – the importance of energy and climate protection, and to encourage citizens and other relevant actors to take a part in the city's ambitions.

In this section, I analyze three relevant case studies of European cities that has recently (2015) submit a SEAP to the European Commission's Joint Research Centre:

- Gent, Belgium ;
- Glasgow, United Kingdom;
- Gothenburg, Sweden.

GENT

Gent, the capital of the East Flanders province, is the second largest municipality of Belgium with an urban population of approximately 250,000 inhabitants. With the country's highest share of young people and a strong presence of institutions for higher education, Ghent is an important centre of knowledge and innovation.

In January 2009, the city of Gent was the first Flemish city to sign the Covenant of Mayors. With it, the city committed to a reduction of local CO2 emissions by 20 percent by 2020 compared to 2007. This commitment was in line with the Belgian National Climate Strategy aimed to reduce national greenhouse gas emissions by 15 percent by 2020 (compared to 2005) and to achieve a share of energy from renewable sources of 13 percent. In 2014, when about half of this reduction was already accomplished, the city adopted a new Climate Plan. The plan contains actions intended to help achieve the remaining 10% of CO2 reduction by 2019 while establishing a roadmap towards carbon neutrality in 2050. This document has been submitted to European Commission as the city' SEAP in 2014 and approved by the EU Covenant of Mayor one year later. Actions in the Climate Plan are organized around five main themes.

Residential sector. Energy consumption in Gent households accounts for about 25 percent of total CO2 emissions. As for the majority of Belgian municipalities, the exiting residential buildings stock in Gent is relatively energy inefficient, especially if compared with that in neighbourhood countries. At the same time the refurbishment rate of existing residential building is currently very slow. In order to fulfil the climate target, the plan supports energy-saving refurbishments through several actions including awareness raising, incentives for energy-saving projects, knowledge building, and good examples. According to the plan, Gent inhabitants can benefit of a wide range of tools such as on-line tailored support for drawing up energy-efficiency assessments, finding and contacting contractors or comparing quotations. Furthermore, depending on income, they may have access to a range of premiums up to 1,500 or 2,500 Euros for energy-efficient refurbishments. For the new buildings, the city will provide additionally incentive for energy efficiency, beyond those provided by The Flemish government. Finally, as the owner of many terrains and promoter of social-housing projects, the City will impose loftier ambitions relating to energy performance and renewable energy.

Role Model. The initiatives that fall within this theme are mainly target to reduce energy consumption of municipal-owned buildings, public lighting, sport infrastructure, city employee's commuting and city's vehicle fleet. To this aim, an energy performance contract will be concluded with an Energy Saving Company for a number of city buildings, public lighting and sport infrastructures. Finally, the city will draw up a sustainable company transportation plan for its employee while the whole municipal vehicle fleet will be gradually replaced by electric vehicles.

Service sector. The City of Ghent wishes to accelerate green economic growth in the city by increasing the share of sustainable entrepreneurs who handle energy efficiently. In this context, the City of Ghent will create a local framework to structurally anchor sustainability in the companies' operation in order to gives entrepreneurs the necessary legal security and incentives to handle energy rationally.

Renewable Energy. In addition to a reduction in the demand for energy, the city intend to achieve its climate objectives trough sustainable energy production. In this sense, the plan support several actions aimed to achieve a 15% of (green) domestic energy production in 2019. Action in this theme are target to new wind turbines, developing a district heating strategy, pushing urban development projects towards climate

neutrality, raise awareness among citizens and companies and support them in their investments in renewable energy.

Mobility. Mobility is responsible for about the 30 percent of total C02 emission. In order to reduce the environmental footprint of mobility the city is working on the following strategies: ensuring proximity, lowering the number of required kilometres, enhancing steps, stairs, and public transportation, and greening modes of transportation.

GLASGOW

Glasgow is the largest city in Scotland, and the third largest in the United Kingdom. It has a total urban population of 1,750,000. The city has experienced economic growth and development in recent years, bolstered by careful planning, a growing and young population and a business growth in high-tech, service and export orientated manufacturing sectors.

In 2015, the City Council approved the Energy & Carbon Masterplan (ECM). This plan is an enhanced SEAP for Glasgow which builds on the first SEAP produced by Glasgow City Council and approved by the EU Covenant of Mayors in November 2010. The ECM provides a single, coordinated strategy and plan of actions and projects across the city to meet a target of reducing Glasgow's C02 emissions by 30 percent by 2020 from 2006 levels. The plan contributes to the objectives defined in the Scottish Climate Act aimed to reduce Scottish greenhouse gas emissions by 42 percent by 2020 (compared to 1990). The ECM also sets out a vision of a transformed energy economy for Glasgow that is based on low carbon and increasingly decentralized energy sources that are better able to meet Glasgow's energy needs and help Glasgow tackle climate change. The plan contains a panel of actions grouped around four main themes..

Buildings. The initiatives that fall within this theme are target to both private and municipality-owned buildings. In this regards, strictly energy standards, based on the LEED rating system (www.usgbc.org), have been set, differentiated according to building use and ownership. For the municipal properties, internal energy audits will be conducted in order to identify those that will benefit most from energy efficiency measures and projects. For private properties, the coordination and enhancement of existing energy schemes will be target to improve energy efficiency and reduce energy consumption and fuel poverty in social housing.

Transport. Action in this domain are target to encourage a reduction in personal motorized transport and an increase in the use of public transport, walking, and cycling. In order to meet these objectives, the plan supports the formation of Quality Partnerships with bus and train operators and with regional authorities. These partnerships are target to make public transport provision more efficient in terms of operational costs and more attractive for citizens, in particular for car users. Furthermore, in order to encourage active travel Glasgow City Council is increasing provision of cycling infrastructures.

Local Energy Production. Given the small amount of local electricity generation in Glasgow, promoting decentralised generation is a key issue in the city plan. The four generators currently operational in and around the Glasgow city boundary only account for a minor part of the total energy supply. Furthermore only wind and solar energy production has been developed so far. Thus, the plan recognizes the need to increase renewable energy production and diversify the sources of energy supply. For this reason, the plan contains a panel of measures aimed at promoting local production of renewable electricity through city-led

projects that bring a return on investment. Beyond this city-led initiatives, also bottom-up approaches are encouraged. In particular, the city promotes local production of renewable electricity through community-based projects.

Local Heat/Cold Production. The provision of district heating is another key policy issue. In this regard, the plan contains actions that promote the installation of district heating infrastructure, targeted at areas of fuel poverty. These projects will be carried out in tandem with building renovations allowing for improvements in energy efficiency to be achieved at the same time.

GOTHENBURG

Gothenburg is the second-largest city in Sweden and the fifth-largest in the Nordic countries. It has a total urban population of 543,045. Due to the Gothenburg's advantageous location in the centre of Scandinavia, industry, trade and shipping have always played a major role in the city's economy.

In January 2014, the City Council approved the Strategic Climate Programme. With it, the city committed to a reduction of local CO2 emissions by 21 percent through to 2020, using 1990 as the base year. The plan contributes to the objectives defined in the Swedish Climate Strategy aimed to reduce Swedish greenhouse gas emissions by 20 percent by 2020 (compared to 2008). The Climate Programme embodies Gothenburg's long-term climate work, which includes not only the municipal organisation but also industry and the people of the city. It also establishes a roadmap towards carbon neutrality in 2050. The actions contained in the plan are grouped in four main themes.

Climate Smart Citizen. The initiatives that fall within this theme are aimed to support citizens to reduce their climate impact through a change in social behaviour and greater awareness. To this aim, the plan provides a set of tool including energy and climate advices to private individuals, organisations and small and medium-sized enterprises; campaigns, events and communication with various target groups and contribute and technical assistance.

Resource-Efficient Urban Planning. The basic idea behind this strategy is the creation of a resource-efficient social structure through densification and planning for more people in the same area and with a reduced need for transport. The location of new construction and new infrastructure will be oriented in a way to make it easier and obvious to walk, cycle or use public transport. Finally, by creating conditions for efficient forms of energy and promoting energy-efficient construction, the urban planning will have a strong contribution in the optimization of the energy supply system.

Efficient Energy Use and Conversion to Renewables. Actions grouped in this theme are aimed at increasing resource efficiency in district heating This strategy can be implemented in a variety of ways, including the creation of new district heating sources by means of a comprehensive, efficient and regionally optimised district heating system, utilising more surplus heat and adapting the grid to achieve as much residual heat as possible. In this theme also fall those strategies aimed at improving the energy efficiency of Gothenburg's privately owned and municipal-owned property holdings. Other actions include the promotion of energy efficiency in industry.

Reduced Climate Stress from Travel and Transport. Gothenburg is also a transport-intensive metropolitan area and is facing major challenges to reduce greenhouse gas emissions resulting from transport. The plan provides a complete set of measure to be implemented in order to invert this trend. They include: prioritise and invest in the travel modes walking, cycling and public transport, working towards a more energy-

efficient vehicle fleet and promote the use of fuels with low climate impact, becoming a world leader in climate-smart cargo handling, encourage shipping that is energy efficient and fossil free.

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The image shown in the first page is from http://www.covenantofmayors.eu; the image shown in the second page is from http://lozie.com; the image shown in the third page is from http://www.arcadenw.org; the image in the fourth page is from http://www.panoramio.com.

05

CITIES, ENERGY AND BUILT ENVIRONMENT

REVIEW PAGES: NEWS AND EVENTS

ANDREA TULISI
TeMALab – Università degli Studi di Napoli Federico II, Italy
e-mail: andrea.tulisi@unina.it

In this number
SUSTAINABLE BUILD ENVIRONMENT: THE RISK OF TOWN CRAMMING

A large share (40%) of European CO_2 emissions are produced in order to heat and service buildings. Even though newly built homes and buildings are achieving increasingly high levels of energy standards, many older and historical buildings do not yet meet modern energy requirements. If we consider that today the new buildings represent a small fraction compared to the totality of the building interventions (less than 1%), it is therefore clear that only a common intervention on the existing could guarantee the possibility of having, on a large scale, significant results in relation to the control of energy consumption. However, in these economically tumultuous times, it is not always easy for cities to face with this challenge; they are actively looking for effective, efficient and proactive new solutions and methods that can help them improve the energy performance of their building stock.

In this context, one of the main topic is that related to the management of energy and environmental resources in urban centers characterized by a growing densification; it is the phenomenon common to many centers of contemporary cities: the town cramming. A building density, mismanaged, can have a negative impact on the urban environment and the living comfort (Hall, 2001): a poor access to natural lighting and solar radiation in the home, the lack of green spaces and the thermal energy storage effect are just some of the effects of this phenomenon. For this reason, higher density developments require a careful attention to design quality, in respect of both individual buildings and the layout of developments. A proper planning should guarantee that homes meet modern standards and expectations for internal space, private and public open space, natural light and ventilation.

In the debate on how to govern properly the transformation of the cities to ensure the maximum advantage for the citizens, the “smart” revolution brought new tools for managing the urban complexity so much that many experts consider smartness and urban sustainability as running on the same track.

This scenario calls for a more conscious awareness to the issues of the territorial government and requires a multi-scale and cross-sectorial approach (Bourdic & Salat, 2012) as well as innovative forms of governance and financing models: from the building's efficiency to the urban morphology, from the individual behaviors of citizens to good practices in public administration.

That's why the international debate on energy issues at urban scale is increasingly less sectorial; it is not a case if the *leitmotiv* of the conferences discussed in this contribution lies in the intention of pooling experiences and skills of different disciplines broadening the debate to the civil society.

UPPD - ANNUAL INTERNATIONAL CONFERENCE ON URBAN PLANNING AND PROPERTY DEVELOPMENT

Where: Bologna - Italy
When: 5 - 6 October 2015
http://www.urban-ppd.org/

The Annual International Conference on Urban Planning and Property Development (UPPD), deals with the subject of building environment on a large scale and mainly from the point of view of urban and regional planning. It serves as a platform for academics, researchers, scientists, consultants and policy makers to share experiences and explore science, methods, tools, analysis as applied to different aspects of the cities in order to improve urban planning and property development and to enhance the lifestyle of the community. The main topics are related to the field of urban planning, urban design, real estate and property development but also to energy use and its implications.

UPADSD - URBAN PLANNING AND ARCHITECTURAL DESIGN FOR SUSTAINABLE DEVELOPMENT

Where: Lecce – Italy
When: 14-16 October 2015
http://www.ierek.com/events/urban-planning-architecture-design-sustainable-development/

The aim of “Urban Planning and Architecture Design for Sustainable Development Conference” is to create a table of discussion and debate around the sustainable development especially in terms of resource consumption. The conference deals with all aspects of development and planning and brings together scientists and other stakeholders from across the globe to discuss the latest advances in the field aiming to highlight developments in managerial strategies and assessment tools for policy and decision makers. There are certain topics related to architectural and urban design with the aim to identify the principles of proper and efficient design to address sustainable and energetic cities. The main topics strictly connected with the energy and build environment issues are the following:

- Planning Approaches for Sustainable Development.
- Energy and the environment.
- Building Physics and Technology.
- Sustainable design and configuration of sustainable cities.

SASBE2015 - SMART AND SUSTAINABLE BUILD ENVIRONMENT

Where: Pretoria – South Africa
When: 9 -11 December 2015
http://sasbe2015.com/

The smart revolution opens other fields of investigation to face with energy challenges connected with build environment thanks to the recent development of advanced smart systems for efficient use of resources. The conference provides the forum to define and test instruments and strategies of this technological revolution starting from the assumption that limited timeframes and resources need smarter ways of rapidly improving sustainability performance of the built environment. On this premise several subthemes branch:

- Smart, sustainable and resilient cities
- Smart and sustainable urban planning, design and management
- Responsive, regenerative and net positive design
- Biodiversity, landscaping and productive environments
- Intelligent buildings and smart technologies
- Smart and sustainable materials, technologies and techniques
- Productive and healthy working and living environments
- Smart and sustainable estate and facilities management
- Smart and sustainable energy, water, waste, transport and communications systems
- Performance assessment tools, indices and rating systems
- Strategies, systems, regulations, procedures, structures and community engagement for smart and sustainable transformation

SBE 16 - INTERNATIONAL CONFERENCE ON SUSTAINABLE BUILT ENVIRONMENT

Where: Hamburg – Germany
When: 8-11 March 2016
http://www.sbe16hamburg.org/

Strategies, stakeholder and success factor are the keywords of this conference. It means that it is now widely acknowledged that a real change for the urban sustainable development comes through a multi-sectorial approach that first involves citizens. The conference main topics are focused on issues connecting building environment, new as well as existing, and sustainability, both on a global and on a regional level but also on building and product level, in terms of strategies and legislation at the local level as zero emission, water management, mobility and environment, organizational efforts. The energy is one of the most important issues of the conference although it is tackled more on the implementation and integration of renewable energies in the urban environment, than on strategies for the reduction of energy consumption. One of the strengths of the conference lies on the location: the hosting city of Hamburg offers the opportunity to discuss the topics close to a number of best-practice buildings and urban-planning concepts developed in the last years with high-energy efficiency standards.

INTEP - INTERNATIONAL "SUSTAINABLE BUILT ENVIRONMENT REGIONAL CONFERENCE 2016"

Where: Zurich – Switzerland
When: 13-16 June 2016
http://www.intep.com/Aktuelles-236.html

The title of the conference, part of the "Sustainable Built Environment" series, confirms the trend line of the last years which identifies in the Systemic vision the main way to face with sustainable challenges related to the urban areas development: "Expanding Boundaries: System Thinking in the Built Environment". It offers a platform for exchange between researchers and practitioners from the construction sector to promote system thinking in sustainable building. The main topics related with energy issues are the following:

- integral approaches for energy and resource efficiency,
- decentralized energy supply and infrastructure for buildings and cities,
- life-cycle oriented buildings and construction materials.

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IMAGE SOURCES

The image shown in the first page is taken from: http://fineartamerica.com/featured/urban-crowding-john-chehak.html

AUTHORS' PROFILES

Raffaella Niglio

Architect, she received a master's degree with honors from the University of Naples Federico II with a thesis in Architectural and Urban Design. She operates in the field of sustainable buildings and environments and since 2014 she works with the Department of Civil, Architectural and Environmental Engineering within the research project Smart Energy Master investigating the "smart" performance of the Metropolitan City of Bari, Italy.

Laura Russo

Engineer, Ph.D. student in Civil Systems Engineering at University of Naples Federico II. She received a master's degree in Architecture and Building Engineering with a thesis on urban expansion and the sprawl phenomena, with particular attention for Campania. Since 2014, she works at the Department of Civil, Architectural and Environmental Engineering – University of Naples Federico II – within the European project "Smart Energy Master" and her research activity is focused on the complex and multidimensional relationship between the city and energy consumption.

Gerardo Carpentieri

Engineer, Ph.D. student in Civil Systems Engineering at University of Naples Federico II. He received a master's degree in Environmental and Land Engineering with a thesis on the integrated government of land use and mobility for environmental sustainability in the metropolitan areas. In July 2013 he won a scholarship within the PRIN project on the "Impacts of mobility policies on urban transformability, environment and property market". He is currently involved in the research project "Smart Energy Master" at the Department of Civil, Architectural and Environmental Engineering – University of Naples Federico II.

Gennaro Angiello

Engineer, Ph.D. student in Civil Systems Engineering at the Federico II University of Naples. His research interests are in the field of accessibility analysis and modeling, land-use and transport interactions and sustainable mobility. He is currently involved in the research project Smart Energy Master and in the COST Action TU1002 accessibility Instruments for Planning Practice in Europe.

Andrea Tulisi

Architect, graduated in Architecture from the University Federico II in Naples in 2006. In January 2014 he holds a PhD in Environmental Technology with a research focus on rehabilitation strategies for semi-enclosed spaces in the "Compact City". He is currently involved within the project Smart Energy Master with DICEA department of the University of Naples Federico II; his research activity is focused on the link between urban open spaces and energy consumption.