TeMA

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Land Use, Mobility and Environment

The concept of “Smart City”, providing a the solution for making cities more efficient and sustainable has been quite popular in the policy field in recent years. In the contemporary debate, the concept of smart cities is related to the utilization of networked infrastructure to improve economic and political efficiency and enable social, cultural and urban development.

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SMART CITIES

RESEARCHES, PROJECTS AND GOOD PRACTICES FOR BUILDINGS

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REVIEWS PAGES

RESEARCHES, PROJECTS AND GOOD PRACTICES FOR BUILDINGS IN THE SMART CITIES

The Reviews Pages keeps the readers up-to-date on developments in five reports: web, books, urban practices, law, news and events. Each report deals with the specific subject proposed in the TeMA issue. These reviews are specialist in nature but contain enough introductory material to make the main points intelligible to a non-specialist. The reader will not only be able to distinguish important developments and trends but will also find a sufficient number of references to the original literature, web and other resources .

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

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

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

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

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

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01

SMART CITIES: RESEARCHES, PROJECTS AND GOOD PRACTICES FOR BUILDINGS

REVIEW PAGES: WEB RESOURCES

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In this issue
SMART CITY AT BUILDING SCALE

It is estimated that, at present, the building sector is responsible for 30% of total global greenhouse gas emissions and consumes up to 40% of all energy (Buildings and climate change. United Nations Environment Programme). Because of the progressive growth of construction industry in developing countries and the massive energy waste related to existing buildings, if nothing is done, building-related GHG emissions would grow at alarming rates over the next two decades. Therefore, it is essential to take action to reduce significantly carbon emissions from buildings, helping the dissemination of the most efficient models and strategies to progress towards a low carbon future.

In this context, the European Commission plays a key role, in fact, many of its initiatives support cities and regions in taking ambitious and pioneering measures to progress by 2020 towards a 40% reduction of greenhouse gas emissions; these measures include the promotion of new buildings with net zero energy requirements and net zero carbon emissions (*Net Zero* building).

Today that it's all about the smart city experience, it is necessary to broaden the idea of *Net Zero* buildings and start thinking to *Smart* buildings. While *Net Zero* buildings are constructed using the most advanced technological solutions, *Smart* buildings are designed to run more efficiently and, more important, to communicate with and about their various sensors/systems. Smarter buildings emerge from a holistic point of view that involves collaboration between facilities and IT organizations at new levels (IBM, Smarter buildings). Various components, together, make up what we call a *Smart* Building: heat generation with heat pump, temperature control with blinds, communication with smart grid, energy generation and storage, interpretation of monitored data and forecast for consumption, generation and storage, etc.

Smart buildings represent one of the critical success factors of a smart city because they contribute to optimize energy consumption, integrate renewable energy, reduce costs and CO2, generate and store CO2, support E-mobility charging and more.

In this number, three websites are presented; they are related to the promotion of sustainable building in Europe and U.S.. The first website analyzed is the European web portal for energy efficiency in buildings:

Build Up. It is a platform that promotes the exchange of information between all stakeholders involved in the construction industry.
The second website here proposed is that of Solar Decathlon Europe: an international competition among universities, which promotes research in the development of efficient houses.
In the end, the third and last website indicated is that of the Better Buildings Neighborhood Program, which is a program within the U.S. Department of Energy helping over 40 competitively selected state and local governments develop sustainable programs to upgrade the energy efficiency of more than 100.000 buildings.

BUILD UP – ENERGY SOLUTIONS FOR BETTER BUILDINGS
www.buildup.eu

The goal of Build Up, the European web portal for energy efficiency in buildings, is to provide a platform to exchange knowledge between the different stakeholders involved in the building sector, aiming to reduce the energy consumption of buildings in Europe. Politicians, building professionals and occupants can share information on energy saving for buildings as well as be updated about EU energy policy in the field. The website meets the needs of three different user profiles: building professional, public authority and building owner or tenant, each of which can explore a specific, dedicated, part of the website.
All the information offered by the portal is grouping into eight different sections: *News, Events, Publications, Links, Cases, Tools, Blogs, Communities* and *Frequently Asked Questions.*
In the *News* section, the user can learn more about the latest European news regarding energy efficiency problems and laws, both nationally and internationally.
The *Events* section includes the schedule of the most relevant energy efficiency related events, divided into Top and Upcoming Events. Anyone registered to the site can submit an event to the portal and the list is often updated.
In the *Publications* section, there are reports, set of rules, informative papers, researches and training material related to the issue of reducing energy consumption in buildings. Users can easily submit a document and share their experience with the community.
More than one thousand of links are listed in the *Links* section of the portal; links refer to a wide variety of organizations, institutions and activities across Europe.
The *Cases* section represents an important source of good practices realized in Europe to save energy in buildings. Cases can be projects, energy efficiency campaigns, or reports that can address different topics, such as innovative technologies, legislation, energy performance certification, design for low-energy buildings, monitoring, controls systems and others. The database includes 433 cases.
In the *Tools* section, users can find and submit helpful tools for the improvement of energy efficiency in buildings. Tools can include software applications, excel lists or other programs, which contribute to energy saving; an example can be the *energy performance calculation procedures*.

The Build Up *Blog* gives members of the portal the opportunity to post their opinions, papers, doubts and responses to others' questions; users can interact with each other expanding the debate related to the energy efficiency themes.
The *Communities* section includes over fifty communities, each of which brings together people with same interests and it promotes the exchange of knowledge and experience. Any registered user can start or join a community, but there are specific guidelines to be observed.
The last section of the website is dedicated to the Frequently Asked Questions, ordered by theme and answered by Build Up experts.
Each section of the portal is frequently updated and the website counts almost ten thousand of registered users, providing to be a point of reference for energy efficiency in Europe.

SOLAR DECATHLON EUROPE
http://www.sdeurope.org

Solar Decathlon is an international competition born in 2002 in the U.S.; the challenge occurs every two years and the next one is scheduled this October, at Orange County Great Park. Twenty collegiate teams, applying from all over the world, are call to design and build energy-efficient houses powered by the sun.
The name «decathlon» comes from the number of contests the teams have to overcome: 10 contests for a total of 1.000 points. Each competition allows assessing a specific feature of the houses, such as affordability or livability; there are two different types of contest: *measured contests*, like task completion (cooking, cleaning, etc.) or monitored performance (maintaining certain standard of temperature and humidity, etc.) and *juried contests*, base on jury evaluation.
The aim of the challenge is to encourage the use of renewable technologies in building industry, educating students about the convenience, both in economic and environmental terms, of building a sustainable home: it is possible to have an energy-efficient and solar-powered house which is comfortable, attractive, eco and affordable.
In 2007, with an agreement between the Spanish Ministry of Public Works and the U.S. Government, the Solar Decathlon Europe (SDE) was born. The competition is held biennially, in alternate years respect the American one and while the first two editions took place in Spain, the 2014 edition will occur in Versailles, France. The organization of the SDE challenge is the same as the American, based on 10 contests.
The last edition took place in Madrid in 2012 with eighteen teams representing thirteen countries. It is very interesting to visit the SDE website because it includes the videos of the eighteen houses that participated in the challenge, allowing users to perceive the SDE's atmosphere. An introductory video presents the competition, its organizers and managers, the jury and some team's members, showing an incredible enthusiasm and excitement. Furthermore, other videos complete the virtual tour of the 2012 SDE edition: each of these videos explores one of the challenge house, giving a team's member the opportunity to explain the project, from concept to completion.

More other useful information can be found in the portal, for example, it is possible to learn about the rules and the way a team can apply for the next SDE, or read the profiles of the jurors.
After the incredible success of the European Solar Decathlon, Solar Decathlon China has been added to the international family of Solar Decathlon competitions, in 2011. The first edition will take place in China, next August and it promises to be a triumph.

BETTER BUILDINGS NEIGHBORHOOD PROGRAM
https://www.1.eere.energy.gov/buildings/betterbuildings/neighborhoods

The Better Buildings Neighborhood Program (BBNP) was born in 2010 within the U.S. Department of Energy to develop sustainable energy efficiency upgrade programs using federal funds. The program aims to upgrade existent buildings, both residential and commercial, to reduce energy consumption and allow consumers to save on energy bills as well as produce environmental benefits across the United States.
The BBNP website consists of six parts: *About, BBP Partners, Innovations, Run a program, Tools & Resources* and *News.*
If you want to deepen your understanding of Better Buildings Neighborhood Program, you can find any answer in the *About* section, where an explanatory video shows the advantages produced by the program, communicating straightforward with users.
The *BBNP Partners* section includes more information about partner profiles, case studies and innovative approaches that have already been implemented in many of U.S. states and cities. This section provides many good practices that can be considered as an example by anyone who visits the portal.
A list of the most successful innovations developed to improve energy efficiency in buildings is provided in the *Innovations* section, distinguishing between for types of innovations: *program design, driving demand, financing* and *workforce development.*
The *Run a program* section contains the guidelines for creating and developing a new program; the step-by-step guidance is based on the most positive experiences tested by Better Buildings communities and it can be personalized according to specific needs.
In the *Tools & Resources* section, there is a wide directory including *Documents and Reports*, and *Tools/Calculators* for homes and commercial buildings, downloadable on line to help build new programs.
The latest available program data, namely up to the end of December 2012, reveal that BBNP partners completed more than fifty thousand upgrades by the end of the year, reaching an amazing result and demonstrating the value of the project.

IMAGE SOURCES

The images are from: https://www.asme.org/kb/news---articles/articles/energy/the-net-zero-water-dorm; http://www.alueurope.eu/energy-efficiency-and-build-up/; http://www.univ-angers.fr/en/index.html; http://energy.gov/better-buildings.

02

SMART CITIES: RESEARCHES, PROJECTS AND GOOD PRACTICES FOR BUILDINGS

REVIEW PAGES: BOOKS

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In this issue

NEW AND EXISTING BUILDINGS: WHAT SHOULD WE DO?

The World Business Council for Sustainable Development identified buildings as one of the five main users of energy where megatrends are needed to transform energy efficiency. About 40% of EU final energy demand is due to buildings (it is a larger share than both the transport and the industry sector) and it is estimated that currently available energy-efficiency measures could cost-effectively save around 28% of this. Buildings are also one of the most significant sources of GHG emissions (36% within the EU); for these reasons EU policy has identified increased energy efficiency for buildings as a key objective of energy and climate policy (COM(2006)545). Refurbishing the existing building stock is one of the most attractive and low cost options to save energy and to reduce the emissions of CO_2 at the same time. Therefore, adopting energy efficiency measures in the built environment is important to reach successfully both energy security and ambitious carbon reduction targets. These few considerations allow to understand easy that buildings hold great potential for cost-effective energy savings; the International Energy Agency (IEA) estimates that current trends in energy demand for buildings will stimulate about half of energy supply investments to 2030 and that the energy savings potential in this sector in 2009 will be in the range of 20 EJ per year by 2030, which is the same as the current annual electricity consumption of the United States and Japan combined. Hence the energy optimization of urban structures needs to be part of the sustainability strategy of each European city. Sustainable policies in European cities have to contribute to the paradigm shift from traditional sector oriented approach to a more integrated approach which ensures the consistency between the district energy supply and urban development (BPIE). It should necessary to support and to encourage the construction of buildings with net-zero energy consumption and on the other side, to implement policies improving the energy efficiency of existing buildings. Nevertheless, the regulations regarding the existing real estate reveal little effective because of the complexity of energy problem. The effort that European cities need to take is enlarging the range action both of measures and regulations from the individual building to urban settlements. In these perspective three documents are proposed in order to share energy efficiency good experiences and policies: the holistic strategy for neighborhood energy efficiency of the project Urb.Energy, the steps for a successful implementation of net Zero Energy Building and the energy efficiency policy implementation in the IEA member states.

Title: Holistic strategies for energy efficient refurbishment of the housing stock and renewal of the related energy supply system
Author/editor: AA VV
Publisher: German Association for Housing, Urban and Spatial Development
Download: http://www.urbenergy.eu/241.0.html?&L=0%3E.%3F1%3D1
Publication year: 2011
ISBN code: n.d.

Urb.Energy project's main objective is the development and implementation of integrated concepts and strategies for the comprehensive energy efficient renewal of residential area in the Baltic Sea Region. The several partners of the project worked together in order to relate measures of energy efficiency refurbishment of the housing stock to overall development of residential neighborhoods and the renewal of energy supply infrastructure. Therefore the project aimed at including energy and climate issues within the urban development policies and instruments too. Since the project outcomes have showed that the different local urban and socioeconomic conditions have to be taken into account (i.e. age and status of buildings or energy supply structure), this guide presents an overview of various suitable and realistic approaches to implement energy and climate friendly measures to improve energy efficiency and the use of renewable energy sources in the housing sector, embedded in the framework of an integrated energy efficiency concept for residential urban areas. It provides lessons and recommendations aiming at giving advice to practitioners on local level to choose appropriate solutions in the development of energy efficiency concepts, measures and supporting structures. The integration of the energy efficient concept into the urban development process starts realizing small scale energy efficiency projects, related to single buildings or to a small area, to test and learn from experience and then developing the energy concept for the entire city. Solitary energy efficiency pilot projects, not considered into urban planning process, do not address energy and climate issues and have a weaker impact on climate adaptation and energy reduction or efficiency in the city. Five are the main components to build up a proper energy and climate concept:

- analyzing the energy supply and consumption of the city/neighbourhood and its CO_2 emissions;
- evaluating the potential to save energy, according to the results of energy balance;
- establishing energy and climate objectives;
- developing an action plan with priority, in order to reach the above mentioned objectives,
- developing a plan for managing and monitoring the implementation of measures to increase energy efficiency and climate protection.

In regard to energy requirement of neighborhood it is helpful using the plausibility check: it evaluates the influence of settlement structure type and size, building density and typology on the energy balance of a neighborhood. Another recommendation concern the cooperation and participation of stakeholders (apartment owner associations, residents) to recognize their interests and to create a climate of confidence and collaboration. Information campaigns and meetings should focus mainly on benefits and economically feasible energy efficiency measures and financing opportunities; in this way it is possible increasing awareness and motivating local stakeholders.

All the know-how described derives from the experience gained by the project partners: in the last chapter of the guide over twenty good practices are presented and they cover a wide range of energy concepts and measures for different urban areas, in order to demonstrate under which conditions energy efficiency measures can be realized successfully and how detected barriers can be overcome.

Title: Principles For nearly Zero-Energy Buildings
Author/ editor: AA VV
Publisher: Buildings Performance Institute Europe
Download: http://www.bpie.eu/nearly_zero.html
Publication year: 2011
ISBN code: 9789491143021

The Buildings Performance Institute Europe (BPIE) promotes policies and measures for increasing the energy performance buildings, and thereby reduction of CO_2 emission levels both at EU and Member State level, in order to make a significant contribution to the achievement of the 2020 EU targets. Nearly Zero-Energy Buildings (nZEB) will become mandatory for all new constructions from 2020 onwards. To facilitate this process, BPIE analyzed ten methodological challenges and their implications for setting a sustainable and practical nZEB definition, providing an outlook on necessary further steps towards a successful implementation of nZEB. A proper and feasible nZEB definition should be based on three basic principles related to the main aims of energy efficiency building sector: reducing energy demand, the use of renewable energy and reducing associated GHG emissions. These principles and the relative approaches for implementing them have been performed to verify and evaluate them; the main challenge of the simulation was to provide robust insights into the nZEB principles effect by applying them to a set of reference buildings, sufficiently representative of the wide variety of building-types, considering at the same time the influence of three different European climate zones. According to BPIE assessment of the European building stock, the most representative buildings are single-family houses and multi-storey non-residential building, and for both of them geometry, technical systems and usage patterns have been defined. Over these characteristics, the main European climate zones (Copenhagen, cold climate; Stuttgart (Germany), moderate climate; Madrid, warm climate) have been taken into account.
The simulations have shown that a new-built nZEB standard, based on the suggested principles and findings from this study, is achievable with existing technologies. Related to single family home outcomes show that it is possible to achieve a 90% share of renewables only by using a 100% heat supply from biomass fired systems (boiler, Cogeneration Heat Power), while for multi-storey office building only the biomass boiler and biomass fired micro-CHP variants exceed the 50% share of renewable and it should be helpful using 100% green electricity due to the higher relative share of electricity (lighting). For both types of buildings, using off-site green electricity significantly decreases CO_2 emissions. Possible barriers to the availability of systems and resources may be a market that is not able to satisfy the increasing demand for new technologies. Investments in general need to rise in the future to satisfy the additional demand created by new nZEBs. Therefore, the structure of legal requirements needs to be adapted or changed. This especially applies to the close linkage in the nZEB concept between requirements for the building envelope and renewable energy systems. It would be useful to merge regulations for renewables (as far as they already exist) with existing building regulations or to broaden the scope of regulations more towards renewable. The concept of nZEB also links to the EU job creation targets.
The EU strategy for creating growth and jobs in a sustainable manner, known as the Lisbon Strategy, promotes innovation within businesses and investment in people to create a knowledge-based society. Job effects of the energy-related costs can be calculated by multiplying these with the turnover per employee. According to that calculation, the implementation of nZEB as a mandatory requirement in the future would create about 345.000 additional jobs.

Title: Progress Implementing the IEA 25 Energy Efficiency Policy Recommendations
Author/editor: AA.VV.
Publisher: OECD, IEA
Download: http://www.iea.org/publications/insights/name,15211,en.html
Publication year: 2012
ISBN code: n.d.

The 2012 International Energy Agency report investigates progress with implementing energy efficiency policies in IEA member countries from March 2009 to April 2011. In order to help countries to improve their energy efficiency, the IEA has proposed 25 energy efficiency policy recommendations that cover 25 fields of action across seven priority areas: cross-sectoral activity, buildings, appliances, lighting, transport, industry and energy utilities. The IEA estimates that if implemented globally without delay, the proposed actions could save as much as 7,6 (Gt) CO_2/year by 2030, almost 1,5 times the current annual CO_2 emissions of the United States. The rigorous evaluation process is based on several information mainly related to IEA energy efficiency indicators, policies and measures database and to policy reports and questionnaire submitted by IEA member countries. The outcomes of this assessment show that there have been significant energy efficiency policy developments since the last evaluation conducted in 2009: IEA member countries have implemented many of the policies in the transport and lighting sectors that were only planned in 2009. The transport recommendations focus on road transport and include policies to promote ecodriving and to improve tyre energy efficiency and fuel economy standards for light and heavy-duty vehicles, due to heavy-duty vehicles are responsible for 30% of worldwide fuel use. In particular, Japan is the only country in the world to have fuel-efficiency standards in place for heavy-duty vehicles. Despite this, policies for heavy-duty vehicles lag behind light-duty vehicles. In regard to lighting sector the report revealed further efforts to improve lighting energy efficiency. For example, the Energy Performance of Buildings Directive (2010/31/EU) requires lighting to be considered within the overall building energy performance. Others energy efficiency policy developments are related to energy efficiency requirements for buildings that are a key feature of all IEA member country policies. Infact, most IEA member countries reported recent policies to improve energy efficiency in the buildings sector: Austria, Denmark, France, Germany and United Kingdom had planned policies to promote very-low or no-net energy consumption in buildings (passive-energy houses and zero-energy buildings-ZEB). Nevertheless, the biggest challenge facing most IEA member countries is to strengthen the energy performance of existing buildings. To do this, countries should improve minimum energy performance requirements for existing buildings and implement policies to increase the rate of energy performance renovations.
Most Italy energy efficiency policy implementation has been guided by EU directives and regulations, particularly in the transport, appliance, lighting, and buildings sectors. On the other side IEA states that Italy needs to enforce these policy measures and to maximize their effectiveness, implementing energy efficiency policies not covered by EU directives; for example, much is still to be achieved both in the industrial sector and high quality and comprehensive information for the entire building stock (i.e. information on use, building size, construction type and age) should systematically collected, in order to identify target and document barriers to increased energy efficiency in this sector. In summary, all IEA member countries still have significant unexploited energy savings opportunities that could be achieved with additional energy efficiency policy implementation, whose benefits extend beyond energy security and climate change mitigation to job creation and health improvements.

03

SMART CITIES: RESEARCHES, PROJECTS AND GOOD PRACTICES FOR BUILDINGS

REVIEW PAGES: LAWS

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In this issue

TOWARDS NEARLY ZERO-ENERGY BUILDINGS: THE FUTURE OF THE BUILDING SECTOR IN EUROPE

Since 2002, with the first Energy Performance of Buildings Directive (EPBD - 2002/91/EC), the European Union has set out a strong regulatory framework for achieving a substantial reduction of the energy consumption in buildings. On 8th July 2010, the European Parliament adopted the EPBD Recast (Directive 2010/31/UE) in order to strengthen the energy performance requirements and to clarify and streamline some of the provisions from the 2002 Directive it replaces.

The new version of the Directive tightens the implementation assignments for the Member States and sets the 9th of July 2012 as the implementations deadline. With the EPBD Recast the Member State has been severely tested since the Article 9 requires that "by 31 December 2020 all new buildings shall be nearly zero-energy consumption buildings (NZEB); and new buildings occupied and owned by public authorities shall comply with the same criteria by 31 December 2018". The EPBD doesn't set specific target for the renovation of existing building, but Member States shall follow the leading example of the public sector by developing policies and take measures such as the setting of targets in order to stimulate the transformation of buildings that are refurbished into nearly zero-energy buildings.

A definition of NZEB is given in Article 2 of the EPBD recast as "a building that has a very high energy performance" whereby "the nearly zero or very low amount of energy required should to a very significant level be covered by energy from renewable source, including renewable energy produced on-site or nearby". Member States shall furthermore "draw up national plans for increasing the number of nearly zero-energy buildings" by December 2014, which will have to include:

- the Member State's application in practice of the definition of nearly zero-energy buildings;
- the intermediate targets for improving the energy performance of new buildings by 2015;
- information on the policies and financial measures adopted to encourage improving the energy performance of buildings.

Each European country shall also draw up a list of the existing and potential instruments used to promote improvements in the energy performance of buildings that should be updated every three years.

THE TRANSPOSITION OF DIRECTIVE 2010/31/EU IN THE MEMBER STATES

The European countries are at different stages in transposing and implementing the EPBD recast at national level. The Concerted Action EPBD (www.epbd-ca.org) and the European portal for energy efficiency in buildings, BUILD UP(www.buildup.eu), provide updated information on national implementation status.

A comparative analysis of EPBD progress towards implementation in EU 27 Member States has revealed significant diversity and that only some EU-27 Member States have managed to fully implement EPBD: some States have only adopted a national plan but have not transposed yet the directive into national law and *vice versa*.

In September 2012 the Commission started infringement procedures against 24 Member States that had not notified to the Commission the national measures transposing the directive into national law (the deadline for transposition in the Member States was 9th July 2012). In the meantime a number of Member States notified the Commission of their national transposition, although several did not, and reasoned opinions were therefore sent to Italy, Greece, Portugal, and Bulgaria in January 2013, to Spain and Slovenia in April 2013, to Belgium, Finland, France, Latvia, Germany, the Netherlands and Poland in June 2013.

Among them Italy (DL 63/2013) and Spain (Royal Decree 235/2013) have recently notified the Commission of their national transposition while Portugal did not and therefore the Commission has decided to refer Portugal to the European Court of Justice proposing a daily penalty of € 25 273.60 to be paid from the date of the judgment until the transposition is completed.

The Member States that have already drawn up national plans for increasing the number of nearly zero-energy buildings but that have not transposed the directive into national law are: Belgium, Cyprus, Finland, France, Germany, Hungary, Ireland, Lithuania, the Netherlands, Slovak Republic and Sweden.

To encourage the transition towards nearly zero energy building the European countries don't rely only on direct regulation but also on several economic instruments for energy efficiency in buildings, such as: economic incentives, duties, tax reduction and grants, taxes, charges, etc.

Austria, France and the Netherlands have established national grants for demonstration projects for nearly zero-energy buildings; Germany has allocated grants and reduced interest loans not only for demonstration projects but also for realization of passive houses (standard very close to nearly zero-energy buildings) and Belgium has established regional and local incentives for nearly zero-energy buildings, because the implementation of the Energy Performance of Buildings Directive is a regional responsibility.

In North Europe Denmark, Ireland and the United Kingdom have established national grants for demonstration projects. In particular, the Irish Department of the Environment, Heritage and Local Government has financed in 2009 ten nearly zero carbon social housing developments and the United Kingdom has introduced tax reliefs for "zero carbon homes". In East Europe, Latvia has set national grants for demonstration projects, and the Slovak Republic has foreseen easier administrative procedures for nearly zero-energy buildings at national level. Slovenia and Greece has established incentives for passive buildings and technologies related to nearly zero-energy concept (Annunziata *et al.* 2012).

ITALY AND THE STEPS TOWARDS NEARLY ENERGY ZERO BUILDINGS

Italy transposes the EU Directive 2010/31 with the Decree Law n. 63 of 4 June 2013 governing "urgent provisions for the transposition of Directive 2010/31/EU on the energy performance of buildings for the definition of infringement proceedings by the European Commission as well as other provisions on social cohesion". The new Decree Law should be enacted into law within 60 days, a period during which the government will be willing to consider any comments made by the Regions.

The new provision amends and completes the Legislative Decree n.192/2005 and is intended to "promote the improvement of energy performance buildings, taking into account the climatic and local conditions, as well as the provisions relating to indoor climate".

The provision, entered into force on 6th June 2013, introduces the following innovation:

- the transition from “Energy Certificate” to “Energy Performance Certificate” (EPAs) to be drawn up by qualified professionals. The EPAS will be mandatory for all new buildings or for buildings undergoing relevant refurbishment, in case of sale or lease to a new tenant and for all properties occupied by public authorities. In case of new buildings the certificate is produced by the builder; in case of existing buildings, the certificate is produced by the property owner. In this regard, the Decree n.63/2013 establishes the penalties for violating the commitment to provide the Energy Performance Certificate for new buildings, for buildings in sale or subjected to a new lease and in case of violating the commitment to report energy parameters in the announcement of an offer for sale or lease. The certificate is valid for a maximum time of ten years since its release and is updated at each major restructuring that changes the building energy class;
- the implementation of a national calculation methodology for the definition of energy performance buildings, which will have to take into account the characteristics of the building envelope, the air conditioning systems and the production of domestic hot water;
- the development, by 31 December 2014, of the National Action Plan to increase the number of nearly zero energy buildings needed to clear the definition of NZEB, setting intermediate targets for improving the energy performance of new buildings within 2015, defining policies and financial measures for the transformation of the architectural heritage in NZEB;
- the determination of the date by which all public buildings will be transformed into NZEB; the Dl. 63/2013 fixed as the deadline December 31, 2018, by which all the buildings occupied or owned by public authorities, including schools, will have to be "nearly zero energy", extending this provision to all new buildings since 1st January 2021;
- the introduction of deductions of 65% for energy upgrading of buildings for expenses incurred from 1st July 2013 to 31th December 2013 and extending the deduction of 50% for renovations until 31th December 2013.

SOLAR THERMAL ORDINANCES: MAKING A COMMITMENT TO LOCAL SUSTAINABLE ENERGY

Following the adoption of the Renewable Energy Sources (RES) Directive (2009/28/EC), the 27 EU Member States, "in their building regulations and codes or by other means with equivalent effect, shall require the use of minimum levels of energy from renewable sources in new buildings and in existing buildings that are subject to major renovation by 31 December 2014. Member States shall permit those minimum levels to be fulfilled, inter alia, through district heating and cooling produced using a significant proportion of renewable energy sources". In the framework of the RES and the EPBD it is therefore essential that not only the Member States should promote and encourage the use of energy in buildings, but above all the local authority. Local and regional authorities, in fact, play a vital role in setting-up and implementing renewable energy projects, energy efficiency measures and other energy-related activities. For this reason, at local level there have been developed some innovative planning tools, called "Solar Thermal Ordinances" (STOs), in order to encourage local production and use of renewable energy sources as well as enhance energy efficiency. Solar Thermal Ordinances (STOs) are legal provisions requiring owners of buildings to install a solar thermal system for new buildings or for buildings undergoing major renovation. They are in most cases part of national or regional energy laws and often implemented by means of the local building codes at municipal level. A growing number of municipalities, regions and countries (e.g. Spain, Portugal, Italy, the Baden Wuerttemberg region in Germany and some Austrian regions) are already making use of solar thermal obligations. The first European city to have a Solar Ordinance is Barcelona in August 2000 requiring residential and commercial buildings to generate 60% of hot water requirements from solar. This paved the way for the STO to be included in the national technical building code (CTE, Codigo Tecnico de la Edificacion), approved in 2006, which includes an obligation to meet some of the Domestic Hot Water (DHW) demand with solar thermal energy (whose contribution varies between 30 and 70%). A major benefit of solar thermal ordinances is their effectiveness combined with low costs and limited administrative overheads for public authorities. As part of the building permit process, the inspection with regard to the renewable energy requirement is simple and thus does not strain the public budget.

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IMAGE SOURCES

The image are taken from www.gsamasternews.it; www.grifoflex.it; www.buildup.eu

04

SMART CITIES: RESEARCHES, PROJECTS AND GOOD PRACTICES FOR BUILDINGS

REVIEW PAGES: URBAN PRACTICES

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In this issue

INTELLIGENT UNIVERSITY CAMPUS: THREE CASE STUDIES

More efficient and cost-effective use of the built environment is increasingly being driven by economic and environmental pressures requiring reduction of the cost of ownership and operation of commercial and public buildings. The emerging solution to these pressures is the creation of innovative and ICT-based technologies that improve buildings' efficiency in a reliable, cost effective, and sustainable manner.

For this reason, despite the current economic crisis, the demand for smart building technologies is still growing. Indeed, the value proposition for smart technologies has been demonstrated and a growing number of building owners are starting to adopt them with positive results. From early applications to commercial and office buildings, smart buildings technologies are now applied to a wide range of building types such as residential and educational buildings. As the technology continues to evolve, improve, and decrease in cost, efficient and intelligent technologies will start to become an even more pervasive fixture in buildings worldwide.

This paper focus on a particular type of educational building: the university campus. In particular, the paper describes and analyzes the use of smart technologies and innovative building solutions applied in three university's campus projects:

– Campus Luigi Einaudi of the University of Turin (Italy)
– King Abdullah University of Science and Technology's Campus (Saudi Arabia)
– Cloverdale Campus of the Kwantlen Polytechnic University (Canada)

The case studies aim to analyze the design solutions and technological opportunities offered by this new emerging approach to smart and sustainable buildings.

Although the three case studies are diverse in nature and combine different techniques, they share a set of characteristics that set them apart from "conventional" buildings. An intelligent site planning, low impact buildings material, bioclimatic strategies and solar design, the integration of building services and computer-based building management systems represent key features in the analysed projects.

Compared with “conventional” buildings, these buildings improves operational performance, increases occupant comfort and satisfaction and provides the owner with systems, technologies and tools to manage and minimize energy and water consumption.

THE STUDY CASE OF CAMPUS LUIGI EINAUDI OF THE UNIVERSITY OF TURIN – ITALY

Opening with the academic year 2012-13, the new seat of the Faculty of Law and Political Sciences of Turin completes the campus that the University of Turin is building as part of a complex program of reorganization of its offices that, started in late nineties, included the moving of the faculties in new structures on abandoned Italgas areas along the river Dora.
With 45,000 square meters, 14,000 square meters of green, 70 classrooms for 80,000 students and the modern library pole, the campus is an integral part of a broader process of regeneration of the Northern Eastern part of the city, once headquarter of high environmental impact industries, a site in complete state of abandonment since the seventies. The new complex is designed with a great focus on the issues of environmental sustainability and energy conservation, using innovative low impact materials and an integrated and computerized management of the technological systems.
The new campus, designed by the British firm Foster & Partners, is composed by seven blocks (with parking and technical rooms in the basement) distributed around a circular plaza. A suspended roof, designed with the most innovative criteria of bioclimatic strategies and solar design, connects and shields the campus buildings. Its overhanging sides, devised and diversified according to solar gain, provide the right compromise between sunshine and shade on the walls. Hence, the high level of comfort inside the building and the significant reduction of air-conditioning costs in the summer. This strategy has permitted the use of large windows (ensuring the containment of heat) and the provision of work-study positions with a direct view, overlooking the surrounding landscape. Recourse was made to low-consumption and adjustable lighting (depending on the type of employment and use of the environments) and integrated lighting equipment. From the point of view of consumption containment, the integration between natural and artificial lighting ensures an energy saving of about 20%.
The walls, designed and built to acoustically insulate the building, provide noise abatement which reaches values exceeding 48 dB: even in the presence of high external noise (due to traffic for instance) the educational or consulting activities take place in a quiet and comfortable environment.
Particular attention has been taken in the use of building materials that minimized detrimental environmental effects while promoting, for example, wood products that meet rigorous FSC environmental standards. Over 7,200 square meters of outdoor photo catalytic flooring have been used that, thanks to the combined action of sunlight, neutralize the hydrocarbon molecules, or dust pollutants that settle on them.
A centralized, integrated and computerized management of the technological systems allows the regulation of consumption according to actual use of the building, while continuously monitoring and reporting indoor temperature and air quality condition.

The supply of heat and cold from the trigeneration plant of the complex allows approximately 15-20% savings compared to separate production with individual machines, better efficiency, reduced emissions and increased effectiveness of controls.

THE STUDY CASE OF KING ABDULLAH UNIVERSITY OF SCIENCE AND TECHNOLOGY CAMPUS – SAUDI ARABIA

King Abdulla University of Science and Technology (KAUST) is a new graduate-level research university established in Saudi Arabia to drive innovation in science and technology, and to support research in areas such as energy and the environment. The University's focus on sustainable development is well reflected in the site planning and in the building design of the new KAUST's campus, located on the Red Sea at Thuwal and officially opened with the academic year 2009-10.

Designed and built in just 30 months, the campus integrates a series of innovative strategies to create a low-energy, highly sustainable project in the context of an extremely hot and humid climate, limited rainfall and potable water resources. With its 800 postgraduate students and 600,000 square meters of lot size, located on a flat desert coastal, the campus itself can be considered as a living laboratory where smart technologies are tested.

The campus, designed by the international architecture firm HOK, is composed by 27 buildings arranged in a semi-circle, which border a harbour on the Red Sea. These buildings are specifically located and grouped to maximize the benefits of the unique site microclimate and ecosystem. The strategic position of the buildings was designed to reduce outdoor walking distances and to mitigate the detriments of the sun's movement and the harsh Saudi Arabian climate by minimizing the amount of exterior envelope exposed to the sun. Light-colored paving materials were selected to reflect solar heat gain and decrease the overall temperature.

A monumental roof connects and shields the campus buildings from the harsh climate. This roof has been designed to incorporate massive solar thermal arrays to provide domestic hot water to all campus buildings, and solar photovoltaic arrays to generate and distribute power to campus buildings based upon demand. While the roof protects the buildings from excessive solar gain, atria and courtyards have been integrated throughout campus buildings to infuse natural daylight and facilitate natural ventilation into a majority of the interior spaces.

Passive ventilation strategies of the traditional Arabic house also influenced the design of two iconic, solar-powered wind towers that harness energy from the sun and wind to passively create airflow in pedestrian walkways.

Recognising the value of the water in the region, numerous strategies to reduce the amount of non-potable water needed to irrigate the KAUST campus have been implemented. The comprehensive irrigation plan, for instance, allocates water reclamation loads from condensate, storm, gray and black water to satisfy a majority of the irrigation requirements.

Particular attention has been taken in the use of building materials selection: 38% of materials have being manufactured within 500 miles of the site, and 21% containing recycled content. 100% of the wood was FSC certified.

Highly interactive direct digital controls optimize system operation while continuously monitoring and reporting system performance, energy harvested, energy recovered and energy used to ensure long-term energy management.
The project delivers exceptional performance in the areas of water (100% wastewater reuse, 42% water reduction) and energy (27% annual energy cost savings, 7.8% percent on-site renewable energy). Furthermore, KUAST campus is Saudi Arabia's first LEED certified project and is the world's largest LEED Platinum campus.

THE STUDY CASE OF CLOVERDALE CAMPUS OF THE KWANTLEN POLYTECHNIC UNIVERSITY – CANADA

Officially opened in 2007 as new home of Kwantlen's Faculty of Trades and Technology, the Cloverdale Campus is a successful example of integration between architecture, natural systems and smart technologies.
With its 17,000 square meter, 21 shops, a lab for a variety of trades and technologies and 27 classrooms that accommodate up to 900 full-time students, the campus was designed to minimize the environmental footprint through efficient use of energy and water resources, while providing improved indoor environments and healthier building sites.
Designed by the Canadian firm Bunting Coady Architects, the campus use approximately 50% less energy than other universities across North America. Indeed, The Cloverdale campus is the City of Surrey's first certified LEED Gold building.
Particular attention has been taken in the site planning: building orientation and landscaping were developed to optimize energy performance of the building. The placement and positioning of the Centre allows more natural light and natural ventilation supplied by operable windows and the use of the skylight as a central air chimney.
A major characteristic of the building is the intensive use of renewable energy resources. The Institute's greenhouses draw power from a geothermal energy system, while a bio digestion system uses methane recovered from green waste to power the greenhouses' operations. . A large south-facing photovoltaic array generates 5 kilowatts of renewable energy.
Several water conservation strategies, such as the low-flow drains installed on the roof, allow a water use reduction of 45 % over "baseline" conditions.
Great attention has been taken in the use of locally produced materials and from non- or low-VOC (volatile organic compound) emitting products: at least 50% of building materials are manufactured locally while the wood for the roof and the interiors was sourced within a 500-mile radius of the campus.
The Building Automation System was embraced as a core area of focus to enhance facility improvements and achieve their environmental sustainability goals, which contributed significantly to achieving the LEED Gold Certification.
Some of the key technologies installed includes building controllers integrated with lighting occupancy sensors, isolation dampers for rooms with scheduled operating times, digital networked thermostats for

precise control and feedback, occupancy sensors triggered by sound, in addition to movement, control of exhaust systems, and awareness and training programs.

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The image are from: http://eandt.theiet.org; http:// torino.ogginotizie.it; http://hok.com; http://exp.com.

05

SMART CITIES: RESEARCHES, PROJECTS AND GOOD PRACTICES FOR BUILDINGS

REVIEW PAGES: NEWS AND EVENTS

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In this issue
SMART BUILDING

The field of smart buildings is one of the most dynamic sectors of smart cities, affected by a major research activities, with many and important innovations in recent years. In the future it's expected greater progress to transform almost all the current concept of building. The goal is to include the development of buildings that turn in real intelligent entities, able to continually adapt to the different needs of different and multiple users.

Of course, the road is still very long, but all over the world there are a lot of experimental projects implemented successfully and that promise to build new buildings and renovate existing buildings in smart buildings. In this context of particular importance for the various operators, investors and industry researchers to organize events that allow to show the benefits of new solutions developed, ready to be applied and the possible developments planned for the future. These events are also an opportunity to promote and initiate an exchange of ideas between the various stakeholders, in fact in almost all the exhibitions are planned sessions for discussion and debate. Most of these events take place in the countries in the developing world, that is in those countries currently interested by a strong economic and social development. In which the greater dynamism and the availability of capital to invest in this sector means that in these countries are numerous initiatives and opportunities to enable the realization projects dedicated to the realization of smart buildings.

Among the many events organized at European and international level expected in the coming months, there is the Green Building Brazil 2013, that is an international conference focused on the theme of sustainable buildings that will take place at the end of august in the Brazilian city of Sao Paulo. This year is now in its fourth edition, which now can be considered the leading industry conference of fields for the whole of Latin America. The Green Building Brazil is organized by the Green Building Council of Brazil, which also seeks with this event to allow for a constructive dialogue on these issues among managers, entrepreneurs and professionals interested in the development of sustainable buildings. In particular, there are many Brazilians and international experts who take turns during the various sessions of the conference to discuss and present new solutions and experiences that have been or are being developed in this area. There are numerous companies that during this conference have the opportunity to show a wide and qualified audience their products and services. Each year the conference is also an opportunity to take stock

of the state of implementation of LEED (Leadership in Energy and Environmental Design) in general in Brazil and in Latin America. And in particular, one of the main topics discussed with is the one on the application of LEED to the next big sporting events that will take place in Brazil in the coming years from the World Cup in 2014 and then finished with the Olympics in Rio in 2016. The goal of the organizers of the World Cup is to organize the first Green World Cup history, then to plan the same objective was also moved by the organizing committee of the Olympic Games in Rio.

From the European point of view one of the main events that will take place in the old continent in the coming months and that will also address the issue related to the development of smart buildings is the Sustainable Conference 2013. This conference will take place in the first half of September in the city of Graz in Austria, and is organized by Graz University of Technology and the Institute for Sustainable Technologies. This conference is one of a series of major international conferences that address the issues of sustainable buildings and that are promoted by the International Council for Research and Innovation in Building and Construction. The program of this conference has a duration of three years. During the first year they prepare regional conference, the second year is devoted to the performance of these, and finally in the third year there is the World Conference, which will take place in Barcelona in 2014. On the website ww.sbconference.org, you can find the list of all the regional conferences that are not carried out and that will take place during 2013, prior to the World Conference. The importance of the organization of these regional conferences borns from the desire to consider all aspects of technical, economic, social and environmental issues related to sustainable building and how these are addressed in the various regions of the world. In order to create a common knowledge in relation to these issues, as well as to promote also the start of fruitful international cooperation. The importance of the creation of such a network of exchange of information arises from the fact that the construction industry is one of those areas that has more room for innovation and has a great impact on the environment.

Another event of particular interest organized in Europe is the Green Building 2013, which is the most important exhibition in the field of sustainable and energy efficient buildings in Denmark and is organized every year in the first part of October in the city of Copenhagen. In the years, this conference with the large participation has become an important point of reference for all the countries of the Baltic region. In this conference there is the participation as exhibitor many Danish companies that have developed practical and effective solutions that generate real benefits for the environment. For them, this conference is an excellent opportunity to show off a national and international level, given the large participation of visitors on the way of politics, the constructions and design. This conference is of even greater prestige as anticipated by a few days one of the most important global conferences related to issues of environmental sustainability and that is the Global Green Growth to be held at Copenhagen October 21 to 22. In Denmark many initiatives undertaken in agreement between the public authorities and the private investors to ensure greater sustainability of buildings, with the intention to arrive in the near future the construction of buildings can reduce energy use and produce more than what they consume. Looking at the success and great participation in these events it can be stated that the achievement of this goal isn't far away.

Another of the countries interested in recent years by a strong development in which cities are expanding is India. In this country there is a big interest on the part of public authorities and private investors in creating new buildings that provide a minimal use of new natural resources and that they are able during their exercise to limit the energy consumption for their operation. This search for new smart solutions is dictated by the absence of new resources and the need to reduce the maintenance costs of the buildings. To respond

to these needs of the various stakeholders is organized Indian Smart Building Summit 2013, which will turn in 3 to 4 October in the city of Mumbai. The topics, during the two days of events, will be numerous and affect all life stages of the building and the various types of use of buildings and also analyzing the way in which the individual buildings interact with each other. So the vision that is provided to participants during the various sessions in which the conference is divided, it is very broad and comprehensive as to highlight the benefits and opportunities deriving from the use of smart solutions related to both the creation from scratch and the renovation of existing buildings.

Another event organized is the Shanghai Intelligent Building Technology now in its 7th edition will take place in 25 to 27 September at the new exhibition center in Shanghai, where will be set up over 10,000 square meters of exhibition space. This event aims to become the reference point for the growing field of smart solutions, which is developing rapidly in China. In fact, with the rapid economic growth of the country and the ambitious goals of urbanization, is growing the demand for new technologies and solutions that deliver increased comfort, convenience, energy efficiency and security of the buildings.

The growing demand for new smart solutions is also due to the strategic choice of the Chinese government to focus concretely to the development of smart cities in China, so this has become one of the main priorities that the Chinese government is working. This choice has led many state and private companies that are investing in these initiatives. For example, the China Development Bank, is committed to pay USD 12.9 billion of euro for various projects on smart cities between 2013 and 2015. This year's edition will focus in particular on three central themes of Building Energy Efficiency, smart cities and smart homes. In addition to the large exhibition areas, with many exhibitors of major global companies are provided a series of forums and seminars as well as to enrich the event for both visitors and for exhibitors.

The planned sessions include discussions and presentations on the following main topics:

– Shanghai International Intelligent Building Development Symposium.
– Building Automation and Energy Management Systems Technical Seminar.
– China Smart Home Industry Alliance Forum.
– Intelligent Building and Wiring Systems Forum.
– Solutions for the city safe and Smart Building: Russian and international experience.
– KNX Technical Seminar.
– Shanghai Intelligent Building Technology - Building Standard forum.

GREENBULDING BRASIL
Where: Sao Paulo – Brazil
When: 27 - 29 August 2013

SUSTAINABLE BULDING CONFERENCE
Where: Graz - Austria
When: 25 -28 September 2013

INTELLIGENT BUILDING TECHNOLOGY
Where: Shangai - China
WHEN: 25 - 27 September 2013

SMART BUILDINGS INDIA SUMMIT
Where: Mumbai - India
When: 3 – 4 October 2013

BUILDING GREEN
Where: Copenaghen - Denmark
When: 9 – 10 October 2013

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