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Session: Smart and sustainable technologies

Author: Yusuf A. Aina¹

Title: Quest for Leveraging GeoICT for Sustainable Smart Cities: Saudi Arabian Experience

Keywords: GeoICT, geospatial technologies, smart cities, spatial enablement, urban sustainability

Abstract: Urban areas are expected to host about 70% of world's population by 2050. Ensuring that the expected rapid urbanization occurs in a sustainable manner require better tools than the traditional planning ones. GeoICT is being increasingly adopted to foster urban sustainability and smart cities. Despite the burgeoning utilization of GeoICT, the development of frameworks of components and guidelines is still at the infancy. This is due to the fact that GeoICT implementations are guided by contextual factors and there is no one size fits all approach. This paper will focus on the topic of leveraging GeoICT for sustainable smart cities by examining the Saudi experience. The first section will review the definitions, roles and applications of GeoICT in sustainable smart cities. The second section will examine the frameworks and best practices for implementing GeoICT. The third section will review Saudi Arabian experience at promoting sustainable smart cities including highlights of case studies. The fourth section will compare Saudi experience with frameworks found in literature and best practices. The final section will highlight policy implications for Saudi Arabia and lessons for GeoICT framework development.

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Session: Energy planning for cities and regions

Authors: Darcin Akin¹, Serap Cetinkaya²

Title: Effect of Various Alternatives Of Transport Network on Urban Structure and Energy Use in Transportation: Case Study of Istanbul Metropolitan Area

Keywords: urban structure, travel patterns, transportation network, hierarchical clustering, Istanbul

Abstract: There were several network alternatives tested in Istanbul's 2023 Transport Master Plan, i.e., a- existing network as of year 2009; b- base network, which included transport infrastructure investments to be built until year 2014; c- maximum network, which included all unapproved projects by related departments of the Istanbul Metropolitan Municipality (IMM), Highway General Directorate of Turkey, and transport related companies of IMM; d- other network alternatives such as highway oriented network, public transit oriented network, and a more balanced transport network for the 2023 Master Plan. In this paper, we model and compare the effect of various alternatives of the transportation network on the urban structure of Istanbul Metropolitan City using travel patterns of all car movements for all trip purposes from the 4-step travel demand model assignments for year 2023 under the network designs of (c) and (d). Travel patterns are modelled using hierarchical cluster analyses (HCA). In the HCA, three similarity measurements were used, namely, "single neighbour", "furthest neighbour", and "average" link distances. The result of the method yielding the highest score based on the internal validation criteria was selected as the best clustering that fits the data. The resulted distances or similarities based on the HCA among the districts of Istanbul will be graphed against the daily energy consumption by vehicles in the network of transportation. Thus, the effect of various alternatives of transportation network on urban structure as well as energy consumption will be examined towards the planning of smart and sustainable cities.

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Session: Governance for smart and sustainable growth

Author: Valentina Andreazzo¹

Title: Services and Retail: an Opportunity for Evaluating Smart and Sustainable Strategies and Governance in Northeastern Italy

Keywords: retail reform, regional planning, economic governance, implementation effectiveness, policy innovation.

Abstract: The reform of retail activities is the result of a series of Italian and European regulations, as the Bersani Decree (D. Lgs 31 March 1998, n° 114) and Bolkestein European Directives (2006/123/CE). This process is an opportunity for investigating the integration and smartness of sectorial and territorial policies. This paper represents a middle-term outcome of a PHD research, which is focusing on “Urban planning, Retail and New Technologies”. The research aims at assessing the effectiveness and the integration between economic strategies and territorial planning, as well as identifying barriers and innovation in local governance.

In Italy, the retail and service legislative framework has been innovating itself over the last seventeen years and it represents a complex background for economic and territorial policy making. The Retail Reform and Services European Directive aim at enabling a full potential of services markets by removing legal and administrative barriers to trade.

Thanks to the retail reform, Italian Regions have been acquiring new legislative competences regarding the regulation of their economic development and therefore play a main role in the economic and regional development governance. The territorial impacts of retail activities’ localization are both social and economic. Indeed, retail is a social element of urban life, and it represents an important economic resource for regional growth that describes the new economic geographies.

The paper is organized as follows. The starting point is related to the observation of laws and plans and the way Italian Northeastern Regions have innovated their economic and territorial governance. A second step represents a first effort to assess the integration and to compare the effectiveness between economic strategies and territorial governance. The last section presents a synthesis of the different regional approaches and methodologies applied.

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The observation and the evaluation of the Economic and Territorial Regional Governance is focused on the relation between Institutions and local and civic stakeholders, the connection between economic development strategies and traditional planning tools.

This paper highlights a complex governance framework and different cultural and methodological approaches to economic and territorial development. Regional institutions pay different attention to impacts of evaluation and activities' localization choice. New regional hierarchies could be designed by innovative strategies and policies, and different governance approaches should be investigated in the future research work for indicating the path for a real sustainable and smart growth.

Session: Benefits, costs and opportunities of urban transition

Authors: Raffaele Attardi¹, Maria Cerreta², Giuliano Poli³

Title: Cilento Labscape: a Collaborative Spatial Decision Support System for Smart Landscape Evaluation

Keywords: Spatial Decision Support System, Landscape, Multi-Criteria Analysis, Multi-Stakeholder Analysis

Abstract: The present research aims at the development of Cilento Labscape, a Collaborative-Spatial Decision Support System (C-SDSS) for the evaluation of multifunctional landscape according to a human smart perspective. The paper presents the experimentation triggered during the research project "Cilento Labscape: an integrated model for the activation of a Living Lab in the National Park of Cilento, Vallo di Diano and Alburni", F.A.R.O. program, Department of Architecture (DiARC), University of Naples Federico II, as methodology for the identification and testing of an endogenous local development model. The C-SDSS addresses landscape transformation and preservation processes, leading to consistent choices with the principles of local self-sustainable development, considering the decision-making environment as a heterogeneous field, where conflicting interests interplay among a set of social actors from public, private and civil sector (people). The methodological approach, implemented in the case study of the National Park of Cilento, Vallo di Diano and Alburni (NPC), in Southern Italy, demonstrates that combination of multi-source and heterogeneous data in the C-SDSS is a major challenge. The multidimensional nature of the landscape evaluation requires a mutual understanding, communication and collaboration, allowing an expansion of the knowledge base to sharpen questions and improving the quality of the decision process. The paper investigates potentials of the C-SDSS for supporting transparent, democratic and collaborative decision processes and integrating expert knowledge with context-aware knowledge in the activation of a Living Lab in the NPC, based on an open innovation approach, in order to outline an alternative model of smart endogenous development and to enhance landscape resources.

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Session: Benefits, costs and opportunities of urban transition

Authors: Raffaele Attardi¹, Maria Cerreta², Valentina Sannicandro³, Carmelo Maria Torre⁴

Title: Multidimensional and Integrated Approaches for the Assessment of Urbanisation Scenarios: the Value of Land-saving

Keywords: Commons, Land-use, Impact evaluation, Composite indicators

Abstract: Studies from the last 50 years have provided many references to the soil/land value as a commons, according to the E. Ostrom perspective, - due to its intrinsic fragility - bringing up the issue of a consequent need for governing and protection. Indeed, soil has demonstrated its fundamental contribution to several functions in the fields of climate change/CO₂ sequestration, ecology system and biodiversity, groundwater recharge, food and agriculture, and landscape. Considering official and draft European documents, soil consumption refers to the concept of “land take”, also known as “urbanization”, “increase of artificial surfaces” and represents an increase of settlement areas or artificial surfaces over time at the expense of rural areas. At the same time, the idea of soil as commons strengthens the assumption of social and cultural dimensions as components of value, in addition to the environmental and economic ones. Given the evidence of the need for governing land consumption while preserving soil value, soil protection has consequently become an increasingly important objective. From this perspective, the EC adopted a “Soil Thematic Strategy” (COM 231, 2006) and a proposal for a “Soil Framework Directive” with the aim to protect soil across the EU, acknowledging its socio-economic as well as environmental importance (COM 232, 2006). The soil, recognisable as an ecosystem structure, can be considered as a non-renewable resource, thus triggering both studies for the assessment of land take phenomenon and actions for its mitigation and reduction. The sum of aspects leads to different points of view that can answer to the question about the assessment of the value of “soil taking” in terms of “opportunities vs costs” (e.g., for renouncing to the benefit of land use), willingness to pay (e.g., the social value of the soil as common), conservation (expenditure for “soil keeping” as a ecological need). In last two decades a deeper and ecosystem approach to land-use policies targeted to the sustainable development enabled a closer understanding of the complexity of urban dynamics exploring the necessity of multidimensional and integrated approaches for the assessment of the use of resources. The

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paper presents a multi-dimensional approach to evaluate the phenomenon of land take and soil sealing implemented in Apulia Region, in Southern Italy.

Session: Cooperation and demonstration projects

Authors: Jean-Marie Bahu¹, Christoph Hoja², Diane Petillon³, Enrique Kremers⁴, Xiubei Ge⁵, Andreas Koch⁶, Elke Pahl-Weber⁷, Gregor Grassl⁸, Sven Reiser⁹

Title: Integrated Urban Energy Planning for the Redevelopment of the Berlin Tegel Airport

Keywords: Integrated urban energy planning, local energy systems, multi-energy simulation, spatial modelling, urban planning

Abstract: In order to achieve their sustainable targets, cities are today looking for better solutions for integrating infrastructure systems into their urban planning. A large variety of tools exist for decision support both in energy planning and in city planning, but few of them combine detailed multi-energy modelling and user-centred collaborative development process at the early phases of an urban project.

With the opening of the Berlin Brandenburg Airport, the Berlin-Tegel Airport (Berlin TXL) will be redeveloped as an innovative hub for cutting-edge research and industry under the umbrella of Berlin TXL – The Urban Tech Republic (UTR). The European Institute for Energy Research (EIFER), the energy provider Electricité de France (EDF), the Department of Urban and Regional Planning (ISR) of the University of Technology Berlin (TU Berlin) and the Drees & Sommer Advanced Building Technologies company for energy design started in 2014 a collaboration with Tegel Projekt GmbH in order to connect urban and energy planning for the redevelopment of Berlin TXL. Based on an innovative modelling approach coupling both spatial and multi-energy systems, they developed a simulation prototype illustrating the interrelation between different technologies, land uses & planning decisions. Several collaborative workshops were conducted as Urban Labs by the TU Berlin in order to integrate relevant actors into the planning process.

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This paper aims to describe the integrative and collaborative approach developed by the participants to answer the needs and questions of Tegel Projekt GmbH regarding the energy planning of the future redevelopment of Berlin TXL according to the spatial settings.

Session: Plenary

Topic: Cooperation and demonstration projects

Author: Milica Bajic-Brkovic¹⁰

Title: Will planning save the cities? Managing responses to climate change

Keywords: climate change, urban planning, planning on the cross-road, cities

Abstract: Climate change confronts planning with new challenges. Although the impacts it generates on cities and regions have been widely recognized and ranked among the highest priorities of spatial development globally, a corresponding shift in planning practice has not yet taken place. The existing models rely on the cross-field exchange of knowledge, responses and responsibilities. Planners include recommendations from other disciplines in their plans and strategies but only sporadically integrate their knowledge with other fields' expertise. Such practices are limited and often weak in coping with climate change. The results are visible in our cities and towns where the effects of climate change manifest most clearly.

“Climate friendly urban development more than ever demands for integration of the manifold social, ecological and economical aspects” (European Environment Agency (EEA) Report, 2012). Correspondingly, planning is expected to move more toward an integrative model and work closely with other disciplines that previously were on the margin or beyond its interest. However, it is not the same form of integration known from the 70s and 80s of the last century. The nowadays approach to integrative planning rests on different understanding of the role that global phenomena and processes hold for planning. Climate change is recognized as a drive in triggering structural changes in organizing planning with regard to conceiving, communicating and implementing planning solutions, and reflects on planning methodology, the way planning process is structured and carried on, and on the content and mode of communication with the “outside world”.

This presentation will bring about the critical points relevant for transforming the planning practice and making it climate change sensitive. It will be illustrated by several successful examples assembled across Europe. They all come from the planning practice sensitive to climate change and illustrate its decisive impact on planning discipline. These case studies demonstrate how the shift in planning philosophy and methodology works, and disclose the specifics of the integrative planning model. The presentation provides important messages for planning practice that may be applicable in different environments and under different local conditions.

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Session: Cooperation and demonstration projects

Authors: Gianluca Baldisseri¹, Emanuele Sascor², Sara Verones³

Title: *SINFONIA: Social Housing Refurbishment in Bolzano*

Keywords: Sinfonia, social housing, energy efficiency, prefabrication, cubature bonus

Abstract: SINFONIA is a cooperative project (with a predominant demonstration component) funded by the 7FP under the call SMARTCITIES -2013.

One of the main measures underpinning the transition of Bolzano towards a smart city status is the retrofitting of buildings following a nearly zero energy standard.

Within the SINFONIA project more than 100.000 m² of gross floor area will be refurbished, nearly 19.000 of them are owned by the Municipality of Bolzano, that in the next four years will renovate three of its biggest social housing complex, for a global number of 220 dwellings.

The refurbishment of these buildings is intended to reach the goal of 40% to 50% of primary energy savings, and significantly contribute to increase the share of renewables by 20% in Bolzano south west district.

Reaching the above-mentioned objectives set by SINFONIA is really challenging in itself, in addition the building rehabilitation will be made with the presence of tenants inside the buildings and in a short period of time, if compared to national standards.

The measures that will be implemented, take in to account all these issues and aim to solve them.

Assessing the feasibility of the solutions employed in the demo sites, and evaluating their replicability and scalability in other context is crucial in SINFONIA, so both the technical and economical aspects will be deeply analysed.

With respect to economical aspects, it's worth noting that the self-financing will be the main instrument for sustaining the realization of interventions.

Regarding to this aspect, within SINFONIA, in Bolzano will be extensively implemented a new tool based on land development rights that support the reduction of energy consumption and

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the production of renewable energy in urban areas, namely the so-called bonus volumetric (actually bonus energy).

Approved in 2013 was resolution no. 362/2013, which significantly modified previous local legislation on the reward-based mechanism by introducing a 20% density bonus for residential buildings in the case of energy retrofitting and demolition with rebuilding. In order to obtain an increase in building volume, these buildings must achieve a Building Energy Performance < 70 kWh/m²y.

The balance between the land development rights gained and their economic value is the key driver and initiator of such a SINFONIA initiative. The new SINFONIA dwellings will replace social apartments owned by the Municipality through the city of Bolzano. The sale will financially support the project.

Session: Cooperation and demonstration projects

Authors: Jessica Balest¹, Giulia Degan², Marco Castagna³, Alyona Zubaryeva⁴

Title: *SINFONIA project: tenant's behaviours in energy refurbishment of buildings*

Keywords: tenant's energy behaviour – SINFONIA – building refurbishment

Abstract: Energy renovation of existing building stock has played a key role to tackle the 20-20-20 European targets. However, many factors (i.e. climate, building technologies, tenants type) have significant impact on building energy performance creating several open challenges that determine the effectiveness of buildings renovation. In this study, we focused on tenants' behaviour with the primary aim of defining a support for buildings renovation-related applications, such as building performance simulations (BPS) and tenants' guidance. The study has been carried out in the framework of SINFONIA, a European project that involves different multi-story social-housing buildings for refurbishment process. They were built in the 70's both in the cities of Bolzano (Italy) and in Innsbruck (Austria). The expected project outcome is the reduction of the buildings energy consumption until the highest class of the regional rating system. Especially, the aim of this study was to create a baseline that can be used for the development of both the tailored social learning approach, and the performance monitoring campaign configuration for the ongoing building refurbishment projects. Mainly, the study responds to the research question: which are the drivers of tenants' energy behaviours in Bolzano? The study addresses the question showing the results coming from questionnaires' analysis about the best social predictors of energy behaviours in Bolzano social housing.

Six buildings were involved and tenants were approached with the questionnaires in order to collect the data about their energy behaviours before the refurbishment. The questionnaire-based survey has allowed to gather data on socio-demographic characteristics, habits, energy knowledge, awareness of energy saving, perceptions about indoor comfort and expenses. Through a regression analysis, the presentation shows how socio-economic characteristics, perception of comfort, knowledge about renewable energy production and efficiency energy systems and attitudes predict energy behaviours in SINFONIA buildings.

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Session: Smart and sustainable technologies

Author: Gulnar Bayramoglu Barman¹

Title: Analysis and Support System for Planning Decisions to Achieve Sustainable Outcomes

Keywords: Support & analysis tool, Sustainable urbanism

Abstract: Sustainable urbanism is an issue extensively studied in the academy by architects, planners, geographers, sociologists, and urban politics scholars; and consequently there is a vast literature to make our cities more sustainable. There are lots of designed criteria and notion discussed and studied by the professions. After the technological improvements an amount of tools are designed in order to handle such a complex issue by providing information, collection data, simulate what will happen in a huge time periods for planners.

However, although some part of the world are aware and have consciousness about our earth and doing the best by practicing all those discussed literature, majority of the world with the dominant stakeholders such as private sector investments partnerships, local authorities and state, which are responsible and influential in the practices of this scope, affecting the city physically, are not always familiar with the meaning and requirements of urban planning and design terms as a result all those existing support tools and written books or published papers are not enough to make everyone, at least whose in charge of practicing urban planning, get the information, as they need lots of time, money and profession to understand. Subsequently rural become extinct, urban areas are extending continuously and neighborhoods exists with lacking of connection with their environment. Inside the world's biggest changes, illusion of postmodern politics occurred as mega projects and new life styles, which trapped within the project area. As David Banister mentioned, planners need to think more imaginatively about the future, rather than being content with current trends just continuing much as they are at present. We can combine the planners and the technology for the stakeholders to inform and guide them to make decisions for the best practices in creating sustainable communities.

With a new kind of support and decision tool, which is objective and unalterable it can be made simple and easy to get the information and the meaning of the notions and most importantly even if they do not have any time to check on, calculate for them for a much more sustainable, livable, walkable cities. As the new system will be build up the professions and will not work with counseling theory, which is based on command-staff relationship it will not being affected by any external factors and will be sustainable for sustainable cities.

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Session: Energy planning for cities and regions

Authors: Pierantonio Belcaro¹, Marco Michieli², Elisa Cosmo³

Title: Mitigating the Effects of Climate Change at Local Level: the Analysis of the Municipalities SEAPs in the Metropolitan City of Venice

Keywords: environmental voluntary agreement, Covenant of Mayors, SEAPs, local policy, emission reduction

Abstract: Central governments alone cannot solve the problems of climate change and energy saving without involving local governments. In fact, always more frequently local governments play a key role in the mitigation of the effects associated with climate change. At the European level, the Covenant of Mayors (CoM) - a voluntary agreement through which cities are committed to meet the goal of reducing by 20% of CO₂ emissions by 2020 through increased energy efficiency and the use of renewable energy sources - represents one of the more successful instruments of local authorities involvement in the implementation of climate change mitigating policies. Even if the accession procedures are relatively easy, the implications are often not very clear for municipalities who participate: sometimes local governments are led to a significant increase in the workload, without reaching their goals. To provide strategic guidance, financial and technical support to municipalities signing up to the CoM but lacking necessary skills and/or resources to fulfill their requirements, decentralized authorities, such as regions, provinces, grouping of local authorities, and/or national energy agencies can support them. In this paper we try to focus our analysis on the Municipalities of the Metropolitan City of Venice involved in the initiative and on the Metropolitan City of Venice as the Covenant Coordinator. We have examined the Sustainable Energy Actions Plans (SEAPs) of these municipalities, starting from their Baseline Emission Inventories (BEIs), and analysed the measures that they plan in the different sectors with a particular attention to the buildings sector.

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Session: Benefits, costs and opportunities of urban transition

Authors: Adriano Bisello¹, Gianluca Grilli², Jessica Balest³, Giuseppe Stellin⁴, Marco Ciolli⁵

Title: Co-benefits of Smart and Sustainable Energy District Projects: an Overview on Economic Assessment Methodologies

Keywords: co-benefit, social benefit, cost-benefit analysis, sustainability assessment, smart cities

Abstract: The concept of “co-benefit” is commonly adopted to define any additional positive impact of a policy, program or projects, arising beside the desired primary goal. Co-benefits relate to human health and well-being, as well as environmental, economic, and social aspects. The concept, investigated from 1990s, is today recognized and worldwide supported by several notable Organizations, to have a better grasp of the economic value of foreseen or applied measures. Nevertheless, given the complexity to get a whole pictures and understand interrelations or cascade effects, the co-benefits are often only sectorally analyzed or only qualitatively measured. Therefore, the aim of this paper is to provide an overview on the methodologies for the economic assessment, applicable to the monetization of co-benefits related to Smart and Sustainable Energy District Projects. Starting from a previously defined framework of expected co-benefits, we analyzed the various techniques, identifying the most appropriate with respect to target stakeholders and expected outcomes. As a result, we obtained a clear and comprehensive assessment model, tailored on a specific project type, operationally applicable. This model would sustain the funding, public acceptance and political commitment of Smart and Sustainable Energy District Projects, allowing the different stakeholder to better understand the whole economic project’s value, beside energy saving and GHG reduction.

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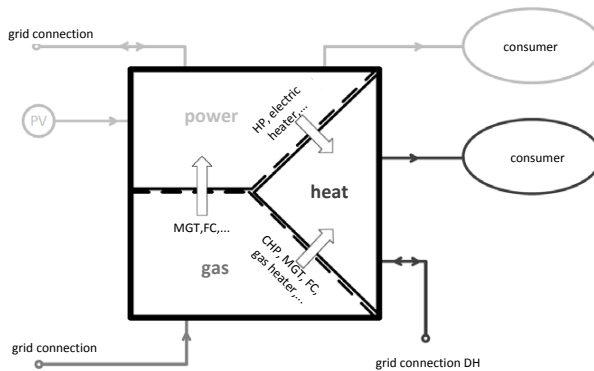
Session: Energy planning for cities and regions

Authors: Dominik Bothe¹, Thomas Kaufmann², Wolfgang Gawlik³, Karl Ponweiser⁴

Title: Optimization of Load Flows in Urban Hybrid Networks

Keywords: multi-energy system, hybrid network, energy hub, MILP, load flow

Abstract: A sustainable supply of energy in urban regions requires an adequate infrastructure and operation. At present the different energy sources (i.e. electricity, gas, district heating) are used separately without any connection to each other. To increase the flexibility of energy supply the usage of energy hubs is a possible way. Energy hubs are connection points between energy sources, which are representing the key elements of so-called hybrid networks. They contain various technologies of energy conversion and can include electrical and thermal storages. Thus it is possible to convert electrical into thermal energy (heat pump...) or chemical (gas) into thermal and electrical energy (CHP...) depending on the used technology.



1.1 schematic illustration of an energy hub

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The right operating strategy of these energy hubs is an essential factor in order to minimize CO₂ emissions of urban energy systems. Therefore a simulation model was developed in Matlab®. The minimization of CO₂ emissions is based on a mixed integer linear optimization of the overall system, consisting of the supplying infrastructure, energy hubs and consumer. The objective function of the optimization is the minimization of CO₂ emissions with the constraint of no overload of the network capacity (electricity, gas and district heating). Due to linear programming the modeling of the electricity, gas and district heating network has to be made linear too. Therefore, the simulation of the power grid is simplified by using the method of DC-load flow. The steady state fluidic calculation of the gas and district heating networks is usually done by an iterative procedure. The necessary linearization is realised by piecewise linearization of the quadratic velocity-term. In addition to the fluidic calculation of the district-heating network, the thermal behaviour of the network is calculated on the basis of the Finite Volume Method.

A small area of an urban region with networks of electricity, gas and district heating serves as a case study for the simulation. The topologies of the networks and the location of the consumers are based on GIS data. Simulation periods of one week are chosen in winter, summer and transitional season. Additional to these scenarios three different values for the CO₂ emissions of power production and district heating are considered.

The result of the simulation is the usage of each energy source and the mode of operation of the energy hub in terms of time.

Session: Benefits, costs and opportunities of urban transition

Authors: Marta Bottero¹, Giulio Mondini²

Title: Evaluating Urban Regeneration Programmes: an Integrated Approach

Keywords: social benefits, urban regeneration, socio-economic rating, stakeholders, strategic assessment

Abstract: In the context of urban and territorial transformation processes, a crucial aspect is related to the issue of urban regeneration, meaning not only buildings restoration operations, but also programmes aiming at eliminating social decline, increasing the quality of life of the inhabitants, supporting the valorisation of cultural resources, protecting the environmental system, bringing economic development and so on.

Taking into consideration the aforementioned complexity, it is of particular importance to provide the Decision Makers with integrated evaluation tools, able to consider the multiplicity of objectives and values when dealing with urban regeneration processes and to include the opinions and the needs of the different stakeholders involved.

Traditionally, the assessment of urban and territorial transformation scenarios has been based on the application of economic analysis, such as the Cost Benefit Analysis. Many authors have highlighted the limits of Cost Benefit Analysis in addressing urban and territorial transformation decision problems; these limits are mainly related to a reductionist approach, that does not allow to consider the overall complexity of the system, and to the impossibility of including stakeholders in the decision making process. For these reasons, methods belonging to the family of Multicriteria Analysis have become more and more important, even if drawbacks related to the use of non-conventional procedures and to the difficulties of conducting the analysis have been put in evidence.

The paper explores the use of a hybrid approach based on the combination of Cost Benefit Analysis and Multicriteria Analysis for supporting decision-making processes in the context of urban regeneration processes. In particular, the article investigates the construction of an

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integrated evaluation model able consider both qualitative and quantitative information and both economic and extra-economic data in order to provide a socio-economic rating of alternative regeneration projects or strategies.

Starting for a real case study related to a social housing estate located in Northern Italy, the paper illustrates the proposed integrated approach for rating four different strategies for the regeneration of the site.

Session: Plenary

Topic: Energy planning for cities and regions

Author: Jürgen Breuste¹

Title: Importance of Ecosystem Services of Urban Green Areas for the Adaptation to the Climate Change – the Example of the City of Linz, Austria

Keywords: urban green areas, adaptation to climate change, urban structural units, risk groups, exposition and sensitivity

Abstract: The increase of the summer air temperatures will be most notable in urban areas since urban building structures and materials stimulate the heat island effect. The number of people who will be affected by increasing temperatures will rise, especially of the heat sensitive group of elderly people (demographic change). Urban planning departments have to develop adaptation strategies in order to be able to limit negative effects of the climate change on their citizens. Due to their climatic ecosystem services, urban green areas can play an important role in this process.

Since the effects of the climate change can vary in different urban areas, there has been a study focusing on identification of residential areas which are most affected by the climate change (surface cover structure and demographic characteristics) in the City of Linz (Austria), by using satellite images and demographic data. Also the perception of climate change problems by the residents of these residential areas was investigated with interview methods to support decision making on the level of sites and for the city. Beside a majority of residents will be affected and belong to risk groups only a minority accepts deeper changes to extend green areas in the sites.

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Session: Smart and sustainable technologies

Authors: Matija Brković¹, Višnja Sretović Brković²

Title: Lighting up the Landmarks with Information About the Environment

Keywords: environment, information, public, lighting, landmarks

Abstract: In order to ensure sustainable development of our cities we all have to do our part. There is a growing awareness of environmental problems, and citizens want to be informed and find the information about the environment relevant not only for those who are making decisions. Many communities are willing to take an active role in making the cities attractive places to live in.

Yet, many causes of environmental problems cannot be easily perceived by the public – e.g. neighborhood-level or city-level energy consumption, air and water pollution, noise. Making such information visible, easily accessible and understandable is the challenge this paper deals with.

We propose to use public buildings and landmarks to communicate information about environmental problems through the inbuilt features they all have – employing their lighting system as a media for providing information on environmental factors. Instead of using one color or randomly changing colors (as it is being employed at many public buildings nowadays), the idea we are advocating for would connect the light color to the corresponding environmental parameter. E.g., when the CO₂ level rises above certain level the building could glow red. The intensity of color or a choice of color is responding to the parameter that is being measured. This is informative, non-invasive, simple and inexpensive solution that can help raise awareness about environmental problems and make public informed. The information presented this way is simple to understand, visible to a large number of people and easily "glanceable". In turn, this can support the involvement of community in problem solving and spur bottom-up action, making us one-step closer to sustainable development of cities.

In addition to presenting and justifying this idea based on several parameters of sustainability, this paper will also discuss the potential benefits to public awareness, and will reflect on the relationship between community involvement and urban planning.

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Session: Governance for smart and sustainable growth

Author: Virna Bussadori¹

Title: Strategic Planning and Long Term Visioning - Between Theory and Practice

Keywords: Strategic planning, place-based, vision, co-production, participatory process

Abstract: Spatial planning is relevant for society, not only in order to avoid negative developments but also for supporting wished-for developments aiming at the optimal functioning of a territory.

Planning is still anchored on strict normative basis, but very often the circumstances in which future developments are imagined differ severely from the assumptions on which regulatory planning was organised while the network society requires a different attitude and new approaches towards good governance in planning practice.

The evolutionary view on spatial development puts extra emphasis on the step-by step dynamic character of plan preparation and on the importance of place-based choices demanding for local freedom of interpretation and performance with regard to a previously agreed set of norms.

Long-term development strategies, aiming at avoiding expected problems to develop, are not automatically recognised in society as topics of high urgency because problems expected in the future situation are not yet considered and as a consequence, the raised issues will be perceived as mere theoretic considerations of experts, which are hardly relevant in the eyes of people concentrating on their daily problems.

Interactive participation aiming at sharing ownership assumes awareness of the relevant stakeholders of the issues at stake; for effective decision-making on strategic items it is necessary that stakeholders acknowledge the issues of a future situation as important with regard to their own interests.

The co-production of a strategy to be agreed among sectors and stakeholders requires organising a process in which decision-making focuses on converging to a common view on the future: a commonly shared vision.

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A distinct aspect of strategic planning is that it concerns long-term structural developments: it is about establishing a global direction of the development of a territory. This global direction is often summarised in the form of a commonly agreed vision for the long-term development of a specific territory. Tools for strategic planning are less juridical-technical oriented.

The value of strategic planning consists of forming a recognisable spatial concept or clear scenario, which has a guiding effect for decisions about forthcoming interventions towards meeting agreed objectives, territorial cohesion and possible synergies; and in order to arrive to a commonly supported coherent vision for the future, the complexity of society requires extensive participatory decision-making processes with many actors.

The presentation aims at illustrating an existing experience of vision making rooted within a participatory process involving local communities and an upcoming experience of vision forming at regional level.

Session: Smart and sustainable technologies

Author: Io Carydi¹

Title: Landscape Infrastructure as an Alternative Tool for Planning the Urban Periphery of Athens

Keywords: landscape infrastructure, urbanization, Elaionas, metabolism, techno-natural networks

Abstract: This paper explores how *landscape infrastructure*- a newly consider term within the theoretical field of Landscape Urbanism- becomes an instrumental and operational design tool for processes of urbanization. Within this perspective *urbanization* becomes closely connected to the study of the material transformations of the ground and the techno-natural networks that metabolize it. However, the potential of infrastructure to integrate environmental and social imperatives on a horizontal pattern formation of the territory remains largely unexplored as a design methodology within the architectural discipline. The area of Elaionas, at the periphery of Athens is central as a case study towards this problematic. Within the current situation of a fragmented ground shaped by highways, dumped rivers, pulp mill industries and heterogeneous forms of informal economy of metal and paper recycling we explore how infrastructure as a design tool linked to the development of urban metabolic systems merges artificial and natural processes rendering them adaptable and fit to current social, economic and ecological determinants as well as to urban change. The case of Elaionas renders possible the development of an interdisciplinary landscape discourse that is gradually transforming traditional conceptions of urban and regional infrastructure by a methodology that informs urban design with complex ecological parameters and natural site-specific conditions, while it analyzes existing assets of the territory and how these can shape potential economic and social synergies. Recycling practices sustainable drainage systems, urban agriculture and bio-refinery practices in the pulp industry merge with clean industry practices and a cultural territory of street markets and archaeological sites providing a thickened ground of interlinked uses that can re-introduce an operational bio-periphery for the city.

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Session: Governance for smart and sustainable growth

Authors: Maria Cerreta¹, Maria Luigia Manzi²

Title: *Valorization Strategies for Marginal Areas: Adaptive Evaluative Approaches*

Keywords: cultural landscape, context-aware planning, financial assessment, multi-criteria analysis, multi-group analysis

Abstract: The paper aims to identify a situated strategy for valorization of the Valle Vitulanese, an inner marginal area of the province of Benevento, in southern Italy, structuring an evaluative methodological approach that recognizes and interprets the Valle as a cultural landscape.

To define a site-specific strategy, an adaptive evaluation process has been elaborated, considering not only the complex context conditions but also their interpretations that address collective choices, where collective choices meet social processed and political institutions. With the so-called adaptive co-management, social dimension plays an essential role in policy process because a broad civic engagement legitimates policy action.

Adaptive evaluations express the complexity of interlinked social, technological and ecological development relating to the contingency of human action in a context of long-term systems change, in which nonlinear, interdependent and pervasive process, revising policy tools and recalibrating goals. Incorporating multi-methodological evaluations into adaptive co-management process is essential: evaluations identify context complexity, but the adaptive approach permits to adapt the same complexity to the change through mutual learning on the individual, community, institutional and policy levels, seeking to overcome the substantial gap between theory and practice.

The proposed approach is based on complex adaptive system thinking, focusing on “adapting” to different kinds of feedback and drawing attention to process as well as tangible and intangible outcomes, exploring a broader decision context that can tailor the decision situation to complex value-focused thinking.

The attention is shifted from the result of the decision process to the decision-making process itself, in order to address correctly rapid social and institutional change and ensure the legitimization of multiple viewpoint, to constantly “adapt” the situated strategy on situated values.

Within an integrated perspective, adaptive evaluation underpins dialogue between knowledge and values, translating such dialogue into the selection of strategic goals and

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actions; it enables the identification of key values and related meanings, the exploration of opportunity and the creation of alternatives. For the Valle Vitulanese a context-aware strategy has been elaborated that leverages the specificity of each municipality to enable local networks creating a dialogue between recovery and development of tangible and intangible resources. The first territorial action develops in the old center of Tocco Caudio, one of the eight municipalities of the Valle, triggering a process of incremental revitalization, able to strengthen the system of values and relationships, materials and intangible, that characterize the context of regional area of which Tocco Caudio is an integral part.

Session: Energy planning for cities and regions

Authors: Antonia M. A. Chiesa¹, Antonella Contin²

Title: The landscape Potential. Investigating the Role of Landscape in Tehran's Metropolitan Development

Keywords: metropolitan architecture, landscape urbanism, green/grey infrastructure, urban sustainability

Abstract: An ecological stance emerges from Tehran's recent and uncontrolled metropolitan development: sprawling North, it invades at an elevated pace mountain landscape threatening its natural resources and compromising an historical hybrid urban pattern traditionally including enclosed gardens, underlying water systems, environment-sensitive architecture. Unfortunately, latest implementation of parks and public green space meant limited contribution to the restoration of an ecological network fragmented by unplanned growth of freestanding high-rise buildings (Bahrami et al., 2012). This investigative paper reflects on the enhancement of landscape potential as part of a research, coordinated by Politecnico di Milano and Tehran Azad University TCB, aimed to the definition of design-based strategies for the endorsement of Tehran's territorial attractiveness. As a matter of fact, the beyond-boundary enlargement of city fabric requires a realignment of urban growth to the territorial geography upon which it proliferates; such urbanization of "nature" overcomes the traditional urban/rural opposition and produces highly hybridized spaces, which may be interpreted through the concept of landscape (Waldheim, 2006, 2010), whose role in the metropolis has to be reframed as triggering element for urban renovation, highlighting its remedial role (Frampton, 1995) in mitigating the critical effects of unsustainable activities. Rather than relying on a static state, the city is informed by fluxes of both natural and cultural infrastructures, information and energetic chains on a distinct topography. The field of urban action is an exchange network system whose spatially elastic, multi-scalar dimensions may be investigated and mapped. On the one hand, the research faces with the need for an implementation in urban fluidity, intended as physical continuity of contemporary trajectories of people, goods and information through the metropolis; on the other hand it copes with the local sophisticated tradition in landscape design –from the Persian garden to the deployment of the Quonats system – emerging both as climate-specific technologies and as powerful iconic patrimony to be reinterpreted in a contemporary way. Integrating the 2006 vision of Tehran

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Plan, the research explores strategies of landscape urbanism with specific reference to the Kan's area: the re-evaluation of landscape as irreplaceable resource is defined through strategies of 1. interface, as design of hybrid urban-natural boundaries, 2. percolation, as intensification of ecological performance, 3. infiltration, or increase in site permeability for slow speed accessibility.

Session: Benefits, costs and opportunities of urban transition

Authors: Ujjwala Chourasia¹

Title: Revival of Traditional Cottage Industries as a Means to Mitigate Livelihood Vulnerability in Urban Areas – Case Study of Two Indian Cities

Keywords: Economic Activities, Livelihood Vulnerability, Cottage Industry, Urban Poor, India

Abstract: In India, most urban areas tend to depend on a limited number of dominant economic activities. Largely monopolistic industrial setup does not leave much gap for entrepreneurship from the part of the poor people, especially in urban areas. There are hardly any Government schemes, which actually encourage entrepreneurship or promote alternate asset creation among urban poor. The vulnerability of livelihoods is largely specific to the context of each city but the shocks and stresses to which people in cities are vulnerable to can be broadly grouped according to the sources of vulnerability as resulting from the social context of cities, the nature of the urban economy, the urban environment and the urban systems of governance.

This paper discusses the possibilities of rejuvenating traditional cottage industries as a means to mitigate the vulnerability of urban economy of Indian cities with the help of Case Studies of two cities in India both of which present us with different but vulnerable economic scenarios.

Korba, is an industrial city in Chhattisgarh State, India. The city is entirely dependent on the coal mines in and around it for its sustenance. The mines feed coal to the numerous power plants functioning there which directly and indirectly provide livelihood to the population of the city. The major issue that the city faces is the depletion of coal in the mines which could last at the most for the next 40 years. This renders the economy vulnerable and requires a shift in focus from the coal based economy.

Ujjain, in Madhya Pradesh State is one of the most holy cities for the Hindus in India and thus is a centre of religious tourism. Millions of devotees flock to this city annually to have a dip in the holy river Shipra and to visit the Mahakal temple dedicated to the Hindu god Shiva. The residents of the city are more or less entirely dependent on the revenue from the tourists for their survival. It is observed that since the arrival of tourists is not uniform throughout the year the city presents us with an economy vulnerable to tourist arrivals.

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Taking a clue from the fact that specific traditional cottage industries once thrived in both cities but are in a dying state at present due to neglect, this paper examines the possibility of building resilience of the urban poor to the vulnerable economies by reviving these cottage industries.

Session: Cooperation and demonstration projects

Authors: Carmelina Cosmi¹, Monica Salvia², Senatroy Di Leo³, Filomena Pietrapertosa⁴, Simona Loperte⁵

Title: *Interregional Cooperation as a Key Tool for the Achievement of Strategic Energy and Climate Targets: the Experience of the INTERREG IVC RENERGY and SEE RE-SEETies Projects*

Keywords: Interregional Cooperation, Sustainable Energy Policies, Resource Efficiency, Local Energy Planning, Stakeholder Engagement

Abstract: Interregional cooperation is fundamental to improve the effectiveness of local sustainable energy policies, as a response to overarching EU strategies and commitments. The RENERGY⁶ and RE-SEETies⁷ projects demonstrate the effectiveness of the transfer of knowledge among people characterized by different cultures and skills to support a real synergy among politicians, businesses and citizens. These projects were rooted on a close international cooperation between scientific institutions and local authorities to produce methods and tools aimed at supporting local authorities in creating a sustainable and resource efficient future and produced local implementation plans ready to be endorsed.

The RENERGY project focused on the transformation of urban communities from consumers to producers of energy, developing efficient energy policies at regional level in an inclusive, integrative approach and supporting the achievement of objectives of the Covenant of Mayors. Exchange of knowledge at local and interregional level was performed through “Energy Labs” and “Case Studies” ensuring a multi-level integration. The toolkit had the purpose to provide local authorities with a roadmap to develop their Local Implementation Plan (LIP). The RENERGY methodology was tested by 11 partners’ countries giving an innovative and positive approach to local energy policy whereas good practice exchanges,

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⁶ RENERGY project was funded by the INTERREG IVC programme (www.renergyproject.eu)

⁷ RE-SEETies project was funded by the South East Europe programme (<http://www.re-seeties.eu/>)

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Energy Labs and Case Studies contributed to the transfer of knowledge and to increase local communities awareness.

The RE-SEETies project was aimed at contributing to the resource efficiency challenge by investigating on energy consumption and waste production and disposal, examining the role of potential changes in consumption patterns and policy making alternatives to support the achievement of resource efficiency targets. A comprehensive approach to energy and waste flows at urban level was thus adopted in order to reduce the overall carbon footprint of cities. A step by step methodology was devised to approach jointly energy and waste issues whereas structured initiatives were promoted to support a change of behaviour and a tight cooperation between municipal officers working on different themes. The interest aroused within and beyond the involved communities as well as the important results achieved testifies the importance of a proactive engagement of local governments and communities on energy and climate themes as well as the necessity of adopting a long –term comprehensive approach to ensure a socially inclusive growth and a steady transition towards a low-carbon society.

Session: Benefits, costs and opportunities of urban transition

Authors: Chiara D'Alpaos¹, Michele Moretto²

Title: Do Smart Grids Increase Real Estate Market Values?

Keywords: Real Estate Market Values, Smart Grids, Investments under Uncertainty, Real Options

Abstract: Buildings energy efficiency is generally considered in terms of energy consumption, costs and GHG emissions reduction in line with the 2020 goals. It is commonly agreed that the greater the building energy efficiency, the greater the property market value. To increase energy efficiency, deep retrofitting was set in place and simultaneously photovoltaic power plants (PV) were installed, boosted through feed-in-tariffs that made them extremely attractive for both institutional and small private investors. Nonetheless Government incentives and regulations were not able to foster consumers to substantially change their energy consumption patterns. In this scenario overall cost-savings by PV-generation systems would only have a marginal impact on real estate market values, if the energy consumption pattern of the household does not match the most beneficial generation pattern and energy management is not properly performed. Aim of the paper is to investigate whether Smart Grids can increase market values due to higher production and consumption flexibility. Smart grids give de facto producers and consumers, the opportunity to be active in the market and strategically decide their optimal production/consumption pattern. In this paper we provide a model based on the real option theory to determine the value of this flexibility and the related market value increase. We model the homeowner decision to invest in a PV plant and connect to a Smart Grid. We determine the property potential market value increase due to the opportunity to perform active energy management given by smart grids and we compare this value increase to the PV plant value per se. To capture the value of managerial flexibility we implement a real option approach. The paper provides a theoretical framework to model the owner's decision to invest in a PV plant, to be integrated in a smart grid, and determines the real estate market value increase. The greater the flexibility the greater the market value. The novelty of the paper lies in the attempt to define energy efficiency also in terms of flexible energy management and its implications in the energy market.

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Session: Benefits, costs and opportunities of urban transition

Authors: Claudia De Stasio¹, Angelo Martino², Davide Fiorello³, Francesca Fermi⁴

Title: *On-line Tool for the Assessment of Sustainable Urban Transport Policies*

Keywords: On-line assessment tool, policy scenarios, policy assessment, sustainable urban transport, SUMP

Abstract: European cities, which are vital centres of economic activity, innovation and employment, face increasing challenges to their citizens' mobility. Urban transport systems are integral elements of the European transport system and are therefore of concern for the Common Transport Policy. Thus, the 2011 Transport White Paper calls for cities to implement a range of strategies to face these challenges - strategies include: land-use planning, pricing schemes, efficient public transport services, infrastructure for non-motorised modes and charging/refuelling of clean vehicles to reduce emissions – and encourage to develop Urban Mobility Plans (SUMPs) that bring all of these elements together.

Tools and guidance documents are key instruments for the development of these strategies in order to help city authorities understanding the range of possible actions and steps to successful implementation. This paper presents an overview of the web based policy support tool and of the urban transport policy roadmaps developed in the European Urban Roadmaps study, supported by DG Move and underpinned by a range of stakeholders' engagement activities.

The aim of the web-based tool is to support authorities of small and medium sized cities in Europe who may not have the resource to major policy assessment and modelling work. The tool provide the local transport policy maker with the ability to readily identify, develop, screen and assess different measures and policies scenarios, thereby enabling city authorities to quickly gather a sense of the scale of impacts that could be expected. It is adaptable to different city circumstances, covers all the transport/travel modes that are used in urban areas and provides quantitative outputs covering a range of different metrics, including costs and cost effectiveness, covering the time period until 2030.

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Being web based, the tool offers easy and wide spread access. Accompanied by guidelines to help users understand issues such as policy design, best practice and data gathering, it also allows the user to adjust policies and see the impacts in real-time so that quick shifting of policy options can be made.

The development of the tool is complemented by the preparation of different road maps, designed to provide realist examples of policy selections that could be implemented by a city to work towards the European Commission goals for sustainable urban transport until the year 2030. Different assumptions are considered on the wider policy environment and therefore on the effort that cities should make to complement the overall EU-wide and national strategies.

Session: Energy planning for cities and regions

Authors: Alice Denarie¹, Marco Calderoni², Matteo Muscherà³

Title: *Technical, Financial and Urban Potential for Italian Solar District Heating*

Keywords: solar energy, district heating, case studies, Trnsys, urban energy planning

Abstract: AIRU, the Italian association of district heating and the Department of Energy of Politecnico di Milano have tried evaluate the economic, technical and urban potential of solar district heating in Italy as an efficient and flexible system to spread the use of solar thermal energy in urban areas. This potential have been estimated with the analysis of five case studies of solar thermal integration in district heating networks in the north of Italy: three with a centralized solar plant in existing DH, one with distributed solar in an existing DH and finally one of new solar district heating network. These studies, realized in the framework of Solar District Heating plus, aim at verifying the technical and economic feasibility of this integration. The choice of the type of integration, centralized or distributed, and the size of the collector field have been decided together with the utilities depending on objective of the integration, available space, and budget. The choice of the collector surface has been strongly influenced by the actual incentive system (Conto Energia Termico), 1000 m² in all the three cases of centralized integration. Besides the more common economic and technical study, a critical analysis looking at the urban aspects of this technology is proposed in order to analyse local potentialities and barriers for this technology.

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Session: Cooperation and demonstration projects

Authors: Janini Dias¹, Ana Maria Sperandio², Denise Geribello³

Title: Studying and Building a Healthy a Private College Project

Keywords: healthy city, Sustainable, mobility, accessibility, urban health

Abstract: The discussions about the healthy city concept and its implementation have grown significantly over the past years. In this scenario, the *Faculdade Jaguariúna (FAJ)*, Brazil, developed a research group that aims to contribute with the development of healthy cities into State of São Paulo, The Project (Sustainable Mobility and Accessibility in Urban Healthy) MASSUr. The project focus on the mobility role in the development of the healthy city and it takes the college itself as a laboratory to data assessments and new solution's implementation. The results are then discussed within a network of cities that have the potential to become healthy cities.

Besides being an academic research the project considers that it is relevant to a college campus to be a health space. Through studies of came and go of the students and workers, considering the college destiny in 2014/2015. The main research line of the project is on mobility on campus. The campus, however, is not taken as an autonomous space; it is approached as a part of the city. So, the city dynamics, as transit flows and zoning, are taken into consideration when we analyze the campus.

This way, MASSUr Project works towards the development of a healthy university, and the replication of those principles in a larger scale.

The first results of this Project are about 50% students uses individual transport, less than 1% use bicycle and 45% uses buscharter transport like bus and vans in 2013/2014. Demonstrating that are necessities to reformulate the local politics.

These results are using to create a new Project named "AMOCampus" (Accessible and Mobile Campus) that predicts an accessible and mobility project of our campus.

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Session: Cooperation and demonstration projects

Authors: Argiro Dimoudi¹, Vassilios Stathis², Christos Pallas³

Title: Transformation of a Small Livestock, Rural Community into a Green, Nearly Zero CO₂ Emissions Settlement

Keywords: -

Abstract: The community of Eleonas, North Greece, is characterized by intense livestock and relatively mild rural economic activity. Residents of the community seek to form organic crops and livestock recycling largely agricultural and livestock residues. These processes are made with a not particularly environmentally friendly way. The community has a new target, upgrading of economic activities in the region through environmentally friendly activities.

The strategic vision is developed in hierarchical steps that aim to satisfy the requirements of rationality and environmental protection:

- primary goal is to reduce energy waste, air pollution and pollution of the rich water resources of the current irrational waste management,
- then to cover the reduced energy needs by producing every possible renewable energy from local sources, especially biomass, energy crops and sun
- and finally, another important goal is to create conditions that will favor the enhancement of entrepreneurship in the primary (alternative crops) and secondary (Milking and slaughterhouses in livestock park) sector in the community.

The aim of the project is the conversion of Eleonas community in a green community of nearly zero CO₂ emissions, and thus, demonstrate the capability of development through a different model that will support the decentralized infrastructures.

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Session: Cooperation and demonstration projects

Authors: Fabio Disconzi¹, Arturo Lorenzoni²

Title: ICT Tools to Foster Small and Medium Enterprises Collaboration in Energy Retrofitting Sector

Keywords: energy efficiency, business model, collaborative tools, SMEs development, local development

Abstract: Since decades the European Commission has turned the spotlights on energy efficiency in the building sector. While the technological domain has been investigated achieving interesting results, on the organizational and financial sides there is still a lot of room for new advancements.

Especially in certain countries, the construction sector has to face a lot of challenges. The highly fragmented markets, the cumbersome organizational models adopted by big enterprises on one hand and the lack of knowledge and skills of Small and Medium Enterprises (SMEs) on the other hand, the perpetual variability of supporting schemes and the plethora of regulation frameworks represent huge barriers in leveraging new ways to collaborate.

Focused on SMEs, NewBEE EU-project sheds a light on innovative methodologies to set-up new collaborative business models in the energy-retrofitting sector which may accelerate the transition towards more sustainable buildings and cities.

SMEs currently face two main problems: a) the availability of easy to access knowledge and b) the ineffectiveness of existing organizational and business models. To tackle these issues, NewBEE provides a comprehensive ICT platform to foster innovative methodologies facilitating the collaboration of actors of energy retrofitting chain enabling the adoption of the business models.

The paper briefly introduces the NewBEE project approach followed by the description of the core modules of the tools:

a. Prompt and accessible information about emerging technologies and business model are collected in the information repository.

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- b. The pre-assessment tool lets buildings' owners to roughly estimate the energy saving potentials of common renovation processes, receiving an order of magnitude of the investment's economics.
- c. The virtual breeding environment is the main module of the tool: it is where SMEs collaborate putting in place virtual collaborative networks to make a proposal.
- d. The financial simulator enables building owners, investors and SMEs to understand the effects of different financing schemes and the implications of energy costs variations on the profitability of the investment.
- e. The energy assessment module provides a professional tool to simulate the building performance before and after the refurbishment process.

The application of the NewBEE methodology has been tested in 4 real business cases: Spain, Slovenia, Germany and Finland. Recommendations raised during the demonstration phase are reported.

In a market traditional like the building one, NewBEE project shows how innovative ICT technologies may help SMEs to fine-tune their business model, creating opportunities to collaborate both in a virtual and real way.

Session: Energy planning for cities and regions

Authors: Bojan Đurin¹, Toni Kekez²

Title: Sustainable Energy and Water Use for Irrigation Demands

Keywords: energy, water, solar photovoltaic water pumping, irrigation, climate changes

Abstract: System approach and sustainable use of energy and water in all kinds of human activities is not required for financial reasons only. It is also a legal and community obligation. The paper deals with the application of Critical Period Method for irrigation system design. Irrigation system includes a Solar Photovoltaic (PV) generator and inverter, a pump station, a water reservoir and pipelines. PV energy is used as energy source for the pump station. Groundwater in combination with rainwater is used for irrigation water demands. This is in accordance with the world and European legislation, directives and strategies related to the negative impacts of climate changes and greenhouse gas emissions. Presented solution can be applied for the rural and urban locations, and also on the local and regional level.

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Session: Plenary

Topic: Governance for smart and sustainable growth

Author: Ekaterina Domorenok¹

Title: New governance tools for innovation and sustainable development in EU cities. An overview of the Structural Funds programming 2014-2020 in Italy

Keywords: place-based approach, urban governance, sustainable urban development, structural funds, European Union

Abstract: A place-based approach has been introduced by the new programming period of the EU Structural and Investment Funds 2014-2020 bringing about new policy tools for territorial development. In particular, two governance arrangements have been designed: Community Led Local Development (CLLD) and Integrated Territorial Investments (ITIs), to encourage an integrated use of the funds for the territorial development at national, regional and subregional level. These tools appear to be particularly relevant for the implementation of integrated actions for sustainable urban development that is among core priorities of the EU Territorial Agenda. Therefore, the relevant operational programmes shall indeed demonstrate that they support sustainable urban development through strategies setting out integrated actions tackling the economic, environmental, climate, demographic and social challenges affecting urban areas, and that urban authorities are at least responsible for tasks relating to the selection of operations.

This paper discusses the opportunities that the new governance tools offer for the improvement of implementation of policies for sustainable urban development and it provides an overview of how the Italian programming documents for the period 2014-2020 have adopted these tools in their operational strategies.

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Session: Plenary

Topic: Energy planning for cities and regions

Author: Peter Droege¹

Title: Intelligent and regenerative city regions (IRCRs) - a research, development and action mandate

Keywords: -

Abstract: Cities, regions and city regions undergo a renaissance in this globalised world, re-emerging as vital domains of collective life, sources of cultural identity, as planning territories and economic spaces – and as autonomous energy systems. City regions play a critical role in working towards to a carbon emissions and nuclear free future. While information and communication technologies (ICT) have emerged not so much, or not only, as predicted in the 1990s,, as constructed infrastructures, but also as virtual and opportunistic exostructures. In this new world of information, communication and energy technologies (ICET) resilient renewable energy systems can evolve, supporting community health and security – and producing substantial value added benefits. Indeed, in the struggle for renewable energy independence, the future belongs to renewable energy, sustainable local income generation and, urgently, regional carbon sequestration strategies.

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Session: Governance for smart and sustainable growth

Author: Hartmut Dumke¹

Title: Outlining Energy Governance: Actors, Steering Modes and Triggers – Shown on an Austrian Case Study

Keywords: Spatial Energy Planning, Energy Governance, actors and policy mapping

Abstract: “Spatial” energy planning is a highly complex matter. But who “does” it? One of the research modules in the Project ENUR (<http://enur.project.tuwien.ac.at/>) tried to answer that. The research scope were three Austrian cities, a small one, a middle sized one and the capitol of Austria, Vienna. The Governance analysis started with mapping the actors (see illustration below), then doing qualitative interviews on the constraints and success factors of the local energy policies and it closed with policy recommendations for the future. The main results (that will be shown and detailed in the full paper and the presentation) can be summed up as follows:

- The population size of the city and the amount of the administrative staff involved in the energy planning has no direct correlation on the implementation strength dynamic;
- Actors from the economic and the civil sector are (so far) clearly underrepresented or even inexistent in the energy planning processes;
- Different steering modes (Governance by Government, Governance with Government, Governance without Government) develop alongside different planning culture traditions, but are also dependent from the city size;
- Many of the energy goals cannot be solved within the City borders- the vertical links need an empowerment;
- Changing and improving the energy planning cooperation matrix needs different vectors: Raising the willingness to participate needs other change formats than raising the competences (such as budgets, expert knowledge, or staff and time resources) – any thematic goal needs a specific trigger to secure the “HOW TO”.

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Session: Plenary

Topic: Governance for smart and sustainable growth

Author: Pietro Elisei¹

Title: Consistent Decision-Making in Urban and Metropolitan Areas based on Participatory and Multi-actor Governance

Keywords: -

Abstract: European cities, especially in this period of fluctuating economic competitiveness and emergencies such as the present migrations of an intercontinental scale, are now confronted, more than ever before, with the necessity to adopt strategic planning tools and to develop the capacity to generate specialized urban policies promptly and effectively. Developing tools and policies capable of providing “real time” answers to often unpredictable, sudden yet far-reaching socio-economic and other urban-related problems is the key to ensuring the capability of the towns and cities in Europe to cope with such problems. It can be argued that this requirement is more evident for urban areas in transition economies, especially in South East Europe, where multi-level territorial governance mechanisms are relatively weak and fragmented. Former excessive governmental centralization and inexperience with the transversal integration of governance levels and key stakeholders are major reasons for this. However, in recent years, it has become evident that in order to survive and thrive, second and third-tier cities in particular need to turn a critical eye towards their planning methodology to improve their resilience to rapid change and enable them to take swift action to adapt to such new, very dynamic challenges. A rather sensitive yet extremely important aspect of this overall planning methodology is the need to adapt certain aspects of the governance culture and not only the governance system and procedures.

Many cities, especially small and medium sized ones, do not have the proper planning instruments to manage this epochal impact on social, economic cultural and urban networks and systems. Moreover, many urban and regional areas in South East Europe suffer from decline and the “shrinking towns” phenomenon. This is creating territorial imbalances affecting the urban, rural and civic fabric of such areas.

Strategic tools for towns and cities “in transition”, especially developed and applied at local level, have to provide operative, efficient and effective solutions for counteracting problems related to market labour, social inclusion, cultural activities and heritage, environmental and landscape protection and valorisation, use and design of public space and mobility. To provide those solutions, they need the instruments to promote specific place-based development

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based on effective participatory planning processes, capable of coordinating horizontal and vertical actors representing the urban and territorial governance entities involved. Currently the urban administrations are generally inadequately skilled or equipped to guarantee proper development strategies for their urban areas or to identify synergic relations with their surrounding rural areas.

Session: Benefit, costs and opportunities of urban transition

Authors: Emanuele Facchinetti¹, Sabine Sulzer²

Title: General business model patterns for Local Energy Management concepts

Keywords: Energy hub; Business models; Business model innovation; Distributed generation; Renewable Energy

Abstract: The transition towards a more sustainable global energy system, significantly relying on renewable energies and decentralized energy systems, requires a deep reorganization of the energy sector. The way how energy services are generated, delivered and traded is expected to be very different in the coming years. Business model innovation is recognized as a key driver for the successful implementation of the energy turnaround. This work contributes to this topic by introducing a heuristic methodology easing the identification of general business model patterns best suited for Local Energy Management concepts such as Energy Hubs. A conceptual framework characterizing the Energy Hub model solution space is developed. Three reference business model patterns providing orientation across the defined solution space are identified, analyzed and compared. Through a market review a number of successfully implemented innovative business models have been analyzed and allocated within the defined solution space. The outcomes of this work offer to potential Energy Hub stakeholders a starting point and guidelines for the business model innovation process, as well as insights for policy makers on challenges and opportunities related to Local Energy Management.

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Session: Benefits, costs and opportunities of urban transition

Authors: Lorenzo Facco¹, Chiara Farinea²

Title: World Cities Efforts Toward Sustainable Growth Comparison: the Chinese Way for Green Plan development

Keywords: -

Abstract: The proposed paper will illustrate the World City Environmental Target project, one of the several endeavors pursued through the Sino-Italian Cooperation Program for Environmental Protection (SICP).

The SICP program was launched in 2000 by the Italian Ministry for the Environment, Land and Sea (IMELS) and the Chinese Ministry of Environmental Protection (MEP). It was included among the “Partnership Initiatives” for sustainable development by the United Nations and its origin draws back to the United Nations Framework Convention on Climate Change (and the Kyoto Protocol).

The “World City Environmental Target” project aims to provide strategic consultancy and policy advices to Beijing Municipal Government (BMG) in the field of environmental protection in order to develop the Beijing Green Plan.

At global level, the biggest and most important cities have recently initiated a thorough commitment against climate change, having a key role in environmental protection and in the implementation of sustainable global policies. Many cities are taking the lead to enhance the environmental management strategies through the development of City Green Plans.

The City of Beijing has already implemented remarkable improvements of the urban environment towards the sustainability principles, paving the way to a wider city’s development strategy, aimed to build a “Green Beijing”. The analysis of the achievements of the World Cities having already implemented Green Plans will be fundamental in order to develop a very advanced plan for Beijing.

The project includes the following activities:

- Activity 1 – Analysis of the World City Environmental Master Plans and identification of the most successful environmental policies and guidelines;

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- Activity 2 – Characterization of the current environmental status of Beijing and development of a Benchmark Analysis with the selected World Cities;
- Activity 3 – Development of a Road Map for implementing a Long Term Strategy for the Environmental Management in Beijing.

Session: Energy planning for cities and regions

Author: Gabriela Fernandez¹

Title: Causal Links in Urban Metabolism: a Case Study in the Metropolitan City of Milan

Keywords: urban metabolism, material flow analysis, consumption, natural resources, policy

Abstract: The standard study of material systems in cities has recently become a critical component of sustainability research and policy. The increasing urbanization of human society combined with the intense material demand of modern economies has driven concerns of over-consumption. Among their functions, cities are an important nexus for the production, consumption and disposal of products. The concept of urban metabolism has historically been restricted to a descriptive role, answering the question. “What do the resources and material flows and transformations look like in a given year?” The research currently investigates the causal links in urban metabolism, reframing the tool as an explanatory one and asking the question, “What are the specific drivers of material and resource consumption in a city and how do they change over time? I attempt to quantify the reinforcing and balancing feedback signals between the behavior, functions, and dynamics within a city and the resources consumed and transformed by focusing on the Metropolitan City of Milan, Italy. This approach to urban metabolism is faithful to the metaphorical antecedent.

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Session: Governance for smart and sustainable growth

Authors: Caterina Gallizioli¹, Francesco Occhiuto²

Title: Between Rural and Urban: Villoresi Canal as Opportunity for New Strategies of Governance

Keywords: -

Abstract: Urban and peri-urban areas in the proximity of natural or artificial watercourses – rivers and canals – are destined to take on increasing importance in view of sustainable development of the city, helping to reduce the pollution rate, to improve the energy balance and to implement a unified design of the landscape. These areas now suffer negatively the influence of urban development because of the progressive reduction of vacant-urban open spaces, forests, or meant for agriculture.

In this context, the Channel Villoresi, plowing for 86 km the region of Lombardy, from west to east, from Ticino Adda, represents an extraordinary opportunity to promote contemporary valorization with a large hydraulic device as an element of landscape not only agricultural but also urban. For this reason, the Consorzio di Bonifica Est Ticino Villoresi (ETV), the entity that manages the channel and the water system in Milan signed a "Pact" in collaboration with various organizations both local and regional. From this pact stemmed the project "Green Multifunctional System V 'Arco Villoresi" to achieve, using the unifying element of the Villoresi Canal, shared activities and synergies that can enhance issues of common interest (such as the Regional Ecological Network – RER –), the representative elements of the landscape, the knowledge and use of protected areas. The V'Arco system therefore goes to specify in time as a detailed program of measures for the landscape renovation of the system of open spaces of North Milan, for a promotion of rural and urban territory with the aim of achieving of a careful management of existing resources as possible solution to problems ranging from local to general.

The project wants to stand as a real opportunity to a potentially new governance on the exploitation of the rural heritage and its inclusion in the Northern Territory of Milan increasingly urban.

In the last years, ETV has been currently developing enriching collaborations with municipalities, parks, provinces and the region aimed at preserving the environment and the landscape. At the same time the actuation and promotion of studies, research and experimentation regarding reclamation, irrigation and environmental preservation, were

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pursued by ETV, in order to transform this hydraulic infrastructure in a new one, able to requalify the territory and to create new public open spaces opened to the collectivity: an actual infrastructure for urban use.

Session: Governance for smart and sustainable growth

Authors: Chiara Garau¹, Ginevra Balletto², Luigi Mundula³

Title: *A critical reflection on Smart Governance in Italy: Definition and Challenges for a Sustainable Urban Regeneration*

Keywords: smart urban governance, governance, urban policies, Italy, smart cities

Abstract:

"Coming together is the beginning. Keeping together is progress. Working together is success"

Henry Ford (1863-1947)

The today's complexity of the city makes difficult to build general references to apply and to approach the paradigm of "smart cities", because an agreement between what may or may not be considered within a city, with its actual relationships, is not always easy to identify as a measurement for spatial analysis. As well as the urban context, associated with the idea of smartness - a synonym for sustainability, efficiency, inclusiveness, technology - must necessarily refer to a territory that goes beyond the city, because it affects the entire place-based system on which it gravitates. In other words, the urban dynamism produces a complex territorial geography, irreducible to traditional political, administrative and hierarchical partitions, where the local, regional, sub-national governments need to be integrated to the central or national level. In this current urban scenario - characterized by the pervasiveness of concepts such as smart cities, open data, flows and territorial aggregations - a good urban planning and an optimal city management to conserve and save resources can be pursued through close cooperation between businesses, universities and local authorities, trying to achieve a balance between tradition and innovation; between the centripetal forces of human interaction in the physical space and the centrifugal flow of data, increasingly evolved by the latest technologies. In relation to these assumptions, the aim of the work is to reflect on the role of the various political bodies to determine the best mechanisms of government and governance for the implementation of initiatives in the field of smartness. To this end, this paper will be organized into two main sections: the first will offer a deep literature analysis on theoretical frameworks about (1) the role of political local bodies, (2) the policies, and (3) its impacts on local communities in governing smart cities. The second will explore the promises

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of “smart cities” in Italian case studies and their stated rationale on addressing from conceptual to actual urban space, even though intelligent and strategic plans encounter messy politics, social systems, and divergent scales of urban governance. Disparities in urban governance scales and in its ideologies across cities have significant impact on the way that actors frame their work and priorities. Finally, conclusions will be exposed, with particular attention to the ways of programming urban networked systems, because it might enable and empower a strategic and transformative planning.

Session: Cooperation and demonstration projects

Authors: Giulia Garegnani¹, Gianluca Grilli², Pietro Zambelli³, Daniele Vettorato⁴

Title: Analysis of Renewable Energy Availability by Means of GIS GRASS Tools: the Case Study of the Alps

Keywords: GIS, renewable energy, Alps, energy potential maps

Abstract: One of the aims of the European directive 2009/28/EC is the increasing of renewable energy production in order to decrease the fossil fuel dependency. The Alpine region is a complex territory with a high energy potential due to the presence of several sources. On the other hand, the Alps are very important for the biodiversity, the landscape value and in general for their ecosystems. Decision makers have to understand the trade-off between renewable energy potential and ecosystem services in order to plan the use of soil and sources. Usually the spatial information about energy potential is missed or data are inhomogeneous and depend on specific study of each alpine country. The aim of this article is to have a clear understanding of the spatial distribution in the entire Alpine region related to hydro, solar and wind-power. We evaluate the theoretical potential with a transparent methodology starting from physical parameters describing the availability of the renewable source (i.e. wind velocity, irradiation, discharge etc.). The methodology can be reapplied in different contest from the alpine region. The energy potential maps are a good starting point to face the problems connected with energy supply and sustainability.

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Session: Smart and sustainable technologies

Authors: Puppala Harish¹, Shalini Kanuganti², Kumar Sarkar Ashoke³, Pratap Singh Ajit⁴

Title: Part To Whole Methodology for Rural Areas to Enhance Spatial Accessibility to Health Care Facilities Using GIS

Keywords: -

Abstract: In many of the developing countries Community Health Care units (CHC) are considered to be the referral units for primary health care. The location of CHC facilities plays a vital role in making the health care more accessible, especially in rural areas. In many of the research works, Maximum Covering Location Problem (MCLP) algorithm with ArcGIS as interface was used in planning the location of healthcare by considering the entire study area as a single unit without considering the population distribution within the study area, which leads to non-uniform distribution of health care units. In this study, to capture the population distribution over the space, Part to whole methodology is coined and is observed that outcome locations, by this approach are most efficient in serving maximum number of people. The impact of new locations, drawn with this methodology is projected by evaluating the present spatial accessibility levels and the change in spatial accessibility with the new locations. To quantify the spatial accessibility Enhanced Two Step Floating Catchment Area method is used in this study. As a case study, a team of 15 members has collected the preliminary data of health care units in Jhunjhunu district of Rajasthan. With the collected data, as attributes in the ArcGIS, map of Jhunjhunu district acquired from National Rural Roads Development Agency is digitized. The best locations that can serve maximum number of people are explored with the methodology coined. From the survey, it is noticed that the maximum acceptable distance, the people are willing to travel is 23 kilometers. It is observed that, maximum number of people would have served with the same infrastructure and is also noticed that the ease with which people are being served is improved. The existing Health care units are observed to be at inadmissible locations. Re-locating the existing CHC's, to cater the maximum number of people is not economically viable. Therefore, a feasible solution to enhance the spatial accessibility and the utilization levels is suggested in this study.

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Session: Energy planning for cities and regions

Authors: Christos Ioakimidis¹, Ali Bagheri², Sesil Koutra³

Title: The Application of Simplified Building Simulation for Predicting and Evaluating Energy Consumption in a District

Keywords: Net-Zero Energy District, Buildings Simulation, Lumped Capacitance Method, Energy Management

Abstract: Buildings consume and produce up to 40% of total energy demand and carbon emission. In European countries, 68% of received energy for heating and cooling, 14% for water heating, and 13% for electrical appliances and lighting. Energy performance is a key element to achieve the European objectives by 2020 and these motivate urban and energy engineers to path of increasing energy efficiency as much as possible. The problematic today lays towards the topic of 'Net Zero Energy Buildings (NZE)' and is arousing more and more interest in a worldwide scale.

Net-Zero Energy Buildings have been a common topic among engineers by means of renewable source of energies and passive strategies for cooling and heating. Developing this idea to design a net zero energy neighborhood or district (NZED) is even a further step for eliminating energy consumption in this sector and still remains a challenge. The objective of a NZED is not only to minimize the energy consumption of the different neighborhoods with passive design methods, but also to design buildings that balance energy requirements with active energy production techniques and renewable technologies.

The aim of this paper is a brief discussion about energy management in a district scale to the potential of a 'smart ground' by using energy simulating methods in buildings, which are powerful tools for predicting and analyzing buildings' thermal behavior and energy consumption. Among various simulating methods and tools, this paper will specifically concentrate on lumped capacitance method which can provide reliable results (comparing to commercial software like TRNSYS and Energy Plus) in a short calculating time as it has a very high calculation pace and it can be used for determining energy consumption during a year or even a decay. The methodology will be extended to a neighborhood simulation using

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urbanization strategies on the basis of contextualization, morphology, typology, accessibility and other parameters through a systemic and holistic approach.

Extending the presented model for a district, different obstacles in this path will be introduced, proposed and analyzed. By predicting energy consumption in a district for a long period of time it will be possible to apply effective energy management policies to an area and leading the idea of NZED to a real objective.

Session: Smart and sustainable technologies

Authors: Christos Ioakimidis¹, Ali Bagheri², Luis Miguel Candanedo Ibarra³

Title: A Bike Sharing System used as a Real-Time Remote Monitoring Emissions Tool: Case Study at UMONS Campus, Belgium

Keywords: bike sharing, university, sensors, pollution, big data analysis

Abstract: The increasing deployment of electric vehicles is typically viewed as an approach that could help decarbonize the transportation sector, which is becoming increasingly linked not only to environmental problems, but also to social issues that contribute to the degradation of the quality of life. At the same time, the university members are often considered to be more receptive to alternative transportation services such as Bike sharing compared to the general population. Considering that academy offer fertile ground for the promotion of innovative actions as part of a smart district/community concept, this paper presents a work conducted at the University of Mons, Belgium, that intent to describe a new approach that would be able to combine the positive effects from the use of a Bike sharing system in a medium (and not only) population urban city of Belgium demonstrated initially in case of the local University Campuses along with the use of the Bikes as environmental mobile sensing units.

Bike sharing scheme is a transportation alternative system that has been rapidly growing in popularity across the world. Global concerns regarding climate change, environmental pollution, unstable fuel prices and energy security make bike sharing a mobility strategy that could assist in addressing many of these concerns. Many cities around the world have invested on bike sharing schemes in order to improve the sustainability of their transportation systems and in the same time reduce their dependency on the private motor vehicle. Bike sharing can provide public transportation services, especially short trip demands that are frequently inadequately served by the fixed route public transit.

To this end, this paper presents a preliminary work conducted at the University of Mons, Mons, Belgium where initially via the University Bike Sharing System analyzes the private

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bicycle mobility in the campus and collect data (i.e. using the existing GPS of the student's smartphones) that can be used to direct investments on infrastructure and mobility (particularly on bike lanes); then it collects real-time data and info about traffic, road conditions and air pollution of the different campuses (and thus that of the city itself) by the installation of the proposed device that has been created at UMONS on the bikes of the sharing service , while exploring the way these information could be integrate on existing public database or open platform, to support the local government planning in creating an integrated system for smart mobility.

Session: Governance for smart and sustainable growth

Authors: Ari Jussila¹, Markku Mikkola², Tapani Ryyänen³

Title: *Collaboration in Regional Energy Efficiency Development*

Keywords: regional energy, collaboration, energy efficiency, co-development, innovation

Abstract: Regional energy efficiency has become an increasingly popular topic in the discussion about sustainability and energy issues. Although energy production, renewable fuels and emissions have gained more attention in the mainstream media, saving energy has become equally important. Additionally, issues like sustainability and regional energy self-sufficiency are increasing their importance as a driver of change, alongside with the traditional energy price factor. Balancing the overall system has an important role in the total efficiency. Optimizing the system requires close collaboration of all partners producing, consuming or transmitting energy. Traditionally, different stakeholders within a region have managed and developed their energy use or production independently. Utilizing for example excess energy of other stakeholders in the region has been rather sporadic. From the system (i.e. region) perspective independent efficiency development in the sub-parts (e.g. individual companies) has its limitations and acknowledging this has directed attention to the opportunities of regional energy cooperation. This requires new kind of collaboration between the stakeholders from the identification of efficiency improvement opportunities to the potential joint investments. The purpose of the paper is to study these potential regional collaboration opportunities between the stakeholders, and the boundary conditions related to their implementation.

The research was carried out as a case study combined partly with participatory observation. The primary data collection methods included semi-structured stakeholder interviews in two case areas and a workshop. Both case areas are located in southern Finland near the metropolitan area. The first is a medium-sized municipality where energy-related stakeholders include also a few large energy-intensive industrial users and producers. The second, emphasizing inter-municipal cooperation, is an area covering three medium-sized municipalities that are about equal in population but differ in land area and industrial structure. One finding is that bilateral collaboration and development is already taking place, but broader cooperation is still somewhat modest. Further, the stakeholders are usually well

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aware of the benefits of broader collaboration and have already identified some potential forms of cooperation (like joint regional planning, an open district heating network and energy production/consumption timing). There are, however, still some barriers to implementation (for instance different interests, ownership structures, juridical issues and benefit/risk sharing models) that have to be overcome.

The paper provides new insights as well as conceptual approaches for promoting regional energy collaboration, which can be utilized especially by the actors and authorities who have a strong interest in developing energy efficiency in a regional context.

Session: Smart and sustainable technologies

Author: Erick Khamala¹

Title: Africa's Prudent Development Planning: The Indispensable Contribution of Space Technologies and Geo-ICTs in Urban and Rural Setups - Case Studies from Kenya

Keywords: Space Science and Technologies, Geo-ICT, Spatial Planning, Community Interventions, 3is Framework

Abstract: Recent advances in space science & technologies and Geo-ICTs are pushing usage to new frontiers - be it in the diversity of the applications; the level of precision & detail of the information gathered; or in the ability to integrate the use of the three fulcrums of space technology applications, namely; earth observation, communication and navigation as well as leveraging on the ever burgeoning space and opportunities continuously presented by information technologies.

Space technologies and Geo-ICTs are, undeniably, platforms that Africa has to fully embrace in its quest for prudent development planning, be it at local, sub-national, national and continental levels. This paper utilizes case studies from Kenya to highlight how geo-spatial technologies and information have been instrumental in supporting community level planning and development in urban and rural setups. The case studies illustrate how LocateIT Ltd is implementing its trade mark '3is Framework' that emphasizes the deliberate configuration of a continuum, spanning from Information to Initiatives and ultimately to Impacts, pillared on incorporation and employment of local youths; adoption of more friendly communication approaches for decision makers; and a clear illustration of societal benefits delivered through investments in these technologies.

The paper hopes to inspire Africa and its development partners & collaborators to embrace new paradigms that emerging knowledge and technologies continue to usher for development planning.

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Session: Governance for smart and sustainable growth

Author: Francesca Leccis¹

Title: Participatory Practices in London Urban Strategies: the Case of Bankside

Keywords: community participation, engagement, neighbourhood planning

Abstract: This paper analyses the Community's involvement in the planning process and in the regeneration programme of the area of Bankside, in the London Borough of Southwark. It is articulated into the five following parts: the introduction, the description of the Localism Act, the presentation of the process of definition of the Neighbourhood Plan of Bankside, the exposition of the experience of the regeneration programme of the area of Bankside and a final conclusion that includes recommendations for policy makers.

The Localism Act, passed in November 2011, shifts more decision making powers from central government into the hands of individuals, communities and councils that, thereby gaining new rights and more power. The act covers a wide range of issues related to local public services, with a specific focus on the general power of competence, community rights, neighbourhood planning and housing. Among these, neighbourhood planning establishes how communities can get more involved in planning for their areas. In particular, it focuses on creating plans and policies to guide new development and in some cases granting planning permission for certain types of development.

Before the approval of the law, when the Localism bill was first drafted, in November 2010, a series of pilot projects was announced by the Government. This constituted the occasion for local authorities to work with community groups to test and apply some principles of neighbourhood planning before the proposals became law. Among others, Southwark was selected as a "neighbourhood planning front runner authority" so that, the Council started collaborating with groups in Bankside and Bermondsey to prepare neighbourhood plans for their areas.

Moreover, residents of Bankside already experienced forms of participation when the regeneration programme of the area was launched with the opening of the Tate Modern Gallery. The promoters of the initiative engaged with the local community from day one, continuing the engagement for all the duration of the project and it continues today. They organised steering groups, consultations, activities and they encouraged people to use the

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Tate. As a result, it was very easy for them to get planning permission. Indeed, they spent so much time on community involvement that they did not face any formal opposition.

In conclusion, the paper shows the positive impact of community involvement in planning processes and provides recommendations for policy makers based on the successful practices of the two examples in the neighbourhood of Bankside.

Session: Smart and sustainable technologies

Authors: Hatem Mahmoud¹, Prasanna Divigalpitiya²

Title: Modeling Future Land Use and Land Cover Change in Asyut Region Using Markov Chain and Cellular Automata

Keywords: Remote sensing, Scenario modeling, Urban development, Egypt

Abstract: Asyut region in Upper Egypt is often considered as one of the most appealing regions for its importance as a medical, an educational and commercial center of Upper Egypt. As a result of those factors and regarding its location, which are surrounded by agriculture land, available lands decreased quickly. The government established a New Asyut city to absorb the urban growth outside the Nile Valley. However, the region importance and the increasing of population have led to a significant urban growth, which has led to increasing loss of agriculture lands within the Nile valley. The modeling of spatially dynamic change is important for innovative strategy for planning. The main aim of the study is evaluating the present urban development situation, extract the urban driving forces, and then investigate the future scenario that help the decision makers in redrawing their policies to realize a sustainable development in absorbing the urban sprawl outside the Nile Valley towards the new cities to save the agriculture areas. Satellite-derived Land Use Land Cover LULC maps of years 1990, 2003, and 2015 of the study area were processed. The explanatory driving forces were quantified and ordered using the binary logistic regression and the Analytical Hierarchy Process. And then the outputs were processed within a framework of the Markov-Cellular Automata, and a Multi Criteria Evaluation MCE to produce the suitability future model. The model was verified using ROC and Kappa statistics. The study concluded that diversified driving forces combinations exist during different periods. It found that the current urban development process is in critical stage where urban and rural areas will face unprecedented stress on agriculture areas by the next 15 years. The present policies can't deal with the future challenges regarding directing the urban development. However, the study suggests differentiated policies, based on investigated scenario, should be considered to guide reasonable urban expansion, thus it has important implications for urban planning and management in Egypt.

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Session: Energy planning for cities and regions

Author: Bardia Mashhoodi¹

Title: Reducing Household Energy Consumption in Rotterdam, an Urban Energy Planning Approach

Keywords: urban energy planning, household energy consumption, geographically weighted regression, reference-class forecasting, Rotterdam

Abstract: Improving the efficiency of Households' Energy Consumption (HEC), is one of the primary goals of the Implementation Strategies 2013 of the municipality of Rotterdam, the Netherlands. HEC in Rotterdam is sharply growing in the last years. Therefore, municipality of Rotterdam actively searches for the urban planning interventions, which revert the current trend. Previous empirical studies on HEC suggest significant association with variety of spatial indicators: demography (family type, age, nationality, unemployment, etc.); housing status (building age, tenure-type, energy-label, etc.) and, often not taken into account at all, urban morphology (rugosity, sinuosity, buildings' contiguity, sky view indicator, etc.). However, two shortcomings in the previous studies are eminent. Firstly, All previous studies in this field implicitly presumed that spatial indicators have a uniform effect on HEC in different locations of a given city and thus tried to unveil such everywhere-true effects. In other words, the effect of the spatial indicators on HEC is considered to be "spatial stationary" and the results demonstrate merely generic-impacts. Secondly, the outcome of the previous studies is limited to the results of the statistical models, and fail to deploy such results for a systematic and intelligible ex-ante planning support system tools for usage of non-scholar decision-makers, and to recommend location-specific urban plans. To tackle the shortcomings, the study area of the research is expanded to approximately 2500 urbanized (with more than 500 addresses per Km² according to CBS definition) neighborhoods (a Dutch institutional zones, so called as buurt) in Randstad region, 2012. Such expansion creates two opportunities. On one hand, the city of Rotterdam could be studied in its greater context. Consequently, the conventional statistical methods (for instance, linear regression model) is replaced with geographically weighted ones (in case of this research geographically weighted regression), free from the boundary-effect. As result, the coefficient of the spatial components (obtained from factor-analysis of about 60 spatial indicators) differs from one neighborhood to another. In other words, the location-specific impacts of the spatial indicator are pointed out. On the

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other hand, a reference-class forecasting model is established which relates every proposed urban plan for a given neighborhood in Rotterdam to the resemblance cases in Randstad. Ultimately, series of interventions specific to different parts of Rotterdam are proposed and validated. In addition, the Rotterdam Energy planning Support System (REPPS) is presented.

Session: Poster exhibition

Topic: Governance for smart and sustainable growth

Authors: Nicola Masotto¹, Giovanni Campeol², Sandra Carollo³

Title: Development Theories and Infrastructural Planning: the Belluno Province

Keywords: Environmental evaluation, Infrastructures, Deficit accessibility, Competitiveness, Population

Abstract: The English term “smart”, as expression of a “good” or intelligent know-how’s evolution, is entered fully in today’s language in accordance to a regional and urban planning.

It is a term that tends to decline the planning process of the city and the territory in a qualitative sense, as opposed to a planning only quantitative.

From the conference of Rio de Janeiro in 1992 the insiders have begun to use in the urban planning disciplines (but also in architecture) terminologies that somehow could be a better way to “do” transformations: we moved from the “ecological city” to “sustainable city” and finally to the “smart city”.

Each adjective represents a vision of the transformations: for example the eco-city was in accordance with more public green areas, sustainable city with attention to the preservation of the physical and chemical references (quality of air, water, etc.) and the smart city as attention to the creation of efficient technologies.

As a matter of fact these forms of transformations don’t have a real meaning since it is absolutely obvious that the city and the territory, as per disciplinary statute, must be transformed considering the human, biotic and abiotic components which mean to have an environmental approach.

Environmental as it came to be defined in the long scientific path (Odum, Leopold, McHarg, Stainer, Nebbia, etc.) that, since the ’30, appears in the ability to use dynamically and synchronically three stimulus that define the sustainable development: the economic, the social and the environmental (biotic and abiotic).

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Depending on the historical periods and on the geographic contexts the speed of use of the three stimuli may be different, but always with attention to the input among the same.

In this case study (the Belluno province) the environmental development (ecological, sustainable, intelligent) sees, in the infrastructural level, the base to reverse a phenomenon of socio-economic decadence of a territory, also considering a pervasive and aggressive competitive policy of the neighboring territories.

The conditions for an environmental development in the Belluno province appear on primary activation of social and economic stimulus (infrastructural in particular) in a medium-long term horizon. Obviously this priority in the use of these stimuli is accompanied by the ability to seize the opportunities provided by the ecological and landscape high-quality conditions available in the Belluno province.

Session: Governance for smart and sustainable growth

Author: Antje Matern¹

Title: Exploring Integrated Approaches in the Provision of Urban Infrastructure Services - Empirical insights from German Cities

Keywords: -

Abstract: The implementation of the EU liberalisation and unbundling policies have restructured technical infrastructure in German cities. Traditional tasks of public service provision have been unbundled and partially privatized—a development that has induced a fragmentation between and within individual domains. This trend of fragmentation and differentiation conflicts with requirements of environmental policies that call for integrated approaches to urban infrastructure development (e.g. with climate mitigation, resource efficiency, waste prevention as objectives overarching different domains).

Based on a comparative case study of four medium-sized cities, the paper asks how key stakeholders in the different domains of urban infrastructures address these new demands in urban environmental policy and which place-based strategies they develop to tackle the dilemma of decreasing public power and increasing demands for integrative planning. Based on a three-year research project funded by the German Research Foundation (DFG*) the paper focuses on cross-sectoral patterns and practices of public service provision. Beyond place-based strategies the case studies indicate general shortfalls in the coordination of cross-sectoral linkages and the promotion of innovations across domains. The paper thus critically reflects the fragmentations between these different domains of urban infrastructure and expounds the potentials and constraints of inter-sectoral coordination and integrated infrastructure planning.

**DFG -Project undertaken by TU Darmstadt, chair for spatial and infrastructure planning: Antje Matern, Jochen Monstadt, Martin Schmidt*

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Session: Plenary

Topic: Benefits, costs and opportunities of urban transition

Author: Ezio Micelli¹

Title: Recycling the City

Keywords: -

Abstract: The long phase of economic stagnation of our Country – a feature we share with several other low growth economies – has important effects on how we conceive and promote the development and the regeneration of the city.

While it is theoretically possible to imagine the return of the economic conditions of the early years of the century with values and volumes in constant growth, it is more interesting to recognize the structural social and economic changes occurred and the necessity of a major shift in order to keep together, into a new perspective, profitability and sustainability, consensus and development.

The arguments I will propose are the following ones. First, it is important to outline the New Normal of the Italian cities, with low – or absent – economic growth and with profound differences among cities and regions. Second, I point out how focusing on the existing real estate stock allows an interesting convergence between economy and ecology. Afterwards, it is possible to outline a geography of the re-cycling process. One last issue relates to aesthetics and technology in the recycle development process.

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Session: Governance for smart and sustainable growth

Authors: Luca Mora¹, Roberto Bolici²

Title: *How to Become a Smart City: Learning from Amsterdam*

Keywords: smart city, roadmap, development process, Amsterdam, policy innovation

Abstract: Smart cities are urban areas in which information and communication technologies are used to solve the different problems that limit their sustainable development in social, economic and/or environmental terms. During recent years, the transformation of ordinary urban environments in smart cities has become an important strategic priority for a growing number of municipal administrations around the world, which have decided to achieve this aim by launching specific strategies characterized by different approaches.

As a result, smart cities have become an expanding phenomenon in the real world and, at the same time, a new but confuse research territory which has been growing sharply since 2010. Unfortunately, despite an increasing interest and the continuous production of scientific publications, the available knowledge concerning the possible ways in which the development of smart city strategies can be faced is very limited. By reviewing the literature produced to date, it is quite evident a lack of clarity and common procedures based on empirical evidence that can be used to guide the different actors involved in the construction and management of these strategies towards successful results.

The study documented in this paper has been carried out in an attempt to reduce this knowledge gap. Specifically, using descriptive case study research and focusing the attention on large European cities, the successful strategy proposed by the City of Amsterdam has been analyzed in-depth and a step-by-step roadmap in which all the phases and activities considered in this successful case has been defined and illustrated in detail. This roadmap can be considered an important step towards establishing a set of common procedures for developing smart city strategies in this type of urban areas, because it provides useful knowledge to consider in other similar initiatives and a possible conceptual framework for supporting comparative research and theory building.

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Session: Cooperation and demonstration projects

Authors: Naomi Morishita¹, Michael Heidenreich²

Title: EU-GUGLE: A Sustainable Renovation Pilot Project for Smarter Cities

Keywords: smart city, renovation, city district renewal, nearly zero-energy, renewables

Abstract: The European building stock is mature, and expanding cities need inclusive innovative renovation solutions for all citizens while intensifying city densification. EU-GUGLE stands for “European cities serving as Green Urban Gate towards Leadership in sustainable Energy”. The project aims to reduce primary energy consumption by 40% to 80% and increase renewable energy use by 25% through nearly-zero energy building renovation models for initiating large-scale, Europe-wide replication in cities and communities. 226,000 m² of residential and public buildings are being refurbished by implementing a balanced mix of technical, socio-economic and financial solutions adapted to local needs. Six EU partner cities are each revitalizing an urban district: Aachen, Bratislava, Milan, Sestao, Tampere and Vienna. The comprehensive integrated approach used in EU-GUGLE is in line with the European Smart City initiative, and each participating city has created nearly zero-energy Smart City master plan based upon lowest energy thermal renovations coupled with innovative renewable energy services incorporating every aspect of smart district life. All stages of the planning, construction and post-occupancy phases of the large-scale district renewals are being documented, monitored and evaluated to create sustainable district renovation methodologies for “smart renovations for smart cities” to meet the objectives of the European Commission’s Smart Cities and Communities Initiative for reducing 40% of greenhouse gas emissions within the European Union by 2020. Early 20th century buildings and large postwar housing developments from the 50’s to the 80’s have been targeted as the building typologies for renewal. Often the tenants and homeowners are marginalized social groups such as low-income families, immigrants and seniors. The integrated design process involves many stakeholders with decisions being made jointly by housing corporations, tenants, designers, and civil servants. Preliminary results among the participating cities have shown how the site-specific concepts and integration strategies may be deployed using an interdisciplinary approach and with an innovative and effective mix of tactics involving a close cooperation between social and communal authorities towards satisfying most building users’ needs. The project results are the basis for comprehensive “smart renovation strategies” to be easily

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transposable to other municipalities across the European Union. After successful implementation and testing of the renewal strategies during the realization phase of EU-GUGLE, the methodology will be applied to districts in two other partner cities.

Session: Governance for smart and sustainable growth

Authors: Farnaz Mosannenzadeh¹, Simon Pezzutto², Daniele Vettorato³

Title: *Barriers to Implementation of Smart Energy Cities in Europe*

Keywords: smart energy cities, CONCERTO, barrier, project implementation

Abstract: Global energy challenges and climate change have urged governments to optimize urban energy systems. European Commission supports this optimization through funding “smart cities and communities” projects under Seventh Framework Programme as well as Horizon 2020. This has led to emerging smart energy city projects in European countries, which not only seek to achieve European Commission energy targets but also aim to improve quality of life for citizens. However, implementation of smart energy projects is hindered due to different economic, legal, policy, administrative, technical, and social barriers. To tackle these barriers, it is necessary to understand them in a comprehensive way. Thus, this paper aims to improve the understanding of barriers to implementation of smart energy cities. We first identify barriers that affect implementation of smart energy projects; afterwards, we suggest a framework for further analysis of barriers. We develop the research through an empirical approach. We investigate all 23 smart energy projects that are already implemented within CONCERTO initiative, which is a European commission FP6 and FP7 initiative that started in 2005. We apply both quantitative and qualitative methods including literature and desk review, semi-structured pre-established questionnaire, interview, and statistical analysis. The research results in (i) a list of barriers that hinder smart energy projects with their level of impact and (ii) an analytical framework for further analysis of barriers. The results help decision makers to better understand implementation process of smart energy cities in order to develop proper policy interventions.

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Session: Plenary

Topic: Benefits, costs and opportunities of urban transition

Author: Nora Mzavanadze¹

Title: COMBI project: Calculating and Operationalising the Multiple Benefits of Energy Efficiency in Europe

Keywords: climate change mitigation, energy efficiency, sustainability, co-benefits, public policy

Abstract: Climate stabilization goals have mostly been viewed from the point of view of their gigantic and unaffordable cost to take for the benefit of distant future generations. The discourse is changing in recognition of multiple benefits that occur when implementing climate change mitigation policies. Implemented energy efficiency measures have multiple synergistic effects on the economy, society and the environment. Therefore, energy efficiency policies are an essential element of transformative urban and regional planning efforts towards new energy futures and a low-carbon economy. They can also help to achieve multiple public policy objectives. So far the evidence of energy efficiency related co-benefits has been scattered, but in the recent years it has been systematically reviewed and collected. No coherent methodologies exist to account for all cross sectoral co-benefits. “COMBI - Calculating and Operationalising the Multiple Benefits of Energy Efficiency in Europe” is a Horizon 2020 sponsored research project that aims to bring into the light the multiple benefits of energy efficiency in the EU-28 and refine the methodologies for their quantification and monetization.

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Session: Governance for smart and sustainable growth

Author: Giorgia Nesti¹

Title: Urban Living Labs: A New Tool for Co-production?

Keywords: Living Labs, co-production, implementation, PPPP, smart cities

Abstract: The economic crisis affecting the European Union has re-launched the debate on co-production, i.e. the participation of citizens in the provision of public services. Indeed, this policy tool is considered a practical solution both to constraints on public financing and to complex problems, such as environmental pollutions, ageing, and unemployment. Through user engagement, in fact, services would be less expensive and better tailored to citizens' needs.

In the current debate, a relevant place is assigned to the Living Lab, a real-life test and experimentation environment where users and producers co-create innovative products and services through an ICT-based collaboration. Living Labs witnessed an impressive spread across Europe, becoming a central part of the 'smart city strategy' adopted by various municipalities such as Amsterdam, Barcelona, Helsinki or Turin. Citizens' creativity, in fact, is an integral part of the smart cities governance and the 'laboratory dimension' perfectly fits with this new urban approach. Namely, the transformation of the city into a living lab is aimed at supporting the process of policy innovation at the municipal level through local empowerment and the promotion of partnership with enterprises and citizens. In this respect, Living Labs are viewed as new form of co-production since they foster the creation of the so-called PPPP - public, private and people partnership.

But can we really consider Living Labs as a new co-production policy tool? Drawing on some European experiences and on the preliminary findings of an ongoing research project on the governance and policy style of some European smart cities, the paper is aimed at investigating whether Living Labs can be really defined as a innovative way to co-produce public service at the local level and at identifying main implementation challenges related to such an approach.

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Session: Cooperation and demonstration projects

Authors: Gilles Novarina ¹, Natacha Seigneuret ²

Title: Building a smart city. Technological Innovation and Sustainable Planning in Grenoble

Keywords: -

Abstract: With smart cities, we observed an urban transformation with two major directions: the sober city or frugal city, with a prior development of technological innovations to save energy; the city of citizens or inclusive city, with active participation of citizens, thanks to new information and communication technologies to establish a democratic debate.

In Grenoble, we noticed that these two orientations have developed successively: first, with the era of urban sustainability with technological innovations, then with the era of austerity with social and local actions. Two main projects illustrate such a strategy: the EcoQuartier de Bonne and the EcoCité. In the first case, the strategy of sustainable urban development passed by several initiatives and programs, such as Charte d'écologie urbaine, Energy planning, with Plan Climat Energie Territorial and also, with European programs, such as CONCERTO. In the second one the project is based on three interrelated components: new mobility, integrated urban block, and cooperative energy management with smart-grids. Focused upon technological innovation, the EcoCité project aspires to implement the third industrial revolution.

Observations and assessments, linked to research programs for minister of ecology and French Council of Energy, place emphasis upon segmentation of urban issues and overvaluation of technology solutions. In the EcoCité project, technological innovation was presented as the solution to the economic, environmental and social problems. This justifies that in the implementation of the project, 90% of the actions are devoted to technological developments (global mobility offer, innovative buildings and cooperative power management), while the remaining 10% of the actions have a social purpose (nature city and inclusive city).

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Session: Energy planning for cities and regions

Authors: Roberta Perneti¹, Dagmar Exner², Valentina D'Alonzo³, Giulia Paoletti⁴, Ramon Pascual⁵

Title: *Building Stock Analysis for the Definition of Retrofitting Scenario at Urban Scale*

Keywords: building stock analysis, renovation scenarios at large scale level, energy strategies

Abstract: In the past recent years, in order to reach the EU-target of reducing the GHG emissions to 20% before 2020, several actions have been started at different scale. In particular, at urban and regional level, the Covenant of Majors proposed in 2010 the Sustainable Energy Action Plan (SEAP) as a tool to promote energy-saving policies and measures to reduced GHG emissions by end users.

Given that buildings account for the 40% of the EU-energy consumption, they represent a strategic sector to be addressed in a SEAP, which can also promote specific measures to foster the building renovation process at urban level.

Nevertheless, in order to estimate reliable energy consumption of the building stock, to define reliable energy saving potential and performance targets, and to determine technology robust retrofitting actions, detailed data as well as consistent and replicable methodological approach are needed.

We developed the typology approach for the building stock analysis (i.e. Tabula), which is based on the classification of the constructions in reference typologies according to the architectural features and the construction period. These typologies compose the matrix, representing the whole building stock of a territory. Then, it is possible to estimate the consumption at urban level, associating to each real building the energy performance calculated for the relative reference typology.

Starting from the analysis of building stock, we developed refurbishment strategies with different level of interventions (base, standard and advanced) for the representative building typologies. Accordingly, we foresaw several energy-saving scenarios considering different

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refurbishment rates and levels of intervention for the building typologies and we identified the most cost-effective renovation strategy at whole building stock level.

The paper presents the enhanced typology approach we adopted for two preparatory studies to develop an integrated energy strategy at inter-municipal level: the Rotaliana-Königsberg Valley Community and the Passiria Valley. The two case studies present different sources of available information for the analysed building stock, thus different strategies for the data collection and approaches for the definition of the typologies have been applied.

The building stock analysis allow to identify the most energy-consuming typologies define effective refurbishment strategies, and it represents a strategic support system for a Public Authority to define policies and incentives for building refurbishment.

Session: Cooperation and demonstration projects

Author: Håkan Perslow¹

Title: the Smart City Approach to Urban Transformation: the Case of SINFONIA

Keywords: Smart Cities, Energy efficiency, urban transition

Abstract: The concept of Smart Cities is highlighted as a key strategy towards the transition of urban areas into sustainable, resilient and prosperous cities.

In a European context, the concept of Smart Cities has evolved over the last years. Today the European Union bases its Smart Cities work on the definition made in the Strategic Implementation Plan by the EIP on Smart Cities and Communities. The SIP identifies three thematic areas; sustainable Urban Mobility, Sustainable Districts & Built Environment and Integrated Infrastructures & Processes to be key areas for transforming cities into smart cities. The plan also identifies 8 horizontal “enabling themes”, that are required in order to fully realise the potential of the first three areas.

SINFONIA was created before the SIP was adopted and does not encompass all the aspects of the SIP plan. Yet, the project can be seen as a very good example of large-scale implementation of Smart City concepts. The presentation will describe the project and how it relates to the ambitions of Smart Cities today, including lessons learnt so far and an outlook to the future of the project.

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Session: Cooperation and demonstration projects

Authors: Simon Pezzutto¹, Farnaz Mosannenzadeh², Gianluca Grilli³, Wolfram Sparber⁴

Title: *European Union Research and Development Funding on Smart Cities and their Impact on Climate and Energy Goals*

Keywords: European cities, primary energy savings, research and development funding, smart cities

Abstract: The scope of this paper is to examine the European Union support in terms of research and development funding on the topic of Smart cities. A detailed literature review, based on a project-by-project investigation, and data analysis process identified this expenditures since the research on this topic was first funded. The portion of the Sixth and Seventh framework programmes funding dedicated to Smart cities is only 3% of the total energy spending. The low funding for the investigated field fails to capitalize on the high savings potential represented by the urban primary energy use in Europe. Restructuring the research and development funding distribution for energy could better capture the potential primary energy savings of the European urban sector and contribute to achieving the European Union's climate and energy goals for 2020, 2030 and 2050.

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Session: Poster exhibition

Topic: Smart and sustainable technologies

Authors: Filomena Pietrapertosa¹, Roberta Chiarini², Paola Clerici Maestosi², Carmelina Cosmi³, Monica Salvia³

Title: SMARTera: a New Approach for Smart Participation Through Social Urban Networks

Keywords: Social Urban Network, Smart Participation, Smart Basilicata, Knowledge Management, Intellectual Assets

Abstract: Conscious citizen engagement is widely recognized as a key element in the Smart City paradigm. In this framework ICT-based solutions can promote citizens awareness, their active involvement as well as the support from policy makers and stakeholders in the definition of sustainable urban development paths. The “Smart Basilicata” research and innovation project⁴ aims at contributing to these themes and fosters the transformation of the Basilicata Region (Southern Italy) into a diffuse smart community by implementing smart actions in quite a lot of relevant sectors (Natural Resources, Energy, Urban Mobility, Culture resources and Tourism, Community Participation). To this end, considering the context of the task “Information technologies for community involvement” a customized Social Urban Network (SUN SMARTera) has been implemented for the City of Matera, Awarded European Capital of Culture 2019. This tool is based on a multilayer structure that produces integrated information and valorizes all knowledge assets, encouraging a new approach to smart participation and allowing to an easily incorporate individual contribution and share new ideas arising from the local community. In fact, SMARTera represents both as an aggregator of experience and incubator of all cultural processes that take place in the city being targeted to strengthen social cohesion through the enhancement of community identity (e.g. history and memory emersion, cultural heritage and intangible goods valorization) as well as creative capacity, acting as a facilitator for tourists and citizens.

To support the preliminary phases of conceiving, designing and implementing of the SUN contents and functions, a short survey was conducted to collect deep needs, requirements

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⁴An Italian project funded by the Ministry of Education, Universities and Research and the Basilicata Region

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and wishes of individuals. To this issue, direct interviews of citizens, stakeholders and tourists were carried out by a multidisciplinary staff. The innovative and integrative methodology adopted for the survey, based on an argumentative and participative approach, aimed at overcoming the limit of traditional surveys and socio-anthropology reportages, experimenting a multitasking approach that can enhance individual freedom, capacities and possibilities. The interviews, besides providing the basic knowledge and information for the development of SMARTera, allowed an in-depth analysis of the local community to support and start effectively its transition towards a smart community. This survey has represented a new possible inquiry model and a first step of any citizen sensor possible project.

Session: Energy planning for cities and regions

Author: Alberto Quintanilla¹

Title: Advanced Grid 2.0 Initiatives and the Introduction of Distributed Energy Resources. Discussion of Pricing Proposals

Keywords: Energy, DER, Distribution, Grid, Pricing

Abstract: Integration of alternative, renewable energy sources is mostly happening at the distribution level (Distributed Energy Resources, DER). The paper first analyzes why this is economically pertinent in terms of different power technologies LCOE. But these energy sources bring other implications for the mode of operation and the business models of all involved actors.

Several administrations in the United States envision and try to lead the shift to towards this “Grid 2.0”. Three main initiatives are discussed:

- New York’s “Reforming the Energy Vision” and the creation of a Distribution System Platform
- California’s Distributed Energy Resource Providers and Distributed Resource Plans
- Texas’ utility DER integration plans at three different levels

Challenges and opportunities derived from these initiatives are displayed. The focus is pricing: current practices related to DER pricing, such as feed-in tariffs or net metering are explained and their main issues identified. Then, the desired features of more advanced pricing models glimpsed in the US initiatives are analyzed.

We use the Texas’ model to illustrate how applying pricing based on real-time locational margin to pay DERs could work, and the benefits it would bring for common users, DER owners and aggregators and the utilities. In particular, how it tackles the problem of grid defection and how it might help save or delay investments in infrastructures.

The US initiatives bring to the table much more advanced ideas to benefit consumers and the society. Some of them are briefly discussed and new lines of research are sketched.

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Session: Smart and sustainable technologies

Author: Bakulesh Rupani¹

Title: Smart Cities and Sustainable Planning

Keywords: -

Abstract: Smart Cities – basically we need to deal with Sustainable Development/ Sustainable Planning. The cities are the machines of development, considered first to achieve the Sustainable Development. In City Planning, we are primarily dealing with physical development i.e. built environment for living community- to have development which is suitable for contemporary life style without snatching opportunities of future generation - to achieve sustainable development.

Effective management of city & local governance make city more competitive, more efficient and more attractive to promote Sustainable Development & are the main parameters of Smart Cities.

Any local Government is the key for Sustainable Planning which involves balanced development of society, economy and environment to fulfil the needs of the city by providing infrastructure, governance & civic amenities. A Sustainable Planning involves various stakeholders like people, technocrats, administrators and implementing staff of local body & politicians on one hand and long term policy & adequate fund on other hand.

In India, particularly in Gujarat we have good planning tool as Town Planning Scheme. It is a Structure Plan of approximate unit area of 1 sq km along with a set of bye laws applicable to that particular area. It is to be developed with physical & social infrastructure like roads, water supply, sewer, open space, parks, school, play ground, public transportation etc. accessible to each plot due to close proximity of the services. It is a self sustaining - self financed tool of planning.

My paper will present how town planning scheme is the unique and effective way of addressing sustainability of a city. Components of the sustainable planning were first identified followed by due understanding of current delivery mechanism of land development and ultimately established efficacy of TP scheme in achieving sustainable development of the city - Smart city.

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Session: Smart and sustainable technologies

Authors: Fani Samara¹, Stergios Tampekis², Stavros Sakellariou³, Olga Christopoulou⁴

Title: *The Evolution and Prediction of Land Uses for the Island of Skiathos, Greece*

Keywords: GIS, statistics, land uses, cellular automata model, indicators

Abstract: The island of Skiathos occupies a total area of 50 sq. Km, accounting for 1.6% of the area of the prefecture of Magnesia and 0.28% of the Region of Thessaly, Greece. The land is hilly and is occupied by farmland, meadows, woodlands, on land covered by water and land occupied by settlements and roads. Also, a large part occupied by burnt areas resulted from the fire of 2007. The aim of this paper is to present the progress of the existing land uses at the Island of Skiathos in the last decades. With the contribution of Geographic Information Systems (GIS) and orthophotomaps, the spatial planning of the land uses can be evaluated for all these years and the total area can also be calculated. Then with the model of Cellular Automata (CA) a provision of land uses for the year 2020 can be made. Our results are important for understanding the impacts of land uses on ecosystems in the frame of sustainable development. In the past, there has been no other research about the land uses of Skiathos Island and, also, this is the first digitization of the area. Finally, this provision is necessary for the rural planning and we will use these results in next paper for making the spatial planning for the Island of Skiathos.

Acknowledgements: This research has been co-financed by the European Union (European Social Fund – ESF) and Greek national funds through the Operational Program "Education and Lifelong Learning" of the National Strategic Reference Framework (NSRF) - Research Funding Program: Thales. Investing in knowledge society through the European Social Fund.

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Session: Cooperation and demonstration projects

Authors: Pier Carlo Sandei¹, Lily Riahi²

Title: *District Energy in Cities*

Keywords: district energy, renewable energy, energy efficiency

Abstract: Cities are responsible for over 70% of global energy use and 40-50% percent of greenhouse gas emissions worldwide. Heating and cooling energy consumption accounts for up to half of the total energy consumption in numerous cities. Taking into account these facts the District Energy in Cities initiative was launched with the objective of increasing energy efficiency and renewable energy use in cities through the use of District energy systems (DES), thus contributing to a concrete solution for sustainable energy.

District Energy in Cities follows a multi-stakeholder partnership model. The initiative is coordinated by UNEP and Danfoss, with ICLEI–Local Governments for Sustainability and UN-Habitat as lead partners. Other partners include representatives of the private sector, industry associations, international organizations, networks and several national and municipal Governments.

The initiative stems from a UNEP report that surveyed low-carbon cities worldwide in order to identify the key factors underlying their success in the fields of energy efficiency and renewable energy, as well as in reaching targets for zero (or low) greenhouse gas emissions. District energy systems emerged as a best practice approach, granting a cost-efficient and sustainable energy supply.

The benefits that cities, regions and countries have achieved from a transition to modern district energy systems are numerous. Some examples are reductions in GHG emissions, reductions in air pollution, improvements in energy efficiency, integration of renewable energy sources, boost in resilience and energy access.

The project is expected to have two phases. In the first phase technical assistance and capacity building will be provided to 1-2 cities in order to demonstrate, in a concrete way, how to develop and implement a replicable district energy approach. In the second phase tailored assistance will be provided to other targeted cities using the district energy modules from the

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UNEP publication "District Energy in Cities: Unlocking the Full Potential of Energy Efficiency and Renewable Energy".

Some of the envisioned activities will be to stimulate the uptake of district energy in cities around the world in order to contribute to climate change mitigation efforts, to develop integrated district energy policy and investment roadmaps, with the involvement of interested local governments, to address investment barriers through a policy-finance continuum bridging approach involving private sector partners and financing institutions. Numerous cities around the world have indicated their interest in joining the initiative. Belgrade and Banja Luka are two examples of the cities that will be targeted.

Session: Cooperation and demonstration projects

Authors: Burkhard Sanner¹, Philippe Dumas², Luca Angelino³

Title: Integration of Geothermal Systems in Smart Cities and Communities: Challenges and Solutions

Keywords: geothermal, smart cities, smart thermal grid, buildings, renewable energy

Abstract: Shallow and deep geothermal systems can be used in all parts of a city, at any scale, from individual single family houses to a whole city district as a part of a district heating/cooling network. Shallow geothermal installations intended to change the underground temperature periodically (e.g. seasonally) fall under the term Underground Thermal Energy Storage (UTES).

At a city zone level, there are several different aspects of geothermal energy use to be considered, dependent on the area and its use. As an example, a small visual footprint and a low noise level (neither chimneys nor fan-coolers) is a benefit of shallow geothermal systems in general, however it is more important in areas where preservation is a key issue, like an old town, than it is for a new commercial centre. Against this background, a poor regulatory framework and a fragmented urban planning can represent serious barriers for the deployment of geothermal technologies. Disseminating best practices and tools can be instrumental to remove existing barriers, notably in emerging markets.

In the longer term, the authors argue that a large-scale integration of renewable energy carriers such as geothermal energy will be facilitated by the development of smart thermal grids (both first and second generation), which will play a pivotal role in the future smart cities.

The first part of this paper will assess the main challenges for the integration of geothermal systems in cities in terms of regulations and energy planning. The second part will present a number of best practices from Troisdorf, in Germany, to Stockholm in Sweden. The third and last part will explore the main features of smart thermal grids, which should be:

- a) Flexible, to adapt to energy supply and demand, to adjust the temperature level, and to align the network development with urban planning;
- b) Intelligent, to enable the end-user to interact with the heating and cooling system;

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- c) Integrated, in the urban energy system from a special point of view (related to urban planning parameters and processes), and from an energy system point of view (e.g. optimising the interfaces to other urban networks such as electricity, sewage, waste, ICT, etc.).

This paper summarises some of the key results of the EU co-funded projects GeoDH (www.geodh.eu) and REGEOCITIES (www.regeocities.eu).

Session: Governance for smart and sustainable growth

Authors: Massimo Sargolini¹, Rosalba D’Onofrio², Luca Cetara³, Roberta Cocci Grifoni⁴

Title: Developing a Decision Support System for Quality of Landscape and Quality of Life in the Sustainable Adriatic City

Keywords: city, policy, quality of life, decision support system, optimization

Abstract:

The target of achieving a high level of quality of life (QOL) in the urban environment involves different disciplines and actors in the context of a city. QOL can be considered as a primary driver for policy making and the effectiveness of policy actions can be measured in terms of QOL by means of specific metrics, represented by a set of indicators. However the abundant scientific and practice-oriented production on the topic of QOL indicators – being also specifically tailored for the urban environment – requires to achieve a limited selection of them, based on specific site-based features. The research surveyed a wide group of indicators (developed in the fields of sustainability, QOL, livability, landscape, environment, etc.) from literature and national and international research projects before identifying a set being able to test landscape sustainability and urban QOL with specific reference to the topics of: a) safety; b) environment and health; c) perception and culture; d) efficiency. The collected indicators are to be used to address three policies of strategic importance for the Adriatic City, namely: 1) risk-reduction and energy efficiency; 2) improving environmental quality; 3) urban regeneration. All the indicators have been selected and analytically described as apt to respond to three main policy-challenges of central importance for the Adriatic City: 1) improving environmental quality and the landscape; 2) re-organisation and redefinition of urban functions; 3) energy and network efficiency. However, the actual application of these indicators requires the identification of specific *units* of the Adriatic City on which the observation and monitoring might take place. On the matter, for the ideal-type of the Adriatic City, the research identifies as *units* some “settlement patterns” and their three sub-categories of: a) urban morphologies and the relationship between built environment, open spaces and street network; b) density (built environment/open environment ratio) according

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to EC GMES Urban Atlas; c) building height according to regional technical database. For each analyzed *unit* a dynamic parametric optimization allows to recognize and collect the unobserved interlinkages among urban settlement patterns (*units*) and the respective possible drivers of QOL. Once these relationships have been defined, new policy advice and scenarios can be developed aimed at maximizing urban QOL by means of appropriate actions on different components of the urban structure of the Adriatic City. This approach is expected to provide a sound basis for the construction of a new generation of urban decision support systems (DSS).

Session: Smart and sustainable technologies

Authors: Susanne Schatzinger¹, Chyi Yng Rose Lim²

Title: *Taxi of the future: Big Data Analysis as Framework for Future Urban Fleets in Smart Cities*

Keywords: big data, Internet of Things, smart cities, sustainable mobility, taxi

Abstract: Smart city needs smart mobility – travels should be made as convenient as possible through sustainable urban transport solutions. Transportation systems in many parts of the world are facing unprecedented challenges in the 21st century as increasing population, urbanisation and motorisation growth continue to pressure these systems. Hence, cities need smart planning for a sustainable future and this calls for greater governance across all levels of transportation decision-making. Reimagining the role of information technologies and connectivity in today's cities enable us to realize the promise of smart mobility through the internet of things (IoT) which provides interlink of vast networks, devices and data that have thus far never been linked. As such, one of the key strategies for smart cities to overcome the urban mobility challenge is to spearhead the technological leap with big data. This can result in a ripple effect that benefits everyone – from improving public-private interactions, business operations, and efficiencies across the spectrum to quality of products and services as well as quality of life in general. Within the frame of smart cities, leveraging big data and IoT is considered to be a key enabler for transforming urban mobility system towards higher flexibility and better integration with existing transport modes as well as providing smart and sustainable mobility solutions such as sharing concepts, electric vehicles, autonomous driving. Using big data analysis as framework, this paper aims to highlight the taxi as an essential part of future urban fleets in smart cities for the shift towards sustainable mobility. Taxis solve a niche in the urban mobility system as they provide to the general public flexible, door-to-door services. Such semi-private character enables full area coverage to better support travel demands, thus the taxi sector has a significant function in the mobility system. However, compared to other transport modes, taxi is often overlooked and receives little attention from planners and policy makers. So what does taxi of the future look like? The project »Future Urban Taxi« rethinks the taxi from bottom up. It focuses on how taxi: 1. as a vehicle has to adapt to user demands and specific urban contexts; and 2. as a system can be integrated into the mobility system of a city in a more effective and sustainable way. This is one of the sub-

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projects under the »*Ambient Mobility Lab*« initiative which is supported with funding from the Ministry of Finance and Economics of the state Baden-Württemberg, Germany.

Session: Governance for smart and sustainable growth

Authors: Giovanni Sergi¹, Carlo Berio²

Title: An Effective Model of Sustainable Development Implemented in Liguria Region: the Case Study of Varese Ligure Municipality

Keywords: sustainable development, renewable energy, certified organic agriculture, certified organic livestock farming, wind farm

Abstract: The Municipality of Varese Ligure is located in the Province of La Spezia and in 2013 it had 2,091 inhabitants and a surface of 137,59 square km. Since the beginning of the 90s the Municipal Administration has implemented a policy for territorial and economic development, which has achieved positive results in terms of sustainable development. This policy has been awarded prizes at national and international level.

In 1994 the Municipal Administration outlined the new Master Plan (Piano Regolatore Generale) and decided to focus on the protection and development of meaningful environmental resources within its territory thus giving up development based on mass tourism and speculative building.

The Municipality has managed to stop depopulation and has become independent through renewable energy. Today 95% of its agricultural production is organic, the number of tourists has increased by 3 times, 140 jobs have been created, urban solid waste has been reduced.

The programme aiming at sustainable economic development has been based on organic certified agriculture and livestock farming, production of electricity without CO₂ emissions. Clean energy is produced by a wind farm equipped with four turbines, which guarantee 7GWh/year, by solar photovoltaic plants and a hydroelectric power plant built in 2005, which has produced 25,000 kWh. In the future electricity could be produced by biomass through the exploitation of the first most widespread woodland in Liguria region.

Varese Ligure has obtained the environmental certification ISO 14001 and has been awarded a prize in Berlin as “the most virtuous municipality in Europe”. It has been awarded the European Energy Award and WWF has rewarded the Municipality of Varese Ligure for implementing a model of sustainable development.

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Session: Benefits, costs and opportunities of urban transition

Authors: Somesh Sharma¹, Harry Geerlings²

Title: Sustainability Benefits Assessment based Transport Project Appraisal: Position Paper for a New Method of Transport Project Appraisal

Keywords: urban transport, project appraisal, cost-benefits, assessment methodologies and techniques

Abstract: The transport sector is closely integrated with different types of infrastructures as well as with the social, economic and environmental conditions of an area. Moreover, in an urbanizing world the need and demand for mobility is increasingly diverse and complex. Due to technological advancements and system innovations there are always various options in a proposal that compete for financing. Multi-sector embedding, multi-sector impacts of transport projects and limited financial resources raises complex challenges in decision making for the selection, prioritization and development of a project. Before a decision is taken for commissioning a transport project, it is vital to carry out an assessment of the impacts of a project on the development of an area and on the society as a whole. Project appraisal helps the project owners in procuring funding for the project. The appraisal also provides useful information that is helpful in creating public awareness about impacts of the project. Several methods are applied for the appraisal of transport projects. Most popular methods are project based such as environment impact assessment (EIA), cost benefit analysis (CBA), and multi-criteria analysis (MCA). Many of the appraisal methodologies in practice are project-based but for the appraisal of certain types of macro level transport projects strategic appraisal methods like Strategic Environmental Assessment (SEA) are also applied. However, each of these methods have their own limitations and shortcomings which has not improved over time.

Transport project appraisal is an important analytical process that can support in complex decision making. It helps in comparing options and prioritization between the competing choices. It can also influence the distribution of financial resources across various projects that are often executed from common sources of funding. Important decisions in the process of transport project development rely upon the estimates and forecasts produced in the project appraisal. Various studies have shown that forecasts using classical methods of appraisal inherently carry significant degrees of uncertainty which have serious implications on project

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financing. This position paper presents a new approach for transport project appraisal. The approach presented in the paper argues for an appraisal process grounded on a sustainability benefits assessment (SBA) of transport projects. Based on a thorough review of classical project appraisal methodologies this paper also discusses opportunities and challenges for sustainability benefits assessment (SBA) and its application in the process of transition to sustainable mobility

Session: Plenary
Topic: Cooperation and demonstration projects

Authors: Wolfram Sparber¹

Title: Heating and Cooling for Smart Cities

Keywords: Sustainable heating and cooling, district heating, low temperature distribution, prefabricated renovations kits, advanced financing tools

Abstract: Heating and cooling is responsible for nearly 50% of the final energy consumption in Europe. While electricity markets and developments are mainly a national competence, the energy consumption on heating and cooling depends in a relevant way from the development of our cities. In order to reach a more sustainable thermal energy consumption, massive building refurbishment actions and heat provision strategies have to go hand in hand.

The heat provision of our cities can change strongly in few years. Especially if decisions are taken to set up district heating and cooling systems based largely on renewable energies or to integrate the heat provision from existing district heating and cooling systems with renewable sources. This is possible if the city administration takes the relevant decisions and the framework is given that public or private actors can roll out the implementation.

The massive refurbishment of existing buildings is a much more complex task, involving many different actors, eventually decisions by thousands of private buildings owners, real estate companies and social housing actors. Only through comprehensive actions including information, sensitization, incentives and obligations such a process seems possible.

Within the presentation possibilities and challenges around this topic will be discussed. The state of the art will be presented and an outlook on possible future developments based on recent research projects and analysis will be shown; these include low temperature district heating and cooling systems, prefabricated renovation kits for energetic refurbishment and advanced financing tools.

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Session: Plenary

Topic: Smart and sustainable technologies

Author: Ric Stephens¹

Title: Megatrends, Black Swans and Game-changers

Keywords: sensors, GIS, big data, remote sensing, standards, statistics, interconnections, app, key performance indicators

Abstract: We are at the crest of an information tidal wave in which data is ubiquitous and omnipresent. Information everywhere all the time offers unique challenges and opportunities for urban planning as the environment, economy and society search for a new equilibrium.

Megatrends are the forces that define our present and future worlds, and the interaction between them is as important as each individual megatrend. Megatrends include energy independence, personal health technologies and smart cities. They guide urban sustainability.

Black Swans are unpredictable or unforeseen events, typically with extreme consequences. Black swans include cyber attack, infrastructure failure and global weirding. They require cities to become more resilient.

Game-changers are events, ideas, or procedures that effect a significant shift in the current manner of doing or thinking about something. Game-changers include 3D printing, drones and artificial.

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Session: Energy planning for cities and regions

Authors: Rita Streblov¹, Katrin Ansorge², Christophe Armbrorst³, Dirk Müller⁴

Title: *Optimized Energy Retrofit Path for Buildings under National Goals*

Keywords: retrofit, renewable energy, combinatorial optimization, dynamic simulation

Abstract: Energy efficiency measures in the building sector provide an enormous potential to energy saving and reduction of CO₂ emissions. However, the refurbishment rate in whole Europe is very low. Across different countries, the rate is approximately between 0.4 % of up to 2.4 %. Different constraints are in conflict with an expansion of the refurbishment rate. In many cases, the investment costs are too high and the building owner sets the refurbishment aside or only selective measures are undertaken which might be suboptimal from an energetic point of view. Furthermore, there exist prejudices against refurbishment measures and a lack of information but also an overload of information may stop decisions for an energetic refurbishment.

This paper proposes a Pareto optimisation using genetic algorithm to identify the most appropriate retrofitting options for single and two family house owners. The concepts can also give an advice for regional planning. We consider the possibilities for the building's envelope together with options for the system engineering. With the use of reference buildings, we can reduce the necessary input to an easy available data set.

To allow a detailed modelling of the whole thermo-hydraulic system the heat sources, the energy conversion units, the heat distribution, transfer system and the building as heat sink we do dynamic calculations on an hourly basis. This enables a detailed resolution of storage effects and efficiency changes of energy conversion units under part load. For the description of the building we use a low-order building model. For the system engineering, we propose a new approach using dynamic plant expenditure figures. This seems to be a promising compromise between sufficient resolution and low simulation effort.

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The results are assigned to different personal needs but also to appropriate collateral requirements relative to regional or national goals in energy savings.

Session: Smart and sustainable technologies

Authors: Khalil Valizadeh Kamran¹, Neda Mousavi², Bahram Nesyani³, Saba Bazdar⁴

Title: Identification of Land Use/ Cover Changes Mapping in an Urban Area Using Satellite Imagery & Support Vector Machine Algorithm (Case study: Some'esara)

Keywords: -

Abstract: Land-use change processes present a variety of trajectories depending on local conditions, the regional context and external influences. This study is an in-depth analysis of spatial and temporal land-use change in a township mountain area for the data period 1989 to 2014 in northwest of Iran. Presently, unplanned changes of land use have become a major problem. Most land use changes occur without a clear and logical planning with little attention to their environmental impact. Since those changes in land use take place in large and extensive areas, so, remote sensing technology is a necessary and valuable tool for land use change detection. Some'esara Township with 1254.543 square kilometer and possible changes are investigated in two times, from 1989 to 2014. For accuracy assessment of this method, after collecting ground truth data, which are carried out through field visiting, Google Earth images and aerial photographs, overall accuracy and Kappa coefficient are used. Overall accuracies of the maps obtained through classification using SVM method for TM, ETM+ images are 93%, 95% respectively, that state high accuracy of this algorithm in classification of satellites images. During 1989 to 2014. The methods enabled four periods to be identified revealing a distinctive evolution in land use, in which urban consolidation is present consistently, together with rotation of the wetland typology involving marsh degradation, gains from agro-forest land or sparsely vegetated areas and the appearance of urban areas.

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Session: Benefits, costs and opportunities of urban transition

Author: Magdalena Wagner¹

Title: How to Support Spatial Decision Making Process?

Keywords: cellular automata, multi-criteria decision analysis, policy making, city governance

Abstract: The issue of spatial management and governance is currently one of major challenges of modern urban planning. Discourse on new ways of urban management gains new meaning and is in fact a discussion about the contemporary urban planners' skills and tools. The paper presents an initial phase of the research which main objective is to develop methods that could aid the local level spatial planning and advocate rational choices. The research presented in the paper is checking whether, and to what extent, methods derived from econometrics, operational research, and mathematics could be incorporated into spatial decision making process. The potentials of parametric governance is being investigated in order to improve the effectiveness of decision making in the area of city governance.

There are several questions that arose during the research. Starting point is an evaluation of policy making procedure at local level. What are the weaknesses of planning procedure and how the process could be improved? Therefore, the second issue that should be addressed is an examination of potential solutions. An assumption was made that spatial governance could be supported by sophisticated mathematical formulas. The question is how it should be done? Which methods shall be used (and which shall be avoided)? Is multi-criteria decision analysis (MCDA) a good solution for urban planners? Answering these questions would allow the selection of the most suitable and accurate techniques for improving spatial decision making. Another task of the research is to produce solutions that are applicable and repeatable. Could the selected methods be applied in real world situations? Is it feasible to incorporate these tools into policy making?

The reflections presented in this study are, among others, focused on building a system that reflects the internal relations between decisions and projects in urban governance, which are a specific expression of the process of city management. Methods and techniques that would be used to assist decision making process in spatial planning should make the process more transparent, objective, and rational as the need to build a new and comprehensive system of urban management is (and will be) a particularly significant challenge in the coming years. The

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paper discusses the initial outcomes of the presented research and indicates challenges that could be addressed in the further work.

Session: Energy planning for cities and regions

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Title: Towards the Multi-criteria Approach for the Planning of the Smart Integrated Urban Energy Infrastructure

Keywords: smart urban infrastructure, city planning, mobility, climate conditions monitoring, citizen services, multi-criteria analysis, decision support

Abstract: This paper presents the decision support approach for planning for the smart and integrated infrastructure within a smart low carbon city project development in Bolzano city. The modelling approach embedded in the geographical information system (GIS) architecture followed 3 step procedure, first the review of the existing urban infrastructure concepts were performed, then several stakeholder consultation meetings were done on the potential necessities and data availability; the group of services needed were identified and grouped in 4 different criteria (mobility, weather conditions monitoring, citizen services and safety/security. Further a valuation of each of the factors and criteria providing quantitative, qualitative and importance weighting values for each of the factors and the level of expert congruence. The results of the study indicate that the stakeholders evaluate factors within the criteria safety as the most prioritized ones, followed by the mobility services. The modelling approach also suggests the most suitable location of the integrated smart sensors and services based on the 1) criteria evaluation of experts and the existing data elaboration. The results of the analysis will be used by the municipality of Bolzano for the installation of the integrated infrastructure systems within the FP7 smart city project SINFONIA.

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