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ABSTRACT BOOKLET

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VALMASEDA, CÉSAR	4286		
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VASILIE, SERGIU	4347		
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SECTION I
KEYNOTE SPEAKERS

4701_The Future of Cities

Baranzelli, Claudia[1]

Abstract

The contribution of Claudia Baranzelli will focus on the main outcome of the "Future of Cities" report, published last June. This report is an initiative of the Joint Research Centre (JRC), the science and knowledge service of the European Commission (EC), and supported by the Commission's Directorate-General for Regional and Urban Policy (DG REGIO). It highlights drivers shaping the urban future, identifying both the key challenges cities will have to address and the strengths they can capitalise on to proactively build their desired futures. The main aim of this report is to raise open questions and steer discussions on what the future of cities can, and should be, both within the science and policymaker communities. While addressing mainly European cities, examples from other world regions are also given since many challenges and solutions have a global relevance.
In particular the report reflects not only on challenges for cities, but also on possible solutions: indeed, cities are uniquely equipped to tackle challenges – the abundance of available physical space, a large and diverse population, a certain level of autonomy, and openness to technological advancements and innovation, to name but a few, may offer ways to relieve the pressures cities face.
The report is particularly novel in two ways.
First, it was developed in an inclusive manner – close collaboration with the EC's Community of Practice on Cities (CoP-CITIES) provided insights from the broader research community and city networks, including individual municipalities, as well as Commission services and international organisations. It was also extensively reviewed by an Editorial Board.
Secondly, the report is supported by an online 'living' platform which will host future updates, including additional analyses, discussions, case studies, comments and interactive maps that go beyond the scope of the current version of the report. Steered by the JRC, the platform will offer a permanent virtual space to the research, practice and policymaking community for sharing and accumulating knowledge on the future of cities.
This report is produced in the framework of the EC Knowledge Centre for Territorial Policies and is part of a wider series of flagship Science for Policy reports by the JRC, investigating future perspectives concerning Artificial Intelligence, the Future of Road Transport, Resilience, Cybersecurity and Fairness Interactive online platform: https://urban.jrc.ec.europa.eu/thefutureofcities.

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4702_Are smart city projects catalyzing sustainable transformation?

Haarstad, Håvard[1]

Abstract

This talk addresses the question of whether and how smart city projects catalyse sustainable transformation. It takes as its point of departure the critique against smart city frameworks – many social scientists have held that the smart city discourse is overly focused on the technological aspects, driven by a techno-optimism, and failing to recognize local needs and contexts. In other words, critics argue that the smart city has little to do with sustainable transformation.

I engage with this literature, but find it tends to ignore the agency of the local smart city actors themselves. I draw on my research on smart city projects and urban sustainability networks in Europe, some of which was summarized in the recent paper "Are smart city projects catalyzing urban energy sustainability?" (Energy Policy, 2019). Looking across smart city projects, I do find that smart does not necessarily mean environmentally sustainable. Cities often have a wide range of other objectives when trying to become "smart" – sustainable transformation is not necessarily a central objective. At the same time, we also found that urban actors engage actively, creatively and strategically with the smart city discourse. Local politicians and planners are apt at enrolling and reframing pre-existing initiatives into the smart agenda, creatively using it to further their own strategic objectives. As many cities have highly ambitious climate strategies, this means that the smartness framing can also be used to catalyse sustainability transformation. Building on this, I discuss the potential for local action and innovation to contribute to wider scale transformation.

In closing, I discuss the way forward for smart urbanism in light of the recent polarized and highly politicized debate on cities and sustainability in Europe. How do we create a more inclusive, sustainable and transformative smart urbanism?

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SECTION II
SPECIAL SESSIONS

4106_Rural-Urban Relationships for a better territorial development

Elisa Ravazzoli[1], Christian Hoffman ,[2]Francesco Calabrò[3] and Giuseppina Cassalia[4]

Abstract

Well-established relationships between urban and rural areas are key drivers for a balanced territorial development. They promote spatial and functional interdependencies between cities and countryside and counteract diverging regional disparities and the feeling of inequality and (Copus, 2013; Habitat III 2015). Dissolving borders and creating strong, mutual relationships between rural and urban areas is essential to foster inclusive, smart and sustainable development in rural Europe (Hjalager, 2016). Access to services of general interest and modern, technical infrastructures covering the local, regional, national and cross-border dimensions enable spatial justice, offer equipollent living conditions, and promote a high quality of life in marginalized, rural mountain areas (Küpper & Steinführer 2018, ARL 2016, Magel 2016, Malý 2016, Fassmann et al. 2015, Miosga 2015, Littke et al. 2013).

The session looks for contributions dealing with physical, relational or organizational proximity (Copus, 2015) for releasing new paths of inter-relationships among different types of spaces, across different sectors, using different instruments or initiatives to meet the targets of territorial cohesion. It investigates how new inter-relationships open new opportunities that increase wellbeing and the living standard in rural/mountain /fragile/marginalized territories and reduce spatial inequalities.

From this perspective, we invite applicants from geography, economics, sociology, urban planning, architecture, political science or related disciplines, who deal with any of the following lines of inquiry:

- **Theoretical, methodological or empirical reflection** on smart rural-urban relationships;
- **Digital technological developments**, to incorporate digital tools as opportunities for smart solutions to live, work and move;
- **Entrepreneurship and new business models** to attract labor markets and ways of cooperation between urban and rural actors as an opportunity for new value-added chains;
- **Social innovation** as initiatives and creative ways to improve social services across rural-urban areas, to reduce, adapt or address natural risks

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and socio-demographic changes (e.g. internal and international migration) and achieve social justice.

- **Tools for integrated governance strategies or policies**, which promote rural-urban connections at regional, national and cross-border levels.
- **Networking Perspectives** towards sustainable territorial cohesion, in terms of multidimensional approaches to enhance local identities, foster collective values and empower community participation.

Keywords
Rural-urban relationships and links; territorial cohesion; spatial planning; social innovation; new business models.

Session format and intended audience

Point/counterpoint debate

4107_Smart buildings, smart communities & smart grids

Dionyssia Kolokotsa[1], Nikolaos Kampelis[1]

Abstract

Smart grid is a dynamic and interactive real-time infrastructure that encompasses the many visions of diverse energy system stakeholders. The Smart Grid concept integrates electrical and information technologies in between any point of generation and any point of consumption. The main objective of this session is to provide valuable insights regarding state of the art technological and scientific advances in the area of smart and zero energy buildings, smart grids and smart communities as captured by high-end collaborative research activities between leading industrial and research organizations.

Keywords:

Smart building, zero energy building, smart community, smart grid

Session format and intended audience

The traditional 4-5 speakers' session – standard theatre setup – is required for this session. Intended audience is researchers and industry professionals as well as policy makers in the fields of energy management in smart buildings, communities and smart grids

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4113_Tackling energy poverty

Ivan Faiella[1], Rossella Bardazzi[2] , Luciano Lavecchia[3], Raffaele Miniaci[4], Maria Grazia Pazienza[5] , Paola Valbonesi[6]

Abstract

This special session is focused on energy poverty, i.e. the lack of access to clean and affordable energy services, such as cooking, cooling, heating and lighting. In this session, we will focus on the issues of definition, measurement and policy measures to fight energy poverty.

Keywords

heating; cooling; energy poverty; vulnerability; income;

Session format and intended audience

Traditional, 5-speakers session. The audience should be made up of scholars (mainly engineers and economists) found with the topic of energy poverty.

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4133_Energy economics for smart and sustainable cities and regions

Simon Pezzutto[1], Lukas Kranzl[2], and Sonia Gantioler[3]

Abstract

What is the new economy facilitating the creation of smart and sustainable cities and regions? The way towards smart and sustainable cities and regions is deeply characterized by the know-how of effective and efficient energy economics (Schipper and Silvius 2018).
A major thematic area is given by the supply and demand of energy in societies. In particular, the application of the principles and tools in economics to analyze the supply and demand of energy, and their relation to and interaction with the economy, specifically economic activity and economic development are of fundamental importance. The discipline also examines energy choices and their impact on market performance, the sustainability of the economy, the welfare of the society, and environmental conditions. Energy economics do not merely employ the concepts and tools in economics, but also principles and practices in natural sciences and engineering, as well as management (Sweeney 2000).
Energy markets are continuously changing. Renewable sources of energy are replacing conventional ones and energy efficiency becomes more and more important in the way to accomplish the mitigation commitments that almost all the countries of the world submitted in their national contributions in the framework of the Paris Agreement, adopted in 2015 at the COP21. Markets become more internationally integrated, but also more locally oriented. Market players are reinventing their roles: incumbent producers are looking for new strategies, while energy consumers are becoming producers as well. Market rules need to be reconsidered, just as the energy policies of governments at the local, national and international level. Energy markets need to be conducive to innovation and flexible solutions, but also to provide incentives for investments, while performing the usual balancing act between security, environment and affordability (Chel & Kausik 2018).
Energy economics studies, among others, energy resources and energy commodities and includes: forces motivating firms and consumers to supply, convert, transport, use energy resources, and to dispose of residuals, market structures and regulatory structures, distributional and environmental consequences, as well as economically efficient energy use. The understanding of energy technology development and identification of policy strategies for the realisation of sustainable energy systems is of crucial importance. This is accomplished by developing and

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analysing forecasts and scenarios of future energy system development and technology change using detailed energy-system models. Energy forecasts/scenarios provide a means to explore future uncertainty of the energy system and to test alternative strategies to identify robust approaches for technology and policy development. Energy systems approaches combine a high level of technology detail with a systems approach which represents the coevolution of energy production, conversion, transmission and distribution, and end-use in an integrated way (Sweeney 2000).
From this perspective, we invite applicants from engineering, economics, sociology, urban planning, political science or related disciplines, who deal with:

- Business models
- Energy markets
- Finance/Financing of energy projects
- Energy prices forecasting/Electricity prices forecasting
- Circular economy/Life cycle assessment – Life cycle costing
- Multiple benefits/Co-benefits
- Prosumer
- Win-Win solutions
- Energy contracting
- Start-up

Keywords

Market analysis; Business models; Circular Economy; Financing of energy projects; Forecasts/Scenarios

Session format and intended audience

A traditional 5-speakers session is planned. During the session tools developed within R&D projects will be presented. We will test the Horizon 2020 Hotmaps Toolbox (https://www.hotmaps.hevs.ch/map), the INTERREG GRETA Tool (https://tools.greta.eurac.edu/), and the see the PLANHEAT TOOL (http://planheat.eu/the-planheat-tool) as well. Respective presentations will last ten to twenty minutes each.
The targeted audience are researchers, employees of the public administration, policy makers, engineers, urban planners and economists.
The presentations of selected abstracts will be introduced by two invited speakers:

- Kranzl, Lukas: The Horizon 2020 HotMaps Toolbox - the open source mapping and planning tool for heating and cooling,
- Zambelli, Pietro: The INTERREG Alpine Space GRETA Economic and Financial simulation tool

4139_Low-carbon and adaptive cities

Gianni Guastella[1], Giulia Lucertini[2] , Francesco Musco[2] and Stefano Pareglio[1]

Abstract

With more than a half of the world population living urbanized area, cities represent the place where both the environmental problems and the policy solutions originate. Adequate urban planning and resource management policies can effectively contain emissions and enhance mitigation leveraging on nature-based solutions on the one side and, on the other, improve the adaptive capacity of cities and regions in response to rising temperatures and precipitations and the increase in the frequency and strength of extreme events. The session brings together scientists and policy-makers to discuss the state of the art of the global pathway to a low-carbon and resilient future the ways global strategies can be effectively downscaled at the urban level, also taking into consideration the difference between metropolitan and second-tier cities in facing the challenges for the implementation of successful and effective mitigation and adaptation policies.

Keywords

Climate change; sustainable cities; urban transformation.

Session format and intended audience

The session will be organized as a policy session – panel discussion in which keynote speakers representing the academia, national and international institutions, and policymakers bring their experience relative to ongoing research and application projects relevant for the topic “planning sustainable cities”. Each speaker will have 15-20 minutes depending on the final number of contributions to explain in a non-technical manner the implications of their projects and the relevance for decision makers at the urban and regional level. After a final wrap-up by the moderators there will be space for participants to ask questions and specially to engage in the debate

Keynote speakers:

- Sara Verones, Autonomus Province of Trento
- Virna Bussadori, Autonomous Province of Bolzano
- Evgenia Mitroliou, ICLEI
- Monica Salvia, Institute of Methodologies for Environmental Analysis – National Research Council of Italy

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4140_Spatially explicit techniques and analysis applied to digital data acquisition for urban and peri-urban monitoring

Antonio Novelli[1], Roberto Monsorno[2] and Raffaela Cefalo[3]

Abstract

The last thirty years witnessed a revolution in digital technology, acquisition methods, measurements repeatability and analysis. In this sense, the volume of data generated from input/output monitoring activities and the possibility to generate new and fast outputs from these data is rapidly increasing.

Despite this great potential, there is still the need to turn this data in FAIR (Findable, Accessible, Interoperable and Reusable) data. Indeed, although this transition is on the way, there are still many challenges to face in order to make new relevant data clearly available, to perform computer-based analysis at new scales and rapidly find patterns or correlation among implicitly derived variables.

Among the target topics for this session, we would like to highlight the following:

- **presentations related to data acquisition and processing aimed at urban and peri-urban areas monitoring. In this sense, no restriction is imposed on the topic, acquisition and analysis methods. Special attention will be given to presentations trying to couple the monitoring analysis with the FAIR principles.**
- **Presentations giving insights on key changes in monitoring practices to foster data transparency and interoperability. Special attention will be given to presentation featuring case studies in urban and peri-urban areas;**
- **Already available or proof of concepts related to digital instruments or holistic approaches to promote accessible and interoperable urban and peri-urban monitoring.**

It is worth noting that the list of suggested topics is not limited to the aforementioned ones, but it is open to related topics involving overview and progress reports on recent high-quality research and emerging new approaches and technology.

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Keywords
Monitoring, Geomatics, decision-support systems, FAIR

4143_A multiscale approach to circular economy: the economics of reuse from buildings to the urban environment

Giuliano Marella[1], Roberto Raga[2] , and Valentina Antoniucci[1]

Abstract

Circular Economy has gained importance on the agenda of policymakers, as testified by the path of European Circular Economy Package, began in 2015 and now completed with the 2019 Report. It also becomes a new economic branch, given rise to new business models and developed new markets. As European Commission states “In 2016, circular activities such as repair, reuse or recycling generated almost €147 billion in value added while standing for around €17.5 billion worth of investments”(European Commission, 2019: p. 1). Nevertheless, good practices and assessment models are still few, despite the increasing interest of academia and industry. Specifically, the latter represents the main theoretical and operative framework because of the relevance of “closing the loop” to the manufacturing systems. The relevance of the circular economy to urban development is still understudied, both in a theoretical perspective and in empirical research.
The present session proposal aims to collect contributions on the application of circular economy’s principles to urban development, with a multiscale approach. Specifically, the main, but not exclusive focus, will be the economic feasibility and planning case studies of interventions promoting a diverse paradigm than the “traditional linear *extract-produce-use-dump* material and energy flow model of the modern economic system which is problematic in terms of economic, social and environmental sustainability” (Korhonen et al., 2018: p. 544). To the urban environment, reuse paradigm applied to the buildings is both a necessity, given the average age of Italian building stock (Fiaip; Enea; i-Com 2017), and an economic opportunity (Mangialardo and Micelli, 2019) to renewal our cities. The construction sector is already working for years to develop new standards and materials processes, while there are still no solid business models shared between developers and public authorities. Similarly, at territorial scale, enhanced landfill mining is a crucial as much as the contentious goal of the public authorities at any levels (Eco Efficiency Consulting and Engineering Ltd. in collaboration with WEFalck, Pöyry Finland Oy 2019), but its economic feasibility is fragile and scarcely tested on empirical evidence. Also, urban plans hardly include successful protocols for landfill mining, treated mostly as a law requirement. In this range of urban activities, the session will accept original papers and presentations suggesting new policy paradigm through case studies, best practice presentations, and economic models on the topic.

Keywords

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Circular economy; landfill mining; urban resilience; environmental valuation

4146_Solutions for decarbonising housing in specific target groups of residents and buildings

Kristina Eisfeld[1], Lukas Kranzl[2], Sebastian Seebauer[3], Andreas Müller[4] and Bernhard Leubolt[5]

Abstract

To meet EU energy and climate targets, retrofitting rates and energy performance of the existing housing stock must be drastically improved as it stagnates due to several issues. Housing and particularly domestic energy consumption for heating play a core role in climate and social policy. The workshop will provide a broad diagnosis of misalignments within climate and social goals, as including all social strata is essential for the transition to a decarbonised society. Climate policy aims to reduce carbon emissions by retrofitting existing buildings and promoting renewable heating systems. Social policy aims at reducing inequality and poverty by limiting household spend for rents and heating and by providing adequate housing for all. However, these policy spheres are hardly coordinated, and increasing evidence shows that broad-brush, uniform policy instruments fall short of expectations or even lead to adverse side-effects. We ask the question of how to include household behaviours as targets of policies **for a fair energy transition.**

Therefore, the workshop identifies and discusses the real-world deployment of policy instruments for decarbonising the housing sector which are tailored to specific target groups of residents and buildings, such as energy poor households, renters with limited access to the housing market, or people living in multistory buildings with low energy ratings. Subject-oriented (e.g. winter fuel payments, rent support) and object-oriented schemes (e.g. renovation subsidies, mandatory efficiency standards) meet particular challenges that depend on the particular household or building segment they address. The workshop focuses on existing buildings, because the bulk of residential carbon emissions occurs from heating in existing houses, which makes large-scale investments in refurbishing these buildings necessary. Within the interplay of renting and large investments, retrofitting may provoke the tenant/landlord dilemma with constitutes a major barrier as interests of tenants and landlords often do not match. Therein, the workshop aims to contribute to the conference objective of co-creating practical solutions with public, private, research and civil society actors in order to increase the quality of life in urban regions.

Keywords

Housing sector; decarbonisation; inclusiveness; tenant/landlord

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dilemma; socio-ecological transformation

4149_Behavioral insights for sustainable and smart cities and regions

Marianna Baggio[1], Nives Della Valle[2]

Abstract

Behavioral Economics has recently started providing policy-makers not only with a richer model of human behavior, but also with a richer policy toolbox to promote welfare (Sousa Lourenco, Ciriolo, Rafael Rodrigues Viera De Almeida, & Troussard, 2016). One concrete application that has attracted tremendous attention in recent years is choice architecture. Building on the evidence that the environment in which individuals make decisions – choice architecture – influences their decisions, Thaler & Sunstein (2008) identify nudging as a cost-effective tool to redirect behavior without forbidding any option or changing economic incentives. This approach embeds a huge potential for cities and regions, as it enables promoting welfare-enhancing behaviors, such as saving water and energy, and encouraging sustainable mobility lifestyles. This is especially true in a context in which cities and regions are increasingly harnessing data-driven technology to provide public services. Notwithstanding, the nudging approach represents only one powerful illustration of a wider range of behaviorally informed policy tools (Loewenstein & Chater, 2017). Moreover, if this approach ends up treating individuals only as passive receivers of interventions, the potential of human behavioral change to promote welfare might be tapped only partially. Therefore, it is essential to make data accessible and interventions transparent. This would not only enable individuals exercising their own agency, but would also prevent private actors from sludging individuals in self-defeating behaviors in order to maximize their profits. Delving into the potential and limitations of behaviorally informed policy tools, this session investigates how behavioral insights can equip regional and urban governments with policy tools to promote welfare in a human-centric way.

Against this background, researchers and practitioners of behavioral sciences are strongly encouraged to contribute to the session, by sharing full papers, working papers and pilot projects dealing with the following topics:

- Behavioral law and economics outlooks of sustainable and smart cities and regions
- Data driven behavioral changes
- Nudging and beyond
- Promoting a culture of evidence-based practice

Keywords

Behavioral Sciences; Behavior Change; Evidence-Based Policy; Nudging

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4161_Smart City Governance – Co-creating Urban Planning and Inclusive Communities

David Ludlow[1]

Abstract

How does smart city governance effectively deliver the key requirements of policy makers to operationalise sustainability and drive the transition to carbon neutral cities? In what way can these requirements ensure plans are co-created with city stakeholders, and based on integrated assessments to ensure effective delivery of interconnected strategic policy objectives? Will this new governance overcome silo thinking to identify policy co-benefits and "win-win" solutions as the principal outcome? And to what extent can the smart city governance solutions be applied to all cities using common tools and methodologies, defining a sustainable business model?

The session seeks to address these and other questions in a roundtable format from presenters identified below. Discussion draws on findings and experience of EU funded (FP7 and Horizon 2020, and Copernicus Programme) open smart city governance research and innovation projects, as well as the integration potentials identified with the Nexus projects of the Sustainable Urban Global Initiative (SUGI) and transition pathways analysis of JPI Urban Europe. All support the development of open governance solutions for urban planning in collaboration with pan-European partner cities.

Keywords

Smart governance systems; holistic approach; open plan process; interoperable systems; robust and common models.

Format: roundtable discussion presentation and discussion supporting full engagement by delegates
Roundtable Presenters:

- 4160 Ludlow, David – Smart City Governance Innovation Architecture
- 4371 Laborgne, Pia – Creating Interfaces: Knowledge co-creation and Participation in Urban Food-Water-Energy Nexus Governance
- 4414 Lissandrello, Enza – Towards a Smart Urban Planning: The Co-production of Contemporary Urban Citizenship in the Era of Digitalization
- 4503 Borsboom-van Beurden, Judith – Smart city governance as foundation of integrated approaches to planning and implementation of smart city projects
- 4245 Wu, Chenling – Research on Tianjin Urban Growth Evaluation Based on Smart Growth Perspective

[1] Associate Prof. European Smart Cities, UWE - Bristol

- 4404 Meyer, Susanne – Success Factors of City Engagement in Smart City Projects and Programmes

4224_Smart city dashboard: managing real time urban data from the Internet of Everything

Clemens Kuen[1], Dieter Steiner[2], Alice Schweigkofler[3] and Katrien Romagnoli [4]

Abstract

Nowadays, hundreds of cities around the globe are, on a various scale, going through an era of smart urbanization: everyone is talking about smart cities. The agenda for smart urban renovation is expected to solve a multiplicity of challenges, holding the key aim to significantly increase the urban quality of life. In this wide scenario, an infinite number of policies, innovations and targets are potentially included, and the question arises, how can local authorities, small and medium enterprises and utility providers approach smart urbanization? During this session, participants can have a look at the ongoing experience of the City of Merano, a medium sized city in South Tyrol, in its transition towards a smart city within the project 'OPENIoT4SmartCities', funded by the Operational Program for European Regional Development Fund ERDF 2014-2020 in Südtirol/Alto Adige. (CUP: B11B17000720008). The developed methodology and tools to guide this transition will be presented.

In addition, the approach adopted for the optimization of urban services will be described. This goes through the widespread application in the urban ecosystem of information and communication technologies. In fact, many cities and towns have started to deploy a multitude of sensors and intelligent devices, and the adoption of digital solutions has increased, generating vast amounts data each day. The main aim of the OPENIoT project is to develop a common data platform, that will be able to organize and manage real time data from the Internet of Everything of a city. The prototype of the platform has been designed based on specific service needs: four use cases in the field of public illumination, water management, waste and parking will be presented.

In the core part of this session the platform will be presented, participants will have direct experience of four use cases, and an interactive session will be organized whilst getting feedback about real time data management. Participants will contribute for the improvement of an enabling tool for the smart urban development of a city. The main objective is to provide an interactive experience with a smart city dashboard, investigating the best way to manage urban data.

Keywords

Digital transition, Co-creation & open data, City dashboard, Big data, Urban Internet of Everything.

Session format and intended audience
Format: testbed session for app and tool

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The session is organized by Systems srl and Fraunhofer Italia under THEMATIC TRACK 2 – Urban (big) data. During the session the activities and results of the project OPENIoT4SmartCities are presented.
In the first part (40 min), three speakers introduce the context of the project and the OPENIoT platform: (1) the framework to which the platform belongs, considering the methodology and tools developed in the OPENIoT project for the implementation of a smart city, (2) the current situation of the city of Merano in terms of smart urbanization and (3) the development process of the platform and dashboard, together with use case applications in the city of Merano.
The second part of the session (50 min) is dedicated to the interactive use of the platform, through four use cases. Four consecutive moderated tables will be organized, in which participants can interact with the OPENIoT platform, experiencing
smart city data management and interact directly with different sensors. The four topics are: illumination, water, waste and parking.
Targeted audience and number of participants: the expected number of participants is about 10-20 people, including smart city experts, researchers, smart city project managers, municipalities, public service providers, innovation hubs, and IoT technology providers. All the stakeholder, which were actively involved in the OPENIoT project will be invited (about 40-45 people).

Keynote speakers:

- 4306 Alice Schweigkofler, Fraunhofer italia, Methodology and tools for the smart city implementation
- 4308 Diego Zanella, Municipality of Merano, The transition towards Merano as smart city
- 4309 Günter Wimmer, Systems srl, The openiot platform and use cases, running on it!

.

4227_Strategies, Policies and Action Plans for Driving Smart and Green Cities: Challenges, Opportunities and Approaches

Mohsen Aboulnaga[1], Marco Sala[2], Antonella Trombadore[3], and Alessandra Battisti[4]

Abstract

Sustainable planning for cities is vital as the world is witnessing a rapid increase in urban population. Currently, 50% of the world's UP is residing in cities (UN-Habitat 2009) and will reach 70% by 2050 (United Nations 2018). Cities globally face huge challenges – intense energy use, heavy transport and traffic congestion resulting in high GHG emissions. About 70% of global total primary energy is consumed in cities, which emit about 65% of the world's total GHG, mainly CO_2 (United Nations 2019; World Bank 2019; World Energy Resources 2016; United Nations 2018); and are responsible for 75% of the natural resources (UNEP 2019); in addition to urban heat islands effect and climate change impacts (Aboulnaga and Mostafa 2019; Aboulnaga et al. 2019). Such huge increase puts pressure on cities' infrastructures that are not resilient. Urban Air pollution (UAP) is a global concern, where at least 96% of the populations in megacities are exposed to $PM_{2.5}$ – exceeding WHO air quality guidelines levels (Marlier et al. 2016: 2-15; Krzyzanowski et al. 2014: 1-185). UAP impacts human health, where elderly and children are the more sensitive and most at risk. About 7 million deaths are reported annually worldwide (WHO 2017), thus improving air quality by using urban framing innovation (Sala et al. 2019; 2018; 2017), adaptive green designs for cities (Trombadore 2018; Trombadore 2017), and urban public spaces' strategies (Battisti et al. 2018) are essential tools to achieve sustainability and livability in megacities and mitigate Climate change. The session addresses how smart and green strategies can drive cities to solving such challenges by using urban farming innovation, energy efficiency tools and mobilizing stakeholders (CES-MED 2018; Aboulnaga, 2016). The panel addresses cities' strategies and policies and, is planned to encompass 4 speakers with important subtopics. The session tries to answer a major question '*How strategies, policies and actions can drive green and smart cities to lessen cities' challenges and adapt to climate change risks*'. The speakers will address four related and vital topics, including: a) City challenges: strategies, actions, stakeholders' mobilization for livable, smart urban areas for climate change adaptation www.ces-med.eu; b) Policies and tools for greening cities - urban farming opportunities www.centreoabita.unifi.it; c) Adaptive design of green facades and natural based

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solutions for resilient architecture and environment www.unifi.it; d) Climate mitigation for public spaces tools implementation and practices https://web.uniroma1.it. The panel targets audiences such as policy makers, developers, architects, researchers and public.

Keywords

Smart cities; Climate change; Urban farming; Strategies and policies; Innovation tools

Format: Format: Interactive discussion between key-note speakers and the audience

Keynote speakers:

- Aboulnaga, Mohsen – City challenges: Strategies, actions, stakeholders' mobilization for liveable and smart urban areas for climate change adaptation
- Sala, Marco – Policies and Tools for Greening cities into Urban Farming Opportunities
- Battisti, Alessandra – Climate Mitigation for Public Spaces: Tools implementation and Practices
- Trombadore, Antonella – Adaptive design of green facades and natural based solutions for resilient architecture and environment

4229_Energy master planning in smart and sustainable communities

Matthias Haase[1], Daniela Baer[2] Adriano Bisello[3], Daniele Vettorato[4]

Abstract

This session invites contributions that are dedicated to the design, development and assessment of smart and sustainable cities with a special focus on the neighbourhood level. Starting from the new focus on energy planning for districts and neighbourhoods the panel welcomes contributions on topics such as:

- "Positive energy districts" as a concept and global outlook on smart and sustainable city development;
- Information and Communication Technologies (ICT) for energy management at community and city district level;
- Integration of small-scale and large-scale energy solutions, and interaction with energy storage solutions;
- The value of demand flexibility for the grid integration of intermittent renewable generation;
- Case studies of regeneration and new developments of smart and sustainable communities. Multidisciplinary planning for smart and sustainable urban development and energy efficient districts and neighbourhoods;
- Local stakeholder structures and strategies for low carbon energy transitions at community and/or district level;
- Citizen engagement and cross-sectoral collaboration for sustainable communities.

Keywords

positive energy districts, energy master planning, neighbourhood level, sustainable energy communities

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4243_P2P transactive platform: a smart citizen-centered solution for Protected Heritage Cities

José Campos Costa[1], João Formiga[2], George Huitema[3], Stefano Barberis[4],

Abstract

This workshop focusses on the challenging question – which tools can heritage sites provide to their citizens to allow them to carve a positive energy future? –, addressed in H2020 SCC-1 project POCITYF. Évora, on the two Lighthouse Cities of this project, faces, as many other European cities, hard-to-circumvent difficulties when considering business-as-usual sustainable solutions, e.g. PV installation in buildings' rooftops or façades, given their legal restrictions on urban-related changes.
This defying situation of heritage sites makes Évora case significantly interesting in terms of replication potentials – Europe is hugely populated by protected cities that shall offer their citizens the opportunity to participate in a fast-paced track towards a green economy, while maintaining the protected areas sustainably inhabited – and innovative – no concrete answer was yet provided to the abovementioned question.

Overall, POCITYF major goal is to deliver a set of Positive Energy Blocks in the Lighthouse cities of Evora (PT) and Alkmaar (NL) and boost their replication in the cities of Granada (ES), Bari (IT), Celje (SI), Ujpest (HU), Ioannina (GR) and Hvidovre (DK). POCITYF aims to transform those cities' mixed-urban environments into healthier, more accessible and reliable spaces, that is, to improve citizens' wellbeing. The project will be carried out along 4 Energy Transition Tracks:

- ETT#1: transformation of existing/new buildings into energy positive
- ETT#2: application of flexibility strategies and storage systems
- ETT#3: integration of eMobility
- ETT#4: innovative social engagement

This session focuses on Évora, whose assigned solutions are identified in the following picture.

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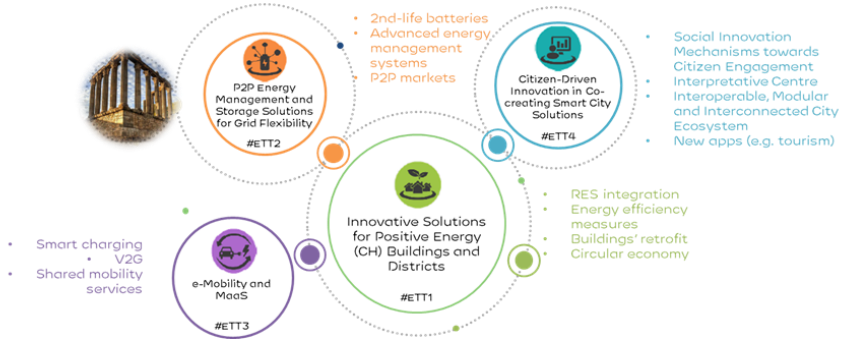

As a tool that will allow Évora citizens to be more sustainable, POCITYF will deploy a P2P transactive platform, designed from an existing platform – Connect with Energy™ – that allows the creation of fundraising campaigns to fight energy poverty. Within POCITYF, innovative modules will be added to this platform, enabling three different use cases:

1. Local Energy Market & Sustainable Behaviour Rewarding Mechanism: a P2P market inside each demo area and between the different demonstration sites will be deployed, allowing for direct energy trading between participants. Besides that, participants will earn project-specific tokens, acquired via sustainable behaviours (related to eMobility, buildings' energy savings or reduced wasted management, for instance), using smart contracts. This use case will promote a wide-level interaction among city-actors (public, private, research, civil society and citizens), encompassing the energy domain, citizen engagement and mobility sectors according to environmental and mobility-related indicators, assessing behaviours that will be posteriorly converted into energy;
2. Social Innovation: citizens' empowerment by allowing them to publish campaigns and donate euros/tokens (donations based on sustainable behaviors, linking the energy domain with citizens and companies' social responsibility – connection with use case 1) to alleviate energy poverty;
3. Green economy: creation of virtual energy wallets, endowing users with the ability to invest in a renewable energy project. That is: receive "shares" in their wallet, use these shares to invest in other projects or donate energy (connection with use case 2), withdraw their shares or reduce their energy bills.

This platform is still on an ideation stage, so, a substantial set of challenges are still open for discussion and will be addressed in this session:

- Feedback on the use cases. Can you identify more?
- Which actors shall be involved and with which role?
- Which revenue flows shall be established in order to present the best business case for all?

- How should/can this platform interact with other platforms, services, products, data (city-level platform, distribution grid, energy market data, weather data, Building Management Systems, current exchange rates, parking lots, logistics, water sector, etc.) in order to increment its value/offering?
- How to ensure long-term citizen engagement?
- Which behaviors (from citizens, buildings or others) should we use as justification for the injection of RES into the demo areas, i.e., for the emission of guarantees of origin?
- Would this solution be easily replicated and scaled? Why? How?
- Which barriers would this solution face in a real implementation (not project-limited)? How to circumvent them?

Keywords
Positive Energy Blocks; cultural heritage sites; Peer-to-peer (P2P) transaction; energy poverty

Session format and intended audience

The session will be structures as follows:
Introduction of the discussion topics by the organizers, followed by a short introduction of the speakers/facilitators and participants.
The session will continue with a World Café setting, enabling discussion with all participants by spreading them over three tables – one for each of the three use cases presented before –, where the discussion facilitators (one of the organizers and the two invited co-moderators) will boost the debate. The discussions will be fast-paced, to enable tables' participants rotation across the various challenges (set of above-mentioned questions) to be tackled in order to increase impact of the P2P platform.
Each facilitator will be assigned to one table and will be moderating and promoting the debate, by going through the previously identified challenges/questions.
After the World Café, each table's facilitator will be joining the organizers in a "Fish Bowl" to present the main conclusions and findings of all the discussions, in a session hosted by one of the organisers (the one that did not act as a specific table facilitator), which will ensure even participation of the facilitators and the remaining attendees, which will sit around and can jump in the bowl.

Finally, a wrap-up session will follow, concluding, this way, the workshop with a Q&A session with all participants.

This session targets (would benefit from) the participation of:

- Academia/ R&D (ICT, economy, engineering, social sciences backgrounds)
- Local/regional political authorities
- Industry
- Utilities
- Waste management companies
- Technological/service providers (IoT, Big Data, AI)

4417_Deep energy retrofitting of residential buildings in the Mediterranean area: the HAPPEN Programme

Roberto Malvezzi[1], Marco Padula[2], Luca Laghi[3], Eraldo Menconi[4], José M. Salmeròn Lissén[5]

Abstract

Mediterranean retrofitting markets form a kaleidoscope of situations joined by common barriers and bottlenecks, which barely have been identified so far as shared challenges, leading to a lack of dedicated solutions and to a substantial delay in achieving the 2020 policy targets. As a matter of fact, buildings consume approx. 40% of Europe's primary energy (BPIE, 2011), being the residential sector responsible for the 27% of such overall consumptions (Power House, 2015). Despite this, renovation rate across Europe is just around 1%, while EU Med countries face a rate up to 2-3 times lower in than the in north-western ones (AViTeM, 2014). This situation has been addressed by the H2020 HAPPEN project (M. Padula et al., 2018),[6] which engages 7 EU Med countries in order to tackle the deep-and-beyond energy retrofitting of the existing residential building stock in the EU Med countries, by proposing a new holistic approach called MedZEB (Mediterranean Zero Energy Building), characterized by the following features:

A) Holistic, i.e. aimed to integrate the most relevant aspects of the retrofitting supply chain: Technological, Financial, Social.
B) Transparent, i.e. aimed to put on the market novel tools for enhancing investors' trust.
C) Adaptive, i.e. focused on "soft values" of the retrofitting, s.a. flexibility of use (also in combination with other existing frameworks), optimization of the investments, well-being and quality of life, district scale design, etc.

Arrived at the midpoint of its implementation, HAPPEN has now produced the technical architecture of its main outputs, among which:
- the HAPPEN technical solutions (HTS), developed according to a one-stop-shop and step-by-step logics, by integrating micro-climatic analyses of the HAPPEN countries and cost-optimal calculations on a selected set of reference buildings;
- the HAPPEN financial solution (HFS), fully integrated with the HTS, and aimed to flexibly assist the funding plan of the retrofitting process according to a step-by-step logic, so to dilute financial costs and speed-up the activation of the works;
- the MedZEB protocol, a guarantee scheme for the good execution of the process, which includes instruments such as the MedZEB Building Renovation Roadmap,

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[6] HAPPEN - "Holistic APproach and Platform for the deep renovation of the Med residential built ENvironment"; Call EE-11-2017; Lead Partner: ITC-CNR

based on the HAPPEN optimized step-by-step approach, and the MedZEB Voluntary Certification Scheme, aimed at testifying the compliance of the interventions with the MedZEB protocol;
- the HAPPEN platform, an assisted digital marketplace aimed to match demand and offer, to defragment the value chain, and to support renovation actors with dedicated digital tools.
These draft project outputs have been pre-tested thanks to an extensive Living Lab and Pilot Project approach carried out within 10 pilot sites across EU Med countries, but it is now the moment for HAPPEN to open their final development to the larger retrofitting world, in order to stimulate their evolution into effective market instruments, ready to be adopted by relevant market actors, and thus, to concretely impact on the dynamics of such a strategic market.
To this extent, this Special Session addresses in particular experts from the retrofitting market or subjects interested to it coming from diverse sectors: from professional firms to financial entities, from institutional levels to energy agencies or certification bodies, from solution providers to associations, from large building owners to building companies. Starting from the actual status as “pre-tested technical and theoretical solutions” of the HAPPEN outputs, the Session will encourage participants to discuss and contribute to their further development to their final status as fully tested, integrated and market accepted tools, on which to found the HAPPEN programme for the deep energy renovation of the Mediterranean residential buildings.

Keywords

Med retrofitting market; HAPPEN programme; MedZEB approach; Cost-Optimal Solutions; HAPPEN platform

Session format and intended audience

The Session will have the form of an open, semi-structured round table, divided in two sessions. In the first session (.ca 30’) four speakers will hold a key-note speech on relevant topics of HAPPEN, concerning the main project outputs. In the second session (60’) a discussion will be held related to the market potential of these outputs, as well as on concrete suggestions on how to turn a H2020 project outputs into real and effective market tools (including e.g. strategic partners to be surveyed, further research to be carried out, synergies to be built with already existing tools, etc.). To this extent, the organizers are building a panel of market experts and stakeholders, who will be invited in order to compose the round table; in this way, such second session will encompass a panel of speakers, who are actual partners of the project, and a panel of external subjects, who will animate the discussion on the topics addressed. Such external panel will have the “first round” right (30’), while a second round will be open to the public (15’), and a third round will be again in the right of the external panel (15’). The external panel will be composed by 4-6 persons from the following categories: the financial and the insurance worlds, solution providers, entrepreneurs from the construction value chain, strategic and market consultants.

Keynote speakers:

- Malvezzi Roberto, Deep energy retrofitting of residential buildings in the Mediterranean area: the HAPPEN Programme
- Luca Laghi, The HAPPEN Protocol: a guarantee system for boosting trust and transparency in the retrofitting market
- Eraldo Menconi, The HAPPEN financial solution
- José Manuel Salmeròn Lissén, The HAPPEN technical solutions: one-stop-shop and step-by-step approach to cost-optimal renovation

SECTION III
POSTER EXHIBITION

4111_Innovative technical solutions within EU-GUGLE and Store4HUC, pilot projects for historical centres

Heidenreich Michael[1], Hemmers Rosa[2] and Dornhofer Andrea[3]

Abstract

EU-GUGLE (http://eu-gugle.eu/): During the project duration of this Smart City project from April 2013 to March 2019, 36 pilot buildings/building groups located in six European demonstration cities have been renovated by implementing a wide variety of energy efficiency measures and renewable energies, with a total investment of around 80M€. The energy savings achieved with the implementation of these measures vary in the different EU-GUGLE pilots depending on the local climatic conditions, type of technology, previous energy consumption as well as on being a listed building.

Store4HUC (www.interreg-central.eu/Store4HUC): It is challenging to provide a low carbon energy supply in cities in a style of energy storages. Especially in historical urban centres it is very difficult to achieve these results, because interventions in this specific area meet strict architectural protection constraints, involve higher implementation costs and often come in conflict with town planning policies. Therefore, the main objective of this recently started project is to improve and enrich energy and spatial planning strategies targeting historical city centres by focusing on integration of energy storage systems to enhance the public institutional and utility capabilities. Examples of both projects will be presented to underline the integration of renewables for mutual smart services in the urban and in particular historical context.

In **Aachen**: Due to developments during the last 80 years, many residential buildings are listed buildings. As a result, the district master plan focuses on revitalizing and improving the attractiveness of the district. Aachen North has a total area of 3 km² with a population of 15,500 inhabitants. It is part of a multi-year urban development program called the Aachen North Social City wherein the efficiency of building envelopes are thermally upgraded, building plant systems are renewed and the energy infrastructure is being revitalized. Approximately 1,500 of the district residents, representing 10% of the Aachen North population, are directly involved in the EU-GUGLE project. The pilot buildings are owned by the City of Aachen (75%) and by GEWOGE, a public housing company (25%).

In **Weiz**: The parish on the Weizberg consists of Basilica Church built in the 11th Century and is a listed building facing monumental protection limitations. The heating plant and related local network of the cooperative "Biomass Heating Plant Weizberg"

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was built in 1999. The network is supplied by a two-boiler system fired with hay at the Weizberg church site. The system is operated without back-up, meaning there is no additional energy storage. A paraffin cell buffer-based energy storage system will be implemented while in Weiz, the biomass heating plant of the parish will be supplemented with a hot water storage tank. The site is part of the energy vision of Weiz (SECAP of the city of Weiz) to save about 40% of C02 emissions per capita from 1990 – 2030 (Bramreiter et al. 2019)
A survey performed in the two cities shows that the majority of the participants are well aware of the harmfulness of the climate change and are aware about energy efficiency and related sustainable actions. The dominance of being convinced on it is depending on the education and knowledge level. Energy performance certificates are voted as relevant and shared with positive attributes in regards to energy efficiency measures similar to the integration of renewable energy with a declared willingness to pay more. The majority would be proud to live in a low-consumption home, neighborhood and city. The success of the project is due to the exchange of knowledge and integrated efforts of engaged members of the two pilots together with parallel efforts in related projects moving towards the same goals.

Keywords:

smart city; low-energy district; renewable energies; energy storage; pilot project

4121_Research on the Urban Waterfront Green Corridor Planning Based on the Sharing Conception——Taking the Changhe Area of Beijing as an Example

Xin LI[1]

Abstract

In the process of the rapid development of urban construction and the expansion of urban scale, there are many problems, such as the lack of connections between urban spaces, the fragmentation of the green space system and the Low utilization of public spaces. In recent years, the Sharing Concept swept all over the world. How to use the sharing concept to build a multi-faceted, feature-rich continuous waterfront green corridor and enhance the vibrancy of the site has become a problem to be considered in planning and design.

Taking the Changhe River area of Beijing as an example, this paper Adopts a question-oriented approach to research. Through literature review, field investigation and induction deduction, this paper analyzes the history of the Changhe River and the urbanization process along the Changhe River，then Analyze the situation of the site from land, transportation, construction, space and other aspects.After that, It summed up the advantages and disadvantages of the river. Based on the concept of sharing concept, sharing participants, sharing the features and advantages of this, illustrate the feasibility and importance of sharing ideas in the planning and design of green corridor. Based on sharing idea, this paper proposed design strategy of waterfront green corridor from point, line and unit.

Sharing Points: The planning hopes to add bicycle and motor vehicle rental point, carry out detailed planning and design for traffic hub and overpass, and build suitable slow traffic transfer system.
Sharing line: we plan and design the walking system, waterfront trail, waterfront revetment, the linear space for fitness near the residential area, bicycle commuter system, water commuter system. We hope to construct a perfect slow line system and linear public space.
Sharing unit: We propose different sharing strategies for the zoo, shantytown, parking lot and sports facilities. Create a river micro park. While retaining the demand for the collection and activities, the green of the reconstruction square and the urban green corridor are connected.
Finally, the urban complex ecosystem is formed which is a coordinated development of people, economic systems, social systems and natural systems. And it Formed a new model for sharing green waterfront corridors.

This paper hopes to use the Yangtze River Basin as an entry point to explore the

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establishment of urban open space and the formation of green space network under the concept of sharing, and provide some ideas and methods for planning and design under the future sharing concept in the future.

Keywords:
Landscape architecture, City planning, Sharing conception, Waterfront green corridor, Urban composite ecosystem

4124_Better Energy Communities: Implementation of a Community Energy Grant Pilot Program in Ireland

Suzanne Smith[1], Padraig O'Hora[2], and John Flynn[3]

Abstract

In line with EU Clean Energy Package goals, the Sustainable Energy Association of Ireland (SEAI) has a multi-level strategy to meet national and EU objectives. Achieving successful energy efficiency savings requires the mobilization of all community sectors, but all stakeholders are not equally informed, motivated or empowered to contribute to targets set by policymakers. Living Lab methods often bring all stakeholders to the same table at the same time to find innovative solutions to shared problems. Leading on from *Concerto*, an EU FP6-funded project, SEAI established a Sustainable Energy Communities (SEC) initiative aimed at (1) harnessing the synergistic potential of local authority, business, community and other public sector energy projects, acting in unison to deploy multiple measures which might not otherwise have been possible and (2) enabling Participating Energy Suppliers to engage in the delivery of energy credits to BEC/CEG under the obligated parties scheme, a mandatory requirement for energy suppliers in Ireland.

A SEC project making an impact is the Community Energy Grant (CEG) pilot scheme under the Better Energy Communities (BEC) initiative, aimed at impacting consumers' investment behavior relating to structural energy efficiency works in both domestic and non-domestic settings. One pilot BEC/CEG scheme, led by the Energy Team at Louth County Council (LCC) in partnership with NetwellCASALA Living Lab at Dundalk Institute of Technology (DKIT), collaborates with local community groups, private and public sector organizations and individuals. Regular co-stakeholder planning and cooperation meetings are a central engagement method used in this program, with BER reviews and energy use evaluations providing quantitative evidence of achieved energy savings. Between 2015 and 2019, structural works completed have spanned domestic upgrades (n=592), in both private and local authority homes, and a range of non-domestic upgrade projects (n=69) encompassing private, public and voluntary/community organizations. Success is reflected in 14.243 KWh in energy savings delivered and a total saving of 4,031 Tons of CO_2 emissions. Analysis of interviews, focus groups, and case-studies suggests this approach may have sustainability, through its impact on community-based energy knowledge and awareness, a position supported by repeat BEC/CEG grant submissions by community stakeholders. The next phase of smart cities and energy grids has arrived, requiring new programs and learnings to reflect the new realities of clean, renewable, local, and smart energy adoption. Using a multi-stakeholder

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collaborative engagement model to deliver the BEC/CEG pilot is informing the national strategic response to climate change. One measure is the scheduled roll out of a substantial and effective national Energy Efficiency Upgrade scheme, supporting regional stakeholders to co-create better and more sustainable communities in which to live and work. The replication of community and citizen-centered program models should facilitate co-learning, mentoring, problem-solving and peer support for sustained energy efficiency behavior change and ensure local and

Keywords:

Energy communities; Living Lab; Stakeholder approach; Public engagement

4127_Safe and sustainable communities

Giovanni Sergi[1]

Abstract

The need to improve the safety of urban settlements has been caused by social and economic situations that have spread in Italy and many other countries. They triggered poverty and social emargination. These situations have led to deviant behaviours which have created discomfort and concern in a relevant part of the public option.
In countries such as the USA, the United Kingdom, the Netherlands, Canada and Australia central and local authorities have worked to implement concrete measures in order to make urban environments safer. To sum up several measures have been implemented among which tools for urban planning to tackle deviant behaviours of some social groups. One of the elements characterising urban policies is the systematic cooperation between public authorities in charge of urban planning, real estate companies and experts in security issues.
In Italy some interesting experiences regard the Municipality of Reggio Emilia, Varese, Padua, Genoa and some other urban areas. It can be argued that over the past few years, the following approaches have been used in Italy, with alternate results: A) National and local legislation, administrative decisions by Municipalities to increase safety and security. This framework includes ordinances issued by Mayors to regulate specific problems such as the use of public areas, the opening/closing time of shops and many other issues. B) Some initiatives regarding urban planning aiming at changing and creating urban areas to improve the safety of areas having different dimensions and functions: a square or a road, a new or already existing residential settlement. C) Some initiatives based on the model of Smart City, which give the opportunity to use new technologies in a systematic way and make cities and territories safer, more efficient and sustainable.
Some experiences in Italy will be analysed together with experiences in the United Kingdom, Canada and Australia.

Keywords:

community security, urban settlements, sustainable communities, environmental planning

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4144_Smart Approach to Management of Energy Resources in Smart Cities: Evaluation of Models and Methods

Jana Teremranova[1] and Anna Mutule[2]

Abstract

A smart city represents a complex approach to the development of all systems, directions and spheres aimed at providing comfortable living conditions for citizens, qualitative management and reliable infrastructure of the city. However, the effectiveness of methods and approaches that are selected for solving smart city tasks and its energetic aspect examined in the paper can vary within broad limits. The paper answers questions how to improve the indicator of project implementability within a smart city and how the interested sides can choose and implement a model that would produce the largest result with the lowest costs, which would promote the success of the model to be implemented.

The first part of the paper provides a review of literature that examines different approaches to the implementation of a smart city depending on specific spheres and tasks. The review analyses various models the emphasis being on their energetic component. Nowadays, a wealth of approaches, methods and algorithms for solving energetic tasks are available. Nevertheless, a shortage of systematization and account can be observed that are aimed at ensuring assistance to the interested persons like city administration or institutions of urban development representing interests of citizens that could assist in choosing an optimal model for implementing a plan of urban development and changes towards a smart city.

The second part proposes a series of criteria for evaluating the existing approaches to a smart city. To understand the choice of the necessary model of the planned implementation within city development, many aspects have to be taken into consideration. The ability to flexibly react to the changes in consumption, crisis situations, unpredicted changes in the needs, manufacturing or delivery of services and goods, as well as taking into account alterations in the legislative base, speeding up or lagging behind the forecasted development of one or another sphere were taken into consideration when developing criteria for evaluating smart city infrastructure. Data availability, their transparency and standardization are part of the smart environment, and serve as a basis for further sustainable and effective development. Dissimilarity of economic sphere in different cities poses certain requirements to the financial flexibility of the model. Application of information and communication technologies, attraction of citizens in active participation in city's life and other factors are necessary prerequisites for a city to be called intelligent, developing, competitive and offering comfortable living conditions.

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The third part presents a scheme of making decisions related to choosing development methodology in a smart city that enables accounting of multifactorness of urban environment development as well as describes a scheme of the block-integrated approach to the methodology of smart city development, which in the authors' opinion can have the largest potential for flexible, sustainable and stable development and will produce the largest qualitative effect in smart city development. Within the international project ITCity realized under ERANet - LAC 2nd Joint Call on Research and Innovation for Latin America, Caribbean and European Union Countries, an analysis of methodology of transition of the energetic component of a smart city in four different by social, economic, energetic and other indicators project partner countries was performed. The application of the block-integrated approach was considered as an optimal model of energetics development in these countries: Latvia, Romania, Brazil and Chile.

Keywords:

Criteria for evaluating smart city approaches, management of energy resources, smart city methodology, smart energy approach

4244_Vulnerability Assessment Approach for Disaster Risk Reduction: Post Kerala Floods 2018

Fathimah Tayyiba Rasheed, SSPCR

Abstract

In addition to planning for smart, sustainable, equitable and economically strong communities, physical planners must now simultaneously tackle the imminent ramifications of disasters like floods and cyclones to ensure that no individual is left behind from being a part of resilient communities. This study, is an attempt to prove that by developing and adapting an approach that understands, quantifies and maps vulnerability, we can help in curbing the adverse effects of disasters. The research is done in context of the 2018 Kerala floods, in a case-study area specific to the coastal region of Ernakulam District.

Between August 1st and 18th, 2018, the state experienced its worst ever floods affecting more than 75% of the total villages spread across its 14 districts and impacting the lives of around 5.4 million people. This humanitarian crisis exposed an array of hidden as well as obvious vulnerabilities of the many coastal communities in the small state.

Therefore, the aim is to develop an approach-based framework for decision makers and physical planners to understand and reduce the vulnerability to disasters; making the existing disaster management process and disaster risk reduction measures much more effective. The beginning of the research is an attempt to understand and explore the concept of vulnerability while examining the past trends and methods of flood vulnerability assessments, with a primary focus on the parameters/indicators that are used to quantify it. Subsequently, an approach is devised in-order to assess vulnerability and the analysis that follows is tracing this approach in the context of the recent Kerala floods of 2018, along the different levels of jurisdiction in the State; from the State to the Community level.

Finally, the study examines the different dimensions of vulnerability and disaster management across state policies and district plans in Kerala to identify gaps. In the context of those findings, an analysis is done of the missing link of socio-economic vulnerability, from District to Local Self Government to Community level (top-down approach), mapping it along the process. Later an identification of the issues and their implications are done through community participation, and the findings are added to the skeleton of the proposed approach to complete a disaster (flood) vulnerability reduction framework and prove its applicability.

Initial background research revealed that earlier, disaster management was looked at as a relief centric process, but after the introduction of disaster risk reduction (as part of the SENDAI framework), the concept of vulnerability (to disasters) came into picture. While Kerala's' State Disaster Management Policy, states that Disaster Management has to be mainstreamed into development planning, as well as address the vulnerable communities, after reviewing of a selection of state development-policies and plans, a concerning lack of adherence to disaster management was

found thereof. From on-ground surveys, analysis and mapping, it was found that in the case study district, majority of the villages that are located in high hazard zones of flooding and landslides ae also the ones with high socio-economic vulnerability weightages, they have the higher population densities and heaver coastal dependence. And to make matters worse, these hazard prone villages/areas are not part of the administrations master-plan zones.
This is the case in most states of India, the entire context is post-disaster management, there is a slight shift of focus required to look at pre-disaster risk reduction measures to reduce the possible impacts that a natural hazard could have on different sections of the society and systems. Moreover, currently there is a heavy dip in the socio-economic growth pattern that is generally seen after a disaster strikes, with proper risk reduction measures and community involvement in all phases, this huge dip could be mended and reduced over time as well.

Keywords:

Vulnerability; Floods; Disaster-management; Risk; Resilience

4155_From a networked society to a community protection network for dam situations

Paulo Olivato[1], José Guilherme Schutzer[2]

Abstract

This work investigates the possible technological implications of the proximity between the productive structures of mining in Brazil in particular the structures of tailings dams. Recent dams breaks in areas vulnerable to risk show us that we were not prepared for the activation of safety devices, escape routes, among other security measures. The same technologies that have led to the installation of the huge industrial and advanced structures from a technical and technological point, were not prepared to minimize the risks of human and material losses in their immediate vicinity and indirect impacts in more distant areas. Would there be possibilities for the use of these resources, in addition to the traditional ones (notably insufficient ones), to improve the security of the population and the compatibility of these economic activities? In order to discuss this issue, we have approached a concrete case of waste dam disruption and draw some hypotheses about the possible applicability of technological innovations, from the simplest and cheapest to the most complex and costly ones, in particular the so-called Internet of Things (IoT), which associates sensors with devices, connected in network. In this sense, the objective of this work is to analyze some practical perspectives of using the concept of community and urban resilience, when new technological perspectives are applied to the mining territory.

As a starting point for this reflection, the case of the rupture of the Samarco Mining Company, located in the Municipality of Mariana, Minas Gerais, Brazil, occurred in 2015. The documented analysis together with the empirical data collected from the area showed that there had not been sufficient urban and environmental instruments to contain *a priori* the effects of the rupture of the dam, which had lethal consequences (nineteen dead people) and severe contamination of one of the main Brazilian rivers, Rio Doce. Neither in the measures contained in the urban legislation nor in the environmental licensing processes themselves there were indications of the need to prepare that territory for possible destructive situations. In this way, one cannot speak of resilience, since there were structural and conjunctural fragilities that resulted in the damaging effects of the rupture of the *Fundão* dam (Samarco). Among the necessary measures, we could mention integrated and preventive policies in the scope of the company and the municipal and state public management. However, in this proposal for a poster for the SSPCR- 2019 (3rd International Conference On “Smart And Sustainable Planning For Cities And Regions”), these aspects will not be

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deepened, but rather the investigation of possibilities of application of technological innovations and measures to reduce risks to life and the environment and to include communities at risk, understood as key players in the co-creation of solutions and coping strategies.

We have, then, the important mineral production which in the country (Brazil) has a large structure of extraction, processing and production flow, making a regional scale. However, the region known as the *Quadrilátero Ferrífero* (comprising more than twenty municipalities) has been the scene of two major recent disasters involving tailings dams, which have gained media attention Samarco (2015) in Mariana and Vale (2019) in Brumadinho. The growth of economic activity including mineral commodities driven by the growth of the Chinese consumer market in the 2000's produced an increase in wealth but did not generate corresponding measures for urban and environmental development, neither at the local scale (in the areas / municipalities), nor regionally, in order to create a culture of risk minimization. The intensification of production by companies to maintain profitability even after the reduction in the international price of iron ore put pressure on production structures with the subsequent reduction of costs leading to lower investments in the development of technical projects and monitoring and risk management. The secondary data collected confirm this trend, which culminated in the weakening of dam safety conditions, releasing forty million cubic meters of tailings into the environment and killing officials and residents of the district areas, as well as its historic and centenary urban facilities. From the regional point of view, the disaster contaminated the Rio Doce Basin, in all its extension and other tributary rivers, making a five hundred and forty kilometers stain. Alongside deep territorial transformation policies, we can imagine that life in an interconnected society can also serve to strengthen our community safety nets. It is known that, despite the problems that the excesses of techniques experiments pose to society, technologies today are advancing and can be beneficial in situations such as these at risk. We talk today about the 'Internet of Things', which means that 'things' are gaining certain skills such as communication, not just from sensors (Wireless Sensor Networks - WSN), but also with each other involving the provision and use of services and, above all, may have the capacity to react to events.

Although some limitations may be pointed to the formulation of discourses and practices linked to the idea of community and urban resilience in dam situations, one aspect that could help in the formulation of resilience programs and policies would be to establish a baseline with updated data to monitor the transformations of that reality in time, including making use of information technologies (IT), with georeferenced data. The research, still in its initial phase, suggests to establish some composite references of territorial reading, in order to measure and analyze the sudden transformations and instabilities in the mining structures. In addition, progressively cheaper monitoring systems, interconnected with mobile devices, could issue warning signals to the population directly through the application of the so-called IoT, possibly mediated by specialized control centers. Although possibilities for intelligent application of technology are presented in these extractive industries (in this case, confronted with real situations or under study), the focus of the work analyzes the

complexity of issues that are involved from the community, historical and structural point of view, without losing sight of the primordial data of disposing of technology at the service of the human being and in the possibility of compatibility of territorial uses.

Keywords

mining dams; risks; resilience; internet of things.

4164_HotMaps - The open source mapping and planning tool for heating and cooling

Simon Pezzutto[1]

Abstract

The poster relates to the Horizon 2020 Hotmaps project and has already been created. For its content, please see:
https://drive.google.com/file/d/15WTJwmi5NjVhJAsMuxxJ3eV6EFLpA1sZ/view?usp=sharing

Keywords: Renewable Heating and Cooling, Open Source, Mapping, Planning

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4190_CitizEE Project - Scaling up Public Sustainable Investments via Citizen Financing Schemes

Pablo Alonso[1], Silvia Caneva[2]

Abstract

Citizen financing schemes (CFs), crowdfunding and cooperative models alike, have been a success in financing renewable energy projects. However, citizen access to such innovative mechanisms is still far from reaching its full potential, especially when energy efficiency projects are the ones seeking funding.

It is therefore essential to advance the business cases for energy efficiency measures and to increase support for respective projects, by standardising citizen financing in investment programs. Moreover, the role of different actors, such public authorities, financial institutions and developers, and the interactions with innovative citizen models, particularly at the regional and national scale should be considered.

Within this context, a European consortium of 8 partners has kickstarted the CitizEE project funded under the H2020 programme. CitizEE aims at supporting European public authorities to scale up funding for energy efficiency in the building sector by attracting citizen private investments.

CitizEE will integrate tailored and widely adopted crowdfunding and cooperative financing schemes (Citizen Financing Schemes for Energy Efficiency projects, CFs4EE) with adequate available or to be developed Public Financing Instruments (PFIs). As a result, CitizEE will enable the set-up of large-scale community energy efficiency programs while strengthening know-how of regional/national stakeholders.

CitizEE's ambition is to put in place a sound enabling legal, financial and operational environment aimed at: (i) making a more efficient use of public funds (ii) mitigating performance & credit risks, (iii) closing financing gaps, (iv) enlarging citizen access financing, (v) reducing transaction costs (vi) enhancing capacity of local crowdfunding operators and cooperatives and (vii) stimulating the required investment towards higher renovation rates and thus a more efficient building stock.

To meet its ambitious goals CitizEE has been structured for achieving the following objectives:

1. Prepare the groundwork for the establishment of Citizen Investment Platforms
2. Evaluate competitiveness of the, to be developed, project financing schemes
3. Demonstrate the viability and market potential of CitizEE's CFs4EE Financing Schemes
4. Develop recommendations for improving the market and regulatory framework

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5. Enhance the in-house capacities of relevant stakeholders
6. Promote the project advantages among those who could support the schemes deployment

CitizEE innovation strategy is based on two criteria:

- Setting up of Citizen Investment Platforms. Consultative body strongly focused on maximising the interaction among stakeholders and with Investment platforms under the European Fund for Strategic Investments (EFSI); and
- Integrating CitizEE's CFs4EE Financing Schemes. Financing mechanism constituted by citizen financing schemes combined with Public Financing Instruments (CFs4EE + PFIs).

4 demonstrators (Portugal, Belgium, Croatia, Lithuania) have been selected to stablish the Citizen Investment Platforms and show the replication possibilities of the project financing schemes proposed.

The project outcomes are expected to deeply modify the current paradigm by contributing to improve citizen participation in the clean energy transition while transforming our energy system to a more secure, sustainable, renewables based, affordable and competitive one. CitizEE estimates that 18.6 million EUR of investments and 10 GWh in terms of energy savings will be triggered by the implementation of the schemes. CO2 emissions will be reduced by around 2,987.50 Tons.

Keywords:

Crowdfunding, cooperative, citizens, energy efficiency, public finance

4191_How can flexible public spaces contribute to the creation of resource- friendly cities?

Antonia Stratmann[1]

Abstract

According to current European policies and environmental targets (SDGs, Kyoto Protocol, Paris Agreement, etc.), it is important to embrace environmentally friendly cities. It is necessary because cities are one of the biggest drivers of climate change. Urban planning influences the environmental and resource friendliness of cities through measures. In this regard public spaces in cities represent a fundamental source and challenge to trigger more sustainable, climate-proof and resource-friendly environments. Depending on how a street, a building or a public square is designed within a city, this can have a significant impact on energy consumption and carbon dioxide pollution. The changing need for land use in cities and regions as well as the climate change adaptation raises the question 'how can urban planning means create flexible public spaces contributing to resource-friendly cities?'
The poster presents the literature approach of designing flexible urban public spaces and presents the current discourse on public space use while simultaneously saving resources and dealing with soil in a sustainable, resource-friendly way.
Why is flexibility important? The requirements for the use of the ground change over time and new uses are constantly assigned to the areas. Flexibility enhances e.g. spaces adaptability. Space adaptability to the changing needs of society, but also offer great opportunities to achieve environmental goals. Flexible spaces consume less ground, because usages can happen in parallel and/or side by side and offers hybrid space organizations. By making land use more flexible, the urban space becomes adaptable for its users. At the same time, and this is the focus of attention, flexible public land use represents efficient land use. This also serves to ensure the conservation of resources and sustainability in urban development. The discourse in literature on flexibility of public spaces is intended to create a basis for testing the reorganisation of settlement and utilisation structures in order to be able to go new ways in climate- and resource-compatible planning.
In the literature some important works have been already published on this topic but only a few connect this issue with necessity to design flexible ever evolving and adaptable public spaces. As an example, Ludwig Mies van der Rohe (Stuttgarter Weißenhofsiedlung, 1927) is a pioneer in the flexible design of private land uses. In recent years, designs for modular construction methods on the level of a single plot of land and building have repeatedly emerged. On a smaller scale, already known solutions for the flexible use of public spaces are intermediate and temporary uses. A consideration at neighbourhood level, including a flexible design and reorganisation of traffic and public urban areas, has, however, only taken place to an insufficient

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extent. Furthermore Jane Jacobs (in: The Death and Life of Great American Cities, 1961) has also dealt with the subject and notes that cities must be mixed in their functions and it is not only physical, built conditions that influence the flexibility of a city, but also the legal planning rules and regulations.
For this reason, this poster gives an understanding on flexibility and explores whether and how it is possible to create and trigger more “environmentally friendly” public spaces by including the idea to design more flexible (i.e. open to different uses and interpretation over time) spaces. In order to explore this issue, the present poster first underscore the current environmental challenges; second, gives an overview of existing approaches in the literature; third provides a possible definition of flexible public spaces regarding to resource-friendly and environmental targets.

Keywords:

public space; flexibility; conservation of resources; sustainable land use; resource-friendly planning

4205_Colorful or colorless? Study on Colorscape in the Perception of Authenticity of Historic District in Beijing, China

Jiaqi WU[1] and Xiao YANG[2]

Abstract

With a fierce conflict between history and modernity, Beijing is a meaningful case for studying the Historical Urban Landscape (HUL) of mega-cities. Put forward on Nara Document in 1994, the authenticity has been the Operational Guidelines for the Implementation of the World Heritage Convention. In consideration of the protection of the historical authenticity, Beijing Municipal Government has just introduced the Design Guide for the Preservation and Renewal of the Historic and Cultural Districts. This guide announced that only gray colors could be used in Beijing's historic districts while any kind of bright colors were strictly prohibited. It is the reason why numerous stores with self-decorated bright-color façade were painted to gray colors recently, which caused a controversy about whether the colorfulness would influent the historical authenticity.

Colorscape is an important component of HUL, but the research of colorscape in historical districts (CIHD) has not been in-depth yet, especially the influence of CIHD to the perception of the authenticity. The research in CIHD is based on Lenclos's theory and methodology. His achievements were mainly in how to collect, induct and extract the urban chromatograms, but did not include the percepetion of urban colorscape. Besides, many researchers conducted a comprehensive survey of the CIHD in Japan. They suggested that it was unrealistic to control the urban colorscaple in a monotonous way or more strictly in one color, and, like Osaka City, the harmony of CIHD was more reasonable and possible. However, what the harmony is in CIHD and how diverse colors would influent the perception of history are still the knowledge gap in this field.

This study compared subjective and objective survey data to analyze how the dispersion and the saturation of the CIHD would influent the perception of the historical authenticity. First, street view images in Beijing were gathered from the Baidu Map to be the data base of CIHD. Second, the MATLAB and K-means were utilized to calculate the dispersion and the saturation of the colorscape in some historical streets. Third, the semi-structured interview was used to study how tourists perceived the historical authenticity of different districts in the image. Lastly, the Multivariate Regression Analysis was utilized to figure out the relationship between the colorscape and the perception of the authenticity of history.

The finding results that there is no significant correlation between the dispersion and the saturation of CIHD and the perception of the authenticity of historical district. Moreover, some bright color tones may have a negative impact on the perception of

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authenticity, but there are also some particular colors that have a positive impact conversely. This paper suggests that moderately decorating some bright colors in the similar color tone of the background in the historical district might not hurt the perception of the historical authenticity. Specifically, some nodes in the historical district with special colorscape may enhance the tourists' willing to perceive the historical authenticity of this area.

Keywords:

Colorscape; Historic District; Authenticity; Street View; Historical Urban Landscape

4220_Low-carbon commodities from CO_2 and waste feedtstocks by engineering microbial factories

Angela Re[1], Loredana Tarraran[1,2], Annalisa Abdel Azim A[1], Valeria Agostino[1], Alessandro Cordara[1], Nicolò Vasile[1], Fabrizio Pirri F[1], Guido Saracco[2]

Abstract

Biogas production via anaerobic digestion (AD) is a smart and consolidated solution for the reduction of greenhouse gas (GHG) emissions, production of renewable energy, and management of waste disposal. Biogas is mainly composed of CH_4 (50–75%), and CO_2 (25–50%), with low percentage of other gases such as H_2S, H_2, N_2 and NH_3. Nowadays, biogas production has become a well-developed field thanks to three decades of subsidized operation. Fueling internal combustion gas engine in a Combined Heat and Power (CHP) unit to produce electricity and heat is one of the most common use of biogas. Another very interesting application is its upgrading to biomethane and direct injection into natural gas pipeline. CO_2 is a by-product of both these processes. The valorization of this CO_2 into valuable products, can certainly enhance the economics and sustainability of biorefineries, allowing to face increasing competition from alternative processing options.

The Engicoin - Engineered microbial factories for CO_2 exploitation in an integrated waste treatment platform - project fits into this framework. The project aims to develop three new integrated microbial factories (MFs) exploiting CO_2 from flue gases of the biogas-fired CHP engines and from purification of biogas to biomethane plus renewable H_2, within an industrial AD platform for the treatment of the organic fraction of municipal solid waste. The three novel MFs will efficiently produce a variety of value-added chemicals for bioplastic sector: lactic acid, polyhydroxyalkanoates (PHA), and acetone.

Lactic acid, a precursor of biodegradable polymer polylactate, is produced by an engineered cyanobacterium strain, *Synechocystis* sp. PCC6803.

PHA, a biodegradable polyester that can be used as thermoplastic or elastomeric material, is produced by the aerobic and toxic metal tolerant *Cupriavidus necator*.

Acetone, a solvent widely used in plastics manufacturing, is produced by the anaerobic acetogenic microorganism *Acetobacterium woodi*.

Synthetic and systems biology approaches are used to improve the uptake rate of CO_2 as substrate as well as to ensure CO_2 fast and selective conversion into the target compounds or to facilitate product extraction.

Keywords:

Bio-refinery; microbial factory engineering; carbon dioxide valorisation; value chain modelling; biotechnology;

4231_HEART project

Jessica Balest[1], Hadil Ayoub[2] and Claudio Del Pero[3]

Abstract

The global energy sector is in the midst of a transition aiming to more sustainable, affordable, secure and clean energy (UN Sustainable Development Goal 7). New technologies and renewed infrastructures will lead to a low carbon economy and society. The European Union (EU) aims at the improvement of energy efficiency (Energy Efficiency Directive 2012/27/EU), ensuring cuts of greenhouse gas emissions (e.g., CO2), ensuring affordable energy for all consumers, bringing environmental and health benefits for all, and reducing energy consumptions (Dunlop 2019). The EU considers energy efficiency as a priority in all decarbonization scenarios for 2050.

Buildings are responsible for approximately 40% of the overall energy consumption and 36% of CO2 emissions in the EU. Reducing the energy consumption of buildings has a key role for reaching energy and climate targets.

EU H2020 HEART (Holistic Energy and Architectural Retrofit Toolkit) project aims at reducing energy consumption in buildings and creating and promoting a holistic retrofit toolkit. The toolkit is an innovative system that integrates several technologies such as envelope, heat pumps, windows, and photovoltaics (PV). The innovation of the toolkit is the combination of all technologies based on an integrated control system that can be used by all the stakeholders for a correct planning of the retrofit and management of the building.

For an effective, sustainable and resilient energy efficiency intervention in cities and districts, the toolkit HEART cannot be viewed as simply technical (Dunlop 2019) but it must integrate the needs of all stakeholder groups such as managers and users of the building.

Stakeholders and technologies will interact using a cloud-platform that is currently being developed. The development of the cloud-platform and the toolkit is based on an analysis of the current needs of the stakeholders, such as households, architects and building owners. The needs of stakeholders are investigated using an analytical framework based on socio-technical system theory (Geels et al. 2018). The analysis of the contents of interviews with stakeholders delineates some recommendations for the current and future activities of the HEART project and for the development of HEART toolkit.

Keywords:

Energy retrofit; smart home; stakeholder needs

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4237_Network theory for the dynamics of weather extreme events

Paola Lecca[1]

Abstract

Understanding the mechanisms of climatic processes on temporal and spatial scales is a very hard task. The current literature on this topics reports that this task is impossible in near future, but of extreme importance for the forecast of both short-term weather assessment and of long-term climate changes. The analysis of data related to the earth climate is hampered by many factors, such as non-stationarity (e.g., abrupt vs. slow changes), chaotic dynamics, non-linear dynamics, high-dimensionality, and natural vs. anthropogenic influences [1]. Furthermore, as regards to extreme events, the main challenge is the non-Normal distribution of the data. The analytical methodologies of descriptive and inferential statistics prove to be ineffective for studying a system as complex as the climate. This study proposes to add to the traditional methods of statistical analysis of climatic data, a new type of analysis that combines the network theory with the concepts of physical statistics. The study deals with two problems in high-dimensional nonlinear dynamics: (i) prediction of extreme events, and (ii) identification of regime changes. In order to treat these problems, we represent the spatial patterns, such as large circulation patterns, as a network whose nodes are the sites in a spatial grid. An edge between two nodes represents the existence of a statistical similarity between the corresponding pairs of time-series of climate records. A weight is assigned to each edge to quantify the degree of statistical similarity between the time-series. A time-correlation analysis is performed to determine the direction of an edge for the cases in which this information is not available. In this study, the edge orientation is interpreted as a putative dependency between the spatial patterns. The prediction of extreme events is made on the basis of the vibrational centrality of the nodes of the network that quantifies the robustness of a node to external stresses (i.e. stresses that do not depend on the topology of the network). Indeed, the network of climate patterns is figured out as a system the network is imagined as a system immersed in a “thermal” bath of several external factors such as, for example, the anthropogenic factor, acting as a disturbance towards the climate pattern. A definition of vibrational centrality in terms of node displacement oscillations, as in statistical mechanics, is adopted. Nodes with high vibrational centrality are more sensitive to external stresses than nodes with low vibrational centrality. Finally, the network is translated into a set of differential equation whose parameters include network centrality measures and vibrational centrality. The analysis of the solution of these equations, and of the phase-space of their system, is finally performed to provide insights about regime shifts.

Keywords:

Statistical physics; network theory; climate dynamics, weather extreme events;

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regime shift.

4277_The Role of Community Innovation in Sustainable Urban Development

Antonella Galassi[1], Micaela Scacchi[2] and Lucia Petríková[3]

Abstract

The power of social innovation in terms of a better use of resources and social capital, along with better networking and increased knowledge transfer, has gained a growing importance over the last decade in discussions on sustainable urban development. The spotlight of the sustainable urban development, as we see, must incorporate the importance of the renaissance of urban communities. Revival and community development, innovative solutions in management of resources and effective local and regional governments are important determinants of smart urban development.
In this regard, the concept brings a new perspective on urban stakeholders. Citizens and local communities, the third sector, start-ups and other communities became the active actors in urban environment, as well as the knowledge holders who are able to create environment for innovative ecosystem encouraging social interaction, creative practice and inclusion of various, previously marginalized groups.
Clarifying the importance, role and impact of communities, communities can be understood as the space of positive deviation capable of generating social innovation or socially innovative practice, existing parallelly with the official state-organized forms of urban governance.
The term has resonated in many discussions in all range of public matters from community planning of urban public space, neighborhood initiatives to citizens participation and engagement in public issues. Several authors refer to communities and civil society actors as those who are able to develop new social practices and introduce novel approaches to acting and decision-making based on cooperation and creation of networks in contrast to the systems of vertical control (top-down government). Case studies show that community action also involves active reconstruction of public policy settings.
The boom in the field of information and communication technologies has also fundamentally affected the development of societies and the way they interact. Trends in Western European cities show that the use of modern digital technologies and interactive tools can be used to involve citizens in urban decision-making processes, particularly when creating or revitalizing common-shared public spaces. The technologies, which enable citizens exploring, analyzing, designing and evaluating spatial information on the basis of shared data (open data), challenge urban communities that show ambitions to move towards the principles of self-organizing and self-learning social systems.

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Our knowledge of the implications of this changing social dynamics on urban ecosystem, however, is still narrow and limited today. In the following research, the authors intend to explore the potential of digital technologies for community development and present a poster with a synthesis of findings based on the literature review and analysis of case studies and examples of good practice.

Keywords:
smart urban development; social innovation; community; digital technology

4280_Solar Panel and Harvesting Systems - Use Cases, Measurements and Reporting Methodologies

Jan Holub[1] and Jakub Svatoš[1]

Abstract

With an increasing number of wearable devices of all shapes and forms, which are equipped with new types of sensors to count steps, measure heart rate or even detect a fall, the requirement for more energy arises. Energy harvesting is one of the possible ways to increase the energy capability of such devices. The solar cells offer a renewable green source of energy to increase the power of wearable devices.
At present, there is no binding uniform methodology for solar cell characterization under real light conditions of everyday life. Solar power performance depends strongly on the illumination and on the angle of the incident light. Therefore, the performance of the cells is measured under the defined conditions: energy density of solar radiation 1000Wm^{-2}, Air mass AM1.5 and temperature of 25°C. In practice, the performance of the solar cell lower is lower due to orientation of the cell to the sun or others sources of light. In addition, the light goes through different layers of atmosphere depending on the time of day and amount of incident solar radiation is heavily dependent on clouds.
The poster presents a daily generation of energy in various daily life activity such as walking, car driving or office working with indoor illuminating. The solar cell, working in its optimal conditions (Maximum Power Point Tracking) achieved by specially developed measurement circuit, attached to a hand of a test person, or laid on the office desk or moved around city in the car cabin (in two different positions – laid on the cockpit desk close to tachometer and laid on the car floor in front of a seat) has been used. Another (hand-worn) scenarios were dining-related (3 scenarios – breakfast inside, lunch outside, dinner in dark restaurant). The hand-worn scenarios have been developed in cooperation with CTU medical research center to mimic situations relevant for diabetes patients using automatic insulin pumps.
Measurements according to all defined scenarios have been repeated every month in the period between April 2018 and April 2019 to achieve all-year-round performance overview. The presented results show real measured amounts of generated energy in everyday life activities, which could be used for a better characterization of solar cells in the future. The results also provide hints for IoT and wearable devices designers and developers, showing the ratio between nominal (datasheet) and realistic (environment dependent) solar panel performance.
The research is supported by the “Energy for Smart Objects” grant provided by Electronic Components and Systems for European Leadership Joint Undertaking in collaboration with the European Union's H2020 Framework Programme (H2020/2014-2020) and National Authorities, under grant agreement n° 692482.

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Keywords:
Solar panel, energy harvesting, maximum power point tracking, performance testing

4287_Snap4city Platform to Speed Up Urban Policies

Paolo Nesi [1], Michela Paolucci[2]

Abstract

The Aim of this paper is proposing Snap4city as a Big Data Smart City Platform to support the city decision makers, allowing them to have information in real time connected to the status of the city managed, so that they can make decisions as quickly as possible. The Platform is already adopted in many European cities such as Antwerp, Helsinki, Florence, Cagliari, etc. and it is capable to cover the extended geographical areas around the cities themselves: Belgium, Finland Tuscany, Sardinia, etc. Thanks to the collaboration with the municipalities and stakeholders of the cities where the platform is adopted, the following main thematic areas have been identified as the most important ones in order to monitor the city's activities and manage both emergencies and daily routines: road infrastructure and mobility, tourism, air quality, public services and events. The Snap4city Big Data Platform has been realized respecting the GDPR and processes every day a multitude of periodic and real time data coming from different providers. It is therefore able to semantically aggregate, in compliance with the Km4city multi-ontology, and manage data: i) with different access policies, more or less restrictive; ii) coming from traditional sources such as Open Data Portals, web services, APIs, IoT/IoE. The aggregated data are the starting point for the services offered not only to the citizens but also to the public administrations and public security service managers, enabling them to view a set of city Dashboards ad hoc composed on their needs, for example enabling them to modify and monitoring public transportation strategies, offering the public services real needed by citizens and tourists, monitor the air quality and traffic status for establish if impose or not traffic restrictions, etc. All the data and the new knowledge produced by the Snap4City Platform can also be accessed, respecting the permissions on each different kind of data, thanks to the presence of an APIs complex system.

Keywords:

Big Data Architecture, Smart City, Decision Support System, advanced APIs, IoT

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4294_Circular economy in Poland: main achievements and future perspectives

Anna Avdiushchenko[1] [2]

Abstract

Circular Economy (CE) is a new strategy of development adopted by European Union (EU) authorities in 2014, aiming to boost global competitiveness, foster sustainable economic growth, and generate new jobs. The CE approach keeps the added value in products for as long as possible and eliminates waste; moreover, it implies complete systemic change and innovation not only in technologies, but also in organization, society, finance methods, and policies. Such an approach leads to a new model of production and consumption, and a new relationship between stakeholders at the local, regional, national, and EU levels. The first work on CE priorities in Poland started in 2016 when the Inter-ministerial Committee for Circular Economy was established. Representatives from nine ministries became Committee members. The main document prepared by the Committee was the Roadmap for Circular Economy Transition. It presented an action plan for CE implementation and focused on increasing resource efficiency and waste reduction in Poland. It was intended to provide effective tools to transition from a linear economy to a circular economy within four main areas: sustainable industrial production, sustainable consumption, bio-economy, and new business models. It was prepared with the active involvement of all possible stakeholders – businesses, NGOs, the academic and research community, and local and regional authorities. In addition to national government initiatives there were numerous attempts to implement CE principles at local and regional levels. One of the most important areas of CE is business models that attract the interest of the business sector, and as such would be adopted by international companies and groups with operations in Poland. The actions of NGOs and educational organizations supporting CE development were also a vital contribution. The goal of the current research was to examine the CE initiatives of national-level, business, and local and regional government projects in Poland for achievements related to the CE model transition during the last three years. This research studied the main policy documents, reports, and expertise of the organizations involved with CE in Poland. The research was also supported by a review of academic literature. This process made it possible to evaluate the current level of achievement of CE goals, to estimate the future perspectives for CE in Poland, and to identify opportunities for updating existing planning policies and tools related to CE-based development in Poland.

Keywords:

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Circular economy, roadmap, local and regional initiatives, transition process.

4304_Exploring the concept of Energy Work Place in Rotterdam district

Nienke Maas[1]

Abstract

The Dutch government has very ambitious plans to meet the Paris agreement. The built environment will have to become fossil free in 2050. This means about an average of 1000 dwellings per day that need to get off the natural gas grid and get an alternative. On top of this required speed, this transition have major societal, spatial and financial challenges.
Local authorities are in the lead, but asset owners will have to invest in buildings, networks and installations to create a sustainable energy system. Energy district planning should not take into account energy only; climate adaptation, heat stress, sewage system, mobility will determine the design of the district. Related stakeholders will have to be included as well. Collaborative planning is required to get all stakeholders aligned. Though the Paris goals are clear, the district roadmap to meet those goals is not that clear. This is due to uncertainties in maturity of technologies, but it is linked to the lack of undisputed knowledge as well.
TNO has developed the concept of Energy Work Place as a way forward to help the energy district planning and explored this in action-research in Overschie, Rotterdam, The Netherlands. The concept of Energy Work Place is based on Joint Fact Finding. Joint fact-finding has been advanced as a method for helping stakeholders grappling with technically intensive policy and planning challenges to collaboratively engage in research and arrive at shared sets of facts to inform their decision-making (Schenk, 2016). It can be seen as a specialized consultative public engagement strategy that decision makers can use to resolve or narrow factual disputes over controversial energy issues (Adler, 2014). To enable the required speed of the energy planning process and to capture the dynamics of the joint process TNO proposes to maximize the lead time for the involved stakeholders to six weeks, with a condense preparation, a high quality facilitation and contribution of expert knowledge. To enable the alignment of investments on district level the Energy Work Place uses a list of prepared questions to get insights in usable assets and unknown linking possibilities. Prepared reference to usable data sets and geographical databases will help to get all these data in place in time.This abstract considers its application in the district of Overschie in Rotterdam and present the 6 week Energy Work Place, in the context of developing an energy district plan. It evaluates the usability of this energy work place in practice, the requirements of the preparation of the data sets, and the value of this concept for stakeholder engagement. This research have been financed by the Dutch Innovation Subsidy TKI Smart Urban Energy.

Keywords:

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Positive Energy District, multistakeholder engagement; Joint Fact Finding; Energy planning

SECTION IV
PRESENTATIONS

4103_Sustainability of cultural diversity in the European Union: National communities and the socio-economic cohesion of the Union

Attila Dabis[1]

Abstract

The oral presentation of the topic indicated in the title would focus on a possible way to utilize the tools of regional development planning for the purposes of preserving and maintaining the cultural diversity of the European Union. Even though it is a legal obligation of the Union under the founding Treaties to actively contribute to the preservation of such cultural diversity,[2] there are no EU-wide programs or projects that would aim to implement this obligation.

The means to reach this goal in practice is to initiate the adoption of an EU legislation, which would create the legal framework for the regional development policy of the EU to grant "*special attention*" to regions with national, ethnic, cultural, religious or linguistic characteristics that are different from those of the surrounding regions (in short, national regions).[3]

Such special attention could entail the establishment of a separate funding scheme within the regional development policy of the EU, that would be accessible directly and exclusively to national regions.

This new funding mechanism would create proper financial incentive for states to value, cherish and preserve their own rich cultural diversity, and at the same time it would empower local communities in a subsidiary manner to invent and implement their own, smart, and innovative regional development plans. Such a new financial framework would thus provide the leverage for local communities to tackle their respective development issues, and prevent eventual demographic decline of their regions, and the outflow of their population, which in itself erodes and endangers traditional minority cultures in the EU.

The presentation will also include a reference on implementing the above by means of direct democracy, through an ongoing European Citizens' Initiative.[4] In this respect, the presentation will promote the idea of local, bottom-up initiatives aimed at

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[2] Article 3 (3) of the Treaty on European Union stipulates that the Union "*shall respect its rich cultural and linguistic diversity, and shall ensure that Europe's cultural heritage is safeguarded and enhanced*." Furthermore, Article 167 (1) of the Treaty on the Functioning of the European Union (TFEU) stipulates that "*the Union shall contribute to the flowering of the cultures of the Member States, while respecting their national and regional diversity and at the same time bringing the common cultural heritage to the fore*".

[3] The term "*special attention*" is used in the context of Article 174. TFEU on economic, social and territorial cohesion in the EU.

[4] See: https://eci.ec.europa.eu/010/public/#/initiative, accessed: 2019.06.27.

tackling complex socio-economic challenges pertaining to the sustainability of cultural diversity on the regional, and European level. The underlying idea is that the preservation of the cultural diversity of humanity is equally important as the maintenance of ecological- and biodiversity. In this respect, the scope, the aim, and subject matter of this project is in line with both the economic as well as the social dimensions of the Sustainable Development Goals.

Keywords:

cultural diversity; sustainability; social cohesion; development policy

4108_Alperia Smart Region: the region-wide approach for South Tyrol

Giorgio Dalvit[1]

Abstract

Alperia is South Tyrol's young energy provider, created in 2016 by the merger of two major player in the region, with a century old legacy in hydroelectric energy production and distribution. The industrial plan set for the newborn company focused on 5 strategic areas:

1. territorial roots;
2. green DNA;
3. R&D;
4. client focus;
5. human capital;

the aim is to be a leading force in the provision of energy services and to foster an intelligent, digital-based energy future for customers and the community. In order to translate this aim into reality a new project has been started: Alperia Smart Region.
By enhancing traditional energy provider activities with the latest developments available in the field of ICT and being driven by the 5 pillars of the industrial plan, Alperia Smart Region offers a series of new services to customers:

- smart energy communities that can boost their efficiency with real-time management and monitoring of their energy production and consumption;
- smart farms that are able to optimize water and chemicals consumption by sensing the actual conditions in the fields;
- smart distribution systems that can forecast future demand and consequently rationalize energy storage and production;
- smart cities that can create synergies between existing services and infrastructures to enhance services offered to citizens and to optimize the use of resources;
- smart mobility that enables the widespread use of zero emission vehicles, such as electric or hydrogen fed, developing both the charging infrastructure and the connected services to the customer.

In order to deliver these services and to manage them in an efficient way, one single, modular, scalable ICT solution has undergone development: the goal set was the implementation of a system that can be scaled in terms of territorial coverage, provided services and connected users whilst sharing user interface, ICT resources and keeping up with technological evolution. The solution adopted is structured on the following layers:

1. Infrastructure: networks and devices enabling communication;
2. Sensors: field data gathering;
3. Service delivery platform: data processing and forwarding;
4. Application and services: elaboration, analysis, system control and monitoring;

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5. IoT HUB: integration, synergies and added value services for end users.

A constant connection with the territory and the tech world are vital to keep the implemented solution at the edge of technological development: collaboration with local authorities and other utilities in the region, fostering of innovative start-ups and in-house test application of selected solutions are action taken to constantly upgrade the region-wide solution developed by Alperia for South Tyrol: Alperia Smart Region.

Keywords:

Alperia Smart Region, South Tyrol, flexibility, scalability, layer structure

4115_Reporting about the development of new maps and indicators for Flanders and the challenge to get these new insights implemented in policy documents

Pisman Ann[1] and Vanacker Stijn[2]

Abstract

Within several European analysis of spatial patterns Belgium and Flanders take a specific position. The average 'settlement area percentage' (=all land used beyond agriculture, semi-natural areas, forestry, and water bodies) for Europe is 4%, but 32% of the Flemish area is occupied with artificial land. Belgium has the highest score on urban sprawl indicators and within an European context almost the entire area is considered as urban.
Recently the Flemish authorities are developing the Beleidsplan Ruimte Vlaanderen (Spatial Policy Plan for Flanders). The central concept inscribed in the policy plan is the policy intention to achieve no net land take by 2040, the so called 'betonstop' in order to increase the quality of life in the region of Flanders.

The aim of the research presented in the paper is on the one hand to expand on the theme of indicators for spatial patterns by analyzing the Flemish area with detailed data across various scales. The results are collected in a report, the 'Ruimterapport', published in 2018. The analysis and the publication were inspired by amongst others the 'Compendium voor de Leefomgeving' (the Netherlands), 'Diagnostic territorial de la Wallonie 2011' (Wallonian Region Belgium), 'Qualité de vie, habitants, territoires - Rapport de l'Observatoire des territoires 2014' (France), SOER 2015 — The European environment — state and outlook 2015 (Europe). On the other hand the paper builds on the difficulties regional policy makers face introducing new planning concepts as 'betonstop' in the recent policy plans, taking into account the given morphological context and the societal resistance against changes.

New maps and indicators are developed for the urban/suburban/periurban/rural dimensions of the human settlement area, urban-rural relations, urban sprawl and settlement patterns by differentiating amongst others between urban centers, ribbon development and dispersed buildings. If possible, the indicators were benchmarked against global European characteristics. Flanders counts more than 1500 centers of different scales and sizes, is characterized by 13.000 km of ribbon development, and more than 150.000 buildings are scattered over the semi-open area.

The paper gives a quantitative, methodological and empirical contribution to the field of urban and regional development processes and contributes to conceptualizations

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of space. The research contributes to the 'transposition' of research into practice and visionary approaches into (planning) policies and tools. The case of Flanders, with its specific sprawl pattern, illustrates the difficulties spatial planning policy makers currently are facing. As illustrated in the paper and the presentation the gap between conceptualization and realization is not easy to address.

Keywords:

urban/suburban/periurban/rural dimensions; planning concepts; indicators; state report, benchmarking

4116_Integrated territorial approaches in portugal: Between eu-led policy iniciatives and national statutory contexts

Ana Pagliuso[1], Cristina Cavaco[2], João Mourato[3] and André Pereira[4]

Abstract

In the last decades, the prefix “soft” has been increasingly used to explain the flexibilization of hard concepts and processes such as planning (“soft planning”) or law (“soft law”),. Soft planning can be understood as a planning process that crosses and dissolves traditional administrative territorial boundaries and introduces new governance practices between formal structures and institutions, aiming at promote place-based integrated territorial approaches. Under the umbrella of soft planning, a growing number of integrated territorial approaches emerged together with, although outside the statutory system.

In Portugal, place-based integrated territorial approaches have been particularly associated with EU-led policy initiatives. The aim has been to cope with urban and territorial imbalance, meeting the specific needs and demands of the territories by means of an articulated set of territory-focused integrated policies that share common objectives and a development-led strategy.

Focused on the concept of soft planning, this article analyses Place-based Integrated Territorial Approaches in Portugal. It uses the Region of Lisbon and Tagus Valley as a case study, since it has been a pilot area in the development of such integrated policy approaches, not to mention being an area with an important socio-demographic dynamic. Its innovative characteristics (structural programming, multiplicity of established strategic frameworks, stakeholders’ relationship and financial methodology) and also the challenges arising from the participation of various Operational Programs in interactions with the corresponding protagonists justify the analysis.

Some questions arise: How does the EU foster Place-based Integrated Territorial Approaches and how does Portugal deal with it within the context of its statutory system? How have Place-based Integrated Territorial Approaches been implemented in Portugal via the EU? How exactly these soft planning tools have been fostering processes of “working across boundaries” based on strategic development-oriented thinking and territorial governance? Are they promoting multilevel governance,

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facilitating the cooperation between institutional bodies and territorial agents, being complementary to statutory planning in order to streamline embodied planning processes? Are these planning approaches promoting the transfer of powers and responsibilities between the different tiers of government, encapsulating processes of devolution or decentralization? How have they been contributing to the emergence of sub-national and supra-municipal planning spaces?

With the aim of discussing these and other interrelated questions, this paper shapes a brief overview on the implementation of Place-based Integrated Territorial Approaches in Portugal since the 80s. It intends to identify the several generations and forms of integrated approaches, their origin, configuration and implementation, before and after Portugal's EU membership. The analysis is mainly structured upon the several Community Support Frameworks (CSF I 1989-93; CSF II 1994-99; CSF III 2000-2006; QREN 2007-2013 and Portugal 2020 2014-2020) and gives a particular emphasis to sub-national/supra-municipal approaches and partnerships.

The article aims to discuss that at different levels of the planning process (planning actors; political spheres; nature of policy instruments; etc.) Place-based Integrated Territorial Approaches have been leading to a general softening of statutory planning tools fostering the dissolution of borders and partnership arrangements between stakeholders.

Keywords:

place-based planning, cross-border dimensions, integrated territorial approaches, soft planning, urban policies

4118_From Big Data to Multidimensional Data: Elderly Care Facility Optimized Planning in Beijing

Jiaqi WU[1], Yuwei ZHANG[2] and Xiyu ZHANG[3]

Abstract

Nowadays, some scholars have put their attention on the shortcomings of Big-data-based planning (BDBP) about the social and spatial justice, but few of them tried to study what advantages and disadvantages different types of data has and how we can intermix them to make our planning more useful. The algorithmic processing of large sets of 'traces' of user activities collected by digital platforms – so-called 'Big Data'. The common types of data, which be utilized to support planning, can be divided into government management data, Big Data and field survey data. In recent years, BDBP has become so popular that it has been regarded as an accurate method to study people's behavior to improve the practicability of the planning. Some citizens, however, are less involved in Big Data production process than other groups, such as the elderly and children, which results that BDBP could not provide the satisfied support for the planning aimed to particular group.

Beijing is a typical and meaningful example for the study of the planning and public policies for the elderly of increasing mega-cities in developing countries. After decades of rapid industrial and urban development, large numbers of mega-cities have formed in developing countries that are generally facing the aging problem. Beijing, whose aging proportion in core urban area is reaching 40%, is facing a serious aging crisis. Moreover, it has a total population of more than 20 million, a high-density urban built environment, and obvious social differentiation, which means that the land and public resource is rare in Beijing. Therefore, it is necessary that planners there should compare different functions of multidimensional data in optimizing the facilities planning for the elderly.

This study, partly accepted and implemented by Beijing Municipal Government, analyzed different service area of elderly facilities estimated by multidimensional data including government management data, Big Data and field survey data. The author collected the official statistics of Beijing Municipality, and gathered the Big Data from APP comments. Network and Distance Analysis was used to build the service capability model of the elderly care facilities. The semi-structured interview and questionnaire survey were utilized to gather the true demand and behavior in service for elderly care facilities. The author then used the GIS and spatial syntax to calculate and simulate the service area of the facility based on each type of data.

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The preliminary conclusions include:
1. Government management Data, Big Data and citizen survey data differ in supporting the calculation and optimization of the service area of elderly care facility planning.
2. Field survey data has advantages in accurately meeting the real demand of the elderly with different attributes, especially in the service area of particular facilities in suburban.
3. Later researchers and planners should consider the different walking distance, willing and frequency of the elderly at different age groups to go to the care facilities.

Keywords:

Service area; Public facilities; Mega-city; Facility Planning; Population aging

4120_The Emerging Identity of Innovation Centers as 'Intermediate Places' between Social and Institutional Regeneration. Insights from Boston and Bologna models

Bruno Monardo[1], Martina Massari[2]

Abstract

The emerging popularity of the so-called 'intermediate places' (Massari 2018), as urban agencies, living labs, innovation and community hubs (Calvaresi & Pederiva 2016), stems from their ability to become a powerful, skillful nexus for social and institutional innovation in urban policies and in planning tools, encouraging the exchange of relations that increases the performance of these structures. The aim of the contribution is to develop twofold critical reflections between the US and Italian interpretation models of 'intermediate places' as 'innovation centers'; in fact these evolutionary hubs are proving to be triggers for new horizons in urban policies towards shared, joint, inclusionary solutions more likely to meet the socioeconomic, cultural and environmental needs of local communities.

In order to analyze the performance of intermediate places and if they can be considered a new generation of 'urban centers' (Monardo 2007), our reflections seek to draw a framework of comparisons, contaminations and drawbacks arising from the assessment of some experiences, in the Boston-Cambridge area (Massachusetts, USA) like the District Hall in Boston Seaport, the Innovation Centers in Cambridge and Boston Roxbury, as well as in Bologna, Italy (COB; Community Lab). First, an operational definition of 'intermediate place' is drawn. Such places cannot be labelled with a unique function or bordered with a singular meaning, but rather drawn up as an inventory of changeable and invariant features. Afterwards, the case studies are analyzed using the dimension of space, governance and process to explore how the performance of intermediate places can foster formal and/or informal institutional changes. Finally, the paper highlights and discusses what are the interpretative keys to establish a more structured role of these places in bridging innovation from social practices to institutional policies, related to their implementation.

The hypothesis is that social innovation (in the Deleuzian-inspired interpretation) is strictly path-dependent, enabled by 'opportunity windows' (Deleuze 1994) in which local actors get mutual engagement and advantage, addressing contextual needs, while creating virtuous cooperation ecosystems (Monardo 2018) and new governance arrangements. In this scenario, intermediate places and innovation centers are proving to be successful because of their capability to leverage on physical contiguity: the recovery of direct relationships between different actors can allow them to act as powerful catalysts and interactive playgrounds in which the operative capacity of practices can expand the visions and strategies providing the perspective of a long-term cultural change. Our contribution is conceived to

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emphasize that the recognition of the variety of place-grounded combinations of micro and macro initiatives, embedded in the social and spatial fine grain of places and encompassing the diversity of actors, can create the conditions for local economies to grow towards a place based, sustainable urban innovation ecosystem. Intermediate places can therefore represent useful contact points between government and citizenship, highlighting the differences of cultural approaches emerging from interaction, as resources and externalities to be taken into consideration both by policy-makers and innovation practitioners. The paper expands the international case study knowledge towards the American perspective in order to highlight the approach peculiarity and the contact points with the European (Italian in particular) sister structures.

Keywords:

Social innovation, intermediate places, institutional innovation

4122_Construction of Resilience in Urban Fringe Based on Sponge City: an Example of Green Space Planning of Shahe in Beijing, China

Xin LI[1]

Abstract

Urban fringe area is important to maintain the sustainable development of ecological safety and security. Under the background of rapid urbanization, the ecological environment in the urban fringe is facing great threat to urban and rural construction. The acceleration of urbanization has brought a series of problems, such as the deterioration of the ecological environment and so on.

This article summarizes the inadequacies of the urban fringe area and the future direction of development from the perspective of landscape architecture through literature surveys, conceptual analysis and related historical research. Clearing research direction is construction of resilient landscape in urban fringe. The study object is the Shahe area in Beijing, China. I analyze the status of the macro and meso level of the site using the 2017 Remote Sensing Images and Field Survey Data. In response to the current status issues, the potential characteristics of water elasticity in this area are proposed. The current status is severe soil desertification, non-point source pollution, pollution of water bodies, imperfect drainage systems, serious water pollution, lacking of systematic green areas, etc. Different resilient solutions are proposed for within the embankment and outside the embankment.

1) Within the embankment: giving space for the river
   Opening the local embankment and adding the ecological embankment; setting the pond to resist the impact of heavy rain; adding wet meadows, increasing ecological habitat.
2) outside the embankment: providing site for the storm-water
   Adding permeable paving and roof greening; organizing storm-water discharge; Designing storm-water pond.

According to Sponge City's control standards formulate storm-water runoff control objectives and conduct catchment zoning planning and calculation. According to the results of the calculation adjust the green area within the studying area. The benefit evaluation of ordinary rainfall mode and rainstorm mode is carried out.

Keywords:

Landscape architecture, Urban fringe area, Low impact development of rainwater system, Elasticity landscape

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4125_Integrated building data for smart regions and cities

Ezilda Costanzo[1] and Bruno Baldissara[2]

Abstract

Regional and local decision makers still require relevant information and training in order to establish long term strategies and to contribute to national and supranational energy and climate targets. As an example, a widespread participation of local authorities to comply with the Italian long term building renovation strategy has not occurred so far. Thus the overall target, yearly 1% floor area of new or deeply renovated buildings to the nZEB standard by 2020 (PanZEB, 2015), proves to be disregarded to date.

Evidence-based, data-enabled assessment of the building stock and of its relationship with the energy system as a whole at a capillary level is crucial to this extent.

In Italy different building databases are already being used to the ultimate purpose of EPBD implementation and to track and record incentives for public and private building renovation. These datasets have an untapped potential for local energy planning, that could be released from wider integration, also including energy consumption data and smart metering data.

Moreover the regulatory landscape is changing towards an interaction of the building with the user, the energy grid and other buildings in a dynamic and functional way.

Within this context, the paper will investigate how integrated data could unlock the value of a more evidence-based planning starting from the DIPENDE integrated dataset, a REQUEST2ACTION (IEE 2014-2017) pilot project combining data from energy performance certificates (EPCs) with bottom-up information on building renovation, and other data in order to support decision making at different territorial scales.

Keywords

Big data, long term building renovation strategies, smart energy planning

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4126_Public research and development funding for photovaltaics in europe – past, present, and future

Simon Pezzutto[1], Juan Francisco De Negri [2], Sonja Gantioler[3], David Moser[4] and Wolfram Sparber[5]

Abstract

Photovoltaics is crucial in achieving Europe's climate and energy transition targets until 2030. Technological innovation is one of the key drivers of this transformation, and public funding of related research and development is assumed to play a major role. The study has thus generated a vast set of data on how funding programmes by the European Union and its Member States as well as by other countries involved in the development of the European Strategic Energy Technology Plan (including Norway and Turkey) have supported photovoltaics research and development. Based on historical data as well as actual trends, the authors also outline possible future developments of public financing provided for photovoltaics research and development. As such the study aims at shading light on the funding provided by the European Union, its Member States and relevant Strategic Energy Plan countries between the early 1970s up to today, and assuming to occur until 2030. Future projections are based on a business as usual scenario.

First insights show that at national level, public financing for photovoltaics research and development steadily increased after the first oil shock in 1973. These expenditures are characterized by a huge peak in the mid 1980's. Afterwards, no major increases or decreases occurred for over two decades. Since the year 2005, when spending reached around 100 million €, at national level photovoltaics research and development funding has again gained momentum, nearly increasing by 40% until 2017 compared to mid-2000. The authors predict that it will likely increase to more than 200 million € in 2030. In comparison, funding provided by programmes at European Union level has augmented from the late 1980's for approximately two decades, though figuring several peaks: at the beginning, middle, as well as end of the 1990's. The last peak was followed by a significant decrease of European Union expenditures, which lasted for over a decade. It then resulted in an all-time maximum in 2007, when expenditures amounted to more than 50 million €. The following decade was again characterized by a drawback, nearly reducing the funding by halve.

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It is assumed that in 2030 expenditures by European Union funding programmes will be near to the peak of 2007, amounting to almost 50 million € again. If research and development financing for photovoltaics at national and European Union level are summed up, it becomes visible that funding remained rather flat from the late 1980's until mid 2000's, fluctuating around 100 million € per year. From 2000 onwards, values constantly rise, reaching more than 200 million € in 2017. The authors expect that overall public spending for photovoltaics research and development will reach approximately 210 million € in 2030.

In addition, the impact of the cumulative funding stock has been assessed. Main results indicate that the observed European countries provide higher amount of financing for photovoltaics than European Union programmes, and expenditures from both sources are expected to grow significantly within the coming decade. In fact, cumulative funding stock induced by photovoltaics research and development expenditures accounts for approximately 6 billion € in 2017, and the national share is almost six times higher than the share of European Union programmes. The outlook also shows that the cumulative funding stock concerning photovoltaics induced at national and European Union level is likely going to rise, reaching more than 7 billion € by 2030. This comparison of research and development funding for photovoltaics at national and European Union level provides a first picture of past, current and future developments in Europe. Related analysis and insights will be used to elaborate recommendations on how their advancement might inform policy strategies and actions, which support research and innovation for the long-term development of photovoltaics technology.

Keywords:

Research and development funding; Europe; Photovoltaics; Status quo; 2030

4128_A Cloud-based Unmanned Aircraft System Traffic Management approach for urban drones applications

Stefano Primatesta[1], Matteo Scanavino[2] , Giorgio Guglieri[2] and Alessandro Rizzo[3]

Abstract

The Unmanned Aircraft System (UAS) market is rapidly growing and new technologies offer potentials in fields still unexplored. When considering the paradigm of Smart City, robotic aerial platforms play an important role in sensing and data collection applications. The management of fleets of autonomous UAS in cities is still complex as it requires adequate protocols to guarantee safety for citizens. At the same time, new questions arise regarding security and privacy related to UAS operations in urban environments. As a result, autonomous aerial vehicles in cities are not fully exploited. The aforementioned problems will be partially overcome with the implementation of UAS Traffic Management (UTM) services, to support safe and efficient UAS operations. Thanks to the modern mobile technologies, the UAS can be connected with a ground segment via Internet, opening the related research area to unprecedented opportunities.

In this study, the management of a fleet of autonomous aerial vehicles in urban areas is accounted for. In particular, the proposed solution relies on a priority-based distributed approach, where the flight mission of each UAS is planned with a distributed planning strategy. The overall architecture is allocated between the Cloud and UAS, which makes the system easily scalable. A central on-Cloud element manages the priorities of UAS, determining how they interact with each other. A planning element, one for each UAS, plans a safe flight mission.

In this Traffic Management approach, Cloud technologies and their advantages are exploited for fleet management. In fact, thanks to the concept of Cloud Computing, the global path and the local trajectory are computed on-Cloud, while the connected UAS executes the flight mission using on-board resources.

The proposed planning strategy consists of two phases: *(i)* a global path planner, and *(ii)* a local trajectory planner.

First, a global planner seeks for a waypoint-based path minimizing the risk to the population on the ground. The risk to the population is defined by a risk-based map, a tool able to quantify the risk over urban areas, taking into account the population density, connection coverage, sheltering factors and no-flight zones. The global planner is performed with a risk-aware path planning algorithm based on the Optimal Rapidly-exploring Random Tree (RRT*) algorithm.

Hence, a local planner generates a trajectory able to follow the path defined by the

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global planner and to avoid collision with other vehicles, when conflicting trajectories are detected. The local planner is based on a Distributed Model Predictive Control (MPC). When potential conflicting paths are detected, the trajectories of the involved UAS are computed considering the trajectories of the involved UAS and the priority level of each vehicle. Practically, the MPC generates a trajectory avoiding vehicles with higher priority.
The architecture presented by the authors is fully implemented based on the Robot Operating System (ROS) to ensure scalability and feasibility of integration. Preliminary Software-In-The-Loop (SIL) simulations in a urban area corroborate the proposed approach. Results highlight how the global path planner ensures the minimum risk UAS path, while the distributed local planning strategy manages the conflict between UAS. This hybrid *glocal* planning approach allows safe management of urban drones without compromise risk to citizens. The proposed Cloud-based architecture fits easily with the concept of Smart City, where autonomous vehicles such as UAS will play a major role. Finally, future developments to improve the integration of drones in cities are discussed by the authors.

Keywords:

Urban drones, UAS Traffic Management, Risk-Based Path Planning

4129_Discrimination against vulnerable and marginalized groups - a hidden barrier to sustainable urbanization?

Vivien Benda[1]

Abstract

Implementing the United Nation's Sustainable Development Goals (SDGs) is a global obligation. The agenda considers the sustainable development's various dimensions - social, economic and ecological - and its targets are strongly shaped by a human-right oriented approach. Sustainable urbanization is may the only path that leads to the resilience of the human communities, which is vital in this rapidly changing world. Goal 11 focuses on the issues of sustainability in cities and other communities which has a strong correlation with significant human rights such as the right to a healthy environment or the right to water and sanitation. The most worrying obstacle of the implementation of this Goal is the discrimination of vulnerable and marginalized groups which can lead to social exclusion and gentrification.

The oral presentation is based on a legal research which principal objective is to identify, categorize and describe the (frequently hidden) discrimination against the vulnerable and marginalized groups. Our main starting point is based on Edith Brown Weiss' principles of inter- and intragenerational equity which generated the statement that we cannot fulfill our obligations towards the future generations without identifying and solving the problems of the present generations which raises the issues of the social justice.

The oral presentation will focus on Hungary and the other States of the Carpathian Basin and on the one hand, uses the primer data of individual research which wishes to explore the discrimination against the ethnic minority communities, for examples in the field of strategical planning of landfills or other facilities with major hazard and pollution potential. On the other hand, the research will also consider the discrimination of other vulnerable people such as disabled people and put a particular emphasis on highly disadvantaged people, for examples women and girls within a marginalized group.

Subsequently, the oral presentation will list the possible solutions to put these communities at an advantage, such as bottom-up approach like the tools of the direct democracy, for example, the European Citizens' Initiative or special measures to create the human-centered cities and other human communities in order to create territorial balance and prevent human right violations.

This presentation could bring interdisciplinary benefits because the conclusions could provide guidance to the sustainable urban and regional planning and its results could be used in researches focusing on the sustainability issues of other regions of the European Union.

Keywords:

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sustainable development, sustainable urbanization, social justice, inter/intra generational equity

4130_Urban regeneration between technological and social innovation

Alessandra Battisti[1], Fabrizio Tucci[2]

Abstract

Urban regeneration is today one of the levers available to cities to reinvigorate the social fabric and stimulate the emergence of new interactions in order to generate possible innovative solutions for intelligent governance and active citizenship through the design of spaces and approaches that favor the commitment and collaborative action by making use of significant technologies and innovations aimed at investments and community-based initiatives that promote new urban and regional developments process bottom up.
The paper presents the architectural, environmental, energy and social regeneration project of a large French residential ensemble of the 1980s, the Arlequin complex of the city of Grenoble. Project promoted by the ENSAG of Grenoble and the University of Rome Sapienza dept. PDTA to develop and test new innovative solutions in the neighborhood context, involving: citizens, SMEs, associations, universities and the public administration, which exploring and experimenting together technological and social innovation processes had the common goal of creating spaces - centers of innovation from below - to improve the quality of life in a neighborhood that presents several problems.
The crucial question was based on a distributed energy system, new production units, decision-making capacities and local responsibility that are significant factors when discussing architectural transformations, new functions, new forms of energy supply, infrastructure and governance. Factors inherent in a multidisciplinary view on the role of urban regeneration as a bottom-up governance process that could lead to a socio-material transition in the architecture, energy and environment market by mobilizing specific factors, institutions and territorial approaches thanks to the involvement of users and citizens.
The work was carried out following a scientific-experimental methodology structured in 3 phases. A first cognitive phase took place in two moments: a preliminary research, through the study of bibliographic material, and a deepening and verification on the area under study. In the first part the theme was studied through the identification of exemplary cases of urban regeneration interventions in areas similar to the district of Arlequin, and parallel studies were carried out concerning the intervention area with the help of online databases and software for environmental and energy simulations. In the second part, in Grenoble, a bibliographic search and analysis of the current implementation tools was carried out, with the support of the municipality of Grenoble. This phase was characterized by continous confrontation

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with neighborhood associations, local inhabitants and municipality. In the second methodological, synthetic-evaluative phase, a critical reading was made of the data collected, followed by a summary of the results obtained. This led to the identification of three intervention axes from which a series of strategies were derived, which guided the subsequent design experimentation, developed in the third and final phase of the research.
Building on know-how and the past, Arlequin thus becomes an open laboratory of frontier innovation capable of attracting businesses and skills to guide the development of the future ensemble thanks to frontier technologies at the service of quality of life and environmental and social sustainability on an urban scale.

Keywords:

Innovative technologies; Active citizenship; Community-based initiatives; Governance; Grand ensemble

4134_A Systematic Study of Sustainable Development Goal (SDG) Interactions for Spanish Cities

Javier García López[1], Raffaele Sisto[2], Carlos Mataix Aldeanueva[3], Julio Lumbreras Martín[4] and Javier Benayas[5]

Abstract

Sustainability has become a global concern for urban development. Indeed, more people live in urban areas than in rural areas, with 55 % of the world's population residing in urban areas in 2018, by 2050, 68 % of the world's population is projected to be urban. While historically was the desired goal of development, it evolved to maintain economic advancement and progress while protecting the long-term value of the environment. Nowadays it is understood as one of the major implementation science challenges.
The Sustainable Development Goals (SDG) are considered as the international reference to establish the sustainability model that we should follow in the future. At the global level, the Sustainable Development Solutions Network (SDSN) has developed the SDG index. Spain, Italy and the U.S. are the first three countries that have developed a similar index based in order to measure the SDG progress in the urban context. This set of urban indicators provides a holistic and inclusive approach and are designed to establish national and global standards capable of measuring sustainable development at the urban level. In Spain, a selection of 85 indicators has been developed divided into 17 goals of the SDG.

Whereas the SDG have a global dimension, their action implementation depends on the level of priority different countries give to them, and on how sustainability issues compete with a country's main problems. It aims to force to look not only at the overall progress of the country but also at the progress of each city.

To analyze the SDG interactions, it has been systematized the identification of synergies and trade-offs using this dataset for 100 main Spanish cities. Knowing from an objective perspective the interactions between its indicators is an innovative first step in defining the critical path of factors to be solved for the sustainable development of any city, setting the priorities of action that must be taken.
The methodology of this study follows two phases: (i) Analytical Study: compounding the published Database SDG index Spain, it has carried out a PCA analysis for the

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results of the indicators and goals. With the results obtained, a table has been made for each indicator, highlighting the most relevant, strong or weak, positive or negative correlations. (ii) Critical Study: Based on the results obtained, a critical analysis, several proposals for improvement of the index and the approach of future research have been carried out.
This research aims to identify the conditions that contribute to social, environmental and economic sustainability in the cities. The study is a significant first step to understand the most relevant urban indicators. The implementation and deepening of the research of these issues are essential for municipalities to find efficient answers to ensure sustainability, to meet the needs of their citizens and to improve their quality of life, achieving the targets set out in the SDG.

Keywords

Open Data; Key performance indicators; modeling tools; statistics; Sustainable Development Goals

4135_City assessment tool to measure the impact of public policies in smart and sustainable cities. The case study of municipality of Alcobendas (Spain) compared with similar European cities

Raffaele Sisto[1], Javier García López[2], Julio Lumbreras Martín[3] and Carlos Mataix Aldeanueva[4]

Abstract

Open data and statistics are a key resource to analyze and compare cities and to find their strengths and weaknesses in order to define long-term strategies and sustainable policies. On one hand, urban planning is geared for adapting cities' strategy towards qualitative, intelligent and sustainable growth. On the other hand, institutions are geared to open-governance and collaborative administration models.

The main objective of this research is the explanation of the methods and results of the application of a city assessment tool for measuring the impact of public policies in the socio-economic and environmental structure of a city. It shows the case of study of the evaluation of the Strategic plan “Diseña 2020” of the municipality of Alcobendas (Madrid – Spain, 116.037 inhabitants). It aims to quantify the impact of the adopted policies, to identify best practices within its strategy and to improve future policies for the next strategic plan.

To develop a tool measuring the impacts of policies in terms of economic, social and ecological performance, the authors have carried out a quantitative analysis using time series from 2012 to 2018. In addition, a selection of Urban Indicators has been aligned to the 17 Sustainable Development Goals (SDG) defined in the Agenda 2030. With this set of indicators, validated by sectorial experts, the tool is able to quantify the impact of the policies in the city, and also is able to support the decision-making processes of the administration.

The set of urban indicators are divided into 5 areas: economic development and employment, sustainable development, open government, social responsibility and quality of life. The data evolution across the last years 2012–2018, are used to monitor and benchmark the effects due to the applied policies. In addition, with this dataset, Alcobendas can be compared to other Spanish and European cities of similar characteristics (e.g. Bergamo, Monza, Pozuelo de Alarcón, San Sebastián de los Reyes, Potsdam, Getxo...) This comparison allows positioning the city in the

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achievement of its strategic areas, incorporating the current trends and fostering the SDG of the Agenda 2030.

Thanks to the quantitative comparable results and the objective approach, this research shows the achievements that have been reached with the current strategic plan “Diseña 2020”.

The visualization of the urban economic, environmental and social impacts cannot only support decision-making processes but can also be used as a political argument to promote and foster long-term planning and urban sustainable development in other European cities.

Keywords:

Open Data, Key performance indicators, modelling tools, statistics, Sustainable Development Goals

4136_Making cities informed implementers of autonomous mobility

Giel Mertens[1] and Rolf Bastiaanssen[2]

Abstract

Autonomous vehicles (AV), or self-driving vehicles, promise widely available, low-cost, clean, door-to-door transport for people and goods. Widespread use on Europe's roads is anticipated by the 2030s and it is expected to have numerous societal implications for equity, health, economy, and governance resulting in potential impacts on city development and design (from street to district- and regional development).
Many European cities are already beginning to experiment with AV. But they're in danger of getting ahead of themselves, as the concept of AV has yet to be integrated in spatial planning, broadly speaking. This is urgent as cities plan district (re)developments, transport infrastructure and other related investments decades ahead of time.
The EU-funded SUV project, which started in September 2019, will support four cities in Europe in stimulating the uptake of electric, shared AV by developing pilots and to incorporate AV in their Sustainable Urban Mobility Plans (SUMPs).
Autonomous vehicles will transform our cities from car-centric to people-centric (the Economist, 2018-03). In 2018, the European Commission provided a vision for the EU's mobility future: 'On the Road to Automated Mobility' states that AVs will be commonplace by 2030 and offer great potential to make transport safer, more accessible and sustainable. This will revolutionise urban planning. Self-driving vehicles will change our lives, just as steam trains and motor cars did before them. It will help achieve social goals (reducing traffic fatalities and improving access for all), and sustainability goals (zero emissions), while impacting all public space. However, cities lack the necessary tools in their local networks to strategically prepare or shape the world of future mobility.
SUV connects cities, experts and business, currently representing six different countries in Europe. This transnational collaboration with each other, allowing cities to source and select globally the best ideas, state-of-the-art approaches and business models that enable cities to have a wide range of design options which goes beyond the usual options in their local network. This transforms cities into informed buyers, ultimately leading to smart implementation of pilots with autonomous vehicles and developing high-quality Sustainable Urban Mobility Plans. Forward-looking specialists see a seemingly endless list of challenges and opportunities related to daily life and spatial planning. Therefore, cities need to develop their pool of international experts in order to connect the fragmented knowledge and leverage this knowledge to develop long-term SUMPS.

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Keywords:
Sustainable urban mobility plans (SUMPs), Mobility as a Service (MaaS), autonomous vehicles, smart cities

4137_Tackling energy poverty in Italy: household models, pilot actions and policy recommendations.

Anna Realini[1], Simone Maggiore[2] and Marco Borgarello[3]

Abstract

Energy Poverty is one of the main social, technical and legislative issues of the present time in Europe, with an estimated number of affected people ranging from 50 to 125 million. The European Commission (EC) has put a lot of effort to solve this issue, as shown, for example, by the launch of the EU Energy Poverty Observatory in January 2018 and the increasing number of initiatives and projects dedicated to this topic. In Italy, the different existing indicators estimate that between 1.9 and 4.5 million households can be considered as “Energy vulnerables/poors”, as they are not able to afford the energy costs to maintain an adequate level of comfort. The analysis of the phenomenon is quite complex, as a large amount of reliable statistical data and accurate numerical models are required to couple the energy needs of families with their energy expenses.

This paper presents a methodology that could be used to build a reliable model to evaluate energy needs, by taking into account the characteristics of the main types of buildings in Italy, together with those of the families occupying them. Based on a proprietary software, that includes the model of 140 “houses”, representing all the combinations of building age, climatic zone and type of building (from single family villas to large condominiums), the average energy needs have been calculated. The results, in terms of theoretical “minimum” energy expenses of a certain household, living in a definite building, can be compared with the actual energy consumption and/or expenses for the same type of household, in order to evaluate their vulnerability level. The preliminary results obtained with this type of modelling are presented in the paper, with the focus on specific case studies in some urban areas. Furthermore, some “soft” actions to tackle energy poverty have been experimentally introduced in some of the analysed vulnerable households: the main results are presented together with some policy recommendations that can be derived from both the modelling and the practical experience.

Keywords:

Energy poverty, household model, pilot actions

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4138_Transport models and sustainable mobility scenarios: the cases of Milano and Parma.

Anna Realini[1],Marco Borgarello[2], Simone Maggiore[3], Silvano Viani[4] and Carlo Caruso[5]

Abstract

In the near future, mobility services will become largely increase their role in challenging climate change. Indeed, transportation represents around 20% of the global energy consumption, with a 40% contribution from urban areas. Through the application of innovative models and data analysis tools, it is possible to analyse transport issues both at local and regional or national scale, in order to understand which are the most promising mobility solutions in terms of both energy efficiency, environmental impact and cost impact. RSE, together with Tandem, has implemented an enhanced transport model for Milan Metropolitan Area (MMA), using the software Visum. The model has allowed to analyse the impacts, both in terms of energy efficiency, environment (mostly GHG emissions) and economics, of different sustainable mobility scenarios. It has then been re-shaped on Parma urban area, in order to understand the similarities and differences between the two types of cities, that can be considered representative of a middle-size town and a large metropolis in the Italian peninsula. This paper, after a brief introduction about the model, examines and compares the main results obtained for the different analysed scenarios, that include, for example, top-down decisions, e.g. change in the cost of public transport, and bottom-up actions, e.g. an increase in the use of car sharing and ride sharing. The scenarios are especially focused on the reduction in the use of private transport, counterbalanced by an increase in the adoption of public transport and shared mobility services, such as the above mentioned car- and ride-sharing. The scenarios can also be combined in order to evaluate the overall impacts of different policies and behaviors and formulate policy recommendations.
The last part of the paper introduces the methodology, that has been tested on MMA and is now being developed for the national level, that allows to extend the transport model and mobility scenarios through the use of mobile telephone data.

Keywords:

Sustainable mobility, transport models, mobility scenarios

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4141_Spatial inequality in water supply and sanitation service delivery: Citizen perceptions and expectations from service providers

Ekane, Nelson[1]

Abstract

This cross-national comparative research focuses on spatial inequality which encompasses unequal access to basic services in urban, peri-urban, and rural settings. From a citizen perspective, this research explores the link between service access in different settings and citizen perception of the type and quality of services provided by public and private service providers. To improve understanding on the extent to which urban bias exists for sanitation in relation to other services, we will compare and contrast with that for drinking water supply. Quantitative and qualitative research methods will be employed to explore how the type and quality of services provided to citizens in rural, peri-urban and urban settings influence citizens' perception of public and private service providers, citizens' willingness to pay for services, and citizens' willingness to participate actively in community development. Field research will be performed in selected sites in DRC, Tanzania, and Uganda. Sites will be selected as cases for comparison – poor and rich sites, distant sites (remote settlements or hinterlands) and sites situated in proximity to cities or urban settlements. This research should contribute empirical evidence that links citizen preferences and attitudes towards service providers with their physical location. The insights from this research are of particular importance in addressing SDG Goal 10 which aims at reducing inequalities between and within countries.
This paper hopes to use the Yangtze River Basin as an entry point to explore the establishment of urban open space and the formation of green space network under the concept of sharing, and provide some ideas and methods for planning and design under the future sharing concept in the future.

Keywords:

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4145_Digital transformation, small town, experimentation: membrana smart research project

Giuseppe Caridi[1], Vincenzo Alfonso Cosimo[2] and Domenico Passarelli[3]

Abstract

In his book Me ++ (2004), Mitchell, when ascertaining the concrete effects that digital information is capable of producing in the various sectors and with regard to aspects that were once extraneous to it, states that binary code is the most powerful tool we have for expressing our projectuality and translate it into concrete actions.
However, the changes that digital transformation is able to produce to the structure, organisation and logic of operation of the city and territory have been taken into consideration, primarily, with reference to the large urban scale, or to specific and circumstantial aspects such as, for example, low-income communities. And yet, what kind of link exists between digital transformation and the smaller centres that characterise Italy and Europe? How can the disciplines of the project interpret it profitably? And, conversely, what are the risks that arise from a deontological and ethical perspective?
This is accomplished by starting from the realisation of a technological device that is i) advanced, with the capacity of self-identification, localisation, status diagnosis, data acquisition, elaboration and implementation; ii) interactive, as it responds to people's stimuli/actions and the changes in the surrounding environment; iii) modular, to be assembled so as to form multisensory and artistic surfaces; iv) intelligent, as it makes use of the latest wireless technology, network scale-up (broadband), downsizing of mobile transmission/reception devices, augmented reality, Internet of things (IOT).
The authors, after having examined the different implications of membrana smart in everyday life, draw the attention towards the different structural criteria with which this medium/instrument allows the organisation of communication and the enjoyment of the city and the territory, highlighting how its value lies precisely in the type and quality of the relationships it establishes with the surrounding environment; therefore, membrana smart does not present itself as an object in space but, rather, as a tool for the construction of space, as an element for the staging of a city and a territory of which it is a part.
The research project finds concrete expression in the proposal of four initiatives for the use of membrane smart for the well-being of communities located in smaller centres. They pertain to i) the regeneration of urban spaces and architectural artefacts that have lost their original function over time; ii) the identification, expansion and protection of latent resources; iii) the valorisation of heritage valued as collective wealth, accessible to all; iv) the entrepreneurial potential of digital technologies,

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especially with reference to teleworking and youth and women's entrepreneurship. In the fragile and scarcely investigated smaller centres, membrane smart's expected results aim at constructing/activating the contexts of interaction design through which to awaken a broad social participation. More generally, this project aims to add new tools to those that already form the designer's repertoire. No longer just hard tools, like the ones we are used to, but also those made up of bits, connections and software.

Keywords:

Digital Transformation; Small Town; Smart Cities, Smart Regions.

4148_Towards a hidden energy poverty indicator for Spanish households

Roberto Barrella[1], José Ignacio Linares Hurtado[1], José Carlos Romero[1] and Eva Arenas[1]

Abstract

Recently, the EU Energy Poverty Observatory (EPOV) introduced, among the primary indicators, the 'Low share of energy expenditure in income' indicator (M/2), which aims to quantify the tendency of 'households in arrears on bills' to reduce their energy consumption. According to the definition of the EPOV, 'the M/2 indicator presents the share of households whose absolute energy expenditure is below half the national median'.

In Spain, researchers from the Association of Environmental Sciences (ACA) and the research center Economics for Energy characterized energy poverty in an integrated way using different indicators applicable to the Spanish case. In the aforementioned reports and, in general, in all studies concerning Spain, the 'low share of energy expenditure in income' indicator (M/2) is not considered or does not include a characterization of energy consumption.

This paper proposes a methodology to characterize household energy consumption in order to quantify the number of Spanish households whose energy expenditure is abnormally low, considering their characteristics. This indicator will be called 'modified low share of energy expenditure in income' ('Modified M/2'). A sample of households from the Spanish Household Budget Survey has been categorized according to the climate zone, house features, and family composition. This work defines, for each household, the 'required heating-expenditure' (RHE), which is the theoretical expenditure required to ensure the indoor environment comfort (heating) and to provide a necessitated level of domestic hot water (DHW), considering the location and the dwelling's typology and thermal characteristics. The climate classification was carried out following the Spanish Technical Code for Building Construction (CTE). On the basis of this classification, the thermal energy demand in the winter period was calculated according to the procedure established by the Spanish Institute for Energy Diversification and Saving (IDAE) for the energy performance certification system. Specifically, the characterization of the RHE has been carried out according to the following parameters: (a) climate zone; (b) number of occupants; (c) dwelling size; (d) insulation level; (e) type of thermal installations and energy supplies. On that basis, the 'share of households whose actual heating expenditure is below a specific percentage of the RHE of the corresponding category' was estimated.

The difference between actual and required energy expenditure 'could be due to high energy efficiency standards, but may also be indicative of households dangerously under-consuming energy'. Complementing the proposed indicator with a characterization of the household income level, it will be possible to eliminate false

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positives (those with a low level of energy consumption but high income) and, as a result, identifying Spanish households that reduce energy consumption due to difficulties in meeting their bills, or in other words due to energy poverty.

Keywords:

Energy poverty; Vulnerable households; Energy expenditure; Indicators; Spain

4153_Tackling energy poverty: JUST retrofitting!?! The interrelation of energy justice and retrofit in social housing

Kristina Eisfeld[1], Tatjana Boczy[2], Daniela Hohenwallner [3], Hanna Krimm[4] and Kathrin Schwab[5]

Abstract

Energy poverty is a key societal challenge impairing people's living standards and rights. Retrofitting programs predominantly takes into account technical aspects, often neglecting social components of energy behavior. The paper builds on analysis of household survey data from the EC-7th FP project SINFONIA and the project BALANCE funded by the Austrian Climate and Energy Fund. By combining and comparing survey results from Vienna and Innsbruck, the paper explores the ex-ante and ex-post energy attitudes and behaviors of tenants in retrofitting apartment buildings. In both research projects, the target groups are citizens living in different kinds of social housing, but categorized as households vulnerable to energy poverty (e.g. due to poor housing conditions and/or inability to keep home adequately warm).

Based on Jenkin's (2016) three tenets of the energy justice concepts, we focus on recognition and procedural justice. While recognition justice refers to a fair representation of tenants and acknowledging their perspectives (specific needs), procedural justice is about practices of letting tenants have a say in a retrofitting process and disclosing information. For both concepts, the distribution of information and engagement with tenants by building owners or retrofitters is key to achieving a just energy transition. This is especially critical for retrofitting buildings with low-income households, as the physical retrofit improvement might be nullified by avert behavior or unintended use.

Our contribution to this topic will be one of the first attempts to quantitatively engage with social factors (such as age, gender, income, and education), information flows and energy behavior before and after retrofitting.
We want to understand the ways in which building owners engage or do not engage with tenants and how a lack of engagement produces unintended outcomes. We want to critically examine the perceptions and effects of information distribution during and after retrofitting. Furthermore, we investigate whether a retrofit has positive or negative spill-over effects on other household behaviors, such as buying energy-efficient light bulbs.

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We hypothesize that the tenant-side outcomes of a retrofit (e.g. more conscious energy attitude, being satisfied) are connected not only to retrofitting work, but also to the degree of information received prior to the retrofit (injustice as non-recognition and non-engagement).
As energy consumption and socio-demographic factors are intertwined, retrofitting projects need to take social aspects into account. This is relevant not only to prevent negative rebound effects, but also to nourish positive spill-over effects on individual behavior as well as entire - often neglected - vulnerable communities.
We raise the question how urban housing retrofitting needs to be designed in order to increase energy-efficiency whilst remaining socially inclusive.

Keywords:

Energy Justice; Retrofit; Social Housing; Energy Behaviour

4154_Governing and planning climate change adaptation in mountain regions: setting up a procedure for sub-regional adaptation measures in the Alps as an application of the Budoia Charter for local adaptation

Luca Cetara[1], Marco Pregnolato[2], Pasquale La Malva[3], Antonio Ballarin Denti[2], Piero Di Carlo[3], Mita Lapi[2]

Abstract

Governance of climate change adaptation received a growing attention in recent times. Much focus is often placed on the level at which adaptation takes place, depending on the affected administrative units, governance structures (e.g. countries, regions, municipalities) and planning/programming instruments (Bonzanigo et al., 2016).
However territorial and geographical differences can be dramatic even between similar administrative units, depending on characteristics that shape territorial units not corresponding to institutional and administrative borders as set by the law (Hanssen et al., 2013; Hamilton & Lubell, 2018).
Mountains are a case with non-conventional territorial units that tend to show recurring features of particular relevance for climate change policy. Notwithstanding their distinctive characteristics – object of long lasting research – they are usually subject to the same set of spatial planning instruments that apply to any other part of the territory in a country.
In this paper we present the prevailing governance structure of climate change in mountain territories, by focusing on the case of Italy where national to regional instruments address mountain zones in the country. We also provide an overview of governance approaches in other countries of the Alpine region (e.g. Austria, Germany, Slovenia, Switzerland). We focus on the application of the "Budoia Charter" in some sub-regional sites across the Italian Alps. The Charter is a voluntary tool for adopting and implementing sub-regional adaptation measures launched jointly by Italy and the Network of Municipalities "Alpine Alliance" in 2017, following the Guidelines on local adaptation to climate change in the Alps developed under the Italian Presidency of the Alpine Convention (2014). We aim to set up a standard procedure for identifying suitable adaptation actions for sub-regional territorial units (municipalities and their groupings, according to territorial or administrative criteria) and some proposal for adjusting regional to local planning tools in a mountain environment, assuming current institutional governance structures as stable in the short run.

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The units under investigation are characterized based on recurring features including: geographical characterization, available sources of knowledge, local climate context and impacts, governance type, resources and key planning instruments, vulnerabilities, preparedness on specific vulnerabilities, and public awareness on climate change. We use existing figures and information, and regional/local stakeholders' assessment aiming at identifying suitable adaptation measures for mountain areas in general and for the sites under inquiry.Measures themselves are selected from consolidated collections based on an assessment of their: institutional significance (e.g. national/regional/local adaptation strategies and plans); geographical scope; scientific contents; experience with concrete outcomes after implementation (e.g. practices from EU Climate-Adapt platform); etc.
Selected measures are assessed for their alignment to overarching and/or legally binding plans (PNACC, 2017) in order to identify mountain and site-specific adaptation measures coherent with binding plans.

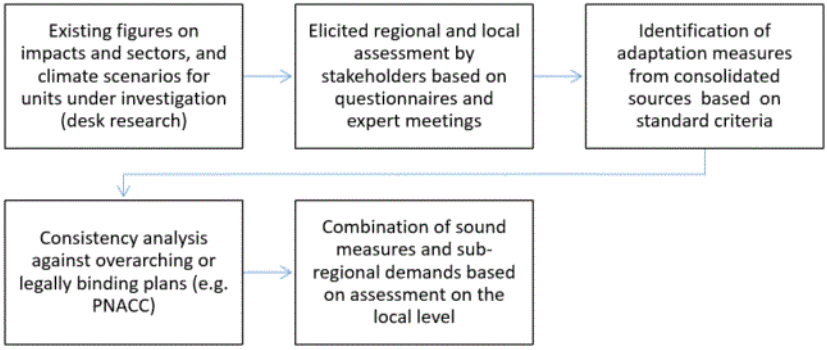

Figure 1: Main steps to set up suitable adaptation actions on the sub-regional level for mountain areas

As a result, we expect to identify a modular approach based on quantitative and qualitative indicators aimed to frame a Decision Support System for sub-regional application of adaptation measures. Research aims at designing a structured procedure for assessing distinctive characteristics of areas where adaptation measures are to be implemented and for selecting appropriate measures. Scientific information (DARACC, 2016; AdaPT Mont-Blanc, 2018; ARPA-FVG, 2018; RSA, 2019) is then coupled and weighed with local demands and perceptions through qualitative and quantitative methods. The procedure will be tested in five pilot-areas at the sub-regional level from Western to Eastern Italian Alps, and is planned to be further extended to other mountain regions in Italy and worldwide.

Keywords:

Adaptation; climate change; spatial planning; procedure;

4157_The circular approach to climate change in metropolitan cities

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Abstract

The theme of urban quality is fundamental for man, because it is the image of the quality of the social relationships that inhabit it and is the place in which they develop. One of the factors that will affect the quality of cities and the relative liveability of citizens in the future is certainly the climate change.
The strategies that aim to make a contribution to the subject of climate change, therefore, tend to be aligned on two main actions: mitigation and adaptation to climate change.
In this work we will try to tackle the latter, in order to adopt strategies that allow the city to adapt to the changes that have already occurred.
The contemporary city is currently subjected to a series of highly stratified complex pressures, which come on the one hand from the need to respond to environmental, social and economic problems and ecosystem risks, and on the other by the proliferation of projects and actions that individuals territories ultimately implement "buffer" and solve the most emerging issues. These operations tend to expand and dilute the actions of the administrations and the funds available in interventions that certainly provide an immediate response but, at the same time, limit the possibilities of an effective long-term sustainability, because, often, such interventions are not accompanied by an in-depth analysis of the needs of the territory.
Therefore, it is necessary to evaluate the needs of the city in a transversal, stratified way and on a plurality of themes, focusing the research among which the following points:
- socializing;
- sustainability and mitigation of climate change;
- resilience;
- innovative technologies;
- resources.
In order to have a multi-layer assessment, the multi-criteria evaluation will be combined with the circular evaluation model called Green City Circle. The evaluation is set up as a circular process, followed by a first investigative phase, followed by a proactive phase of solutions and a implementation phase up to a final stage of evaluation of the results and strategic for long-term sustainability.
The survey has provided a questionnaire to a representative population sample, in order to examine the perception of environmental issues in the urban context and in particular of climate change and, on the other, the real needs of the citizens in terms of environmental quality demand and public green spaces to stakeholders in the area.
The methodology proposed is based on an integrated approach between participatory planning techniques and the NAIADE method for the Multi Critical Social

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Assessment - SMCE - of "complex" collected information (quantitative and qualitative data). The objective is to develop a methodological framework consisting of suitable tools directed, first, to the acquisition and then to the evaluation of the information (qualitative and quantitative) on possible alternative scenarios with respect to the proposed problem with Green City Circle. In detail, the proposed model is based on the identification of stakeholders; the definition of alternative scenarios; the definition of the assessment context, the assessment of the impact of alternative scenarios on the criteria in question and the final creation of the impact matrix and the Green City Circle. This tool supports: the classification of alternative scenarios proposed on the basis of certain decision-making criteria and considerations of possible "alliances" and "conflicts" between stakeholder groups regarding proposed scenarios, measuring their acceptability. It is a suitable tool for planning problems characterized by great "uncertainty" and "complexity" regarding existing territorial, social and economic structures and their interrelations. The proposed methodology will be applied to the city of Catania to define the model of management of green areas.

Keywords:

Green Infrastructures; urban ecosystems services; green public procurement; win win solutions; urban responsability and sustainability.

4158_A Spatial Multi-Criteria Decision Support System For Stress Recovery-Oriented Forest Management

Gianluca Grilli [123], Irene Capecchi[1], Elena Barbierato[1], Sandro Sacchelli[1]

Abstract

Recent trends on natural resource management highlight that natural environments are very effective for stress recovery and for the general psycho-physiological health. This is particularly important in a context of increasing urbanization, because always more people seek restoration in the nature as a way to reduce the stress caused by everyday life in urban settlements. Dedicated spaces for stress recovery increase the well-being of people and a territorial balance between urban and natural environments. At the same time, larger recreational opportunities are beneficial for marketing, in terms of increased number of potential tourist segments to attract, and for their potential spillovers to local economies. With respect to forests, there is a growing interest on understanding the marketing and tourist potential of forest therapy policies. The literature suggests that people do not show a unique response to all natural settings but some environments are more effective than others for restoration. This raise planning issues for regions that aims at providing spaces for stress recovery, because when the land use is specifically designed for restoration the probability of visit is higher. For this reason, it is important for decision makers to collect information to identify the most suitable areas to dedicate to stress recovery and forest therapy.
With this in mind, the purpose of this paper is to provide a geographically-explicit Decision Support System (DSS) that assists decision makers in planning dedicated forest areas for stress recovery. The DSS combines four sets of indicators in a multi-attribute decision analysis and identifies the areas with the largest stress recovery potential. The first set of indicators considers variables describing the degree of usability of the forest (in terms of accessibility, forest functions, slopes etc.), while the second is dedicated to risk analysis (share of rocks, risk of rock falls and fire risk). The third set considers psychological factors such as number of tree species, forest density and cover, forest height. The fourth set include physiological features. A novel aspect of the work is the inclusion of people's physiological responses to different forest types and forest density as physiological indicators to consider in forest planning. We conducted a lab experiment in which we collected electro encephalogram (EEG) responses of a sample of 20 people to different spherical videos showing forests with four different forest types (Turkey Oak, Black pine, European Beech and Douglas fir) and two different forest density (high and low). The videos of forests were then compared to a video showing an urban environment. The EEG analysis concentrated on "beta" type waves, for which the literature has found

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an association with stress levels. The beta waves obtained after showing each of the video were compared using ANOVA and OLS regression to identify statistically significant differences originated by the sight of different forest types. Preliminary results show that all forest types provided lower stress levels compared to the urban environment. In addition, Douglas fir was found to be the most effective tree species to lower stress levels. The combination of EEG indicators with the other sets of variables provides a spatially-explicit map of forests with a large forest therapy potential. The proposed DSS is applied to a case study called “Comprensorio di Rincine” (*Rincine district*) in Tuscany (Italy).

Keywords:

Regional planning, smart living, territorial marketing, socio-ecological dynamics

4159_Smart Governance and People's Participation through Smart City Initiatives in Ahmedabad: Rhetoric and Reality

Bhargavi Pambhar[1]

Abstract

First indication of smart city appeared in 1997 (Aurigi, 1997). Since then, the concept of the smart city is widely exploited to develop numerous characterizes, frameworks and technologies. One major correlation within all the different definitions of smart cities is the exploitation of *information and communication technology (ICT)* in urban development, the definition of smart refers towards the creation of efficient systems with respect to the present context. ICT is leveraged to efficiently improve living-standards.

It is observed that smart cities majorly follow top-down approach by considering technology and global businesses. It is usually supply oriented, concerned with economic politics (Soderstrom & McFarlane, 2017). Smart city policies, proposals, and projects are generally in the hands of corporate elites (Soderstrom & McFarlane, 2017). Corresponding to smart city definitions, smart city components i.e. smart governance also differs from case to case. According to Janssen & Estevez, E-government or Digital Government is seen as an effort to introduce ICT to improve efficiency in the public sector and service delivery (Janssena & Estevez, 2013). Many have mentioned that citizen-centric approach, transparency, and openness are the essential part of the smart government (Bertot, Jaeger, & Grimes, 2012). Despite different models and definitions, stakeholder involvement in governance is found to be fundamental across all cases (Scholl & AlAwadhi, 2016). This study examines the various aspects of smart governance through smart city initiatives undertaken by the city of Ahmedabad. Using key stakeholders' consultation and focused group discussion with selected group of communities, the study provides an acco unt of each of the smart city projects on the basis of smart governance. It focuses on smart governance aspects such as a) collaborative leadership and shared vision; b) integration and coordination of all government services; c) citizens' engagement; and d) digital ecosystem. Though the city of Ahmedabad, has attempted to achieve the above aspects of smart governance through the implementation of smart city projects, however, there are a few bottlenecks in achieving the smart governance aspects. It has al so identified the areas where substantial improvement of governing mechanism is required. One of the major achievements of smart city initiative of Ahmedabad is to establish a full - fledged digital ecosystem for monitoring the various essential services in the city. The city has engaged with the people; however, it seems that serious engagement and progressive involvement of citizens and citizens group into the project planning is lacking leading to a scenario of tokenism as far as citizen's participation in the smart city projects are concerned.

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Keywords:

stakeholder approach; bottom-up approach, participatory governance, public engagement, social and spatial justice, social inclusion, social network and stakeholders analysis, human-centered cities

4160_Smart City Governance Innovation Architecture

David Ludlow[1]

Abstract

Cities face multifaceted challenges throughout Europe and globally in understanding how to improve economic competitiveness while simultaneously achieving social cohesion and environmental sustainability. Europe's persistent sustainability challenges are systemic, tied in complex ways to prevailing economic, technological and social systems, creating interlinkages that make it hard to effect rapid reductions in socio-economic and environmental pressures, and the attainment of the necessary sustainability transitions. Governance plays a critical role in transformations to sustainability, including governance for transformation, governance of transformation, and transformations in governance.

This paper addresses the latter issue with focus on the development and future evolution of urban planning and governance systems enabled by the smart dynamic of technological and social innovation in addressing the systemic challenges of sustainable urban development.

The concern is the need for governance systems that facilitate and promote effective transition pathways toward sustainability. In this regard the paper describes the principal dimensions of an innovative governance architecture as a basis for governance transformation drawing on the experience of a number of major EU funded pan-European research and innovation projects developing the agenda of smart and future urban planning and governance promoted in the framework of Horizon 2020. This experience is further referenced to the strategic research and innovation agenda of JPI Urban Europe, and developed in regard to the transition pathways elaborated by the European Environment Agency. This experience highlights 3 key requirements for the governance model, forming the prime dimensions of an innovation architecture promoting smart governance solutions for sustainable cities.

First requirement is support for a holistic approach to city development. This is generated by integrated assessment of urban policies focused around a comprehensive set of economic, social, and environmental sustainability indicators. City planning targets the management of the interconnected socio-economic and environmental reality of the city-region in a spatial framework. These complex and interconnected facets of the urban ecosystem demand systemic and integrated socio-economic and environmental assessment of spatial impacts. The aim to secure the essential “win-win” policy co-benefits central to the delivery of the transformation agenda adopted by city politicians globally.

Second requirement is based on the understanding that integrated assessment although essential, on its own is insufficient in resolving these urban challenges and delivering the transitions demanded. The effective implementation of sustainable urban development by city planning also requires the full engagement of all

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stakeholders in an open plan process. The purpose to enhance transparency, accountability and trust in governance and the decision-making process. For policy and decisions-makers, open dialogue with citizens is not only a way to understand society's expectations but also to identify barriers and opportunities for transformation in delivering the highly challenging agenda of climate change mitigation and adaptation.
Third requirement is based on the recognition that planning systems in seeking to deliver open integrated planning solutions to societal challenges are asking much the same questions in all cities. The reason is that common global and regional drivers of change including climate change, economic transformation and urbanization, are defining and driving common problems in cities globally for which common political and technical solutions are evident. Furthermore, enhanced communication is seeking to overcome silo containment and enable free information flow across governments and scale, emphasizing the common requirements for interoperability in the governance system. The prospect therefore arises that solving the problems of city living enabled by a new democratic, transparent and effective urban governance model, creates a set of solutions that can be applied to the realization of sustainable cities globally, and drives the business model of a European knowledge-based economy.

Keywords:

Smart governance systems; holistic approach; open plan process; interoperable systems.

4162_Preference-Based Planning Of Urban Green Spaces: A Latent Class Clustering Approach

Gianluca Grilli[12], John Curtis[1,2]

Abstract

Green spaces (GS) within cities refer to all types of green covers, including public parks, sporting fields, riparian areas (stream and river banks), canal pathways, street trees etc. GS provide several benefits to users, including opportunities for psychological restorative experiences, physical activity and social interactions. The availability of GS has been linked to positive effects on physical and mental health, with such associations widely verified by empirical studies. The balance of evidence suggests that proximity to GS is sufficient to increase mental well-being, however the direct use of GS for recreation and physical activity allows people to gain a wider range of benefits. In addition to health-related benefits, GS provide ecosystem services that are useful to mitigate pollution, improve air quality and the general life quality of city dwellers. The use of GS is affected by individuals' attitude to consider GS as recreational sites and by their local availability. It has been pointed out that GS planning at city level often lacks of social justice considerations, in fact most of low-income neighbourhoods have no or limited availability of GS. The uneven accessibility of GS is recognized as an issue of environmental justice and it become a planning priority worldwide.

In this paper, we propose a methodology to cluster urban dwellers depending on their latent attitude to use GS. The analysis is based on a probabilistic latent class allocation which allows depicting segments of GS users, based on their current GS accessibility and their socio-demographic characteristics. The model is flexible and allows several specifications, including multivariate analysis with multiple indicators simultaneously and the inclusion of covariates to better define class membership. Our model specification include several categorical dependent variables that were collected on Likert scales, while explanatory variables include neighbourhood quality, means of transport used to commute to GS and habits of physical activity in addition to socio-demographics. The dataset for our application originated from a questionnaire survey administrated in Ireland to a sample of 1,006 Irish city dwellers, stratified by age, occupation, education and place of residence.

Our results show groups with similar attitudes and orientations towards the recreational use of GS and highlight cohorts of urban dwellers with limited GS access and frequency that represent potential target groups of socially-efficient GS planning policies. Stimulating the GS visits with specific land use planning is beneficial for individuals' well-being and for the wider society in terms of decreased social cost for healthcare and pollution and increased environmental quality.

Keywords:

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Urban planning, environmental justice, latent class analysis, smart living

4163_Assessing sustainability of circular economy supply chains: a case study on coffee residues in Italy

Martina Boschiero[1] and Simon Pezzutto[2]

Abstract

The circular economy (CE) concept is gaining always more attention among researchers and institutions, since it is seen as a possible way to increase the sustainability of our production and consumption systems. Indeed, CE intends to recover and valorise wastes and residues (from now on named by-products), adding value to these materials which can be included back into supply chains, minimizing the waste creation along the production pathways.
However, prolonging the life-time of a material (i.e. by-product) do not automatically imply sustainability itself. When modifications on the current industrial system occur due to the inclusion of by-products, it is fundamental to precautionary verify their potential in reducing resource and energy consumption, greenhouse gas emissions, and other environmental, economic and social burdens along the whole life-cycle chain.
Life Cycle Assessment (LCA) is an international standardized (ISO 14040/2006; ISO 14044/2006) methodology that allows to quantitatively assess the environmental performance of a product, process or system along their whole life-cycle. Based on the LCA concept, the Life Cycle Costing (LCC) method evaluates the costs occurring along the whole chain, trying to analyse the economic side of sustainability. LCA and LCC studies are fostered by current policy at European level and they have been increasingly applied by industry to help in identifying environmental burdens and to enhance economic benefits.
Based on the considerations reported above, in this work the environmental and economic impacts through LCA and LCC of a circular economy case study are investigated.
Coffee is one of the world's most popular beverages and the second treated commodity in the World, amounting worldwide to about 10 million tons (2018/2019). In 2015, Italy was the third-largest international green coffee importer, after the USA and Germany. Coffee is imported in Italy especially for the roasting, which is, together with the brewing, the industrial process responsible for the final flavor and aroma of coffee. Roasting of coffee generate a biowaste, called silverskin. It consists in a very thin and fluffy material accounting for 1,5% of green coffee's beans total weight, amounting to about 7.500t/year in Italy. Currently, silverskin is unexploited.
Within the multidisciplinary project titled Circular Coffee (CirCo, founded by Cariplo Foundation), the possibility to use this industrial coffee waste as a raw material in other industrial processes, embracing the circular economy concept, is examined.

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Indeed, silverskin have been found to be rich in cellulose and other value-added chemicals (i.e. polyphenols, fat and waxes), extremely interesting for the paper and the cosmetic sectors.
Besides the verification of the technical feasibility of using silverskin in other markets, it is fundamental to assess the environmental and economic impacts of the whole industrial chain, in order to guarantee a sustainable circular system.
The goal is to verify if the use of silverskin as raw material for paper production will bring to a decrease of energy demand and to environmental and economic benefits for the Italian graphic paper sector.
The results of this work will give useful insights to entrepreneurs and to policy makers, identifying environmental and economic trade-offs which could occur along the system's life-cycle.

Keywords:

Circular Economy; Life Cycle Assessment; Life Cycle Costing; Agro-industry Residues; Energy Savings

4166_ESMA - Ecological and Sustainable Material Application

Martino Gubert[1], Stefano Avesani[2] , Martina Boschiero[3], Valentina D'Alonzo[4] and Dario Bottino Leone[5]

Abstract

ESMA promotes the integration of new materials in the building sector, based on the circular economy concept, to minimize the impact of construction on the environment. The project main objective is to analyze regional opportunities and potential for secondary raw materials supply developing a resource map including industries and their related "waste" materials. The analysis will have as main final driver the product final cost evaluation, in order to be competitive on the construction market. The map has the specific objective to identify existing production cycles and the potential of natural low environmental impact crops, defining a matrix of the possible new materials to be included in the construction value-chain, together with their technical features and possible use cases. ESMA is a Life Cycle Costing methodology applicable to the construction sector for the development of a wide range of products. Specifically, a focus is made on KNF-KAP product that is a natural based insulation material composed by Kenaf and fruit kernels (e.g. Apricot). Kenaf is an herbaceous plant defined as "smog-eating", as the plant absorbs CO_2 from the atmosphere to a more significant extent than any other crop, being also characterized by an extremely short life-cycle. Fruit kernels are industrial waste used normally as combustible biomass. With reference to apricot, the fruit is currently employed in many factories around IT and EU, so its Kernel can be easily retrieved. Material strengths lay in its high level of renewability and the low embedded energy.
O1_Enhance the inclusion of circular economy principles in the construction sector, acknowledging their potential and verifying the final cost over the whole Life Cycle
O2_Develop a new insulation product based on KNF–KAP
R1_A regional screening of potential and opportunities to include re-use materials from several production sector within the construction industry
R2_Develop a preliminary catalogue of new potential building materials
The main expexted results are:

- Two maps of potentialities and opportunities of the Region that showing waste materials of industries/factories and the existing and potential crops area (kenaf, maize, etc.)

- A catalogue of several potential new materials in the building sector and preliminary feasibility study

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[5] EURAC phd

- A preliminary LCC and LCA analysis of the materials selected and technical data sheets of the most interesting materials with cost indicator compared to traditional equivalent materials

- A report of a deeper analysis of an insulation panel made with KNF and KAP with numerical results related to energy performance simulation

- A final report with all the activities developed and with preliminary market potentialities to be deeply investigate in a future development

During the project several potential partners will be involved in order to continue the development of the project with their own fund or with provincial funding (L.14 or L.6). Moreover, there will be the possibility to insert some specific development in EU projects.

Keywords:

Circular Economy; material re-use; recycling materials

4169_Tools for integrated strategies addressing Inner Areas' abandonment: Sustainable and Integrated Energy Strategies toward a better territorial cohesion.

Francesco Calabrò[1], Giuseppina Cassalia[2]

Abstract

Despite the evolution of the urban-rural relationship over the past European programming cycles, inner areas - in less developed regions of Europe, for instance - are still facing economic, social and environmental problems, resulting in unemployment, depopulation, marginalization, disengagement, or degradation of historic and architectural capital.
In order to counter this dramatic trend of demographic abandonment, Inner areas need strategies to improve socioeconomic conditions and activate unused territorial capital. Within the local-based strategic planning, a key role is played by energy-related issues: both in economic terms an of effects on the environment. Energy systems optimization under uncertainty is increasing in its significance to extend longer in time the energy stock. This paper presents the approach of Sustainable and Integrated Energy Strategies (SIES) applied on a case study, providing an evaluation of monetary and non-monetary techniques to identify the optimal mix of actions to be undertaken in the energy field, in relation to the specific characteristics of each individual Municipality of the inner area. The culture of evaluation—in this sense—is an essential key towards the development of policies that counteract the dynamic of population decline of marginalized territories.
In its preliminary phase, the study considers both the containment of consumption, and the local production of energy from renewable sources. Among the renewable sources, three different technologies have been taken into account: "traditional" renewables, such as photovoltaic and wind power; "innovative" renewables, such as solar micro cogeneration; biomass in small plants.
The suitability of the implementation of SIES is analyzed in this paper by means of combination between the Costs Benefits Analysis (CBA) and a multicriteria decision analysis (MCDA) model able to combine a set of parameters, systemizing the characteristics of the territory, the types of action possible and their economic implications, in terms of investment costs and the value of the energy produced / saved, as well as environmental considerations. It involves various experts and stakeholders to choose the parameters and to assess the weight to be assigned.
The approach presented in this paper allows for better understanding and valuation of marginal areas in which strategic planning is more difficult because resources are unequally distributed. By highlighting straight and weakness, the study results concern both public and private bodies. In the case of public entities, the SIES helps mitigating the costs for energy currently supported by the Municipalities. In this case, the necessary investments and return times are decisive, as well as the sources of

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capital procurement. In the case of private subjects, SIES may constitute a measure to combat depopulation, fostering the achievement of residence convenience's conditions in inner areas.

Keywords:

Strategic Planning; Inner Areas; CBA; Energy Actions; MCDA.

4171_Relevance of cultural landscape policies and the need for smart and open source frameworks in current urban development processes

Calcatinge Alexandru[1]

Abstract

This paper will sum up and extend on a two years research on the use of Open Source Innovation, Hardware and Software in creating relevant Policies for “Smart” Cultural Landscapes Development processes in urban and rural areas. In this respect, the term smart is also related to the acronym SMART (Specific, Measurable, Attainable, Realistic, Time-bound) that should be the criteria and goals for a Cultural Landscape Development project. Thus, the research was started in order to support my lectures on Cultural Landscapes and Development for the Master’s Degree Programme from the University of Architecture and Urbanism in Bucharest and it includes the most relevant findings on the aforementioned areas by creating a base framework for future research. Amongst those research studies, relevant as a very base for future development will be set by the open source paradigms in urban and rural development and the relations between cultural landscapes, open source hardware and open innovation in rural and urban development.
The paper will be divided into three distinct parts. First part of the paper will present the way I relate with the theories around concepts like cultural landscapes, smart cities in general and in particular, event-driven architecture, sensor-based big data applications, IoT and governance networks and crowdsourcing principles in smart city development, open source culture (hardware and software), open innovation and other, by building a small theoretical framework. Also, this part will present the paper’s methodology that will answer how data was collected and analyzed. Shortly, this was achieved by gathering and critically analyzing known definitions and theories approaching aforementioned concepts. Then, based on those theories, the concepts are analyzed from the urban developers point of view, by showing how actual cultural landscapes policies relate to them.
The second part will emphasize on different case studies relevant to the research subject, like: different open source software and hardware solutions used in several urban related cases; relevant smart city solutions from around the world (with a little emphasize on funding and financing besides the technical aspects aforementioned) ; and a short analysis of several cultural landscapes specific regulatory papers like European Landscape Convention, the Spatial Development Glossary of CEMAT, Landscape facets - reflections and proposals for the implementation of the European Landscape Convention, Guiding Principles for Sustainable Spatial Development of the European Continent, European Rural Heritage Observation Guide, European Innovation Partnership on Smart Cities and Communities.
The third part of the paper will build upon the findings of the first two parts, by creating

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a feasible framework for future cultural landscape policies in conjunction with the contemporary smart city policies and specific open source software and hardware solutions. All this, in order to develop sustainable urban and landscape projects.

Keywords:

Cultural landscapes; open source; open innovation; smart cities; smart regions;

4172_Assessing integrated circular actions as nexus solutions across different urban challenges: evidence towards a city-sensitive circular economy

Maria Beatrice Andreucci[1], Edoardo Croci[2]

Abstract

Cities across the world are actively exploring the circular economy concept, as it has been recognized as a key urban planning and design approach for the green transition, simultaneously enabling greater energy and material efficiency, lower pollution, as well as job creation, social inclusion, human health and wellbeing. The city can be viewed as a complex socio-ecological system, in which infrastructures and urban forms have co-evolved along with sociocultural practices and lifestyles of the urbanites. Circular design and systemic thinking have not yet been incorporated into planning and design of the urban built environment, and this limit has progressively created vulnerabilities and risks. Among the different urban resources, available land is often scarce, as it is natural landscape. Consequently, it is particularly important that vacant public space is re-functionalized and brownfield sites are restored. Equally, green infrastructure – urban forests, green roofs, green walls, permeable pavements, constructed wetlands – provides critical ecosystem services (supporting, provisioning, regulating and cultural services) at different scales: building, district, city, region. Green elements and systems in the urban built environment regulate climate, air, and water quality; enable nutrient and water cycling and soil formation; provide space for growing food and for recreation. Using a mixed methods approach, including literature review and case studies analysis, the research identifies several opportunities and challenges to integrated circular actions ("nexus solutions") across different urban challenges, i.e. socio-cultural, economic and financial, regulatory, political, institutional, ecological, environmental and technological. The study then focuses on critical dilemmas to implementing nexus solutions. Providing an overview of selected international initiatives, the proposed contribution, levering on an extensive interdisciplinary research, will showcase how districts and cities are progressing the circular economy concepts in practice. Evidence provided by projects and case studies (such as Freshkills Park, a landfill reclamation project on Staten Island, in New York City; Royal Seaport, a major urban regeneration project in Stockholm; and Buiksloterham, a neighborhood and an urban living lab in Amsterdam North) will be provided, aiming at testing and validating circularity at different scales. Only recently (2018) the European Commission, in the circular economy action plan, committed to come forward with a simple and effective monitoring framework. Beyond strengthening the logical value chains among the different circular concepts, the goal of the research is, therefore, to provide input and feedback to practitioners and decision-makers by highlighting how districts and cities

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can be made healthier, safer, smarter and climate-resilient through adaptive monitoring and evidence-based design. The outcomes of the conducted study will identify in particular the impacts, both positive (benefits) and negative (trade-offs) of incorporating circularity into the urban planning and design processes, as well as how these can be assessed in order to stir robust systemic change in the long term.

Keywords:

Circular Economy; Urban Ecosystem Services; Nexus; Well-being of citizens; Adaptive Monitoring.

4174_Projections of energy demand in European cities using downscaled population scenarios

Gianni Guastella[1], Enrico Lippo[2], Stefano Pareglio[3], and Massimiliano Carlo Pietro Rizzati[4]

Abstract

This work is an attempt to estimate future energy demand in cities based on current population projections. In Europe, the urban population is growing rapidly, and it is expected to reach 80% of the total population by 2050. This increase in urbanisation will surely shift significantly the demand for energy in cities but the real extent of this change depends on several factors determining the energy demand from the residential and transport sectors. Many of these factors, such as the urban form and the urban mobility systems, are the object of planning policies and the projected energy demand conditioned to future economic and demographic scenarios is a piece of highly relevant information for urban planners and policymakers. Starting from national-level energy density data we derived statistically downscaled energy consumption data and applied spatially explicit econometric models to reproduce population projections at the grid level for all EU member states. We then upscaled the grid-level data at the urban level using the boundaries of the Functional Urban Areas in Europe. Results suggest that the amount of energy required by cities strongly depend on their land-use patterns. This evidence poses significant challenges to the planning of future cities as it points out how the current patterns of land use will soon become unsustainable in terms of energy demand as the urban population continues to grow.

Keywords:

Energy Demand; Energy Density; Land Use

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4175_Investigate Walkability: an evaluation model to support urban development processes.

Francesca Abastante[1], Simona Fiorino[2], Marika Gaballo[3], Luigi La Riccia[4] and Isabella M.Lami[5].

Abstract

Cities are characterized by a large number of walking paths. However, pedestrian infrastructure and related services are often underestimated in municipal urban transformation processes and budgets. Designing walking networks is not only important to create a functional and multi-modal city in transport choices, but also to make urban settlements sustainable and inclusive. This is notably in line with the objectives of the 2030 Agenda for Sustainable Development and in particular, how to make cities sustainable and resilient dealing, with the overall changes that are affecting cities, resulting from the constant urbanization of the current century.

In this panorama, the present research proposes a methodological framework based on indicators assessment and Geographic Information System (GIS) with the aim of integrating walkability aspects in urban development projects.

To test the methodological framework we identified the main University Campus of the Politecnico di Torino (Turin, Italy) as a case study. This case study is particularly interesting since allowed us to pursue a dual purpose: to improve the knowledge base of the current state of the walkability issue and propose analyses in view of the design of the new masterplan currently ongoing for the campus.

In order to achieve the objective, the methodological framework has provided for the analysis of the literature on the subject of walkability with the specific purpose of understanding the indices and indicators to be used in this field. We have therefore observed the national and international literature over a period of 10 years (it is a recent topic) taking into consideration theoretical and applicative articles.

Second, after having identified the indices and indicators through literature, we applied a qualitative method based on questionnaires in order to verify the sensibility on the indices and indicators identified. The questionnaires were submitted to a selected sample of 100 participants including: Professors, research fellows, PhD students, students and administrative staff.

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In parallel, we have mapped the current situation of the campus in GIS to identify the most problematic areas of the campus from the point of view of walkability.

Third, the results obtained by the questionnaires have been aggregated and analyzed according to statistical models (Park, 2008; Galanis and Eliou, 2011; Ford, 2013; Shatu and Yigitcanlar, 2018). This step turned out to be fundamental since allowed us to identify the final weights to be assigned to each index and indicator.
Accordingly, the weighted indices and indicators have been inserted in GIS software to obtain evaluation maps of the current situation of the University Campus highlighting weaknesses and strengths of the area in exam.

Finally, basing on the maps obtained, the present research makes a step further proposing alternative project scenarios of development for the masterplan able to improve and/or solve the weaknesses identified.

The future development of the work will involve the generalization of the results obtained that could be translated in strategic policy guidelines to include the walkability assessment in urban transformation project. This will allow to consider walkability in development processes and their implementation in territorial governance tools in line with the sustainability objectives imposed by European document standards.

Keywords:

walkability; sustainable development goals; sustainable urban mobility; walkability evaluation index; sustainable campus.

4176_The role of stakeholders' risk perception in management policies. A case study comparison in Southern Italy

Stefania Santoro[1], Giulia Motta Zanin [1]

Abstract

Across Italy, risks related to water due to the hydro-geomorphological characteristics of the territory have affected communities, environmental systems, urban areas and economic activities. Around 16,6% of the Italian territory is classified as being vulnerable to these kinds of risks and the approximately 8.300 km length of the Italian coastline is further increasing the complexity of this system.
Evidences demonstrate that it is not easy to determine the effectiveness of a risk management policy to reduce risks related to water.
The unsuccessful results of management policies to reduce risks related to water, based on the traditional paradigm of Operational Research (problems formulation in terms of a single objective and optimization, passive stakeholders' involvement in terms of knowledge elicitation, actions carried out by single decision makers, etc.) led practitioners and policy makers to consider stakeholders' risk perception, such as socio-economic dynamics, interaction, previous experience, values, and cultural factors, facilitating bottom-up approaches.
Specifically, evidence demonstrated that the comprehension of risks related to water requires not only a deep understanding of the main physical phenomena to be addressed, but also acknowledgment about stakeholders' knowledge, role, objectives, interdependencies, network of interaction and their risk perception(s). Literature highlights that the effectiveness of risks related to water management policies heavily depends on human behaviours, decisions, actions and interactions. These elements are not neutral, but commensurate with the perspectives and frames held by the actors who make the decisions. The perceived risk influences agents' decisions and actions. Therefore, differences in risk perception could have a twofold implication. On the one hand, they could lead to conflicting situations. On the other hand, they can offer opportunities for the development of innovative solutions hampering the effectiveness of the risk management policies.
In order to understand the role of stakeholders' risk perception about natural hazard in urban context, a multistep methodology has been applied into two case studies in Apulia Region (Southern Italy). Specifically, the analysis of flood risk in the city of Brindisi and the coastal erosion in the city of Margherita di Savoia have been conducted.
This work has been subdivided into two steps. The first part gives a general overview on the approaches usable for overcoming the traditional risk management tools and the factors influencing stakeholders' risk perception. The second part tries to elicit

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stakeholders' risk perception through Problem Structuring Methods. Specifically, in order to collect knowledge, semi-structured interviews have been carried out with stakeholders and decision makers. In order to structure knowledge, a Fuzzy Cognitive Maps (FCM) approach has been used, to represent stakeholders' mental model. FCMs are useful to understand the relationships between people's knowledge and perception about various types of risks, as well as the role played by risk perception in inhibiting or encouraging adaptive actions by individuals and institutions.
Finally, a comparison will be carried out between the two case studies. It will aim at highlighting the common points and the differences regarding the role of stakeholders' risk perceptions about risks related to water in management policies.

Keywords:

Water Management Policies, Stakeholders' involvement, Fuzzy Cognitive Maps

4177_Combining EPCs, Census and Survey Data to Map Fuel Poverty in Italy. A Small Scale Analysis

Riccardo Camboni[1], Alberto Corsini[2], Raffaele Miniaci[3], Paola Valbonesi[4]

Abstract

Public registers of the Energy Performance Certificates (EPCs) across Europe are potential sources of valuable information to investigate fuel poverty in small areas. Indeed, the EPCs provide detailed data on the efficiency of the accommodations, and an estimation of standardized consumption. However, EPCs are silent on the occupants' characteristics and their data need to be complemented with information from other sources to provide useful insights for the policy maker.

This paper presents a strategy to create an integrated database to map the fuel poverty risk at the municipal level by combining EPCs, census and survey data. Differently from most of the available literature, we do not obtain the database by combining municipal summary statistics. We rather enrich every single record of the EPC register with the necessary information available from census and survey data. More specifically, we consider the case of Treviso province (North-East of Italy, about 880,000 inhabitants in 94 municipalities) with about 20,000 EPCs, whose data we link to those of the about 280,000 inhabited dwellings recorded by census. Accommodations with EPC are systematically different from the not certified ones. Thus, when combining the two data sources particular attention must be paid to ensure to link records referring to dwellings that are as similar as possible to each other. To this aim, we apply a "nearest neighbor" statistical matching procedure: every EPC is linked to a house in the census dataset, in the same municipality and with the same heating system and whose characteristics are such to make the probability of being certified as similar as possible to that of the actually certified accommodation. The outcome of this procedure is a dataset of about 20,000 (geo-referenced) records of certified dwellings with information of their energy efficiency, standardized consumption and the (donated) characteristics of their occupants (e.g. age, education, occupational status, homeownership, etc.). In order to provide insights not only on the subpopulation living in certified houses but on the entire population, we set up appropriate post-stratification weights. Finally, to account for the variability in the linkage outcome due to the estimation step, we rely on bootstrap for all the inference that follows.

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We use such enriched dataset to study the probability to live in an energy inefficient accommodation: once controlled for few characteristics of the dwellings, the features of the resident households are irrelevant. We obtain similar results focusing on standardized heating costs. As – at least in the short term - households can hardly adjust the type and technological endowment of their accommodation, this evidence confirmes that standardized heating needs are only marginally determined by the characteristics of the households but rather by those of their accommodations. When we further enrich the dataset by imputing income data from the Survey on Income and Leaving Conditions, socio-demographic characteristics - along with income, and accommodation characteristics - do play a role in the probability to be in fuel poverty. Our results provide two indications for policy makers. First, EPC registers – combined with other data sources – can be used to identify the areas where the risk of fuel poverty is higher. This would allow to design area-specific interventions, focusing on the different origins of the problem (e.g. poor housing conditions rather than insufficient income). Second, info on housing conditions could integrate the eligibility rules of policies whose declared aim is to support households at risk of fuel poverty. Indeed, if such rules do not take into any consideration housing conditions, and provide discounts on energy expenditure on the basis of (equivalent) income, there is a risk to misallocate the resources devoted to contrast fuel poverty.

Keywords:

Fuel poverty; heating costs; probabilistic record linkage.

4179_Seeking Fair Inclusion of Women in Public Transport Using Urban (Big) Data: The Case of H2020 DIAMOND Project

Rawad Choubassi[1], Andrea Gorrini[1], Anahita Rezaallah[1] and Ludovico Boratto[2]

Abstract

Currently, 60% of Europe population resides in urban areas of over 10,000 inhabitants. Cities are engines of economic growth and account for approximately 85% of EU's GDP. As most of journeys start and end in cities, urban transport plays a curtail role in ensuring the well-being of city dwellers and in the achievement of goals related to socio-economics, energy dependency and environment-related policies, at local, regional and national levels.
Encouraging the shift towards the use of public transport that is sustainable, affordable and safe for everyone is the main challenge for European cities, as they are increasingly facing problems of congestion, road safety, noise and air pollution.
While current strategies for planning and implementing urban public transport are considered to be gender neutral, research proves that women experience and use transport systems differently than men. They prefer to use public transport, despite their more complex mobility patterns, since they are more concerned with economic aspects, reliability, safety and last mile connection availability of the service.
The EU Horizon 2020 project DIAMOND (under grant agreement No. 824326) aims at turning different sources of data to fair and actionable knowledge, ensuring women inclusion in transport sector both as users and employee. The research follows a gender-sensitive, multi-disciplinary approach that brings together different urban and mobility experts, transport authorities, computer and data scientists, mobility economists and social scientists across 8 different countries. The project focuses on four cases of: Urban Public Transport Infrastructure (Metro and Commuter Rail), Autonomous Vehicles, Bicycles Sharing and Women Employment in Transport Sector.
Considering the increased use of advanced Information and Communication Technologies (ICT), Mobile Apps, Internet of Things (IoT) in urban transport systems and other digital data sources such as social media, the disaggregated data will be used to understand and trace the mobility patterns of women, ask their opinion and identify the factors important for them, in order to plan and design a fair, gender equitable and integrated urban public transport network.
The paper presents the data-driven approach that enables fairness for women in transport. Especially in the context of Urban Public Transport Infrastructure, showing how different data sources can be analyzed to extract actionable knowledge to support stakeholders in their decision-making.
In this approach, data is collected from Open Socio-Demographic and Territorial Data from national and local geoportals and national census databases, Big Proprietary Data regarding mobility ridership provided by public transport authorities,

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Observation Checklists of Universal Design Indicators of Transport Facilities, End-Users Needs and Expectations collected through focus groups and surveys and User-Granted Data from social media.
Knowledge is then extracted through data analytics, based on Geographic Information Systems (GIS), Bayesian Network, Machine Learning and Analytic Hierarchical Process. It is aimed at defining a hierarchical model for design parameters influencing inclusion of women in urban public transport and development of a fairness toolbox useful for policy makers, city governors, urban and transport planners for improvement of current urban transport and planning and implementation of efficient and gender equitable future ones.

Keywords:

Urban Mobility, Big Data, Data Analytics, Inclusive Transport System, Gender Equitable

4180_How can regional authorities effectively support the transition to Electric and Connected Autonomous Vehicles? Introducing an explorative field study

José Veiga Simão[1]*, Francesca Cellina[1], Roman Rudel[1], Albedo Bettini[1], Daniele Vettorato[2], Alyona Zubaryeva[2],Sonia Gantioler[2], Fabrizio Sossan[3], Gerald Franzl[4], Cristina Pronello[5]

Abstract

The emerging technologies of Electric Vehicles (EVs) and Connected and Autonomous Vehicles (CAVs) are both foreseen to undergo a dramatic growth in the near future. Many local administrations are currently fostering innovation by addressing technical challenges towards EVs massive deployment, particularly regarding the charging infrastructure and the grid (diffusion and standardization of charging plugs and communication protocols and upgrade of the electrical system to meet the increased power demand). However, by failing to account for the disruptive impact that the diffusion of CAVs might have in a very near future, they risk to largely invest in EV-based fast obsolescing territorial infrastructures and to later lack the capability to address the possibly radically different needs created by a wide diffusion of CAVs.

Indeed, if diffusion of CAVs will mostly take place in terms of electric, shared vehicles within Mobility-as-a-Service (MaaS) frameworks, thus leading to shared ECAVs, as many future scenarios currently hypothesize, deep transformations in urban-level mobility patterns would occur as well. For instance, ECAVs would no longer be parked for 95% of the time but would increase their running time, to serve one customer after the other. Such a transformation would require to rethink the role and function of urban spaces and the interactions with and between components of the electric grid system, and to define new business models, by power and transport providers and possibly also totally new players.

To support urban and regional institutions to tackle these critical challenges and steer the transition towards ECAVs, we recently launched an applied research project aimed at exploring innovative territorial infrastructures capable of effectively supporting these emerging technologies in road mobility. The project engages academic institutions, utilities and start-up companies from Switzerland, Italy and Austria and focuses on two regional case studies:

- the region of Canton Ticino in Southern Switzerland: a wide area with four small-to-

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medium size urban agglomerations that constitute an urban continuum characterized by sprawl, while the remaining mountain areas are characterized by low population density;
- the region around the city of Bolzano in Northern Italy: a small-to-medium sized city and its surroundings, characterized by polycentric small density settlements;
The project will start by identifying the most likely future scenarios for the diffusion of ECAVs, depending on the diffusion of EVs and possible ownership schemes for CAVs (private vs shared property). Then, the two most likely scenarios will be simulated on the case studies by means of regional traffic and grid models, and their effects will be evaluated against a Business As Usual scenario, which only envisions the diffusion of EVs. This will allow to explore and assess: (i) how future diffusion of ECAVs would affect urban planning and design, particularly under a Sharing Economy framework; (ii) how to manage peaks in power demand due to a wide diffusion of electric mobility in the smart grid system, through vehicle-to-grid (V2G) and vehicle-to-home (V2H) power strategies; (iii) how to optimize EVs charging station infrastructures bypassing investment in fast obsolescing ones; and (iv) will lead to the identification of new business models.
During the all project activities local stakeholders and communities will be actively engaged, allowing to highlight the pros and cons of different scenarios and favoring later adoption and/or acceptance of the envisioned infrastructure solutions.
As a final project outcome, in Summer 2022 the project will develop a set of guidelines aimed at supporting regional authorities in the transition towards ECAVs and at optimizing the related infrastructures. At the conference we will instead present and discuss preliminary insights from the project, particularly regarding future scenarios for ECAVs.

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Keywords:

Electric Vehicles; Connected Autonomous Vehicles; Mobility transition; Vehicle-to-grid power strategy.

4181_Unlocking the social impact of built heritage projects: evaluation as catalyst of value?

Cristina Coscia[1] and Irene Rubino[2]

Abstract

The multidimensional sustainability concept is currently acquiring increasing importance, and it is now informing both public and disciplinary debates as well as decision-making processes at the global level. In line with this tendency, the theme of the sustainability of multi-scale interventions (e.g. at the building, urban and territorial scale) has undoubtedly started to be faced, but common practice suggests that a particular dimension of sustainability -i.e. the social one- has not been adequately taken into account yet.

Given this framework, the inclusion of the social sustainability goal into the design phase of a project, together with its monitoring and measurement, now represent one of the most important contemporary challenges; this is due not only to the accountability requested to public interventions, but also to the emergence of new economic frameworks and investment paradigms, such as the so called *impact economy*. Coherently with their own nature, *Social Housing* initiatives are one of the sectors that have mostly incorporated so far the social sustainability principles into real practice; however, an expansion of the social sustainability approach to other fields should be envisioned.

Interventions regarding built heritage resources could represent for instance a promising field of action allowing the advancement of new, integrated and empowering value propositions. In fact, the implementation of projects combining restoration, regeneration and the achievement of social goals could be seen as catalysts of value able not only to preserve and transmit the intrinsic and cultural components of these resources but also to facilitate in targeted communities the development of a sense of place, attachment and stewardship, together with social participation, well-being and cohesion.

Starting from the critical analysis of a selection of significant Italian and international case-studies, this contribution aims to highlight how - and to what extent- the social sustainability dimension has been integrated (or not) into restoration and reuse projects concerning built heritage resources, paying particular attention to the frameworks followed (e.g. *Logic Model*, *Theory of Change*), to the evaluation strategies implemented and to the new indicators adopted to measure the planned (and unplanned) social impacts. With reference to evaluation strategies, it will be also underlined whether and to what extent they take into account new balances and new mixes of risk and return components (social responsibilities of private investors and self-financing targets for public institutions).

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Then, this contribution aims to underline that the integration of evaluation approaches from the very beginning of a project, throughout its development and even after its completion could function as a catalyst of value too: in fact, evaluation approaches may help better identify social goals, define successful strategies to achieve them and finally measure them. Additionally, it advances that – in the context of projects that entail the restoration of local built heritage resources- the accomplishment of the above mentioned social goals may represent not only benefits in themselves but also well-being conditions favoring the activation of positive behaviors and support towards heritage.

Keywords:

social impact; well-being of citizens; evaluation; theory of change; built heritage

4182_Alternative scenarios for a post-carbon district in Turin: an integrated approach to support urban sustainability.

Cristina Becchio[1], Marta Bottero[2], Stefano Corgnati[3], Federico Dell'Anna[4], Giulia Pederiva[5] and Giulia Vergerio [6]

Abstract

Cities represent the places with the highest environmental and energy impact in the world. Their transformation through a sustainable key lets to reduce the pressures registered under these area. In this context, the European Commission outlined the new post-carbon city paradigm as characterized by buildings consuming low energy due to smart heating and cooling systems, and sustainable transport solutions based on the use of private electric and hybrid vehicles. The actions to tackle climate change have the opportunity to create collateral benefits which together with the emission reduction can potentially provide an economic, environmental and social improvement for the whole community. Their inclusion in the analysis is of fundamental importance to remove barriers and reveal the real potential of the renovation project at urban/district scale.
In accordance with the guide of European Commission, the tool used when evaluating public projects and policies is the Cost Benefits Analysis (CBA). It has been highlighted that one of the main limitations of the CBA method is the estimation of all positive and negative externalities in monetary value. To overcome this obstacle, a growing scientific literature on the application of Multi-Criteria Analyses (MCA) in the context of energy investments is emerging. In this study, we propose the application of the COSIMA (COmpoCIte Modelling Assessment) model, that combines the CBA and MCA methods, for ranking alternative retrofit scenarios for a district located in Turin (Italy). The integrated evaluation extends the conventional CBA into a more comprehensive evaluation tool for retrofit investments, including decision criteria that would otherwise not be considered. Moreover, the COSIMA method allows to consider the opinion of the different stakeholders involved in the decision-making process, that is a crucial point in urban transformations. The case selected for the methodology validation is the neighborhood of San Salvario, located in the city of Turin (Italy), in which transformation interventions have been proposed in the following sectors: buildings, public lighting, transport, water and waste management. The COSIMA analysis assisted in the selection of the best performing combination of alternative measures and proposes useful guidelines for the Turin's

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municipality.

Keywords: Decision-making; Co-benefits; Urban renovation; COSIMA approach; Energy transition

4185_Low-carbon transitions in European countries under the influence of extreme political, social, economic and energy-related developments

François, Davi Ezequiel[1]; Poganietz, Witold-Roger[2]; Pellinger, Christoph[3]; Guminski, Andrej[4]

Abstract

Explorative energy scenarios represent important means of orientation for society and key players in the energy sector to explore plausible possibilities that can happen in the future considering a set of primary conditions. In the challenge of the transition to low-carbon energy systems, scientific views of the future, yet imperfect, are useful to design strategies and act aiming to promote a desired future and/or to avoid an undesired one. Frequently, scenario analyses for the decarbonization of the energy systems limit their scope to techno-economic slight variations of the status quo. Such analyses present limitations in two ways for the development of adequate energy policies for a low-carbon future. First, energy transitions are driven by additional forces like social and political, and not only technological and economic. Second, the occurrence of extreme developments, although sometimes rare to occur and recurrent, can have very strong positive or negative effects on energy systems, like the worldwide effects of the oil crisis in the 1970s, especially on global economies. Scenario analyses based on Cross-Impact Balance (CIB) can help to overcome these limitations since CIB allows to address multifaceted and complex system analysis. This study aims to discuss preliminary results of a CIB scenario analysis for the decarbonization of the German energy system (electricity, heat and mobility) under the influence of multidimensional and extreme developments. The same scenario analysis is being conducted for three groups of neighboring countries of Germany, namely: East-Europe (Czech Republic, Hungary, Poland, Slovakia, Slovenia), Southwest (Austria, Belgium, France, Italy, Netherlands and Switzerland) and Nordics (Denmark, Norway, Sweden and United Kingdom). For the CIB analysis, 25 descriptors and corresponding trends were developed. A descriptor qualitatively and/or quantitatively describes a given topic of interest. The interrelationships among the descriptors were established based on literature research and participatory methods, including brainstorming, workshops, online survey and interviews with European experts. The descriptors and trends cover extreme socio-political, economic and energy developments, so as slight variations of the status quo, at the global, European and national levels that could have positive or negative impacts on the European energy systems. Examples of trends considered are: 1) the creation of hegemonic economic areas (e.g. China in Africa); 2) strong cooperation an integration

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of the European Union (EU) (e.g. possible “United States of Europe”); 3) the collapse of the EU; 4) societies that regard values and principles of solidarity as particularly important; 5) the establishment of authoritarian regimes; 6) circular economy based on solidarity; 7) market economy controlled by the state; 8) a restriction on the access to strategic resources from abroad through restrictive measures in the importing countries; 9) a strongly increasing frequency of extreme weather events; and 10) a trend towards unbundling European electricity grids (e.g. self-sufficiency of European countries). Preliminary results from the consistent scenarios identified via CIB for Germany present trends that follow the status quo or extreme developments following the current situation. However, the scenarios do not present extreme developments that contradict the status quo, like the collapse of the EU, low/high long-term oil price well below/above US$70 per barrel, the establishment of authoritarian regimes or sham democracies, and market economies controlled by the state. These preliminary results can indicate that it is challenging for science, based on current and past knowledge from the literature and experts, to draw future views that combine a set of parameters that contradict the current view of socio-political, economic and energy developments that can influence the decarbonization of the energy systems in Europe.

Keywords:

Energy transition; extreme developments, Cross-Impact Balance Analysis; socio-technical scenarios

4186_Smart Creative Cites: Culture, Economy, and Community at nexus

Maria Beatrice Andreucci[1], Anna Laura Palazzo[2]

Abstract

In 1995, the English planner Charles Landry and Franco Bianchini, an expert in policy and cultural planning, published "The Creative City", focusing on three intertwined topics while investigating the concept of the Creative City: the cultural, social, and economic impact that arises from creativity in cities; the need to promote integrated urban planning levering on knowledge from other disciplines (economics, sociology, ecology, psychology, etc.); and the active inclusion in urban planning processes of ordinary, often marginalized persons or groups, such as minorities or immigrants. Few years later (2000), Landry publishes "The Creative City. A Toolkit for Urban Innovation", a book in which he challenges and further develops his ideas by proposing them as a "toolbox for urban *renaissance"*.

At the beginning of the XXI century, the American economist Richard Florida publishes what is considered a milestone on the subject of the creative city: "The Rise of the Creative Class" (2002), in which – relying on facts and figures – he emphasizes the characteristics of people performing creative activities in cities, as well as the conditions that cities must offer in order for the "creative class" to be attracted and settle in them.

The Smart Creative City is a more recent concept. it grew out of economic science, especially the so-called "Experience Economy", which for the past ten years has been studied by a growing number of authors and researchers from different disciplines, so as to count nowadays on a rather extensive and diversified literature. Regarding specifically the economic development of cities, creative industries represent undoubtedly a strategic sector in the urban regeneration process, and the socio-economic feature of smart creative cities can be considered the most evident and critical one.

The proposed contribution briefly presents the theoretical framework at the basis of the Smart Creative City concept, together with the different approaches to its historical development, analyzed through ideas, evidence and paradigms of its main promoters and researchers, Richard Florida and Charles Landry, as well as their most notable critics. Describing different direct and indirect experiences through storytelling and best practices, the authors discuss recent advances in international thinking and evidence about smart creative cities, and do so particularly in light of themes advanced in the on-going debate about the critical functions of cities and regions in XXI century's experience economy. The paper specifically addresses cohesion, governance and vision in an urban context. Authors consider that creativity, art and culture have, within the Smart City and Community concept, a much broader power than it is usually attributed, and the proposed illustration of successful and

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unsuccessful experiences and practices serves as a profound reflection on: different dimensions of urban creativity; cultural and artistic projects and events as urban “regeneration devices”; and the role of national and supranational stakeholders in supporting culture, circular economy, art and community at nexus. Authors conclude that the creative city concept is a sound paradigm for inclusive planning and resilient urban design, which is in full progression and whose frontiers cannot not be foreseen yet.

Keywords:

Community Empowerment; Creative Sector; Experience Economy; Policy Making; Urban Regeneration.

4188_Nature-based solutions on the blockchain: A review into the use of emergent institutional technology in environmental governance

Sonja Gantioler[1] and Viktor Bukovszki[2]

Abstract

The concept of nature-based solutions (NbS) has been promoted as a way of mitigating environmental, social and economic challenges caused by unsustainable urbanization patterns and transformations. Despite the growing evidence of the efficacy of NbS, and an academic discourse articulating their actual or potential values, how they evolve from theory into a more widely and integrative practice remains an open question. The implementation of NbS represents still a niche especially in the urban development sector, relying either on bold, forward-thinking public actors, or large enough public pressure to sway business opinion. Widespread, viable and replicable business models for investing in NbS are still missing. Short-termism, horizontal specialization, hierarchical control and risk aversive culture inhibit different actors in capturing the oftentimes long-term, widely dispersed, indirect and entangled values of NbS. This results in a diminishing number of actors who 'entrepreneurially' engage in NbS development. There is thus a need to investigate governance and business frameworks better able to operationalize the complex value delivery of NbS.

The presentation and resulting paper will in particular explore the opportunities and limitations of using institutional technology. It will be argued that institutional technology applications of blockchains – namely for distributed ledgers, smart contracts, decentralized autonomous organizations – open new opportunities for engaging on NbS. This includes drastically socially scaling collaborations, by allowing to actively involve an increased quantity and diversity of actors. Moreover, by eliminating the need for intermediaries, also reducing transaction costs, institutional technology can flatten the hierarchy of these collaborations into governance network structures: a group of autonomous, but interdependent actors with different backgrounds and resources, steering their institution by negotiation and mutual learning, and thus creating self-regulating adaptive systems that are capable of responding to uncertainties inherent in NbS. However, using distributed ledger technologies and smart contracts outside fintech is still a novel field. Nevertheless, first proofs of concept exist regarding their application for environmental governance, for example with regard to smart energy microgrid, blockchain credits for water use, or climate tokens for crowd financing climate action. Insights from a structured analysis of existing examples will be presented to discuss how the use of these technologies can be integrated into planning policies and tools for NbS implementation.

At the same time, the presentation will also highlight potential risks and threats that

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come along with an increased use of institutional technology. Besides the widely discussed potential impact of high and steadily increasing energy demands, this refers for example to how institutional technology might disruptively affect value systems in relation to NbS, as well as relationships of social trust - in existing democratic institutional settings of environmental governance, and of reciprocity between citizens, policymakers and business. It will highlight how many of the existing examples have failed to look beyond technological development to the underlying understanding of 'good governance'. It will discuss potential risks of how the digital divide and a lack of understanding or deliberate 'obfuscation' of encryption and algorithms could translate into a loss of very basic democratic rights. It will also argue how its reliance on perfect information and suggestions of certainty might expropriate the human individual of its free will and such of the right to actively shape his future, as discussed by Shoshana Zuboff. The paper will finally conclude on what forms of governance or planning processes can form a countervailing power considering the different actors of the urban and regional ecosystem.

Keywords:

nature-based solutions; environmental governance; institutional technology; blockchain; governance network

4192_Renewable energy communities: business models of multi-family housing buildings

Valeria Casalicchio[1,2], Giampaolo Manzolini[2], Matteo Giacomo Prina[1,2], David Moser[1]

Abstract

In recent years, the energy sector has gone through a period of profound challenges as a result of the decarbonization objective.
The new European directive on renewable sources (RED II), which has been revised and has entered into force in December 2018 as part of the Clean Energy Package for all Europeans, has opened new perspectives on the consumers and the decentralization of energy production. According to what emerged from the World Energy Council, consumers and decentralized energy production are the main actors of the underway change.
Therefore, the energy transition involves (i) the energy market, (ii) the regulatory framework for distributed renewable generation and for renewable energy communities as well as (iii) the efficiency and reliability of the system that must improve its smartness and digitalization.
The aim of this work is to perform an analysis of the inclusion of the energy communities in the Italian regulatory framework. So far, in Italy, it has not been possible to realize a “one-to-many” self-consumption solution in which the final consumer is not unique. Thus, forms of collective self-consumption, as prosumers of multi-family housing buildings, have not been tested.
As a consequence of the contents of the RED II directive, an important change regarding self-consumption is expected over the next few years.
The analysis focuses on the several strategies which can be adopted by tenants so to share rooftop photovoltaic module production and stored electricity and the consequent economic impact on their electricity bill.
In order to perform the analysis, we have created a function in Python which simulates different possible business models to be proposed to prosumers of multi-family housing buildings through which it is evaluated the economic return of every participant in the energy community.
The function receives as input the configuration of the renewable energy community (number of multi-family housing buildings, number of tenants), the electricity demand of each owner, the production profiles of the installed photovoltaic panels, which is the only resource of the prosumers for the electricity production, and the parameters of the installed electricity storages. The function returns as output the electricity bill of each tenant considering the cost of the energy purchased from the grid and the

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economic revenues from self-consumption and from the sale of the excess production for each of the business model adopted. Therefore, the advantages and disadvantages of the different models are highlighted.
This work has also an additional objective which consists in improving the confidence in the prosumer community concept. Moreover, it highlights the issues concerning the revenues management which will emerge with the regulation definition. It is considerably relevant to focus on the management analysis of multi-family housing buildings because it is the first step in assessing the feasibility and cost-effectiveness of renewable energy communities. Then, a broader study can be carried out in order to estimate the energy community impact on the national energy system and thus evaluate the most proper planning policies.

Keywords:

Smart community; business and value model; challenge common spaces for the sharing economy; prosumer

4193_Enhancing Knowledge Learning and Innovation Network during Planning Participation——An Empirical Analysis of Rural Construction in Yanhe Village, China

Qiuyin Xu[1] and Tianjie Zhang[2]

Abstract

As a central factor for building smart and sustainable regions, innovation requires the effective combination of local knowledge with expert knowledge, as well as the support of extensive network. However, due to geographic distance and less agglomeration, rural regions have less possibilities for accessing external knowledge and worse connectivity than urban regions. Quite a lot of spatial planning has greatly improved ICT infrastructure in rural regions, but cannot guarantee the improvement of knowledge level and innovation ability there. How can we effectively enhance knowledge learning and innovation networks in the construction of rural regions?

This paper takes the rural construction of Yanhe Village in Hubei Province, China as a case, and discusses the issues mentioned above. Locating in the southwest mountainous area of Hubei Province, Yanhe Village is relatively remote. It faced many problems such as serious environmental pollution, economic backwardness and so on. Since 2003, with the help of Green Cross NGO, the village committee led the villagers to carry out a large number of construction actions. The environment and economy of the village have been rapidly improved. More significantly, after the withdrawal of the NGO, the economy of Yanhe Village has maintained steady growth and the environment has been well maintained.

Via literature research, fieldwork and in-depth interviews, this research finds that besides the infrastructure improvement, the curriculum training conducted by Green Cross NGO helps a lot in enhancing knowledge learning. In this process, local elites were effectively driven by external knowledge disseminators, and became local knowledge disseminators. The seminars and collective construction actions carried out by the village collective itself further digested the new knowledge. As the initiative of village committee members, township and village enterprises and migrant workers grows, the formal and informal relationships between multitude actors became richer. This article emphasizes that, besides ICT infrastructure, it is very important to provide training and guidance for villagers, especially local elites. And diverse subjects should be encouraged to participate in rural construction. The resulting innovative environment makes the introduction and implementation of innovations possible.

Keywords:

Social practice; Smart region; Spatial planning; Socio-ecological transformation

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4195_A case study of biomass power generation in rural areas in Southern Italy

Andrea R. Proto, Salvatore F. Papandrea, Francesco Calabrò, Giuseppina Cassalia

Abstract

In the last years, forest managers increased their interest in renewable energy markets, tending to expand the role of woody biomass as an energy source. The support of biomass fuels and products is a way to support the growth of agriculture, forestry, and rural economies, but also for foster major new local industries, reducing consequently the need for oil and gas imports. Particularly, forests represent one of the largest potential sources of biomass in Italy and the forest-based biomass can be obtained from different woody residues that are produced during timber harvesting and other silvicultural operations. Moreover, woody biomass, considered as all plant and plant-derived materials used, has great potential to provide renewable energy at middle and local scale. In addition to the many benefits common to renewable energy, woody biomass is particularly attractive, since it gives several environmental and socio–economic benefits, such as the reduction of greenhouse gas emissions, the enhancement of forest health, but also the generation of income and employment for the rural communities. However, woody biomass could be used for bioenergy production without negatively influencing the other forest management goals, such as sustainable harvesting of saw-timber production. Logging residues, but also timber deriving from silvicultural operations like thinning activities on stands damaged by natural disturbances, is an opportunity to get easily available woody biomass residues, which had little or no market value.

This paper presents a methodological approach useful to establish a biomass supply chain to support a potential power plant for energy production, taking into account the woody resources available, but also the potential suppliers and constraints of productivity. For this purposes, an important issue is the correct supply chain: indeed, the supply of forest residues is not constant, both in the short and medium term. Indeed, the woody biomass occurrence in a forest context can be strongly variable, in relation to the type of biomass, its yield, but also in relation to the topography and the applied supply chain. For these reasons, the authors also investigated the logistic efficiency for a potential power plant. The study site is located on the Calabrian Apennines (southern Italy), in a typical rural area where there is available woodland useful to supply the supposed power plant.

The method of assessment of forest biomass supply chain developed in this study can be used for several planning tasks for the calculation of available local forest fuel potential. Before choosing a strategy for supplying a power plant with a source of wood-fuel, it is crucial before and after economic calculations to interact with the different actors of biomass supply chain.

A particular aspect deepened in this study is the verification, through the Contingent Valuation, of economic convenience for the local community to choose this solution.

Keywords:

Biomass, wood supply chain, Decision support system, Contingent valuation

4196_POCITYF H2020 project – a Transformation Framework for Protected Heritage Cities

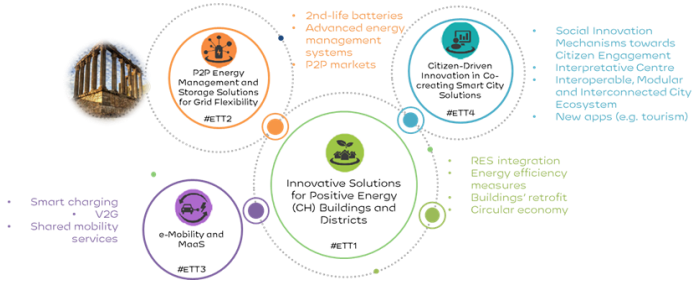
José Campos Costa[1]; Nikolaos Nikolopoulos[2], Vivi Giourka[3], George Koutitas[4], Nuno Bilo[5],

Abstract

The presented abstract intends to result in an oral presentation for thematic track 1. POCITYF, a recently smart cities and communities EC funded project, major goal is to deliver a set of Positive Energy Blocks in the Lighthouse Cities of Evora (PT) and Alkmaar (NL) and boost their replication in the cities of Granada (ES), Bari (IT), Celje (SI), Ujpest (HU), Ioannina (GR) and Hvidovre (DK). The project will be carried out along four (4) Energy Transition Tracks, i.e.:

- ETT#1: Transformation of existing/new buildings into energy positive;
- ETT#2: Application of flexibility strategies and storage systems, also by;
- ETT#3: Integrating solutions offered by eMobility; all of the above to be sustainable and serve their primary scope, considering for
- ETT#4: Innovative social engagement and co-creation techniques.

This presentation focuses on Évora, whose assigned solutions are identified in the following picture, namely the protected city centre, allowing that to act as a strong example for cultural protected cities, wide spread across the EU.



At a first level, POCITY introduces the demonstration of 10 Integrated Solutions, being in position to overcome legislation barriers and architectural constraints existing in similar-to-Évora cities. Such include a) circular insulation materials, b) PV canopy and skylight, c) PV thermal panels, d) hybrid wind/solar generation systems and

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positive energy district level retrofits including e) DHC (biomass, waste and geothermal), f) smart lamp posts, g) smart energy farms (ETT#1); all supported by h) smart distribution management systems, i) ATES heat/cold storage and j) innovative short and long-term seasonal storage, (ETT#2) and k) deployment of V2G solutions for EVs (ETT#3).

However, to boost the installation of such solutions, rendering them cost-effective in the long-term, underpinned by innovative business models, POCITYF capitalizes as well on the introduction of a P2P transactional platform, built on an existing platform – Connect with Energy™ – that allows the creation of fundraising campaigns to fight energy poverty. Connect with Energy™ is developed and tested by Gridmates Inc. in EU and USA and offers to electric utilities and end users an engaging technology for peer to peer smart energy donations. With this solution, POCITYF intends to contribute for the solving of the question – which tools can heritage sites provide to their citizens to allow them to carve a positive energy future?

The innovative feature of the platform enables its users to debit and credit their accounts with project-specific tokens, related to excess of energy and citizens' sustainable behaviors (related to eMobility or buildings' energy savings), using smart contracts. On top of that, it promotes a wide-level interaction among city-actors (public, private, research, civil society and citizens), encompassing the energy domain, citizen engagement and mobility sectors according to environmental and mobility-related indicators, assessing the behaviors, posteriorly converted into energy. Other use cases will be implemented: 1) empowerment of users by allowing them to publish campaigns and donate euros/tokens (donations based on sustainable behaviors, linking the energy domain with citizens and companies' social responsibility); 2) creation of virtual energy wallets, endowing users with the ability to invest in a project, receive "shares" in their wallet, use these shares to invest in other projects or donate energy (connection with use case 1), withdraw their shares or reduce their energy bills.

This holistic approach renders Évora as a real-life technologically advanced testbed, orchestrated under a City Information Platform, and enhanced by an innovative P2P transactive layer, to act as a good example for EU and worldwide, of how smart technologies can offer people the opportunity to be actuators in this fast-paced track towards a green economy, while maintaining their protected areas sustainably inhabited.

Keywords:

Positive Energy Blocks; cultural heritage sites; Peer-to-peer (P2P) transaction; energy donation

4197_Cross-City Commuting in Guangdong-Hong Kong-Macao Greater Bay Area: Features, Trends and Comparisons

Guanqiu Wu[1], Zibo Xing[2]

Abstract

The rapid growth of metropolitan regions has become a key issue in urban governance and planning. With the improvement of transportation infrastructure and the transform of the regional industrial chain division pattern, the daily cross-city commuting at regional scales is becoming larger and larger. However, there is only limited research focuses on this topic. At the same time, intelligent planning expands from smart cities to smart regions. Accurate and high-frequency tracking of cross-city commuting behavior has become accessible with the intelligent technologies. Based on big data from Baidu map, the employment, residence and other commuting features could be identified and analyzed. This study aims to analyze commuting issues by scrutinizing the Guangdong-Hong Kong-Macao Greater Bay Area (GBA) of China as a case.

GBA is one of the regions with the strongest economic vitality in China. In 2018, the total GDP of the region reached 10.9 trillion yuan. The study focuses on seven core cities on the coast of GBA, which can be spatially divided into the East Coast and the West Coast. First, explored the features of cross-city commuting at the community scale. Using Gephi to build a cross-city work-residence network among community units, the weighted Degree of each node were calculated, it was found that cities of the East Coast were more closely connected, and the inter-community relationship was more complex. The flows tended to be average. However, in the West Coast, commuter flow between Zhongshan and Zhuhai of was huge, but the connection between the communities was simple and the flow direction was clear. Using the global Moran's index to analyze spatial autocorrelation on employment and residence, it was found that both were clustered. Second, data at the city scale showed that in the East Coast, the relationship leaded by commuter flow between cities were tighter, the input and output flow of the cities were basically balanced, and the coverage of cross-city area was wider. The connection between commuters in the West Bank was simpler, the input and output flow of the cities were out of balanced, and the coverage of cross-city area was smaller.

The conclusion shows that the number of cross-city commuters in GBA has increased year by year, and the economic situation as well as commuting features and trends between the East Coast and the West Coast are different, which brings new challenges to the planning of transportation facilities, industrial layout, urban infrastructure and urban growth boundary. An in-depth analysis of the properties of cross-city commuters could be explored in the future, providing further support for smart regions planning.

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Keywords:
Cross-City Commuting; Smart Region; China

4199_Quantitative attribution analysis of heterogeneity of spatial agglomeration of Cultural and Creative Industries in Beijing

Qiu Ning[1]， Zhang Tianjie[2], Han Xinyu[3]

Abstract

In recent years, with the urban renewal, transformation and development, the role of cultural and creative industries (CCI) in urban renewal and development has received extensive attention. CCI include 9 types in china and the location of every type shows heterogeneity of spatial agglomeration. This paper takes the main urban districts of Beijing as the research object, and focus on the factors which influence the location of agglomeration.

In the experimental part, the first step using the enterprise data (about 70000) identify the spatial agglomeration centers (SCA) of every cultural and creative industry through Kernel Density Estimation. Though combining every CCI's location and the environmental characteristics, we can qualitatively analyze the attributions of them. Secondly, summarize all the main SCA, which include comprehensive (agglomerating multi-CCI) and single (agglomerating single CCI), among which the comprehensive type is CBD area (agglomerating 7 kinds of CCI), University agglomeration area (agglomerating 4 kinds of CCI), historical district agglomeration area (agglomerating 3 kinds of CCI)and other single types. Then summarize all the main attributions and obtain relevant data, which include infrastructure, policy, creative class, atmosphere of history and culture, land rent, college, tourism, population density, creative atmosphere, university and inclusiveness. Finally, we quantitatively analyze these attributions in every type of cultural and creative Industry based on the geodetector method. This method is used to detect the degree of geographical factors which is the cause of the heterogeneity of spatial distribution of CCI.

The result indicates that according to the quantitative attribution analysis the 9 types of CCI can be re-classified into 3 heterogeneity categories: Culture-leading type, Creativity-leading type and History-continuation type. The dominant attributions of every category are different from each other. To be specific, ①Culture-leading type includes 4 kinds of CCI, including history and culture, tourism and entertainment, advertising and radio, television and film. The domain attributions are atmosphere of history and culture, tourism, infrastructure and population density; ②Creativity-leading type includes 3 kinds of CCI: design service, software and network, publishing. The domain attributions are creative class, land rent, university, creative atmosphere, policy and inclusiveness; ③History-continuation type includes 2 kinds of CCI: art trading and other ancillary services. This type is less affected by the above attributions, but more affected by the existing market and historical persistence. The result help us understand the motivation and influential factors of CCI.

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In the end, this paper puts forward three related optimization suggestions facilitate the prospect of CCI: Creating Brand Value of Space through Cultural Identity; Providing spatial support for industrial linkage; Creation and Cultivation of Low-Cost Innovation Space.

Keywords:
Cultural and creative Industries；Spatial Agglomeration；Quantitative attribution analysis；Heterogeneity categories；Beijing

4200_Vulnerability towards summer energy poverty from a gender perspective. The case of Madrid

Miguel Núñez-Peiró[1], Carmen Sánchez-Guevara Sánchez[1], Ana Sanz-Fernández[1], Marta Gayoso-Heredia[1], José Antonio López-Bueno[1,2], F. Javier Neila González[1], Cristina Linares[2], Julio Díaz[2] and Gloria Gómez Muñoz[3].

Abstract

Recent research has addressed the special relationship between energy poverty and women. Despite few studies are yet available, results show that there might be strong gender inequalities connected with household's energy deprivation. Furthermore, differentiated health impacts have been detected between men and women, locating women into a more vulnerable position. In this sense, the so-called *feminisation of energy poverty* is urging a revision of the existing studies from a gender perspective to foster its inclusion within energy poverty alleviation policies.

The present study explores the links between summer energy poverty and gender in the city of Madrid. Summer energy poverty is considered another variety of energy deprivation particularly relevant within mid and low latitude countries, in which energy consumption for cooling is increasing heavily. It also seems to be particularly relevant in cities, in which the urban heat island (UHI) introduces relevant variations in the microclimatic conditions that might increase the cooling demand.

Following the methodology developed in previous studies, the risk of suffering from summer energy poverty is in this paper explored considering households' gender composition. The geospatial distribution of their vulnerability, as a function of income, is compared with other indicators related with their exposure to high temperatures: the housing energy efficiency and the cooling degree hours (CDH). The evaluation at the sub-municipal scale is carried out among the different subgroups in which a woman is the main breadwinner, such as single women with children, single women over 65 years old, or gender-mix households. Their situation is also compared to those households in which a man is the main breadwinner. The analysis of the selected variables is conducted using a *hot spot analysis* based in the Getis-Ord statistic (Gi*), which evaluates the autocorrelation of each variable according to its spatial distribution.

As expected, results confirm that women are likely to be at a higher risk of suffering from summer energy poverty than men. Women living alone and above 65 years old seem to be under the highest risk. They concentrate in areas with a low efficient housing stock, strong UHI intensities and, despite living in the wealthiest neighborhoods of the city, they tend to have a much lower pension than their male counterparts. Additionally, there is also a significant proportion of single parent

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households lead by women living in low-income areas, in which they are exposed to higher outdoor temperatures and live in a low efficient housing stock. On a general basis, the income gap between women and men makes it advisable to address summer energy poverty with a gender perspective. This investigation will help incorporating the gender mainstreaming into urban environmental interventions to promote more inclusive cities.

Keywords:
Summer energy poverty, gender perspective, intra-urban variations, urban audit, urban heat island

4204_City Evaluation Framework: fields, domains, indicators for advanced planning processes for urban transformation

Andrea Martín[1], Estefanía Vallejo[2], Ana Quijano[3], Carla Rodríguez[4] and Cecilia Sanz[5]

Abstract

Sustainable urban transformation is characterized by multiple factors (e.g. technical, socio-economic, environmental and ethical perspectives) and a number of administrative structures that should address the evaluation of alternative urban planning scenarios or opportunities. This defines a complex decision making process that includes different stakeholders where several aspects need to be considered simultaneously. In spite of the knowledge and experiences during the recent years, there is a need of methods that lead the decision-making processes.
Leveraging on current developments in different European Smart City projects (MAtchUP and MAKING-CITY), a City Evaluation Framework is proposed to support cities in their strategic planning process through the definition of a methodology to assists city managers and stakeholders in the progress of cities towards sustainability and smartness. This methodology based on indicators allows assessing specific characteristics of the city, diagnose challenges or discover patterns through reliable metrics but also to compare different aspects of the cities thanks to the normalisation of the indicators and the calculation of indexes.
Specifically, the city level evaluation framework aims to (I) identify the city needs and challenges that help city managers in the decision-making process when prioritizing a city strategy, (II) measure different aspects of cities to be aware how close a city is to become sustainable and smart, (III) monitor the progress of the city to show to what extent sustainability and smart goals have been reached, and (IV) provide information in a comprehensive way to facilitate the communication of information to stakeholders and city planners, (V) set a reference methodology for benchmarking and comparison of different aspects within and between cities.
Based on the outcome of the literature review, the structure of the City Evaluation Framework is performed under the concept of sustainable development. Specifically, the evaluation framework covers 7 dimensions that correspond with the 3 components of the sustainability concept (economic, social, and environment development) and the combination of these four components (bearable, equitable, viable and sustainability). Additionally, 4 fields have been defined to cover the technical solutions to be implemented in Smart City projects (energy, mobility, ICT and citizens; and its particular variations for the case of each project). On the other hand, each pillar (or category) has been split in several domains (or application fields) to focus the characterization in specific topics.

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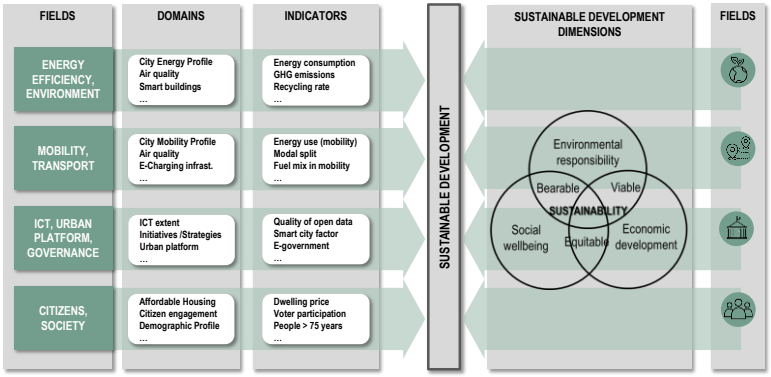

Figure 1: City Evaluation Framework approach

The definition of this methodology is been a learning process based on Cartif experience in Smart City projects and in the hypotheses about normalization, weighting and aggregation processes to build indexes per domain and field. Uncertainly and sensitivity analysis stage would be the last but not less important step to examine the suitability of evaluation methodology, from the selection of indicators to aggregation techniques. As a result, city's needs, priorities, and their progress will be easily identified thanks to the visualization of the data in a spider radar graph.

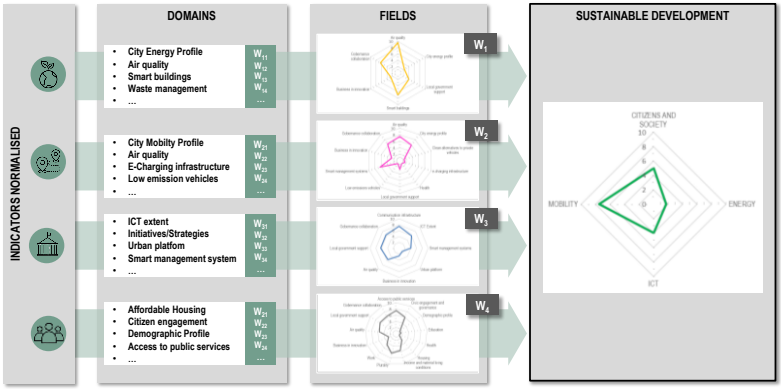

Figure 2: City Evaluation Framework results

Keywords:

Smart cities; urban planning; sustainability; indicators; indexes.

4206_Building stock material composition at national and European level: the HotMaps repository

Silvia Croce[1], Stefano Zambotti[2] and Simon Pezzutto[3]

Abstract

Within the European Union (EU), buildings currently account for 40% of total energy use and 36% of total green-house gases emissions. Thus, there is the urgent need to improve the energy efficiency of existing buildings. Furthermore, the refurbishment of the existing building stock is a key factor for the future of the building sector and for the achievement of the European climate and energy targets. It is estimated that 80% of the buildings that will be occupied by 2050 in Europe have already been constructed. In a longer perspective, this implies that the share of building being renovated will surpass the one of new constructions. The refurbishment of the European building stock can relevantly contribute to limit the environmental impacts and to reach the objectives of climate change mitigation. However, the energy retrofit of buildings also has an influence on the use of materials and the production of waste; the construction sector being already responsible for a consistent share of waste generation and consumption of raw materials. In cities many potential valuable materials are already available on-site, and can be reused or recycle based on the principles of circular economy, saving natural resources and reducing the environmental impacts. To boost circularity in cities, and especially in the construction sector, a detailed knowledge of the material stock already existing in buildings is crucial.

In this scenario, the understanding of the composition of the building stock in terms of construction methodologies and materials is crucial for the definition of effective refurbishment programs at European and national level. This study presents the results of a building stock analysis conducted in the framework of the Horizon 2020project HotMaps. The aim of this research was to analyse, among other parameters, the construction features for the buildings in both the residential and the service sectors, subdivided by typologies and construction time periods. The data, collected and mapped for each European member state, and aggregated at EU28 level, are freely accessible and downloadable from the HotMaps repository. For the residential data set, several already available data sources have been used; on the contrary, the scientific sources detailing typical construction features in the service sector resulted scarce. For this reason, an expert questioning has been carried out. To fill the gap in literature, a questionnaire examining the features included in the database has been sent to two experts per EU member state; the collected data have been analysed, and the results have been clustered in geographical areas (Northern, Central, Eastern, and Southern Europe). Construction materials and methodologies

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have been analysed for the four main components of the buildings, i.e. walls, roof, windows, and floor slabs. The results are discussed for seven time periods – before 1945, 1945-1969, 1970-1979, 1980-1989, 1990-1999, 2000-2010, and post 2010. The residential building stock has been categorised in building typologies based on their dimension (i.e. single family houses, multifamily houses, and apartment blocks); while the service sector have been systematized based on the main function (e.g. office, trade, education, etc.). The results aggregated at European level show that, in the residential sector, bricks are the most widespread material for walls construction, combined with concrete slabs, and roofs with brick-cement structure in all time periods. With regard to windows, wood is still the most used material for the fixtures; single glazing characterise the majority of the building stock until 1969, while since 1970 double glazing is the most diffused. Triple glazing is starting to spread after 2010. In the industrial sector, concrete is the most common material for all building typologies and time periods.

Keywords:

EU building stock; construction materials; construction methodology; building refurbishment

4210_Territorial development tools for cross-border smart and sustainable regions

François Levarlet[1], Andrea Gramillano[2]

Abstract

European Territorial Cooperation (ETC) is one of the two goals of the EU (European Union) Cohesion Policy with 2.75% of the total resources available for ERDF, ESF and the Cohesion Fund for the 2014-2020 period. ETC, in line with the Treaty on the Functioning of the European Union (TFEU), aims to tackle territorial development challenges and find shared solutions by investing in cross-border, transnational and interregional cooperation programmes. Cross-border cooperation programmes promote territorial cohesion, reduce regional imbalances and support the development of adjacent maritime and land border regions.

The scope of this paper is to analyse to what extent ETC cross-border programmes contribute to the EU 2020 Growth Strategy, develop and implement ad hoc territorial development tools offered by the EU regulatory framework, namely the Community-led local development (CLLD) and integrated territorial investments (ITI). CLLD is a specific planning instrument, involving local stakeholders in the definition and implementation of local development objectives. This approach was first experimented through rural development programmes and then extended to all the other European Structural and Investment Funds in this programming period 2014-20. ITI is usually applied when there is an integrated approach to invest in a specific area or territory.

The paper will provide examples on how cross-border programmes have contributed to EU 2020 Growth Strategy with their investment priorities and will illustrate how the CLLD and ITI instruments have been implemented. For each instrument of territorial development mentioned above, the paper will illustrate the context of intervention, the strategy developed, and the results achieved to date. In a second part, we will discuss the main issues addressed by these experiences. Challenges are mainly in terms of value added; in other words: do these instruments improve the efficiency, effectiveness and impact of cross-border programmes? The performance can be analyzed in terms of capacity in addressing cross-border potential and obstacles, sustainable development issues and tackling administrative barriers. Concerning the last point, both the CLLD and ITI have to tackle the following challenges to achieve their objectives: (a) setting-up a common institutional framework at cross-border level, (b) ensuring a sufficient level of administrative capacity to implement and develop the new instruments by also capitalizing on previous experiences, (c) building a context of trust and exchange. In conclusion we will argue that, under specific conditions, both CLLD and ITI can ensure a more efficient and more effective approach to localized territorial development challenges.

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Keywords: Cross-border cooperation; Territorial approach; CLLD; ITI; Sustainable development

4214_Integrated solutions for the provision of Services of General Interest in peripheral mountain regions

Peter Laner[1] and Christian Hoffmann[2]

Abstract

The provision of Services of General Interest (SGI) is recognized as important for the quality of life and the social and territorial cohesion in the European Union.
Peripheral mountain areas tend to suffer from weak service provision due to low demand triggered by depopulation, low population densities and the therewith related lack of critical mass. The decline in demand is often amplified by the need to commute, which has the effect that commuters consume most of the basic services at their workplace. Consequently, these conditions of large distances to nearby urban areas are often combined with a limited range of market operators and diminishing financial means, which makes it difficult for private actors and public service providers to maintain services of general interest.
Very mountainous regions in the Alpine Space represent such peripheral areas with low population densities, while urban centers with central services are concentrated in the major valleys and along major transport axes. In 2013, more than 65% of the municipalities within the Alpine Convention had a population size of less than 2.000 inhabitants. Consequently, the Interreg Alpine Space project INTESI (Integrated territorial strategies for services of general interest) investigated in detail the current situation of service provision in peripheral areas.
We conducted quantitative close questionnaires and qualitative interviews and workshops with local stakeholders from nine test areas of five different Alpine Space countries (Italy, France, Austria, Slovenia and Switzerland) to reveal existing strengths and weaknesses of the provision of SGI. Additionally, we gathered information about investments which will be made in the future by local authorities. The aim was to identify solutions implemented by the test areas, which can counteract the weaknesses in terms of availability, accessibility and quality of the services. The investigation dealt with a broad range of services, considering transport, telecommunication, health and social care, basic goods, education and administration services.
The results of this study introduce the complexity from various contextual perspectives for delivering services in peripheral areas. Above all, thinking in administrative units and the local cultural roots lead to a lack of territorial cooperation. Service distribution in rural areas suffers not only from a lack of cross-border cooperation, but also from not applying integrative approaches to benefit from linking services of various sectors. It is not only the lack of collaboration of countries and regions, but also the missing cooperation between service providers among different service sectors.
The presentation will focus on cross-sectoral (integrated approach) and

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intermunicipal/ interregional solutions (territorial approach) for the maintenance of services, considering also technological approaches through ICT, developed by the test areas. To conclude, we will present general ideas of pilot activities conducted by the INTESI project, which developed new e-services for peripheral regions.
The contribution to the session can give a valuable input for the discussion on how to overcome municipal borders and spatial inequalities in the field of service provision, giving some recommendations for integrated territorial solutions and needs for research.

Keywords:

Services of General Interest; peripheral mountain areas; cooperation; digitalization

4216_A small solar microcogenerator

Giulia Fresca[1], Carolina Toscano[1], Francesco Pulice[1], Riccardo Barberi[1,2]

Abstract

This experimental work focuses on the development of a solar microcogeneration system capable of producing about 1 kW of electric power and up to 3 kW of thermal power, designed for the decentralised and diffuse production of heat and power with high conversion efficiencies at low power scale.
The presented solar system makes use as microcogenerator of an industrial free piston Stirling engine of small size, with an electrical efficiency up to 32%, originally designed for domestic combined heat-power applications in gas boilers.
The heat acceptor of the Stirling head has been completely re-engineered for the solar application. The solution was the development and characterization of a cylindrical symmetry conical-shaped heat absorber placed on the head of the Stirling engine. The heat absorber transfers the concentrated heat to the front and side surface of the Stirling cogenerator towards the fins of the internal heat exchanger of the motor itself. The heat absorber performs a dual function: on the one hand it serves for preheating the engine in the starting phase and on the other hand it acts as a thermal stabilizer.
A paraboloidal solar dish concentrates solar energy onto the Stirling head, resulting in very high heat fluxes with local temperature up to 550 °C. The reflective surface of the paraboloid was made of Alucoil ALLMIRR aluminium sheets. The surface of the ALLMIRR has a theoretical reflectivity of 90%, which is reduced to 87.8%, as observed with spectroscopic measurements, after the flat sheet has been deformed to assume the parabolic shape required by the geometry of the concentrator. The solar dish concentrator is moved by a suitable two axis solar tracking system.
This cogeneration system produced 9,267 kWh of thermal energy and 1,779 kWh of electricity in a year, using a paraboloidal mirror with a surface of 9.6 m^2 to collect the solar radiation. A traditional non-cogenerative system composed of photovoltaic panels with 18% efficiency and thermal panels composed of flat solar collectors, inclined to the south at 39° with respect to the horizontal plane to compensate for the local latitude, and optical efficiency of about 0.80, will produce the same amount of thermal and electrical energy by using 4.6 m^2 of photovoltaic panels and 14.4 m^2 of additional thermal panels. In total the non-cogeneration system requires a collecting area of almost 19,0 m^2, about two times larger than the presented solar microcogeneration solution. In one year the average electricity produced is about 185 kWh/m^2 and the average thermal energy is around 858 kWh/m^2. The resulting annual electrical efficiency is about 9%, but can be improved, and the annual thermal

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efficiency is about 46%.
All experimental data have been collected in Rende (CS), an Italian climate zone C.

Two solar microcogeneration systems in the experimental area at the Department of Physics of the University of Calabria, Rende, Italy

Keywords:

Solar energy, Cogeneration, Stirling engine, Green Energy, Solar dish

4217_Transposing integrated data-driven urban planning from theory to practice: a roadmap for smart and sustainable cities

Viktor Bukovszki[1], Ahmed Khoja[2], Natalie Essig[2], Åsa Nilsson[3] and András Reith[4]

Abstract

There is a growing interest in urban applications of emergent ICT solutions under the smart city (SC) paradigm. This SC market is burdened by the difficulty of translating the complexities of urban management and development as ICT specifications, prompting the need for consultancy services. However, the services currently in practice are either too global for applicability, connected to single ICT suppliers, or focusing on single sectors. There is no common understanding of what an SC consultant is or does. This points to a lack of standards for SC consulting which would be transposed from the research of evidence-based, integrated urban planning. Although there are multiple approaches to provide entry points of ICT in urban planning, standardization and uptake by practice necessitates their demonstration in real-life cases.

This presentation outlines a step-by-step methodology to data-driven, integrated urban planning and showcases its application to three case-study cities with distinct, planning problems. The methodology is a transposition of principles, tools and methods used in data analytics and business intelligence to urban planning. These references were adapted as 'accessory' activities to a generic, cyclic planning process. Each accessory defines an entry point for ICT applications and supplement planning by expanding collaboration and participation scope, building up and maintaining necessary data, mediation of insights among actors, and decision-support through analytics. This activity-based approach defines supporting ICT functions for SC market suppliers, while also delineating a competence matrix and portfolio for SC consulting. The resulting planning cycle was tested in an eastern (Veszprém), northern (Aarhus) and western (Bamberg) European city on planning problems with complex, multi-sectoral implications. In the case of Veszprém, two alternative solutions for inner-city parking shortage were compared: capacity expansion and substitution by public transport densification. For Aarhus, arguments for more ambitious green development were made by showcasing their multiplicative benefits. For Bamberg, regional clustering opportunities were mapped based on the distribution of performance in the urban network. Finally, all cities were given investment advice on potential ICT solutions relevant to their specific problems.

The results are presented as feedback and validation from case study participants focusing on whether the accessory activities had the expected role in the process, and on the degree of support they received in navigating the SC market. Based on the reports of the cities, the applied method: contributed to a better understanding of the different functionalities that ICT can have in the planning process, delivered new arguments for specific urban development

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decisions, and helped prioritizing data production for the city needs both for diagnostic and monitoring purposes. The main contribution of the study is the demonstration of a directly applicable methodology to urban planning in the European context, requirements for the professional profile of a SC consultant to use this knowledge in practice, and ICT specifications to bridge the articulation gap within the SC market.

Keywords:
urban planning; smart city; ICT

4218_Attractive EU national markets for the provision of energy services to residential customers

Stefano Zambotti[1], Silvia Croce[2] and Simon Pezzutto[3]

Abstract

The energy sector is witnessing a critical transformation. The increasingly competitive and customer-oriented markets are shifting the value creation within the value chain, from upstream to downstream. This has an enormous potential for improving energy conservation, efficiency, and increase the share of generation from renewable sources. Indeed, the servitization trend in the energy sector is attracting a lot of attention from different stakeholders as it has the potential to create positive economic, social and environmental spillovers. The aim of this research is to analyse the EU national markets and identify the most promising for Energy Service Companies (ESCOs) offering energy services to the residential sector through Energy Performance Contracts (EPCs) and Energy Supply Contracts (ESCs). EPCs are long-term contractual agreements where the customer benefits from new or upgraded energy equipment and the ESCO's remuneration depends on the savings resulting from the reduced energy consumption. ESCs are long-term contractual agreements that concern the efficient supply of energy. In such contracts the ESCO provides services such as heating, cooling, domestic hot water, compressed air or electricity. The subject of the contract in this case is the utility value and not the energy value. The main difference between the two formulas is that EPCs go beyond ESCs. While ESC is based on a business model that guarantees energy supply; EPC is a business model for energy savings. The ESCO enters into a bilateral agreement with customers (usually for the duration of 10 to 15 years) and takes on the operational risk. It usually offers customized options including planning, operation, and maintenance elements and it also manages energy purchasing and financing of projects. The global value of the ESCO market grew 8% to USD 28.6 billion in 2017, up from USD 26.8 billion in 2016. However, in Europe the ESCO market remains underdeveloped compared to other major regions, representing 10% of the global total. Moreover, energy contracting has mainly seen application in the industrial and commercial sectors, leaving quite some room for improvement in the residential sector. Critical factors for ESCOs' profitability and viability are energy market rates, energy demand, primary and secondary conversion equipment efficiencies, energy efficiency of walls, roofs, floors and windows, and the ratio of owned to rented dwellings. In this research project we take advantage of the building stock analysis (BSA) database produced within the H2020 HotMaps project, the goal of which is the development of an open source heating/cooling mapping and planning toolbox and the provision of default data for the EU28 at national and local level. These data and

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tool allow public authorities to identify, analyze, model and map resources and solutions to supply energy needs within their territory of responsibility in a resource and cost-efficient way. To measure the attractiveness of a market we consider the profitability potential for ESCOs and the potential contribution of EPCs and ESCs to the achievement of the objectives set by the UN in the Sustainable Development Goal number 7, namely energy affordability and energy efficiency. According to our results, the most attractive EU national markets are found in eastern Europe; in countries such as Romania, Bulgaria, Hungary and Slovakia. In these countries, the cost of energy has the highest impact on households' living costs within the EU, the overall energy efficiency of buildings is the lowest, demand is above EU average, and the ownership share is above 84%.

Keywords:

Energy Service Companies; Energy Performance Contracting; Energy Supply Contracting; EU Building stock

4219_Institutional readiness for Circular Economy in small advanced open economies

Lina Dagilienė[1], Jurgita Bruneckienė[2] and Viktorija Varaniūtė[3]

Abstract

The value of economic growth for society has come into question as a result of increasing inequality, progressive technological change, and the complex impacts of globalization (WEF, 2018). Given the context of urban challenges, industry 4.0 and linear transformation of natural resources to production, consumption, and waste, economic development must be not only technologies driven (Martin et al, 2019; Krammer, 2017) but have a particular focus on productivity and long-term sustainable growth (WEF, 2018). The paradigm of Circular economic (CE) activity seeks to overcome this by promoting reduction and reuse of materials, remanufacturing and recycling of products, but the consequences of its wide-scale implementation for economic dynamics, business cycles, wealth, and welfare remain unclear, and a deep understanding of the paths from linear to circular economy is still lacking.

Moreover, the European Commission has recognized the urgency of moving towards CE and in 2015 adopted the Circular Economy Package and an Action Plan. On the national level many member states identified priorities related to the CE in their Smart Specialisation Strategies. However, the EU is confronted with a double challenge for policymaking: supporting the laggards to catch up (e.g. Lithuania, Latvia, Slovakia (EEA, 2016)), and challenging the frontrunners to make next steps to fully closing loops and moving towards shorter loop R-imperatives (Reike et al., 2018).

This paper analyzes how national policy strategies influence the CE implementation in small advanced open economies through lens of institutional and systems perspective. The content analysis of national strategic development document is utilised for identifying the institutional readiness for CE targets. The systems perspective is being mentioned in the papers of CE (Davies and Hall, 2006; Kirchherr et al, 2017); CE is a systems level and inter-organizational approach (Korhonen et al, 2018; Kircherr et al., 2017). In almost all papers on the CE, the focus is stressed on resource efficiency and waste reduction (Ghisellini et al, 2016), increasing resource productivity and decoupling resource utilization from economic growth (D'Amato et al., 2017) at different aggregation levels.

By using system perspective, we analyse EU Circular Economy policy at meso-macro levels in the following small open economies: Lithuania, Latvia, Estonia, Slovakia. Mostly the analysis is done at the national level and particularly based on the analysis of large economies – China, the United States, Italy, Germany, or the United Kingdom. Hence, there is a lack of comprehensive analysis of CE in small advanced

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open economy countries. The recent study of Barragan et al. (2018) derives the conditions on fundamentals that explain why small open economies without direct ownership of raw materials rationally activate or deactivate the main recycling loops of the CE. Their model provides an explanation as to why small open economies behave in a linear, fully circular, or mixed linear-circular manner. Recent research on good practices for shifting towards CE (Su et al., 2013; Dangelico and Pontrandolfo, 2015; Paquin et al., 2015) demonstrates that a successful change is possible by applying cooperation practices and involving all stakeholders.
The research methodology is analytical analysis of secondary data based on the EU monitoring framework on the Circular Economy, as well as content analysis of scientific literature and grey literature.
The findings are important for fostering circular economic development for small advanced open economies.

Keywords:

Circular economy; small advanced open economies; targets; economic development

4221_Multiscale Urban Analysis and Modelling for Local and Regional Decision-Makers

Janka Lengyel[1], Dr. Jan Friedrich[2]

Abstract

In today's highly complex urban environments, decision-makers are facing far-reaching uncertainties regarding the medium- and long-term impact of their implemented measures. At the same time, they must operate between several intertwined interests and restraints; budget, socioeconomic profile, environment, local culture and history, desires of the current and future users of space, and so forth. It is therefore, at an extreme urgency that their decisions would be assisted by innovative instruments. They must provide assistance in setting priorities for urban design and planning actions and in optimizing and foreseeing their possible effects on an extensive time-scale. Against this backdrop, the past few decades have seen an increased interest in modeling urban structures via concepts and methods from physical sciences. This greatly advanced our knowledge of urban environments by putting the main emphasis on the strong reciprocal relationship between each of the spatial, social, infrastructural and economical dimensions. However, there have been relatively few computational attempts to unravel interdependencies across spatial and temporal scales. We contend that intrascale processes play a critical role in urban dynamics, thus it is quintessential that they would infiltrate into latter endeavors. Additionally, we believe that for accuracy and credibility purposes, spatial models must rest on a thorough investigation of existing space-time patterns and processes.

In this paper, we firstly present a spatio-temporal analysis of the Ruhr Metropole in Germany. In terms of spatial scales, the densely inhabited Ruhr area is of great interest as it is lacking a clear political or economic center. Additionally, in such unique polycentric structures, due to their extremely dense interactions and interdependencies, city - or in fact any organizational - boundaries become overly fuzzy. The Ruhr area also demonstrates some distinct traits of its historical development, manifesting in substantial socioeconomic differences along its three rivers. Secondly, building upon the analysis, we will review results of a multiscale urban model. We used our empirical findings for the deduction of both the internal model-dynamics and its external driving mechanisms. The model simultaneously unfolds the subsystems of population, residential migration, employment location, land price, land use and accessibility. In more detail, the residential and economic dynamics are captured by the well-known master equation approach from statistical physics, whereas land price and land use are modeled by a novel method whose emphasis lies on the spatial organization of urban structures. The method is

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motivated by the alikeness of spatial fluctuations, e.g., of land price, to fluctuations in turbulent media. Lastly, we discuss the relevance of this study for the local and regional stakeholders involved in the interdisciplinary research project ``New Emscher Mobility'' (NEMO). The main focus of the project rests on the envisioning of possible long-term urban development scenarios for the Ruhr Area, with mobility as its core trigger of change. It sees the conversion and renaturalization of the river Emscher and its tributaries, which have for decades served as an open sewage system, as a unique opportunity to provide sustainable intermodal mobility for the Ruhr region.

Keywords:

Urban Planning; Multiscale; Empirical Analysis; Modelling; Scenario Approach

4222_A Spatial Decision Support System (SDSS) for increasing the energy performance of the existing building stock

Valentina D'Alonzo[1], Daniele Vettorato[2] and Pietro Zambelli[3]

Abstract

Within the strategies at different scales for the reduction of energy consumption and CO_2 emissions, the building sector has been identified to have a great potential to improve energy efficiency and reduce CO_2 emissions. Therefore, it is fundamental to implement in this field saving solutions and energy systems based on renewable energy sources (RESs). In this framework, the importance to estimate and localize the thermal demand of the existing buildings rises also to develop proper scenarios for covering the demand with RESs and fostering more efficient energy systems throughout focused energy measures.

The thermal energy targets are ambitious and cannot be easily achieved without both energy renovation measures and electrification of the heating demand of the buildings. Thus, heat pumps gain a relevant role in the energy transition of cities and regions. Among other sources, the shallow geothermal energy (SGE) is regarded as an environmental-friendly and sustainable alternative to fossil fuels. Geothermal heat pumps (HPs) are more efficient, compared to air-source HPs, and their pollution impact on the local environment is very limited. Nevertheless, SGE growth is limited by the scarce knowledge of the technology, the fragmented regulation, and high installation costs. Hence, it is necessary to increase the awareness of its advantages among policy-makers providing insight on how to include this source into energy strategies and plans.

This study presents a SDSS aimed at supporting local decision-makers in integrating the expansion of energy production from RESs and the energy renovation of the existing building stock. The proposed methodology combines two main steps. The first one concerns a GIS-based evaluation of the space heating demand of the existing residential building stock starting from different kind of data. The second one concerns an objective-driven approach to develop strategic scenarios for decreasing the thermal demand of the residential building stock and refurbishing part of it. All the data processing is done using open-source software (i.e. GRASS GIS, QGIS, R and Python) and following a spatially-explicit approach. The SDSS is applied to the case study of Valle d'Aosta Region (NW of Italy).

As main results, the space heating demand of each building defined as residential in Valle d'Aosta (around 41,700 buildings) is estimated. Then, the strategic scenarios for the regional energy system want to suggest sustainable pathways for its energy transition toward a *Smart Energy Region*. The construction of scenarios start from

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two driving forces that will influence the energy system in the future: 1) using SGE for supplying the space heating demand of the buildings, replacing as much as possible the fossil fuels; 2) refurbishing part of the residential building stock for decreasing the thermal demand. The developed scenarios are compared through some indicators: (i) heated surface involved; (ii) CO_2 emissions saved; (iii) costs of heating system replacement with a geothermal HP and (iv) of energy renovation of buildings; (v) electrical consumption for HP utilization.
From the results, the discriminating factor for the reduction of CO_2 emissions appears to be the refurbishment of buildings. Indeed, the contribution to the emissions saving given by the replacement of the heating system is relevant but lighter. Thus, the energy renovation of the building sector is confirmed to represent a great effort but also a big opportunity for reaching the targets of energy saving and CO_2 emissions reduction. The replacement of fossil fuels with RESs in the heating systems should be combined with measures aimed at decreasing the space heating demand of the residential building stock. The proposed SDSS can help during the decision-making process allowing to analyze from various viewpoints the different alternatives and also to localize where is better to address the energy measures, i.e. to prioritize the actions.

Keywords:

Spatial Decision Support System; shallow geothermal energy; housing sector decarbonisation; scenario analysis; spatial-based approach

4223_Defining urban and rural areas: Characteristics and problems related to the methods currently adopted

Valentina Cattivelli[1]

Abstract

The recent morphological development of urban areas, the settlements´ dynamics as well as sprawl and densification phenomena have profoundly modified urban and rural areas and generated new territories, which are characterized by different degrees of urbanity. These territorial transformations were determined by economic, demographic and social changes, which – in turn – are partly conditioned by the territorial dynamics. The traditional methods of classification based on the distinction between urban and non-urban areas are no longer functional to describe the territorial outcomes of these transformations.

In recent times, scholars started questioning the urban/rural dichotomy, proposing a multi-scalar approach and focusing on patterns of territory continuity, thus challenging the framework based on traditional administrative boundaries. This has led to an overproduction of classification methods. These methods are based mainly on demographic dynamics, economic specialization, settlement structures as well as on the combination of some of these trends. Despite this methodological effort, the OECD-Eurostat method continues to be the most widely used method for official statistics and scientific analysis and we are still far from the adoption of a single method of classification that describes all the territorial transformations.

This presentation illustrates the results of a desk analysis activity started a year ago. This activity consisted of interviewing the managers of the statistical offices of European countries to find out which classification methods they had adopted to identify urban and rural areas in their countries. They have provided some information about the official classification method and their ideas about the methods to adopt in order to map the territories that merge urban and rural characteristics, like the peri-urban territories.

Subsequently, the analysis is focused on the study of national and local strategic planning documents. Local policy makers sometimes use different and case study-targeted methods to identify different territories, by adapting official statistical methods. This is usual in the formulation of rural development policies that assume territorial classification that go beyond the traditional and dichotomous urban-rural classification.

Finally, the study includes a description of the methods developed by the most important scholars of this subject. To identify these methods, it has been useful to analyze several papers extracted from Google Scholar and published in the last 10 years.

Keywords:

urban definition, urban-rural, territorial zoning, territorial classification

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4225_SUMPs implementation: designation of capacity gaps of local authorities in the delivery of smart and sustainable projects

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Abstract

In order to assist cities with the implementation of their mobility plans, it is essential to analyze which factors influence their capacity to plan, develop and implement mobility measures. In this study, the methodology of a three-fold analysis is presented and its application in conjunction with the cities (Coventry, Kalamaria, Alba Iulia, Turin, Rome, Valencia, Stuttgart, Erfurt and Palanga) involved in the current project is discussed. In this process, first, the scope and current status of cities were identified. Then, an evaluation framework was developed to encompass all the aspects that can describe the capacity of a city to implement sustainable urban mobility plans. Based on the collected information and the synthesized evaluation process, a capacity assessment of the participating cities was conducted.

In the first step a comprehensive characterisation and contextualisation survey was conducted to assess the sociodemographic, economic, cultural and political context of the cities as well as their actual situation in terms of mobility and transport, their main activities and their limitations in this field. All cities showed needs, particularly in areas such as non-motorised transport, intermodality or electromobility, whereas the most urgent needs when considering policy priorities are related to non-motorised and public transport, urban logistics, mobility management and electromobility.

The developed Evaluation Framework contains information on technical, financial and institutional aspects of the operation of a Local Authority (LA) and aims to guide and support the capacity assessment of each city to develop and implement sustainable mobility plans. This framework is designed taking into account the scalability principle that may allow future deployment and application to medium-smaller cities and to different economic and cultural environments. The framework is then a critical success factor of the capacity assessment, since it will allow a common approach when engaging with each LA, from large to small size cities. Cities' diversity is, for this purpose, a major advantage, since it sets a wider range of factors/ indicators to be evaluated, leading to a deeper understanding of current and future issues that LA deal with while planning and, in a subsequent stage, implementing transport measures.

As part of the methodology, each LA representative is asked to give her contribution with insightful visions about what is worth assessing in the current city among a set

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of specific operational challenges, allowing to identify the applicable indicators that best describe every specific situation pointed out. The baseline assessment is then conducted based on the elected indicators. With that knowledge, the project supports LAs and transport stakeholders in the development of more effective approaches regarding sustainable mobility plans and their implementation in all partner cities.
Based on the collected information, a capacity framework was developed and employed to perform the capacity assessment of the partner cities. A set of indicators was used with which the performance of individual cities can be measured. In total, twelve local organizations including Municipalities were interviewed in seven cities. The results indicated the areas on which each City Authority should focus in order to improve its capacity to implement mobility measures. Conclusions were based on both the performance and the importance that was attributed to each factor. Each mobility measure was associated with different challenges depending on the nature of the measure and the scale of the city. To address these challenges, an impact assessment framework was proposed and applied through close collaboration with cities and local agents. The result of the process was the set of specific targets for each city´s challenge and measures.

Keywords:

smart mobility; sustainability; capacity evaluation; SUMPs; Local Authorities

4226_Co-creation Pathway as a visionary approach to embed Nature-based Solutions into urban regeneration processes. CLEVER Cities 9 Action Labs, a comparative study.

Israa Mahmoud[1] and Eugenio Morello[2]

Abstract

Nature-based Solutions (NBS) implementation in urban contexts has proven outcoming multiple collateral benefits to reverse the current trend of ongoing degradation of natural resources adversely affecting biodiversity and human health and wellbeing. Yet, the current urban planning policy frameworks have an albeit rigid structure to easily include NBS evolution, integrated definitions and their co-benefits to get mainstreamed and upscaled on a wider spatial scale. Based on this understanding, in this research we test a complete co-creation pathway that encourages decision and policy makers to embed citizen engagement methodologies as an approach to co-design and co-implement NBS in a shared governance process aiming to increment to the greening potential of urban spaces, towards more inclusive and climate resilient cities.

On one hand, we assess a tendency to involve a multiplicity of stakeholders that collaborate in the co-construction of an Urban Innovation Partnership (UIP) aiming at increasing the social recognition around NBS implementation projects; and at the same time tacking both financial and governmental aspects. On the other hand, the innovation embedded in NBS paves the way to combine a multi-scalar flexibility in tools of implementation and place-based urban actions, hence resulting in propagated economic, environmental and social spatial impacts.

The novelty in embedding the co-creation process in urban planning lies in catalyzing resources towards the transposition of research into practice and planning tools to be applied by local authorities and decision-makers in urban contexts. In this matter, three front runner cities (London, Hamburg and Milan) are under investigation as part of CLEVER Cities- a Horizon 2020 funded project –, aiming at implementing NBS in different contextual urban regeneration processes, through nine up-running urban living labs. Grounded on a comparative analysis of these three cities and nine living labs, key characterization for NBS implementation framework could be categorized into: (1) current urban planning strategies in each context (2) specific environmental and social challenges addressed, (3) different typologies and scales of NBS integration within existing community initiatives, (4) availability of financial investment and main stimulating actors or stakeholders, and (5) specific governance challenges as response to co-design and co-implementation planning processes.

Although NBS are lately gaining a widespread consensus among researchers and pushed forward by the European Commission funding schemes with a remarkable

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scale, there is a further need to formalize their role and potential with a multitude of actors and implementation mechanisms. Nonetheless, it is doubtless that citizen engagement in urban planning processes has become more structured and institutionalized in a more active way. However, co-creation of NBS is still a fuzzy concept and time-consuming task; henceforth, bringing the process inside local authorities' headquarters, municipality seats and public or private entities reveals to be rather challenging.
As research results, we emphasize using co-creation as a visionary approach to embed and upscale NBS in an innovative and inclusive shared governance process, yet, at the implementation scale of NBS with local communities requires a radical paradigmatic shift in societal, individual and administrative urban planning practices.

Keywords:

transition pathways; participatory governance; public engagement; social and spatial justice; co-creation NBS;

4228_Constraints, stakeholders and boundary definitions in Energy (master) planning between neighbourhood and district

Matthias Haase [1], Daniela Baer[2]

Abstract

Reaching for the climate gas reduction goals of the Paris Agreement, stakeholders on all geographical and organizational levels from nations, regions, cities and communities are challenged. Following bottom-up approaches for energy planning on the neighborhood level is a promising attempt to reduce energy demand, increase efficiency and lower the carbon footprint in a multi-stakeholder approach.
As more and more countries push to improve the efficiency, environmental impact, and the resilience of their buildings and communities, the need for early and comprehensive energy master planning is critically important. The best energy master planning is highly dependent on a thorough understanding of framing goals and constraints, both local and regional, and their associated limitations that will dictate the optimum master planning design.
Scientific methodology adopted
This paper will analyze and contrast the framing goals and limitations that must be considered when energy master planning is conducted for communities in six different countries. The analyses will be based on findings from countries participating in the International Energy Agency's "Energy in Buildings and Communities Program Annex 73" The analysis will cover design constraints such as emissions, sustainability and resilience goals, and regulations and directives, and regional and local limitations such as available energy types, local conditions and different levels of stakeholders as well as community objectives. With a closer look at 2 case studies it will illustrate how a comprehensive consideration of these can be used to guide the planner toward design options that will lead to an optimum solution for a master plan.
An analysis of the different constraints on different planning levels was done and the key stakeholders were identified. They can be characterized by different governance structures and thereby stakeholder constellations.
Results obtained
When it comes to energy master planning, there are different levels: staring from the city level, followed by the neighborhood and then the district. At the end is the group of buildings with their building regulations. If we want to reach climate gas reduction goals we need to make use of the potential at all levels. Therefore, it is important to analyze the potential reduction goals. These should be discussed with the relevant stakeholders in different constellations. The energy master planning on district level is confronted with constraints from higher and lower level. This understanding should be taken into consideration when energy master planning is conducted.

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Keywords:
Stakeholder analysis; energy master planning; neighbourhood level

4230_The Ecobonus incentive scheme and energy poverty: is energy efficiency for all?

Giulia Iorio[1], Chiara Martini[2], Michele Preziosi[3], Paola Ungaro[4]

Abstract

Energy poverty affects roughly 50 million people in Europe, representing a critical issue with health, social, economic, environmental implications. In European Member States' strategies to tackle with energy poverty, energy efficiency measures are more and more recognized as a long-term solution, to accompany and complement social security policies.
Internationally, while there is common agreement on the main components of energy poverty (among which poor energy performance of buildings), there is not a shared definition of the issue. Italy introduced, in the 2017 National Energy Strategy, a definition of energy poverty, combining three elements: the presence of a high level of energy expenditure, an amount of total expenditure below the relative poverty threshold, and a null value for the purchase of heating products for households with an overall expenditure lower than the median. In 2018, the draft of Integrated National Plan for Energy and Climate adopts the same definition, provides an estimation on the evolution of energy poverty in 2030 and lists the tax deduction scheme for energy renovation of existing building stock (Ecobonus) among the specific measures dedicated to energy poverty. Implemented as alternative measure under article 7 of the EED (European Energy Efficiency Directive), the Ecobonus allows the households in the no-tax area – which are likely to be energy poor households – to transfer their tax credit to financial institutions, work suppliers or other private entities, reducing the investment cost to adopt energy efficiency interventions.
In order to face energy poverty, it is compelling to figure out if the energy policies in force are effective to address the phenomenon, as recommended by the European Energy Network (EnR). In other words, a crucial aspect is to estimate if existing policy measures have differentiated impacts on different income groups, in terms of who is paying their cost or who has access to the financial incentives. In this vein, our study investigates if the Ecobonus is an effective policy measure to mitigate energy poverty. Basing on information at regional level, from Istat sample surveys on households and from ENEA microdata on Ecobonus, the paper examines the possible relationships between indicators such as households equivalent income and incidence of energy expenditure on total expenditure and the access to the Ecobonus. Additionally, the

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study analyzes if these relationships vary for the different categories of interventions proposed by the Ecobonus, such as the replacement of windows and shutters or heating systems.
The hypothesis is that the incentive measure, in its current approach, has a regressive distributive effect on population, not efficiently supporting energy poverty eradication. To our knowledge, the relationship between the distribution of income and interventions incentivized by the Ecobonus has not been investigated before, neither at regional level nor in the energy poverty framework.
Results of the study have significant implications for policy makers, to better understand how adjusting energy efficiency measures to deal with energy poverty. As instance, the possibility of tax credit transfer, introduced in 2017, could be further modified in order to facilitate lower-income households in accessing the incentive scheme. Also the regional policy action, in particular associated to a targeted use of European structural funds, could help in making energy efficiency existing measures more effective in tackling energy poverty. Further research should explore which compensation instruments could be adopted to reduce the imbalances potentially generated.

Keywords:

energy poverty; energy policy; energy efficiency; distributive effect

4233_Energy Retrofit in Public Housing and Fuel Poverty Reduction: Cost-Benefit Trade-Offs

Chiara D'Alpaos[1], Paolo Bragolusi[2]

Abstract

In compliance with the EU 2030 Climate and Energy Framework, the Italian National Energy Strategy (SEN) ranks energy efficiency as a priority, and the Italian "Action Plan for Energy Efficiency" (PAEE, 2014) identifies the building sector as a key element for achieving the 2030 objectives set by the Country.
The Italian housing stock is one of the least energy-efficient in the EU-27. The residential sector accounts for 36% of all primary energy used in Italy: nearly 76% of Italian dwellings were built before 1981 (49% are more than 50 years old).
According to the Italian Ministry of Economic Development, almost 90% of the Italian building stock exhibits an excessive energy demand. This condition widely affects public properties and specifically public housing. The design and implementation of buildings energy retrofit strategies in public housing is a complex process whose objectives is to provide high quality housing standards, whereas reducing social disadvantage and leveraging on environmental sustainability. Due to the lack of financial resources, public housing energy retrofit is nowadays a critical issue in Italy. Nonetheless energy-retrofit may play a key role in reducing fuel poverty, especially in public housing contexts where there is a convergence of factors accruing it: low-income households, which cannot afford high electricity energy prices, and poor energy efficiency of homes due to lack of insulation and/or inefficient heating systems.
Although the urgent need for investments in the improvement of public housing energy performance is widely recognized to comply with the Directive 2010/31/EU (recast in 2018 as Directive 2018/844/EU), the spreading of good practices is strongly hampered by their cost-effectiveness.
In this paper we analyze different energy efficiency measures to be implemented in public housing, evaluate their impact on buildings energy performance and determine the relative cost-benefit trade-offs.
Aim of the paper is to provide a theoretical and methodological framework to identify cost-effective and cost-optimal strategies of intervention that match technological advancements and knowledge in energy retrofitting, with both social and environmental needs and end-users behavior. We take into consideration the adoption of basic energy-efficiency measures involving the building envelope, heating and domestic hot water systems. We compare costs (e.g., investment and operating costs) and benefits (e.g., energy cost savings and increase in property market value) and determine how far and how much it is optimal to push on retrofitting of public

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housing assets. We provide analysis of results from large-scale retrofit case studies of public housing in Padova. Data are compared on a range of retrofit options: different strategies, costs, actual CO_2 reductions and associated benefits.

Keywords:

Public housing; fuel poverty; buildings energy retrofit; cost-benefit trade-offs

4234_Urban Open Geodata Integration using Virtual Knowledge Graphs

Linfang Ding[12], Guohui Xiao[1], Diego Calvanese[1], and Liqiu Meng[2]

Abstract

With the advances in sensor technologies, sensor (or geosensor) data have been increasingly collected for monitoring the environment and urban dynamics. For instance, networks of meteorological sensors are essential to monitor atmospheric processes, and to assess both long-term climate change and short-term weather events. Vehicle sensing technologies are prevalent in measuring real-time traffic situations, which can support decision making in public traffic management and individual travel planning. The integration of vast amounts of heterogeneous sensor data is helpful to understand the behavior of complex environmental phenomena.

However, integrating such data sources remains a challenging task. The reason is that it typically requires combining information coming from different sources via data integration techniques, and then making sense out of the combined data via sophisticated analysis methods. To address this challenge, we rely on two well-established research areas: data integration and geovisual analytics, and propose to adopt a virtual knowledge graph (VKG) based approach to decouple the challenges of data access and analytics. The core component of our framework is an ontology, which provides a conceptual representation of the concepts that are relevant for the domain of interest, and of the relationships that hold between such concepts. The concepts and relationships of the ontology are used as vocabulary in terms of which to specify the knowledge graph. The framework itself consists of two modules centered around such a domain ontology: (1) a VKG module used for data integration, in which declarative mappings specify the relationship that holds between the domain ontology and the underlying data; (2) a module for geovisual analytics, designed for the exploration of the integrated data presented in the form of a VKG. The knowledge graphs is “virtual” since the data itself stays at the sources, and is retrieved only on demand, when queries are issued and have to be answered for the purpose of performing analysis. In this framework, VKGs play a central role: on the one hand, they provide a coherent view over the data in the sources, abstracting away the details of how such data is structured; on the other hand, the VKG layer acts as a mediator for analytic tasks and visual exploration of spatiotemporal patterns.

We test our framework in a scenario for the investigation of the spatiotemporal patterns of meteorological and traffic data from several open data sources. Specifically, we use the province of South Tyrol in Italy as test area. In this use case, we use meteorological and traffic data available from the Open Data Portal of South

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Tyrol (ODP) and The State Institute for Statistics of the Autonomous Province of Bozen-Bolzano (ASTAT). More specifically, from ODP we download data of municipality boundaries, meteo stations, sensors, and measurements over a period of almost 40 years (from 1980 to 2017). From ASTAT we download statistical data on traffic volume and speed in 2017.

To evaluate our approach, we implemented our framework as a web-based visual analytical system, relying on the VKG system *Ontop*. The virtual approach allows for a large flexibility for the experiment. In fact, while proceeding with our experiment we gained a better understanding of the data, and we could easily adjust the mapping to take this into account. The experiment confirmed our hypothesis that the framework is well suited for the exploration and understanding of heterogeneous geospatial data.

Keywords:

open data; sensor data; virtual knowledge graphs; data integration.

4235_Energy poverty in the EU: A cross-sectional analysis of policy effectiveness

Giulia Chersoni[1], Magda Fontana[2] and Sergio Giaccaria[3]

Abstract

The combination of higher energy prices, low income and low residential energy efficiency has resulted in the rise of domestic energy deprivation throughout the EU. The character pertaining to the multidimensional nature of the problem and the complexities associated in measuring its incidence, underline the policy difficulties to tackle the issue effectively.
Existing inequalities in access to infrastructure and services, and the spatially dynamic nature of the problem prevent to define homogeneous solutions. At the same time, the lack of a common definition at the EU level results in different approaches to the estimation of energy poverty, which translates in unclear policy to tackle the issue. The majority of national alleviation policies focus on income support schemes such a fuel, heating and electricity subsidies, which represent short-term solutions that could displace the incentive to invest in structural measures. However, even though investments in energy efficiency addresses the essence of the problem, market conditions, dwelling characteristics, and socio-economic inequalities differentiating EU countries prompt for a case specific study to define effective policy approaches.

The paper aims to assess the effectiveness of income support schemes and energy efficiency incentives in alleviating the households' energy poverty status.

- Data are drawn from the Second Consumer Market survey (DG Consumer and Transport, 2015) that collects almost 30.000 observations across EU Member States (EU 28 plus Iceland and Norway). In addition, we collect over 330 data on the type of income-based support schemes and energy efficiency incentives at place in EU countries.
- Method: logistic regression model.
- Dependent variable: based on the information in the survey, we construct an energy poverty index that define energy poor households as those that suffer from electricity arrears. This measure overcomes some of the main weakness of the EU-SILC based arrears indicator, such as sampling method and inclusion of water bills.
- Explanatory variable: household socio-economic characteristics (i.e. age, gender, education, income level, urban density, ownership status), investment in energy saving technologies (i.e. insulation, solar panel/heat pump), energy market characteristics (i.e. market functioning, service

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quality), and policy measures (i.e. energy efficiency incentives, social tariff, governance assistance bill, governance assistance income) controlling for annual mean energy prices and GDP.

The model allows to establish a link between specific policy design and energy poverty levels, and to stress how country-specific factors affect the energy vulnerability challenge. First, the set of household and structural variables combined with country specific policy types and intensity has enabled to analyze differences and similarities between EU countries. Second, the definition of an energy poverty index has allowed to homogeneously compare policy effectiveness in each Member State.
Results show that economic incentives alone, if not targeted, might not be sufficient to promote energy relevant investments in energy poor household. The analysis suggests that effective energy poverty alleviating measures should combine financial incentives, income support schemes, and tailored strategies according to contextual and demographic characteristics.

Keywords:

Energy poverty, energy efficiency, policy effectiveness

4236_Thermal Performance Evaluation of Unshaded Courtyards in Egyptian Arid Regions

Hatem Mahmoud[1] and Ayman Ragab[2]

Abstract

In the hot arid regions, the successful design solutions like the courtyards ought to adopt with the heat stress. The courtyard design contributes meaningfully towards improving the thermal performance of the building, as it directly affects user's behavior and their usage for the space. The study aims to evaluate the thermal performance of different courtyards with different Sky View Factors SVF and orientations, to generate guidelines for future designs. The study was conducted in the new campus of Aswan university which has been built in the desert zone in the new Aswan city. Field measurements and simulations were used for monitoring the microclimatic parameters which affect the thermal comfort in these courtyards. The thermal conditions were evaluated using the "Physiologically Equivalent Temperature (PET)". The study assigned the weakness points in the university courtyards as it quantifies its thermal behavior to optimize its design guideline for the future.

Keywords:

Hot climate, Thermal comfort, ENVImet, University campus, Egypt

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4241_Modeling low-carbon energy transition in the territories: a TIMES-SUDPACA model to assess a long-term decarbonization strategy for the south-east region of France

Carlos ANDRADE[1], Sandrine SELOSSE[2]

Abstract

The SUD Provence-Alpes-Côte d'Azur Region (Region SUD) in southern France recently redefined its objectives concerning the decarbonization of its territory and especially of its energy system as a response to guidelines specified in different national climate-energy laws and plans, which establish targets to reach a low-carbon scenario by 2050. In addition, the NOTRe law (Nouvelle Organisation Territoriale por la république) gives the French regions the necessary competences to develop their own energy system and policies related to other climate topics. Thus, a TIMES-SUDPACA bottom-up optimization model representing the energy sector of Région SUD was developed in order to analyze the impact that these policies might have, and to propose alternative policies that might lead the region to achieving its energy transition. The decarbonization of Région SUD presents different challenges than for the rest of France, such as risks to the electricity supply due to a non-looped electricity grid that affects the east of the region, concentrated consumption in the coast of the Région SUD and a high level of renewable potential, but low local energy production. In addition, the Région SUD is composed by six departments that show different characteristics regarding its energy system. One particular difference is that the departments situated at the coast (Alpes-Maritimes, Var and Bouches-du-Rhône) have their energy consumption concentrated in the areas next to the sea. In order to, better study the possible evolution of their system, this departments have been divided in two zones, high consumption zones and low consumption zones, getting in total nine study zones and nine energy systems. In this way, this model analyses the energy transition of each of the energy systems of Région SUD through three different scenarios. The first scenario is the "Reference scenario" which analyses the possible evolution of the energy system of the region without including further policies that would affect the evolution of the energy system. Through a second scenario, it is analyzed the application of the current policies proposed by the region to reach a carbon neutral scenario, and identify if these policies are sufficient enough to reach an energy transition. In a third scenario it is analyzed what are the necessary developments to reach a carbon free scenario in 2050. The first results from the model show that with the use of available local renewable resources and a reduction in demand, decarbonization of Région SUD might be possible for some sectors, such as residential and commercial, but that the energy transition of the transport sector will require more accurate policies.

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Keywords:
Regional energy system, Long-term modelling, TIMES-SUDPACA, Low carbon transition

4244_Vulnerability Assessment Approach for Disaster Risk Reduction: Post Kerala Floods 2018

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Abstract

In addition to planning for smart, sustainable, equitable and economically strong communities, physical planners must now simultaneously tackle the imminent ramifications of disasters like floods and cyclones to ensure that no individual is left behind from being a part of resilient communities. This study, is an attempt to prove that by developing and adapting an approach that understands, quantifies and maps vulnerability, we can help in curbing the adverse effects of disasters. The research is done in context of the 2018 Kerala floods, in a case-study area specific to the coastal region of Ernakulam District.

Between August 1st and 18th, 2018, the state experienced its worst ever floods affecting more than 75% of the total villages spread across its 14 districts and impacting the lives of around 5.4 million people. This humanitarian crisis exposed an array of hidden as well as obvious vulnerabilities of the many coastal communities in the small state.

Therefore, the aim is to develop an approach-based framework for decision makers and physical planners to understand and reduce the vulnerability to disasters; making the existing disaster management process and disaster risk reduction measures much more effective. The beginning of the research is an attempt to understand and explore the concept of vulnerability while examining the past trends and methods of flood vulnerability assessments, with a primary focus on the parameters/indicators that are used to quantify it. Subsequently, an approach is devised in-order to assess vulnerability and the analysis that follows is tracing this approach in the context of the recent Kerala floods of 2018, along the different levels of jurisdiction in the State; from the State to the Community level.

Finally, the study examines the different dimensions of vulnerability and disaster management across state policies and district plans in Kerala to identify gaps. In the context of those findings, an analysis is done of the missing link of socio-economic vulnerability, from District to Local Self Government to Community level (top-down approach), mapping it along the process. Later an identification of the issues and their implications are done through community participation, and the findings are added to the skeleton of the proposed approach to complete a disaster (flood) vulnerability reduction framework and prove its applicability.

Initial background research revealed that earlier, disaster management was looked at as a relief centric process, but after the introduction of disaster risk reduction (as part of the SENDAI framework), the concept of vulnerability (to disasters) came into picture. While Kerala's' State Disaster Management Policy, states that Disaster Management has to be mainstreamed into development planning, as well as address the vulnerable communities, after reviewing of a selection of state development-policies and plans, a concerning lack of adherence to disaster management was

found thereof. From on-ground surveys, analysis and mapping, it was found that in the case study district, majority of the villages that are located in high hazard zones of flooding and landslides ae also the ones with high socio-economic vulnerability weightages, they have the higher population densities and heaver coastal dependence. And to make matters worse, these hazard prone villages/areas are not part of the administrations master-plan zones.
This is the case in most states of India, the entire context is post-disaster management, there is a slight shift of focus required to look at pre-disaster risk reduction measures to reduce the possible impacts that a natural hazard could have on different sections of the society and systems. Moreover, currently there is a heavy dip in the socio-economic growth pattern that is generally seen after a disaster strikes, with proper risk reduction measures and community involvement in all phases, this huge dip could be mended and reduced over time as well.

Keywords:

Vulnerability; Floods; Disaster-management; Risk; Resilience

4245_Research on Tianjin Urban Growth Evaluation Based on Smart Growth Perspective

Chenling Wu[1], Haotian Xu[2]

Abstract

China's urban growth has been more obvious in the 30 years after the reform and opening up. Urbanization is in an accelerated development stage, In order to achieve sustainable and reasonable development of the city, avoiding urban expansion such as over-exploitation, waste of resources and redundant construction. Based on the theory of smart growth, taking Tianjin urban growth management as the research object, and the Analytic Hierarchy Process (AHP) is used to evaluate Tianjin's urban growth management policies, from urban growth intensity, urban growth efficiency, urban growth livability level, etc. In three aspects, it constructs a comprehensive evaluation index system for urban smart growth, quantitatively analyzes Tianjin's smart growth and changes in recent years, reveals the main elements and internal mechanisms of urban growth management, and reflects the effective role of urban growth management practices.

Keywords:

urban growth management; smart growth; comprehensive evaluation; Tianjin

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4246_Investigating the role of occupant behavior to design energy poverty strategies. Insights from energy simulation results

Angela Santangelo[1] and Simona Tondelli[2]

Abstract

Energy poverty is very much interlinked with the housing stock characteristics in terms of energy performance. While in the owner-occupied sector cost-savings are expected to be the main stimulus for building energy-efficient renovation, the interventions within the social housing stock combine the energy-saving goal with the social and economic co-benefits (e.g. poverty alleviation, health improvements), thus contributing to face stigmatization, social segregation and energy poverty, particularly prevalent in social housing sector. However, to design renovation strategies aimed at achieving multi-benefits rather than just improving the building energy performance still remains a challenge, and considerations on energy poverty alleviation are far from being embedded.

To the aim of this investigation, building energy renovation is believed to be a key opportunity to roll-out a comprehensive urban regeneration strategy with the aim of tackling energy poverty. However, at the same time, it is important to note that the gap between expected and actual energy consumption in buildings is highly dependent from the human factor. Indeed, energy saving is not only a matter of technology, but it is influenced by the use and the behavior of occupants. Research has shown that occupants can use three or more times as much energy for heating as their neighbors living in dwellings with similar characteristics.

The overall aim of the paper is to provide an insight on building energy simulation and occupant behavior modelling as powerful tools to support policy-makers in taking decisions on which strategies to apply to increase energy efficiency of public housing stock while reducing energy poverty. To do so, this contribution investigates the impact of occupant behavior to reduce energy consumption at household level. The Italian public housing sector is taken as a reference to investigate to what extent understanding the human factor can give a contribution to alleviate energy poverty. The Italian housing stock is allocated on the basis of availability and size in relation to the household composition. Income level and housing needs being equal, low-income households living in energy efficient dwellings result to have lower energy expenditures than peers living in old inefficient dwellings, with a consequent disparity in energy poverty conditions and both horizontal and vertical inequality.

An Italian multi-family public housing building is assumed as case study. Three dwellings with different sizes and exposures have been considered having three different occupancy patterns in turn. The results show to what extent the heating loads is influenced by occupant behavior. In order to be effective, feedback and other

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informative policy instruments should be taken into account differences in household characteristics and occupancy patterns. The research findings are then applied to test a new social rent calculation scheme as a strategy to tackle energy poverty. Different scenarios are built to inform the policy-makers on the added value of adopting multi-purpose energy efficiency strategies while renovating the public housing stock.

Keywords:

occupant behaviour; energy poverty; public housing; energy renovation; social rent

4248_Regeneration by regulation. An institutional approach to urban transitions.

Anita De Franco[1]

Abstract

In Italy, as elsewhere, the presence of Dilapidated Private Buildings (DPBs) is increasingly a matter of concern for local communities. DPBs, as such, pose direct functional problems to local citizenship (e.g. decreasing quality of living for local communities and fiscal revenues for municipal authorities). Although there are different policies of interventions, the magnitude and nature of the problem of DPBs require a better understanding of sustainability and regeneration policy goals in the light of contemporary processes of 'urban transitions'.

Starting from the reference of Italian city context, the paper will discuss causes and strategies of intervention for the regeneration of DPBs from an institutionalist approach, which recognizes that all socio-economic processes develop within precise institutional settings. The methodology includes: i) the review of national and international literature on dilapidation, urban abandonment and institutionalist approach in planning; ii) review of laws, codes and regulation of Italian planning frameworks in the domain of urban regeneration; iii) fieldworks and empirical investigations on DPBs in Italian city contexts; iv) semi-structured interviews with relevant actors (policy makers, institutional representatives, technicians, etc,).

The paper is structured as follows: Section 1), it will introduce "the problem at stake" that is the issue of DPBs in compact city contexts, highlighting the principal transitional processes in place. Section 2), what are the "institutional causes" underlying the accumulation of DPBs (e.g. fiscal and property issues) that are particularly common in Italian contexts as elsewhere in Europe. Section 3) the "strategic conditions for intervention" where the paper will critically address how the regeneration of DPBs links to sustainability goals in a more dynamic perspective. The final discussion Section 4) will discuss how recent sustainable development and regeneration goals for DPBs open a critical juncture to re-discuss 'planning' and institutions for urban transitions.

Keywords:

Urban Regeneration; Urban transitions; Neo-institutionalist approach; Sustainable development.

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4250_From the neighborhoods to the city: BAF analysis scale up for soil sealing monitoring in Padua

Francesca Peroni[1], Guglielmo Pristeri[2], Salvatore Pappalardo[3] and Massimo De Marchi[4]

Abstract

Soil sealing is at present one of the main phenomena that has affected urban areas. It is strictly interrelated with urban expansion and new urbanization, where infrastructures and buildings cover natural areas with impermeable materials. Soil sealing strongly affect the main Ecosystem Services linked to the soil, such as microclimate regulation, groundwater reserves, soil biodiversity, food production.
According to European Environment Agency (2017), Italy is one of the most sealed EU countries, and Padua (in Veneto Region) is one of the cities of small size, most affected by the phenomenon (ISPRA, 2018). Indeed, the total surface of the city is 93 $km^{2,}$ populated by 213.268 inhabitants (ISTAT, 2011). According to ISPRA 2018, the municipality of Padua shows 49,40% of the territory that is completely sealed, with 46 km^2 covered by impervious surfaces. As reported, in 2015 the municipality of Padua was considered one of the 20 Italian cities with the highest values of soil sealing.
At present, in scientific research different methodologies are used to estimate and to monitor soil sealing at different scale. Here, we adopted an ecological urban index, the Biotope Area Factor (BAF), together with the use of Geographical Information Systems. BAF was introduced by the Berlin Council in late 1980s and it is at present used in other cities to assess soil sealing. BAF index values ranges from 0 (as completely impermeable surfaces) to 1 (as complete permeable surfaces) within 9 defined classes. BAF value 1 corresponds to a green or agricultural surface; while BAF value 0 corresponds to buildings, streets or parking. The general aim of this study is to model the BAF index for the whole territory of Padua, by combining high resolution orto-photos (2015) with a geo-topographic database at urban scale. All the data were analyzed and processed in open source GIS environment (QGIS). Methodology was developed in the two main phases: 1) ranking land cover classes of the geo-topographic database according to BAF Index values; 2) validating geometries and BAF classes by photo-interpretation, at 1:1000-1:500 geographical scale, of four macro-area samples (300 ha), namely four representative

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neighborhood of the city.
We found that the average BAF index for the city of Padua is 0.59, highlighting some sectors with low degrees of permeability (i.e. San Lazzaro neighborhood, BAF Index value 0.35) and other areas with high level of permeability (Basso Isonzo, 0.64). Validation by spatial correlation using the four neighborhoods shows an R^2 of 0.8. It is worth noting that, in the case of Padova BAF, values are extremely polarized. Indeed 37,7 km^2 of surfaces shows 0 value of BAF index, meanwhile 55,7 km^2 of surfaces present 1 value of BAF index.
Our study shows that a detailed BAF analysis for soil sealing monitoring at urban scale can be performed by combining a geo-topographic database (or a detailed land use map) with high resolution images. Geo-visualization and quantification of impermeable surface by BAF thematic maps represent a powerful set for urban planning, to mitigate and compensate soil sealing.

Keywords:

Soil sealing; sustainable urban planning; Geographic Information System (GIS); monitoring.

4251_Innovative approaches of energy governance: insights from the literature and the practice

Silvia Tomasi[1,2] and Sonja Gantioler[1]

Abstract

As the scientific branch of the United Nations recently reported, the climate is dramatically changing and its impacts are already affecting our societies (IPCC, 2018). Thus, a consistent change in the energy production and consumption system is urgently needed. The energy transition can be characterized as a complex change process concerning the way energy is produced and consumed (Cherp et al., 2018). In fact, the energy transition involves at least two dimensions: the technological one, as it requires the introduction of technological innovations, and the societal one, as the impact of technological innovation would be limited if such a change would not be matched with social innovation (Hoppe and De Vries, 2018; Domanski et al., 2019). At the same time, it has been widely recognized that such a process involves a change also in the governance of the energy system: decentralized energy systems need a multi-level and polycentric governance approach, which embraces strategies at different scales, including, even if not limited to, the local one. In addition, non-state actors are gaining a central role in energy decision-making, like civil society, business and local public authorities (Sovacool, 2014; Sovacool, 2011). In this framework, new approaches of energy governance are emerging, which can be described as forms of social innovation, ranging from energy communities to the design of urban living labs among (Hoppe and De Vries, 2018).

However, a theoretical framework linking together and exploring the connections among the concepts of energy transition, governance and social innovation is still lacking. Hence, this work aims to contribute to a theoretical framework of new approaches of energy governance in the energy transition, by especially elaborating on the interplay of the concepts of governance and social innovation in the context of energy transition.

Therefore, our study analyzes the linkages between the concepts of governance and social innovation in a context of energy transition, both in the literature and in the practice, aiming to answer the following research question: “How is the energy governance changing in the energy transition, and what forms does it take?”. Thus, we first carry out bibliometric analysis, by performing an extensive and systematic literature review of the concepts “energy transition”, “governance” and “social innovation” using the most common scientific search engines (i.e. Scopus, Web of

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Science, Google Scholar), and explore the identified papers through content analysis. Then, we present the most significant case studies found through the revision of the literature and compare it to first experiences collected on the ground, such as in the context of the Horizon 2020 project Stardust.
As such, our work will contribute to expanding the knowledge about new approaches of governance of the energy transition and supports the local energy planners in including the social innovation dimension in their local energy strategies.

Keywords:

Energy transition; Multilevel Governance; Social innovation; Bottom-up Approach

4253_Energy System Models for City Climate Mitigation Plans – Challenges and Recommendations

Burcu Unluturk[1] and Anna Krook-Riekkola[2]

Abstract

Cities have a crucial role in reducing climate impact, being responsible for around 75% of global GHG (IPCC, 2014). To decrease their emissions, many cities have developed climate mitigation plans (Reckien et al, 2018). Understanding how the transition can be achieved to the lowest cost, considering the local resources and conditions can be assessed with Comprehensive Energy System Optimization Models (ESOMs). ESOMs have been used at national level for many years, while only recently on city level, e.g. INSMART (Simoes, 2019), KomMod (Eggers and Stryi-Hipp, 2014) and SureCity (Pardo-García et al, 2019). The aim of this paper is to share challenges and recommendations when developing and using city level ESOMs to support cities' work with their climate mitigation plans. Even if this paper is based on the TIMES-city model, developed within the TIMES modeling framework (Loulou et al, 2016), the findings are of relevance for all ESOMs.

The generic TIMES-city model was developed within the SureCity project. It was populated with data for Malmö, Almada and Judenburg in collaboration with their civil servants. The model structure distinguishes between activities that municipalities can impact direct vs indirect, and includes the following sectors; Energy supply, ELC&DH, Residential buildings, Private commercial buildings, Municipality managed buildings, WWW, Public lighting, Transports and Industry. The calibration of the model was based on each city's existing technologies and energy use, whereas the database of future technology and fuel options were kept city independent. In a scenario generator, scenarios can be defined by varying key assumptions like demand projection related to population and GDP, fuel prices, technology options, CO_2-targets.

While working with the civil servants, we identified that data on energy related entities (e.g. district heating plants) was straight forward to collect even when private owned, while data on non-energy related entities (e.g. schools) was more difficult to find. Even though energy consumption is straight forward to measure in municipality owned entities, this is often not done. Therefore, a combined top-down and bottom-up approach was needed. For transport sector, national average values were used in combination with information about fuel purchased. Similar, total electricity in buildings was known, while purchase distribution per building type was only documented in the economic system. We found out that one major obstacle in civil servants providing adequate information, was the difficulties in understanding the energy system concepts and terminology, thus it is important to have those well

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described in the in-data templates.

The following information was identified as critical for a “rough city model”: I) Energy balance calibration based on aggregated city statistics, disaggregated based on expert knowledge. II) Aggregated demand per energy-intensive services, e.g. space heating. III) Demand projections based on growth index. IV) Techno-economic-environmental characteristics of key technology options. V) Country policies and energy prices. VI) Scenarios varying climate targets.

The following additional information was identified as critical for an “adequate city model”: I) Energy balance based on measured energy flows. II) Splitting demands into categories, e.g. space heating split into different building types. III) Demand projections based on city specific drivers e.g. population growth projection. IV) Technology constraints. V) City specific policy options. VI) Thoroughly defined scenarios based on cities’ conditions, by civil servants with good understanding on how the scenario assumptions affect the model.

Keywords:

Climate mitigation plans, Cities’ energy transition, Energy system optimization model

4256_Rural-Urban Synergy: Forestry Resources for Post Carbon City to Mitigate Climate Change

Domenico Enrico MASSIMO[1], Mariangela MUSOLINO[1], Pierfrancesco DE PAOLA[2],

Alessandro MALERBA[1]

Abstract

Marginalized rural territory, abandoned forests and traditional jobs can have new life and development according to the here proposed Strategy and Project "Natura-Based Post Carbon City", in a framework of territorial cohesion.
Strategy aims for climate change mitigation by energy passivation of built environment by using bio material (able to insulate) extracted from woods and tested in University Laboratories.
Climate Change is a world global emergency. Very soon it will jeopardize any achievement in development, growth, welfare, fight against poverty. Planning (Economic; Strategic; Regional; Urban) must face this top emergency by understanding and solving it. According to tested scientific understanding: city and building energy over consumption causes over 45% of Climate Change.
Then an important part of real total solution of Climate Change is in Greening = Passivation = Insulation (for both: cold winter; hot summer) of: Buildings, Districts, whole Cities. It means the use of the cheapest existing green alternative energy: the NOT consumed one! After just one work of Passivation, building energy consume can decrease dramatically and perpetually of less 40-60% kWh, and:
a) people will spend less money to pay energy bills, then will have more disposable income for living expenses and re investment in greener building;
b) Climate Change can be addressed and solved in the near future.
Passivation is a win – win Strategy: no one will lose.
"It is possible to choose ecology over carbon", between two alternative materials using for building Passivation:
a) polluting and exhaustible materials, derived from oil (*exempla gratia* : spray insulating foam; polystyrene panels), that increase petrochemical oil well drilling, green house effects, soil contamination;
b) Natural Eco Friendly Materials, such Cork (almost eternal) made panels \ sheets: renewable, organic and replenishable; they have already at the beginning a positive because revamping of existing cork oak forests or new plantation of new cork oak groves produce CO_2 sequestration and carbon sinks.
Geomatic Valuation University Laboratory, GeVaUL, (at Mediterranea University of Reggio Calabria, Italy) invented, designed and started up in the Region of Calabria (Southernmost of inland Italy) the Cork Sustainable Chain for green cities (so called: "Filiera Sughero") trough:
-detecting and geo referencing on Gis cork oak forests in the region;

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-organizing many oak farmers in the chain;
-revamping and restoring local abandoned cork wood forests, and plant new ones;
-coordinating cork firms able to harvest tree bark (=cork)
-offering job to unemployed people and training them to learn harvesting tree bark;
-detecting manufacturers able to process raw material in total ecological way producing organic panel and granulated,
-involving tenants, owners, condominiums, to build up a Post Carbon City.
GeVaUL Laboratory implemented Strategy in the real world, starting from several buildings and, among them, the Urban Blocks #128 and the Urban Block #36 that is University Architecture Department of 20.000 m^2. Eco sustainable retrofitting of these buildings, using organic cork panels and granulates, produced astonishing insulating results.
These Prototypes have been generalized by designing the eco retrofitting of the whole University Latin Quarter as a Green District. This will produce sensible results: 30 million of kWh plus 10 million of kg of CO_2 will be saved each year.

Keywords

Rural-urban relationships; green building; post carbon city; territorial cohesion;

4257_Efficient Energy Economics. Real Estate Premium for Green Building

Domenico Enrico Massimo[1], Mariangela Musolino[1], Pierfrancesco De Paola[2], Alessandro Malerba[1]

Abstract

Present research addresses contribution of energy economics and urban appraisal in term of valuations and support to urban sustainability strategy, focused on liability (>45% of total) and fault of the construction and building sector in global energy crisis and climate change phenomenon.
Present research aims to:
-define Climate Change (and consequent Global Warming) mitigation measures, namely and mainly the use of the greenest energy (the not consumed one thanks to efficiency) i.e. energy saving in Green Building and Post Carbon City;
-define a valuation and analysis framework and toolkit;
-analyze market behavior toward Green Buildings by the mean of Multiple Regression Analysis and other powerful stochastic tools;
-detect potential unexplored market premium for Green Buildings.

Greenest energy, or NOT cosnumed energy, or efficiency, or saving can be obtained thanks to building natural insulation or passivation or greening.
The use of NATURE-BASED bio-ecological materials with high insulating properties (for building passivation) make possible to obtain:
-improvement of building quality and naturality;
-indoor higher thermal comfort and healthier environment;
-sizeable significant and considerable reduction of the energy needed and therefore of its consumption;
-parallel reduction of outdoor pollution produced and introduced into the atmosphere;
-reduction of the monetary costs for construction energy management;
-building higher market value.

Although the initial cost of the NATURE-BASED sustainable intervention is a little higher if compared to the business as usual one (BAU = i.e. without ecological characteristics), nevertheless the over-time financial valuation shows how this initial differential higher cost is rapidly off set, paid back and equalized thanks to the considerable reduction of the annual energy management costs, i.e. thanks to innovation in energy efficiency and saving. This result can be quantified by actualizing the annual energy saving in the life cycle of the intervention, considering a current interest rate.

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Overall outcomes of simulations and experimentations is a consistent energy saving in urban management that fostered-up and stimulate the research to investigate toward eventual advantageous effects or premium in the real estate market.
In order to estimate the eventual existence of some market premium and effects of Green Building practices in construction and real estate sectors, a deep analysis of the apartment transaction market of the City of Reggio Calabria, Calabria region, Italy (EU), is performed.
Data sample of about 500 observations have been collected and then validated by applying different stochastic models such as MRA, ANNs, GWR.
All the data collected are spatially managed through a specific real estate Geodatabase, or GIS, and let them remotely available thanks to the creation of a dedicated real estate WebGis.

In the study area, the first sale of apartments in some buildings with demonstrated ecological characteristics and certification belonging to energy class A or B has been unexpectedly detected. Green apartments have a differential in market price compared to brown apartments (brown. means housing built as usual, BAU, without any ecological features) more than +20% due to the characteristic of energy sustainability. Results obtained are unexpected for the small real estate market of a poor town like Reggio Calabria located in a marginal economic region such as Calabria.
Results have shown the effectiveness of research methods.
Future objectives can be pursued and reached starting from the current results. It is desirable to apply the new research strategy in international contexts on different Case Studies in order to confirm its reproducibility and promote a global ecological retrofit in a framework of a broader sustainable urban Regeneration strategy for a Post Carbon City (PCC) and a Fossil Fuel Free Future (FFFF).

Keywords

Market analysis; multiple benefits; forecasts \ scenario; self financing of energy projects;

4258_Beyond the city limits – smart suburban regions in Austria

Nina Svanda[1], Petra Hirschler,[2]

The majority of the population in Austria lives and interacts in (sub)urban regions. Their areas of activity cross the borders of cities, municipalities and countries. The urban regions consist of the core city and the catchment area and the balance and the equilibrium between the city and its surroundings is very important for a sustainable spatial development. The size of the urban regions in Austria ranges from small and medium sized regions to polycentric agglomerations and the metropolis of Vienna.
Nevertheless urban regions are currently not sufficiently defined as type of region nor established as planning or action level among political and administrative stakeholders. One of the reasons is that urban regions as functional spaces with flexible borders extend beyond political and administrative borders. Due to this lack of clarity with respect to political responsibility for urban regions, it is often difficult to find support for urban regional cooperation on the political level.

The "Agenda for Urban Regions in Austria" is a first milestone to implement an Austrian policy for urban regions. It identifies measures for regional actors and especially policy-makers on different administrative levels to remain urban regions capable in the future and to encourage and support collaboration. The following six key points have been defined for an Austrian policy for urban regions and agglomerations:
- Urban regions take action – in their own fields of action and define priorities
- Urban regions have instruments – to plan and develop
- Urban regions have governance structures – to support cooperation among their actors
- Urban regions learn – and engage in systematic knowledge management to achieve this
- Urban regions are funded – and have the means to create incentives
- Urban regions are on the political agenda – and engage in awareness-raising and lobbying to position themselves and achieve defined areas of competence

Urban regions have to master challenges in many different fields covering the entire spectrum of spatial development. They have to take actions to improve mobility and

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accessibility across city borders, to secure free space for everyone by a prudent use of free space and natural resources and to support diversity and cohesion to offer space for the diversity of lifestyles. A very important action is the sustainable development of settlements and business locations through improved interaction of cities and municipalities within urban regions to achieve more for less money.
One of the key point is that urban regions practice governance to support cooperation among their actors. The steering and coordination of the spatial development in urban regions, the governance, affects not only different actors in urban regions (horizontal coordination) but also the coordination between federal government, provinces, municipalities and cities. With the establishment of governance structures in urban regions steering and coordination areas shall be adjusted to functional areas. In this way it is possible to solve spatial challenges jointly, to bundle resources and to raise the willingness to cooperate among the actors in urban regions. One example measure for the establishment of governance structures is the development of planning and administration associations to enable “planning at the urban level” for the whole urban region.

Keywords:

urban regions, governance, collaboration, smart regions, integrated approach

4260_Tourism in the time of the smart regions

Maria da Graça Moreira[1]

Abstract

Tourism has been one of the economic activities that have developed most in, in the last decades. The growth in the number of people who make tourism along with the changes in information and communication technologies (ICT) are having a great impact on the appropriation of urban and rural spaces.
The climatic alterations will have an increasing impact on tourist activities, reducing some, but valuing others. Information about the weather and the time that is felt in every place is an important aid for planning tourist trips and it is one of the most common information online.
The evolution of Information and Communication Technologies (ICT), from static to relational information, the mobility and connectivity of the devices and the possibility of secure transactions have had a very rapid and interesting development.
From the national level to the local or neighbourhood levels, technology is changing the way information reaches the local and foreign population.
But urban and regional planning is far from being able to predict or control these new forms of appropriation of urban space and accommodate them.
The development of regionalization and its transposition into digital or smart regions, depending on the type of ICT-related development, is a very important issue for Portugal.
The country is again with regionalization on the agenda and this research, with the tourism item is very pertinent. At the beginning of this millennium, there were some experiences in creating digital regions that did not have much evolution.
The easy way to disseminate tourist information through public services such as municipal and regional services, allowing each territory to disclose what they consider most interesting or where they want to invest, or even the most innovative place without any intermediation, is very important and can be or not, a sustainable way of economic development.
The development of useful APPs for tourism activities that disseminate information and facilitate the appropriation of the urban or rural space in a much larger way than traditional tourism use to do is amplifying the economic impact but also opening new territories to tourists that were not prepared for that.
At the outset of technology use, ICTs have proved to be very useful to everyone, but more and more problems are emerging at the local level.
This presentation intends to analyze some of these new challenges to regional planning and city management, created by the tourist activity at the local level. It also intends to reflect on new regional management instruments.

Keywords:

Tourism and ICT, smart regions, regionalization in Portugal

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4261_Evolutionary Development Enhanced by Green Energy Policy

Carmelina Bevilacqua[1], Claudio Marcianò[2], Domenico Enrico Massimo[1],

TRANSITION AND RESILIENCE FOR EVOLUTIONARY DEVELOPMENT

Macro regions such as South Italy are backward and still are trapped in the 2007 Great Recession (Svimez, 2019) without recovery in terms of most important regional economic determinants: traditional (gross product; export; investments; employment) and innovative (resilience; innovation; specialization). Private and public efforts aim to coordinate Resilience and Transition toward Evolutionary Development able to improve regional economies and to implement interactions between the economic, the human and the natural spheres.

EVOLUTIONARY DEVELOPMENT AND ENERGY DETERMINANT

Often, Energy is the missed determinant in regional \ urban planning, even if it is a key factor in production, quality of life, Earth survaival.
Environment and Energy are themes in the:
-forerunner Evolutionary Economics (Boulding, 1966; 1981), along with theme of Sustainability (von Carlowitz, 1645–1714; Meadows, 1972; UN, 1987);
-Evolutionary Approach (von Griethuysen, 2002) as alternative economics to apprehend growth as an open system encompassing the economic, the human and the natural spheres;
-Evolutionary Development (Balland, 2018) and its analitical tools able to foster up knowledge comple xity, regional diversification, relatedness (Hidalgo, 2007).

RELEVANCE OF ENERGY IN POLICY AND PLANNING

The Energy mis-policy can defeat resilience, transition, prosperity and safety of people, cities and globe because of the almost total dependency from fossil sources of energy, and given the Climate Change and growing emissions and the consequent dangerous pollution of atmosphere, air, water, land, food.
On July 30, 2019, 14.000.000.000 m^3 of Greenland ice sheet melted, in in just 24 hours!

Given the melting of poles and glaciers, Shanghai might be soon sunken city. The costs of damages will be many times higher than all accumulation of private profits overtime.
Because of Climate Change, Energy policies at urban, regional, country and world level are NOT optional anymore. They are urgent and strongly needed.

GRASS ROOT RESILIENT POLICY: GREEN, CARBON FREE, ENERGY

Then an important part of real total solution of Climate Change is in Greening =

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Passivation = Insulation of: Buildings, Districts, whole Cities.
It means the use of the cheapest existing green alternative energy: the NOT consumed one! After just one work of Passivation, building energy consume can decrease dramatically and perpetually of 40-60% kwh.

Passivation is a win – win Strategy: no one will lose.
Many cities, towns, and communities try to stop the ecological worsening by building up a grass-root RESILIENT ENERGY POLICY, alternative to disaster of \ on Earth caused by growing combustion of fossil energy, and based on decentralized, democratic and green energy production according to EU2030 Objectives: GREEN, CARBON FREE, ENERGY.

CASE STUDY \ CASE ACTION

Academic community supports households, owners, firms, in implementing a real world action to foster-up a resilient energy policy at urban scale, building up a Green City.
Mediterranean University implemented Green Energy Strategy in the real world, starting from several buildings in its Latin Quarter and, among them, the Blocks #128 and the Block #36 that is University Architecture Department of 20.000 m^2 retrofitted using organic cork panels and granulates, producing astonishing insulating results.
These Prototypes have been generalized by designing the eco retrofitting of the whole University Latin Quarter as a Green District. This will produce sensible results: 30 million of kWh and 10 million of kg of CO_2 will be saved each year.

TOOLKIT

RESILIENT ENERGY POLICY estimate, forecast and implementation, are heavily supported by state of the arts valuation tools, including latest generations of: WebGis; rDBMS open PostgreS; Multi Criteria Valuation; stochastic approaches .

Keywords

climate change, evolutionary development, transition, resilience, sustainable cities

4262_The Role of Buildings Retrofit for Energy Poverty Vulnerability Mitigation in Portugal

Pedro Palma[1*] and João Pedro Gouveia[2]

Abstract

Energy poverty is a multi-faceted complex societal challenge and a growing concern in the EU, currently affecting between 50 and 125 million people (Thomson and Bouzarovski, 2018). In Portugal, the energy-poor population ranges approximately between 2.1 and 3.7 million inhabitants (Eurostat, 2019). Energy poverty stems from the combination of inefficient buildings and HVAC systems, high energy prices, and low incomes (Garcia et al. 2009; Pye et al. 2015; Dobbins et al. 2019) and results in thermal discomfort, which in its turn is the cause of serious health issues and excessive mortality (Garcia et al., 2009; Parsons et al, 2009; Liddell et al. 2015). Building retrofit is an important path for reducing energy bills and tackling the serious issue of energy poverty (Webber et al., 2015; Gupta and Gregg, 2018).

Energy efficiency policies and measures are an important cornerstone of buildings energy transitions and could potentially reduce around 15% of the EU energy consumption by 2040 (IEA, 2016). Serious efforts have been conducted to improve energy efficiency in buildings and appliances (e.g. Energy Performance of Buildings Directive (EPBD), Eco-design and Labelling Directives, the Energy Efficiency Directive). After the EPB directive implementation in 2010, energy consumption in buildings has decreased by 11% by 2017, an annual reduction of 2% (BPIE, 2019). Notwithstanding, the Portuguese building stock is aging and has low energy performance, as 75% of the buildings have an energy performance rating equal or lower than C, below B- level that is the standard for new buildings. Furthermore, households have low ownership rates of HVAC systems, especially for cooling (only 10%) (INE, 2011) and the ownership of decentralized, low-efficiency HVAC systems is generalized (Bernardo, 2015).

In this work, the effect of a deep energy retrofit of the building stock on energy poverty vulnerability of the population is assessed for 25 Portuguese NUT3 regions. For the walls, roof and windows, the optimal heat transfer coefficient (U-value), according to the current residential buildings' energy performance regulation, is used to calculate the space heating and cooling theoretical energy consumption, as in Gouveia et al. (2019) and Palma et al. (2019). This consumption is subsequently utilized in the replication of an energy poverty vulnerability high-resolution spatial scale composite index, developed by Gouveia et al. (2019). Energy poverty vulnerability levels are also estimated for a reference situation, i.e. without any building retrofit, in order to compare vulnerability levels before and after the retrofit actions. Furthermore, an

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economic analysis is performed, to estimate the cost associated with each retrofit action that was tested. The goal of this study is to identify the most impactful and cost-effective energy retrofit actions, regarding the different building typologies, geographical regions and climatic zones, in the reduction of energy poverty vulnerability levels of the Portuguese population. The results of this research provide valuable insights to feed policy design and support measure implementation at various scales, which is paramount to improve the population's thermal comfort, health, well-being and quality of life.

Keywords:

Energy poverty vulnerability; Buildings retrofit; Portugal

4265_SUSHI: SUStainable HIstoric city districts – Sustainable Alfama

João Pedro Gouveia[1a], Júlia Seixas[1], Pedro Palma[1], Vera Gregório[2], Victor Vieira[2]

Abstract

Historic districts at Mediterranean cities have peculiar characteristics that make them unique for those who live there and for tourism. Common features as, for example, urban fabric made of medieval structures, composed by narrow streets with few green public spaces and ancient and degraded heritage buildings, populated by elderly inhabitants and massive tourism fluxes, are at the origin of problems hampering the well-being and development of such districts. To name a few, the following may be referred: a general lack of climate resilient public spaces, due to low presence of green areas in a densely inhabited areas; severe limitations to implement energy efficiency measures and the utilization of renewable energy sources in the historical buildings, restricting many possible interventions to improve thermal comfort while mitigating greenhouse gas (GHG) emissions; very congested streets with excessive use of private cars with serious impacts on air pollution and noise, and GHG emissions; loss of the sense of community spirit, hampering the authenticity every tourist likes to experience. Due to their location, they also share common climate features, like very hot and dry summers and mild winters, being heat waves, flash floods and water scarcity threats, which tend to be exacerbated under future climate changes.

SUSHI project departs from an holistic approach to address common challenges already identified in historic districts of six cities from five EU Mediterranean countries [Lisboa (PT), Valletta (MT), Savona (IT), Ptuj (SI), Nicosia (CY), and Sassari (IT)] to work, within a shared framework, to change their historic districts towards more sustainable, climate resilient and inclusive ones, through innovative integrated solutions and social change. The project is adopting a common framework to identify innovation opportunities to accelerate the learning process to transform the historic districts into sustainable and lively ones. SUSHI key concept is to put sustainable development at the heart of the districts transformation to become the engine for local empowerment, by taking integrated approaches instead of isolated challenges.

SUSHI aims to demonstrate how a collaborative approach to taking integrated action in those cities for systemic change will deliver innovation through social change towards sustainability and climate change mitigation and resilience. There is a huge opportunity for innovation in this process that should be tackled and developed through a participatory process with the districts' stakeholders and local population to assure its effectiveness in the long term. Taking the six historic districts, SUSHI will deliver tested innovative solutions along the innovation chain, namely on: mobility & accessibility, local economic development & tourism, housing & buildings, circular

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systems & nature-based solutions, communications& progress monitoring, community participation, business models& finance platform, urban planning approaches, and governance & partnerships. The project is evolving from a Vision to an Agenda, to a Plan to change the historic districts, by increasing the concretization of projects and supporting components. Apart form the overall strategy and work being done across cities, herein a specific focus will be given to the work in the historical district of Alfama in Lisbon (PT) and the activities being developed to engage local stakeholders, deliver a circular economy local plan and a co-created living lab for sustainability.

Keywords:

Resilient Cities, Living Lab, Sustainable Districts, Circular Economy Local Plan.

4267_SocialRES Project. Fostering socially innovative and inclusive strategies for empowering citizens in the renewable energy market of the future

Silvia Caneva[1] and Pablo Alonso[2]

Abstract

Realising an accelerated expansion of renewable energy will require a switch from centralised to decentralised energy production and greater social participation, together known as energy democracy. The increase in energy democracy and social equity will be an essential part of the clean energy transition. A transition that could represent one of the most fundamental social, economic and technical changes in modern history.

The most common businesses associated with social innovation in the renewable energy sector are Cooperatives, Aggregators and Crowdfunding platforms. These businesses facilitate consumers to take a more active role in the electricity system. Achieving sustained growth in energy democracy requires a better understanding of support structures for successful social innovation across technical, legal and economic systems. SocialRES aims to devise more effective ways of increasing social innovation leading to greater social acceptability as well as more durable governance arrangements and socioeconomic benefits.

Through research excellence and co-creation of knowledge with relevant stakeholders, SocialRES will develop socially innovative and inclusive strategies for the energy system of the future. SocialRES will supplement the existing fragmented data on social innovations with new understandings from businesses, end-users and stakeholders to provide a comprehensive evidence base for policy design. The project will employ innovative techniques such as a Peer to Peer (P2P) crowd-investing for renewable energy sources (RES) projects, P2P lending and P2P virtual RES energy aggregator platform.

The SocialRES team combines partners from a range of disciplines together with industry expertise to develop a comprehensive understanding of the strengths and limitations of the current renewable energy system to foster social innovation and to shape a roadmap for a future, more innovative and equitable system. SocialRES is coordinated by WIP – Renewable Energies. It is financed by the European Commission under the H2020 Programme. It started in May 2019 and will end at the end of August 2022.

Keywords

Crowdfunding, cooperative, aggregators, citizens, social innovation, renewables

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4268_Title of the Abstract: From Ruggedised to Parma Futuro Smart: how to build the city of the future starting from an EU funded project

Cristina Pellegrini[1], Enzo Bertolotti [2], and Marco Mordacci [3]

Abstract

Parma has been developing a lighthouse trajectory by building up vision, capacity and plans as a Fellow city in the running SCC1 project RUGGEDISED. The project adopts a common governance, participatory and replication approach that culminates in the delivery of an Investment and Action Plan for post-project execution. The City of Parma, starting from RUGGEDISED, has developed an intensive participative process to develop a Smart City Vision 2050 and a Smart City Plan 2030 with the key city stakeholders.

RUGGEDISED is a smart city project funded under the European Union's Horizon 2020 research and innovation programme. It brings together three lighthouse cities, Rotterdam, Glasgow and Umeå, and three fellow cities, Brno, Gdansk and Parma, to test, implement and accelerate the smart city model across Europe.

As fellow city, Parma has engaged in a deep replication and knowledge transfer process with the final aim of getting ready for smart solution replication by the end of the project. The City promoted the development of a smart city governing group to interact with local stakeholders in order not only to be able to immediately transfer good practice or appropriate solutions to the local context, but also to shape how the City will be in 30 years and commit all to work together and make concrete plans to achieve it. The smart city governing group is steering the local replication efforts inside the Administration and with the involvement of key stakeholders, and deploying a participatory foresight process to assist in developing a long-term Smart City Vision and a Roadmap for deployment of the vision. To further localise the process and to foster the engagement of all the parties involved in the foresight proces beyond RUGGEDISED, the City of Parma launched the PARMA FUTURO SMART initiative to embrace all the activities linked to the smart city process.

The smart city process has obtained great participation from key local and regional stakeholders, with a strong commitment in carrying on and steering smart city's activities and initiatives within and beyond RUGGEDISED project. More notably, several private companies are engaged in this process, ranging from the most to start ups, innovative SMEs and local and regional incubators and research centres. In the next few months, Parma will consolidate the Smart City Plan 2030 and will open up the process to citizens, to further pave the way forward towards a smart, inclusive, attractive and competitive city.

Keywords:

Participative approach; smart city governing group; Stakeholders engagement; Smart

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City Plan 2030; Smart City Vision 2050.

4269_Valuing Data: Staff Skills and Digital Government Transformation in Scottish Local Authorities

Lucille Tetley-Brown[1]

Abstract

Scottish cities aspire to be 'Smart Cities' utilizing data and digital technologies to achieve *"a strategic approach to sustainability, citizen well-being and economic development" (*Smart Cities Scotland Blueprint 2016:7). A critical aspect of this is 'institutional sustainability', whereby local government organizations play an active role in the step change and paradigm shift needed for humanity to live within our means at a planetary level. A Smart City is bigger than a Smart City Council, but the local authority plays a central role. The old adage "think global, act local" rings true. This paper analyzes data usage for public service delivery at local government level; including for policy-making and implementation, where feedback loops can enable consistent assessment to determine if desired outcomes are achieved.

Much is effused about positive impact from 'use of data' in local government. This paper addresses whether local government staff are ready to capitalize on data-related opportunities. Recent Digital Government literature shows that when conceptual analysis is made, findings are optimistic: much is possible in theory. However, when empirically assessed can rhetoric equal reality?

Data has been used in public service delivery for centuries: the UK Census is over 200 years old. The challenges and opportunities lie at the cusp of the so-called Fourth Industrial Revolution, with an increased blurring of the boundaries between the physical, digital and biological worlds. This is contextualized by datafication of everything (Van Dijck, 2014). Whether particular digital data sought to be used by a local authority is 'big', 'open', 'linked', 'personal', or all of the above, the public sector needs data-embracing governance structures, tackling ethical considerations of these new ways. With Web 2.0 (social) and the advent of Web 3.0 (connected, IoT), local authorities in Scotland are navigating adjustment to these new ways, with expansion of connected devices and more digital data generated,

It appears attempts are being made to strengthen data-driven culture within Scottish local authorities. There is elevation of the importance of clear, coherent datasets made readily accessible intra-organizationally. The opportunities and benefits flowing from a well-organised data repository are numerous. The paper looks at North Lanarkshire Council's 'ChatBot' initiative, whereby Artificial Intelligence (AI) is used to communicate to the public, answering queries about public services. As a first step, an ordered overarching Information Asset Register for data is vital so accurate information is conveyed. This highlights the importance of valuing data as an asset to achieve a data-driven culture within the local authority.

The research explores various local authority investments intended to strengthen staff skills and contribute to viewing 'Data as an Asset' within the organization.

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Examination is made of the role of information management as connected to technical mechanisms (e.g. public service delivery task structures), physical technology systems (e.g. Master Data Management) and individual users. The paper uncovers linkages between staff capabilities and effective, practical 'use of data' (digital and otherwise) by considering local authority IT and non-IT investments intended to improve information usage.
The paper is part of an emerging body of Urban Transformation Research, using Socio-technical Theory and Complexity Theory as frameworks. The purpose is to analyze how the abilities of local authority system users could contribute to transformation of public service delivery in Scotland. In addition, perceived versus real barriers will be uncovered in the empirical research. The insights have value for facilitating improvements in the local authorities analyzed, as well as being applicable across the UK and beyond.

Keywords:

Digital Government; Data Quality; Transformation

4271_Planning for Smart Cities in developing countries: Challenges and ways forward (Making Kosovo's cities smart, sustainable and inclusive)

Shqiprim Ahmeti[1], Edmond Hajrizi[2]

Abstract

While it is estimated that roughly 70% of the world's population will live in cities by 2050, public service efficiency and effective resource-usage are becoming pressing issues for cities,with a climate that is rapidly degrading. Thus, ensuring sustainable development and quality of life in complex social ecosystems of cities and urban areas are becoming important concerns. Smart City initiatives are expected to help cities to overcome the limitations of traditional urban development that tends to manage urban infrastructure systems in silos and to manage city resources more efficiently while addressing development and inclusion challenges. For more, its's considered that Smart Cities have a lot of potential for the circumstances of many developing countries but this potential is not being fully utilized.

As known, many of developing countries are characterized by lack of financial resources to carry out and plan sustainable developments, while sustainable development is often not possible as there are other priorities on hand. In developing countries there is also a governmental conflict between immediate profit and investment towards sustainable technologies, with corruption and lack of efforts at a municipal level being among other characteristics of these countries. When it comes to solutions, a highly coordinated 'smart' approach and 'smart' thinking to Planning and Implementation has to be adopted in these countries, while local government, service providers, public utility agencies, town planners and policy makers should be involved. Innovative approach to Academia on one hand and 'Public-Private Partnership' on the other, may be also considered.

Despite of being aware of challenges of dealing with such topics in a developing society, here at University for Business and Technology we've started an initiative for making Kosovo's cities smart, sustainable and inclusive. Our vision for an urban future and our aim to initiate the transformation process of Kosovo cities lead us to a such initiative, which is supported by a number universities abroad, local governments, academia, students, financial institutions and public in general. Our story may serve as a successful example of dealing with smart and sustaianble planning topics in developing societies, by giving a real example in terms of organizing, overcoming the challenges including the lack of human and financial resources as well as low institutional will, as well as succeeding in rising of awareness on related topics.

This paper is structured by a descriptive language while deduction method is used. It

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refers to books, articles and assessments related to topic, as well as to the experience from the field. The scope of this paper covers theoretical framework of Smart City and Smart Planning concepts, as well as a specific example of practicing smart planning in developing countries, with all its challenges typical for the last ones.

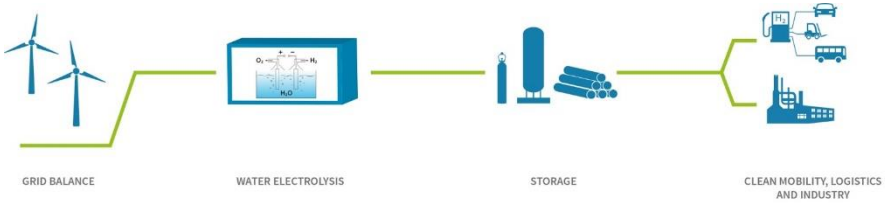
Keywords:
Smart Planning, Smart City, Chalenges, Developing Countries, Urban Future.

4272_HyBalance Project – Facilitating the transition in energy, transport and industry through Power-to-Hydrogen

Guillaume Gerin[1],

Abstract

HyBalance is a demonstration project that showcases the use of hydrogen in energy systems. Special focus is to reduce greenhouse gas emissions. Local pollutants are also reduced when hydrogen is used in fuel cells, e.g. for zero emission mobility.
The hydrogen is produced from water electrolysis, enabling the storage of renewable electricity generation, such as from wind turbines. It aims to help balance the grid, and the hydrogen is used for clean transportation and in the industrial sector.
The production plant is located in Hobro (Denmark). It was inaugurated in September 2018. The country has taken a lead position in energy transition with more than 40% of wind power production, aiming 50% by 2020 and 100% fossil free energy by 2050. In this context energy storage when electricity demand is low become a key success factor to smoothen the fluctuating renewable electricity production in accordance with the customer consumption.
Electricity produced in excess is consumed by the electrolyzer in the HyBalance plant to split water into hydrogen and oxygen. The hydrogen is then stored in trailers or injected into a pipeline to deliver to industrial customers and clean mobility market.
The HyBalance demonstration project creates the valuable chain known as power-to-hydrogen.



The HyBalance project is led by the partners:

- Air Liquide and CHN (Investor & operator of the plant)
- Hydrogenics (Electrolyser manufacturer)
- Ludwig-Bölkow-Systemtechnik (life-cycle analysis)
- Neas Energy (grid balancing services and power trading)
- Hydrogen Valley (dissemination and local Hydrogen development)
- Associated partners are AkzoNobel, Sintex and Energinet.dk

Project investment, approximately 15M€, has received the grant of European funding from FCHJU and Danish funding from EUDP.

[1] Air Liquide Advanced Business

The project involves several advanced technologies. Polymer membrane (PEM) electrolyzer of 1.2 MW, the first megawatt-scale EU project, is able to produce up to 500 kg hydrogen per day. Also, an innovative software electricity system will be implemented to manage grid balancing services.
Many lessons have been learnt from the design and construction of the plant and the electricity grid management to achieve low hydrogen price as well as on the plant operations and maintenance perspective.
The experience benefits will also lead to improvements on reliability and robustness of the equipment.
The HyBalance project will serve as an important national and international demonstration hub to pave the way for green hydrogen sector development, facilitating commercialization and operation of plant and diversifying the applications in a midterm future.

Keywords:

Power-to-gas; Energy storage; Renewable energy; Hydrogen production; Electrolyzer;

4274_Strategic urban planning as a long-term vision for sustainable city and regional development

Judyta Wesolowska[1], Malgorzata Mirecka[2], Tomasz Majda[3] and Anna Jachimowicz[4]

Abstract

The number of people living in cities is rapidly growing. The UN 2018 report foresees that in 2050 almost 70% of world's population will live in urbanized areas. This will present new challenges for creating sustainable cities, especially in terms of urban planning in relation to environmental issues, social expectations and economic growth. One way to answer the problems is by strategic method of planning which include a set of concepts, procedures and tools adapted to current needs and local societies. This method has to combine analyses performed at various levels i.e. social, economic, and spatial.

Creating such strategic vision for sustainability implies in depth study of the existing condition and ambitious but reasonable ideas for the future accounted in relation to common assets. Moreover, all of this requires accountability within a time and budgetary framework, in aspects such as city means for building the infrastructure and utility grid, required for propped development of the urbanized area. These new expectations in the development actions conducted in strategic planning requires all stakeholders interested in reshaping the city, to become more actively involved in the planning process and sharing of interests, aims, and knowledge.

In last decade, spatial planning in European cities is undergoing significant changes. Some of them are effected by a wide range of EU initiatives that include structural funds, others are more internal and due to domestic adjustments in changing planning conditions and processes. In both cases a shift from government to governance type of planning with stronger emphasis on collaborative planning, is strongly visible. Lately, architects, urban planners and spatial practitioners in Poland dispute upon the need for changing an approach towards planning the development of cities and urban regions, and ways of implementing them in national urban policy. The imperfections of the currently prepared urban planning documents are becoming more and more visible, especially in lacking tools for shaping spatial landscape, protecting architectural, urban and environmental values, or establishing new development areas, justified by demographic data and relevant future needs (growing number of inhabitants in relation to residential area, commercial and office space demand etc.) of the area as well as current and future citizens expecting to live in smart and sustainable city.

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Authors aim to provide propositions for new strategic spatial planning approach based on two research elements – (i) critical planning literature review, which will be used to broaden the scope, and (ii) European strategic planning practices and case analyses, showing best examples of lately proceeded and preferably implemented plans. The purpose of the analyses is to investigate how strategic planning convert into local planning as well as the role of planners in spatial policy-making.

Keywords:

Strategic urban planning; local plans; sustainable development;

4275_Internet of Things (IoT) as Enabler of Circular Economy at the Urban Scale – Case Study of the Fashion Industry in New York City

Younghyun Kim[1] and Savannah Wu[2]

Abstract

Cities hold an important role for enabling the transition towards sustainable production and consumption of materials and resources. According to statistics provided by the United Nations Department of Economic and Social Affairs in 2018, not only is the urban population expected to reach 66% of total global population by 2050, but cities are also where 75% of the world's natural resources are consumed. With increasing awareness and urgency to address the risks of climate change, resource depletion, and waste accumulation, the concept of the circular economy is gaining momentum as a guiding framework for urban planners to design and implement system-level strategies and policies to enable sustainable economic development. A circular economy, as defined by the Ellen MacArthur Foundation, is a system that is regenerative and restorative by design with the aim to eliminate the concept of waste. In the process, economic, societal, and environmental values are expected to be regenerated.

Today's fashion industry is one of the sectors that has the greatest opportunity to transform from a linear take-make-waste approach, to a more circular model. According to studies by McKinsey & Company, accompanied by falling costs, streamlined operations, and rising consumer spending, clothing production has doubled from 2000 to 2014 while the number of garments purchased each year by the average consumer increased by 60 percent. With the unsustainable impact of fast fashion businesses in mind, this paper takes place in New York City's fashion industry scene in order to examine how principles of the circular economy could be operationalized using innovations in the Internet of Things (IoT) to connect materials and products to a digital platform via digital identification and standardization schemes.

We ask the following research question: What are the opportunities and challenges for IoT technology to enable system-level transition towards circular fashion at the urban scale? This question is addressed by examing the history of fashion production, its waste management, consumer behavior, as well as by conducting semi-structured interviews with key stakeholders engaged in the IoT for circular fashion such as Eon and Closed Loop Partners, apparel producers, owners (brands, retailers), customers, circulators (resellers, renters, peer-to-peer, repairers), recyclers, non-profits, and governmental organizations. We aim to uncover (1) the

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roles of stakeholders and their inter-operability on a digital foundation, (2) how the materiality of clothes, fabric waste, their production, energy consumption processes, and end markets shape opportunities and challenges in achieving a circular fashion using IoT technology, (3) implications on new ways of thinking about economic value regeneration in the fashion industry, and (4) potential for increasing knowledge transparency, measurement, and accountability across the fashion supply chain in New York City.

Keywords:

Circular economy; Circular fashion; Internet of Things; Digital identification; Waste management

4279_BUILDUP portal for energy efficiency in buildings

Roberta Pernetti[1]

Abstract

The BUILD UP initiative was established by the European Commission in 2009 to support EU Member States in implementing the Energy Performance of Buildings Directive (EPBD).

BUILD UP is funded and managed by the Executive Agency for Small and Medium-sized Enterprises (EASME) on behalf of the European Commission.

The BUILD UP web portal (https://www.buildup.eu/)is intended to reap the benefits of Europe's collective intelligence on energy reduction in buildings for all relevant audiences. It will bring together new practitioners and professional associations while motivating them to exchange best working practices and knowledge and to transfer tools and resources.

The BUILD UP web portal targets professionals working in the building sector (public or private) with an interest on the latest developments at technical or practice level, policy legislation, financial issues, etc related to energy efficiency.

The BUILD UP web portal is provided by a consortium led by everis in the frame of a service contract signed with the EASME and is engineered based on open source software, including Drupal.

Keywords:

BUILDUP portal, energy efficiency, EPBD, EASME

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4281_Innov-Aree: accompanying mountain imaginary to become sustainable reality.

Andrea Membretti (Eurac Research and University of Pavia)

Abstract

Imaginary may not move mountains, but they certainly move people. The strength of representations, especially when shared, is measured in their performative power, that is, in their ability to "shape" not only ideas but also the physical and mental spaces in which they can live, grow and take root (Schütz 1962; Pizzorno 2006).
The "new mountain dwellers" - mainly young people who choose highlands as their horizon of life - are at the same time users and creators of imagery on the mountain (Corrado et al. 2014; Membretti et al. 2018). We will therefore move from the analysis of the processes underlying the construction of these representations, in their link between the individual and social dimensions, to investigate the generating force of new bonds, embryos of design, spatialized actions and, of course, possible frustrations, renounces, retreats. The tension between the daydream and the reality that, at times, one prefers not to see.
The first step of our reflection is the consequent analysis and discussion of the data collected through a survey that we have recently conducted in Piedmont, aimed at investigating the imagery of those who are actually planning to go and live in the mountains to make it an existential space in the round, between economy, society, environment and personal realization (Barbera et al. 2018).
The research was born within the project "InnovAree", an initiative aimed at promoting the socially innovative development of mountain and inland areas of Piedmont, activating the tools of micro-credit and ethical finance. The promoters of InnovAree (Accademia Alte Terre, Collegio Carlo Alberto, Uncem- Unione Nazionale Comuni, Comunitá e Enti Montani and SocialFare-impresa sociale) are committed culturally, socially and on the entrepreneurial side, to favor the new population and the permanence in the highlands by innovative people and enterprises, aware of the enormous material and immaterial wealth, constituted by this important portion of the Piedmontese territory.
InnovAree was set up in 2017 as an experimental practice, with the objective of connecting the "demand of mountain" expressed by many different subjects characterized by an entrepreneurial vocation, with the supply of dedicated services to accompany them (Barbera and Membretti, 2019). To this end, InnovAree has set up a system of different skills and tools to support the implementation of new projects and/or the strengthening of existing projects aimed at the socially innovative development of mountain and inland areas of Piedmont, through the accompaniment of experts from different fields (from the development of business models with social impact, to the architectural and urban planning), activating the tools of micro-credit and ethical finance.
The project lasted 24 months, from July 2017 to June 2019, accompanying 16 entrepreneurial initiatives: through the development of the experimental prototype, it was possible to actively involve those (new graduates, freelancers, associations, non-

profit organizations, etc.) who intended to develop projects of life and work in the mountains of Piedmont, starting from the typical but also innovative sectors of those territories (agro-sylvo-pastoral, personal services, hospitality, culture, renewable energy, etc.).
On the basis of the data collected through the survey and the observations and reflections developed in the two years of the experimentation of "InnovAreee", we will ask ourselves about the potential for sustainability of the imagery of which these "new highlanders" are carriers, in relation to both the horizon of values they express, as well as the daily routines of life in the mountains that they prefigure.

Keywords:

New highlanders - Alps – Mountain economy – Cultural innovation – Space production

4282_Zagreb Smart City Strategy

Lea Petrović Krajnik[1] , Damir Krajnik[2] and Ivan Mlinar[3]

Abstract

A “Smart city” is a city where investments are focused towards smart citizens who use renewable energy resources wisely and widespread technological networks to combine sustainable economic growth, whilst improving the quality of life through interaction of all stakeholders. The aim of this paper is to show the basic steps made in the elaboration of the Zagreb Smart City Strategy and its main results.
The Framework Strategy for Smart City of Zagreb - *Zagreb Smart City* was made by the *Working Group for the Development and Implementation of the Smart City Project - Zagreb Smart City* in 2018, with participation of numerous leading Croatian experts in various fields of smart solutions and technologies. The main purpose of the Strategy was to determine the vision and strategic goals of the future development of smart solutions, technologies and applications in the City of Zagreb, and then to define measures and activities needed for their implementation. The Strategy elaboration was based on Smart city theory, strategic frameworks and relevant documents on international and national level. The existing situation, development possibilities and the application of information and communication technologies and smart solutions for the most prominent sectors (quality of life, economy, city administration, environmental protection and fight against climate change) had been analyzed.
The study proposes a *Vision of the Smart City of Zagreb by 2030* with elaboration of main goals and description of individual strategic areas. Main focus was on priority measures (a total of 27), which outlined activities that need to be carried out in order to achieve the vision and goals. Mitigation and adapting to negative impacts of climate change as well as opportunities for financing the implementation of measures and activities were also taken into consideration. Selection of strategic topics was made based on recommendations and guidelines from existing strategic documents on the development of smart cities at the international and national level, taking into account the specifics of the City of Zagreb.
The Strategy recommends the elaboration of action plans for specific strategic areas, containing more significantly implementation details (technological solutions, scope of application, financing etc.). Based on action plans, it will be possible to anticipate the necessary budgeting and other financing sources for the implementation of

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envisaged solutions. All implementation activities need to be coordinated considering relevant strategies and legal frameworks at national and European level.
For the implementation of activities and measures, it is necessary to involve a wide range of stakeholders - City government and administration, companies and institutions, independent experts, entrepreneurs and private companies as well as citizens of the City of Zagreb who represent the most important stakeholder group. Citizens are among the most significant users of smart solutions and technologies, thus such solutions should be developed for their benefit and for comprehensive improvement of quality of life in the City of Zagreb.

Keywords:

Action plan; Priority measures; Quality of Life; Smart City; Zagreb;

4284_The behavioural climate transition

Massimo Tavoni[1]

Abstract

Achieving climate stabilization will require unprecedented change in our societies. Most of the existing assessments have focused on techno-economic mitigation strategies. Although supply side transformations will be to attain 1.5-2°C, they will be far not sufficient. This talk will provide an overview of the behavioural transition compatible with climate safety. It will discuss results from different disciplines - integrated assessment modeling, behavioural economics, field experiment- and illuminate the challenges and opportunities related to behavioural change and a sustainable climate world.

Keywords:

Behavioural economics; climate change; sustainability; mitigation.

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4285_An innovative tool for reshaping urban identities: the case study of Bolzano (IT)

Giulia Isetti[1], Anna Scuttari[2] and Valeria Ferraretto[3]

Abstract

Human mobility in urban contexts can be tracked via GPS devices. This approach is not limited to merely retrace mobility behaviors and patterns, but, in some cases, it even enables to predict them. This constitutes a useful basis of information for researchers and policy makers to rethink and redesign urban strategies by, for e.g., improving urban structures, proactively managing traffic and implementing services where aggregation points can be identified. This does not only have a positive impact on citizens' and commuters' quality of life, but also on tourists' experiences. In fact, understanding visitors' mobility patterns can often help improving visitor management, planning of on-site movement and tailoring the marketing of attractions. Yet, this approach often lacks to provide further qualitative insights, such as motivations for specific transfers and feedback and perceptions in relation to the surrounding environment. To address these limitations, in the present paper we discuss the case study of the city of Bolzano (South Tyrol, Italy). Within an exploratory research, an innovative tool has been selected (https://gogulliver.co/) to map and analyze human attitudes and behaviors in terms of mobility, but also to capture respondents' perceptions towards Bolzano itself and towards single points of attractions within the city. The tool allows in fact not only a GPS tracking, but combines "longitudinal quantitative data collection as well as deep ethnographic research".

In order to include the major categories of people present in the city, three target groups have been specifically targeted, i.e. people living, working or just visiting the city. Therefore, a sample of local inhabitants, commuters and tourists currently in the city are asked, during the collection data time span 01.10.2019-31.12.2019, to install an app on their smartphone devices that will track their mobility patterns for a maximum period of one week. Moreover, tailored questions and feedback requests will be asked. The GPS tracking system will be able to trace back this information to a specific location within the city and the immediate surrounding area. Furthermore, the interaction with the user is enhanced by the fact that respondents will be able to upload material, such as pictures and texts. Results will be analyzed comparing tourists', commuters' and residents' behaviors, attitudes and drivers, so that to identify peculiarities and specific needs or areas to be improved for the different segments. Moreover, the analysis of qualitative data should allow to better enucleate the identity itself of the city of Bolzano and a better defined positioning, not only for

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touristic marketing purposes, but, above all, for the people living and working in the city.
Aim of the present paper is to present the application of this exploratory research and possibly show some preliminary results.

Keywords:

GPS tracking, urban policy making, urban identity, mobility behaviors, points of interest

4286_Advanced methods to support multi-scale energy planning: the TEC4ENERPLAN project

Gema Hernández Moral[1], Victor Iván Serna[2] and César Valmaseda Tranque[3]

Abstract

Energy directives aim at decreasing energy consumption and assuring a low carbon environment, in line with climate change mitigation strategies. Their implementation gives rise to the need of energy plans to improve actual energy tendencies. However, making informed decisions in energy planning is not always immediate, nor it is based on contrasted criteria, since normally the current conditions are unknown or it is quite costly to deeply analyse the situations.
On the other hand, there is a vast amount of publicly available data as well as energy related information that could be further exploited and connected in order to inform decision-making. Automatization of the processes is key in this respect, since the decision-making support should be cost-effective in order to pragmatically be able to implement it in the different energy planning processes and if possible, avoid any error prone method intrinsically linked with human intervention.
The TEC4ENERPLAN project will develop advanced methods and algorithms to support energy planning at different scales, which will contribute to the future generation of tools to contribute to the implementation of energy policies, focusing on the needs of the actors involved at each of the planning scales. These methods and algorithms will be based on the interoperability among different data sets and the multi-disciplinary technological advancements to effectively manage data, the automatization of the generation of simulation models, real data treatment as well as the mapping of information.
In particular, these methods will be implemented in a series of seven modules, each of them focusing on a service to be provided to specific stakeholders at a specific scale, but which could be connected among each other. Firstly, at the building level scale, the (1) Digital Building Twin, will enable the connection of BIM models to a control and monitoring network (BACN) and also to a building energy performance simulation models (BEPS). Then, the district and city scales can be tackled with (2) AutoCityGML, which automatically generates a CityGML file from cadastre of a specific city, and with (3) Indicators4Cities, which allows the evaluation and benchmarking of the performance of a city according to specific pillars. These two district and city level modules can be linked to the regional scale, which is tackled in (4) Gis4Ener, (5) Gis4Plan, (6) ResParcel, that evaluate respectively the energy performance of a city by automatically calculating demand and consumption (4), CO2 emissions of the different land uses (5) and the RES potential of a city (6). Finally, the last module – generation of an open data platform [(7) ODP4Ener] – enables to visualize the results in a user-friendly manner.

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The intertwining and the further development of these modules will contribute to support energy planning at different scales.

Keywords:
Energy planning, multi-scale, decision-making support, toolkit

4287_Snap4city Platform to Speed Up Urban Policies

Paolo Nesi [1], Michela Paolucci[2]

Abstract

The Aim of this paper is proposing Snap4city as a Big Data Smart City Platform to support the city decision makers, allowing them to have information in real time connected to the status of the city managed, so that they can make decisions as quickly as possible. The Platform is already adopted in many European cities such as Antwerp, Helsinki, Florence, Cagliari, etc. and it is capable to cover the extended geographical areas around the cities themselves: Belgium, Finland Tuscany, Sardinia, etc. Thanks to the collaboration with the municipalities and stakeholders of the cities where the platform is adopted, the following main thematic areas have been identified as the most important ones in order to monitor the city's activities and manage both emergencies and daily routines: road infrastructure and mobility, tourism, air quality, public services and events. The Snap4city Big Data Platform has been realized respecting the GDPR and processes every day a multitude of periodic and real time data coming from different providers. It is therefore able to semantically aggregate, in compliance with the Km4city multi-ontology, and manage data: i) with different access policies, more or less restrictive; ii) coming from traditional sources such as Open Data Portals, web services, APIs, IoT/IoE. The aggregated data are the starting point for the services offered not only to the citizens but also to the public administrations and public security service managers, enabling them to view a set of city Dashboards ad hoc composed on their needs, for example enabling them to modify and monitoring public transportation strategies, offering the public services real needed by citizens and tourists, monitor the air quality and traffic status for establish if impose or not traffic restrictions, etc. All the data and the new knowledge produced by the Snap4City Platform can also be accessed, respecting the permissions on each different kind of data, thanks to the presence of an APIs complex system.

Keywords:

Big Data Architecture, Smart City, Decision Support System, advanced APIs, IoT

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4288_Urban density and household electricity consumption: an analysis of the Italian residential building stock

Valentina Antoniucci[1], Adriano Bisello[2], Giuliano Marella[1].

Abstract

The incidence of urban density on household electricity consumption is still scarcely investigated, despite the greater attention on building energy performance and the electrification of heating systems advocated at European level.,
While it is known the positive correlation between urban sprawl developments and the increasing of marginal costs of public infrastructures, services, amenities, public and private transports, there has been little research on the relationship between urban form and electricity consumption in the residential building stock.
The present work aims to contribute to fill the gap in the existing literature, presenting the early results of ongoing research on the role of urban form in the household electricity consumptions in Italy and, consequently, the related energy costs.
There are different features, related to urban densities, affecting the electricity consumption: first, the urban sprawl and the compact city are characterized by diverse building typologies, which present diverse degrees of electricity demands. For instance, it is well known the phenomenon of the so-called “urban heat islands” asking for more cooling systems depending on power supplies. The building typology and, in general, the form of urban dwellings, is crucial to forecast the electricity requirements, taking into account the single housing units and their spatial composition in multi-family homes and neighborhood.
This aspect of the household electricity consumption, at least in Italy, is less analyzed then, for example, the role of buildings in thermal energy consumption. After a brief literature review on the topic, the contribution presents empirical research on the electricity consumption at urban level in 103 Italian cities analyzing the diverse consumption patterns at diverse conditions of urban density to verify whether exists a significant statistical correlation between them.

Keywords:

Energy Sprawl, housing market, energy consumption, households behavior

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4290_From contingent valuation to benefit transfer: a literature review of the assessment of environmental goods

Valentina Antoniucci[1], Giuliano Marella[2] and Roberto Raga[3]

Abstract

The resources consumption, their scarcity and the growth of human population constantly increase the pressure on policymakers and public authorities for soil recovery and reducing pollution in urban areas worldwide. This phenomenon has led to a rapidly growing demand for enhancing ecosystem services, waste management, and the economic values involved. In this perspective, landfill mining (LFM) is a crucial issue in urban and regional environment's recovery, but its economic feasibility is still scarcely studied. In a traditional economic perspective, LFM does not guarantee profits for private entrepreneurs, so only public authorities promote these activities. However, focusing on population utility's function, it is possible to assess the positive externalities resulting from LFM and assign a monetary value to them. There are several valuation techniques to assess non-market goods, but the most used and most effective in the environmental field is the contingent valuation method (CVM), allowing to estimate, in the this context, the willingness to pay (WTP) for LFM. The aim of the present contribution is to provide a taxonomy of CVM case studies in the fields of waste management (i.e. municipal solid waste recycling, landfill mining), given the very few empirical researches on the economic sustainability of LFM. The goal is to collect an original database on WTP for waste management and to define a set of statistically significative variables in enhancing waste treatment at urban level. These data may be helpful to design further empirical research on LFM based on the benefit transfer methodology (BT). This technique consents to transfer value estimates from an existing multiple "study sites" to an unstudied "policy site" with similar characteristics. The adoption of BT permits to overcome the scarcity of economic data on recent cases of LFM and, at the same time, to identify the socio-economic features affecting individual behaviors and designing the utility function that maximizes the opportunity of enhancing LFM.

Keywords:

circular economy; non-market goods; contingent valuation; benefit transfer; landfill mining.

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4291_Rural areas as opportunity for a new development path

Stefano Aragona[1]

Abstract

The paper proposes an integrated view of the territory in which there is no conflict between rural areas and urban areas. This is in line with the indications of the 2007 EU *Charter of Leipzig* which calls for integrated planning strategies between rural and urban, small, medium, large and metropolitan areas. Therefore is suggested an ecological multidisciplinary approach to the territory, using the concept of ecology proposed by the 1950s by Dioxiadis. Concept then taken up by Appold and Kasarda in the early 1990,. And that is the key word of the Encyclical *Laudato Sii for the Care of the Common House* of Pope Francis 2015 - which refers to the principles of the 1992 *Rio Conference* - based on the centrality of "human ecology" and on the alliance between man and nature, which in 1995 Scandurra had requested in *L'ambiente dell'uomo* (The Environment of Man).
The well-being of the person and of the Communities must be the objective of those who deal with the development of the territory. Rural areas in this sense can offer great opportunities. Opportunities given today by the many technological innovations, both tangible and intangible, potentially available. However, this should not overshadow the need for links that facilitate access to these areas. There are many advantages from a social and economic point of view in rural areas, as highlighted by the initiative implemented by the Municipality of Rome, by a Public Call, in 2015 in granting abandoned agricultural public areas to youth cooperatives for agricultural and educational activities.
One of the important positive effects of the presence in rural areas is the reduction of hydrogeological risk thanks to the presence and daily maintenance of them. Among the aspects that raise questions, which are difficult to answer, is linked to the risk that the more accessible an area becomes, the more there is a threat of its loss of uniqueness.
Last but not least, it should be pointed out that the rural areas are a sort of territorial "reserve", as recalled (2018) at the Assembly of the National BioArchitecture Institute (INBAr), the President of the National Union of Mountain Community Communities (UNCEM). An indispensable reserve since more researches shows that in large urban areas the quality of life is worsening. In this regard it seems paradoxical that many international bodies continue to urge their growth and that in this way there are options, such as high speed, which favor some urban centers but which, without local public transport policies, penalize the rest of the territory.
But they are also reserve areas linked to the climatological changes that are making the sea level rise. Thus, progressively, hundreds of millions of people currently living in marine cities will have to migrate to other safe places. All this means that some

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geographical areas, primarily Calabria, are potentially territories where scenarios can be hypothesized for a different mode of anthropization, different modes of anthropizations indispensable to move towards the objectives of the UN 2020 - 2030 Charter on sustainable development.

Keywords:

opportunity, multidisciplinarity, sustainability, new anthropization, scenarios

4292_Can in-home displays help fighting energy poverty?

Valeria Fanghella[1], Nives DellaValle [2]

Abstract

SINFONIA project is one of the first attempts to combine technological and behavioral policy levers to fight energy poverty in social housing districts. Tenants of Bolzano social housing are provided with renovated dwellings. To enhance the management of the renovated capital stock, they are also provided with an in-home display (IHD) that provides real-time feedback on energy consumption and households parameters. But how will tenants react to IHDs? Previous studies investigate which features and benefits of IHDs generate engagement, but they are poorly informative on their effectiveness in low socioeconomic status settings.

With this study, we examine the behavioral process underlying tenants' usage of IHDs. Differently from the existing literature, we consider how cognitive biases affect the degree of interaction with IHDs. Their consideration is particularly important in settings characterized by low socioeconomic status. Indeed, scarcity affects the cognitive process in a way that may undermine the effectiveness of projects requiring active behavioral change (such as IHDs). We consider locus of control and time discounting as cognitive biases, because they are likely to significantly oppose to behavioral change, especially in low socioeconomic settings.

Locus of control represents the extent to which individuals perceive outcomes in their life as caused by their actions, and time discounting how stronger subjects value outcomes that are closer in time.

To integrate the different elements and account for their relative importance, we develop a theoretical model on the decision to interact with IHDs. On the one hand, by interacting with IHDs, users reduce their energy bill and their emissions, deriving economic and moral utility. On the other hand, interacting with the IHDs generates disutility, for instance in terms of opportunity cost of time to understand and interact with the IHD. The interaction will occur if the expected benefits are higher than the costs. We propose that such cost-benefit evaluation is affected by locus of control and time discounting: the more external the locus of control and the higher the time discounting, the lower the engagement with IHDs. This is because a more external locus of control downgrades the perception of energy-saving resulting from IHDs usage and the related utility. Moreover, as economic and environmental benefits are delayed compared to the moment of interaction with IHDs, utility terms are discounted, whereas disutility ones are not. We expect heterogeneity in users' locus of control and time discounting. However, given the social housing context, these cognitive biases might make perceived costs loom larger than perceived benefits, thereby undermining IHDs' effectiveness.

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We will test our model on field data from Bolzano social housing districts. First, we will administer a survey to social housing tenants to collect the behavioral parameters of our model. Second, we will measure tenants' interaction with IHDs. Specifically, as IHDs send pop-up messages, we will measure how much tenants interact with the monitor compared to the number of messages they receive.
Our results will provide valuable insights for future projects seeking to fight energy poverty, especially if they require active users' engagement. Considering how contextual characteristics affect policies' effectiveness enables a more informed policy-making and increase the probability to achieve projects' objectives.

Keywords:

Social housing, energy poverty, real-time feedback, behavioral economics

4295_Build or reuse? Forms of regeneration of the built environment and the real estate market in Italy

Alessia Mangialardo[1], Ezio Micelli[2]

Abstract

Urban regeneration strategies for local authoritier and developers are different and mainly depend on the economic feasibility and the expectations of private investors. The main strategies to requalify assets are twofold. Some hypothesize the replacement of obsolete buildings with new interventions, while others prefigure the retrofit of exsisting buildings.
The aim of the research is to investigate about the feasibility conditions of the reuse of the existing city by highlighting the conditions that favor the demolition and reconstruction processes with respect to interventions based on the assets' retrofit.
The research presents the variables that determine the choice between the two options, highlighting, on one hand, the role of urban planning instruments and the densification of the areas and, on the other, the relationship between the land rent pressure and the market values of the existing buildings.
The model is tested in three cities that correspond to as many urban typologies: large metropolitan cities, medium-sized cities and small towns.
The results show how the demolition and reconstruction strategy represents an option that can hardly be pursued. If in the large metropolitan areas it appears possible to radically replace the existing real estate assets, in the medium-sized cities and especially in the small towns, urban redevelopment must necessarily take as a constraint the transformation of the existing real estate assets, renouncing to demolition/reconstruction operations appearing to be hardly feasible.

Keywords:

urban redevelopment; buildings' retrofit; real estate investments; urban planning; upcycle

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4300_Management of disaster waste from earthquakes in the Circular Economy. Approaches in Japan and Italy

Shinya Suzuki[1], Andrea Messora[2], Osamu Hirata[3], Roberto Raga[2] and Ayako Tanaka[1]

Abstract

Over the years the number of catastrophic events in the world has increased (Government of Japan, 2018). Large volumes of disaster waste (DW) and debris can be generated, depending on many different factors, the nature and intensity of the catastrophe and the affected country are only a couple of those.
Now more than ever, with global warming, pollution and other environmental issues, it is essential to rethink the waste cycle in terms of circular economy. That is reuse, greater process efficiency and longer product life.
When the government must face an overproduction of waste in a very short time period, a fast response and proper management are required. Technology and the increasing awareness in environmental sustainability are leading to employ a circular economy approach in the rubble treatment in order to enhance reuse and recycle of materials. The main literature available in this topic deals mostly with disaster waste management plans, technical guidelines, and isolated case studies. This session aims to present a deeper cross-case study between three recent earthquakes under a different point of view: 14/04/2016 in Kumamoto city (Japan), 06/04/2009 in L'Aquila city (Italy) and 20/05/2012 in Emilia region (Italy).
The debris composition lead to a different management, the basic flow of disaster waste is analysed, enlightening the choices and the treatments to reduce environmental threats, maximizing reuse or recycling to reclaim useful resources, recovering energy from the incinerated waste, and minimizing the final amount sent to landfills. In the Italian cases due to the high presence of inert and homogeneous materials, a very high percentage of recycling rate has been achieved: in Emilia was mostly recovered as landfill daily and permanent cover, in L'Aquila regenerated into new construction materials. In the case of Japan in Kumamoto a considerable fraction has been incinerated for energy recovery and other fractions has been recycled. Despite the disaster, it is even important to say that if managed effectively, disaster waste can become an important resource to be reused and recycled for the reconstruction process and can have a positive effect on the economy and on the society; reducing the environmental treats caused by extractions of new materials.

Keywords

Circular economy, disaster waste, environmental sustainability, recycling

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4301_Solutions for decarbonising housing in specific target groups of residents and buildings

Kristina Eisfeld[1],Lukas Kranzl[2]

Abstract

To meet EU energy and climate targets, retrofitting rates and energy performance of the existing housing stock must be drastically improved as it stagnates due to several issues. Housing and particularly domestic energy consumption for heating play a core role in climate and social policy. The paper will provide a broad diagnosis of misalignments within climate and social goals, as including all social strata is essential for the transition to a decarbonised society. Climate policy aims to reduce carbon emissions by retrofitting existing buildings and promoting renewable heating systems. Social policy aims at reducing inequality and poverty by limiting household spend for rents and heating and by providing adequate housing for all. However, these policy spheres are hardly coordinated, and increasing evidence shows that broad-brush, uniform policy instruments fall short of expectations or even lead to adverse side-effects. We ask the question of how to include household behaviours as targets of policies for a fair energy transition.

The paper identifies and discusses the real-world deployment of policy instruments for decarbonising the housing sector which are tailored to specific target groups of residents and buildings, such as energy poor households, renters with limited access to the housing market, or people living in multistory buildings with low energy ratings. Subject-oriented (e.g. winter fuel payments, rent support) and object-oriented schemes (e.g. renovation subsidies, mandatory efficiency standards) meet particular challenges that depend on the particular household or building segment they address. The paper focuses on existing buildings, because the bulk of residential carbon emissions occurs from heating in existing houses, which makes large-scale investments in refurbishing these buildings necessary. Within the interplay of renting and large investments, retrofitting may provoke the tenant/landlord dilemma with constitutes a major barrier as interests of tenants and landlords often do not match. The paper aims to contribute to the conference objective of co-creating practical solutions with public, private, research and civil society actors in order to increase the quality of life in urban regions.

Keywords:

Housing sector; decarbonisation; inclusiveness; tenant/landlord dilemma; socio-ecological

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4304_Exploring the concept of Energy Work Place in Rotterdam district

Nienke Maas[1]

The Dutch government has very ambitious plans to meet the Paris agreement. The built environment will have to become fossil free in 2050. This means about an average of 1000 dwellings per day that need to get off the natural gas grid and get an alternative. On top of this required speed, this transition have major societal, spatial and financial challenges.
Local authorities are in the lead, but asset owners will have to invest in buildings, networks and installations to create a sustainable energy system. Energy district planning should not take into account energy only; climate adaptation, heat stress, sewage system, mobility will determine the design of the district. Related stakeholders will have to be included as well. Collaborative planning is required to get all stakeholders aligned. Though the Paris goals are clear, the district roadmap to meet those goals is not that clear. This is due to uncertainties in maturity of technologies, but it is linked to the lack of undisputed knowledge as well.
TNO has developed the concept of Energy Work Place as a way forward to help the energy district planning and explored this in action-research in Overschie, Rotterdam, The Netherlands. The concept of Energy Work Place is based on Joint Fact Finding. Joint fact-finding has been advanced as a method for helping stakeholders grappling with technically intensive policy and planning challenges to collaboratively engage in research and arrive at shared sets of facts to inform their decision-making (Schenk, 2016). It can be seen as a specialized consultative public engagement strategy that decision makers can use to resolve or narrow factual disputes over controversial energy issues (Adler, 2014).
To enable the required speed of the energy planning process and to capture the dynamics of the joint process TNO proposes to maximize the lead time for the involved stakeholders to six weeks, with a condense preparation, a high quality facilitation and contribution of expert knowledge. To enable the alignment of investments on district level the Energy Work Place uses a list of prepared questions to get insights in usable assets and unknown linking possibilities. Prepared reference to usable data sets and geographical databases will help to get all these data in place in time.This abstract considers its application in the district of Overschie in Rotterdam and present the 6 week Energy Work Place, in the context of developing an energy district plan. It evaluates the usability of this energy work place in practice, the requirements of the preparation of the data sets, and the value of this concept for stakeholder engagement. This research have been financed by the Dutch Innovation Subsidy TKI Smart Urban Energy.

Keywords:

Positive Energy District; multistakeholder engagement; Joint Fact Finding; Energy

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planning

4305_THE CRISALIDE PROJECT: Digital city-driven opportunities for rebalancing urban development and life quality through innovative planning processes

Pietro Elisei[1], Elena Batunova[2] and Miruna Draghia[3]

Abstract

Great cities, especially in their golden ages, are recognised as “innovative milieus” or “cradles of civilization” (Hall, P., 1998). Over the last decade, smart and digital city concept has emerged with a far-fetched speed. As a natural consequence, cities are facing more and more challenges aroused from societal transformation. But at the same time, cities are the natural habitat for developing innovation, which, inherently, requires change.
The change, as an innovation catalyst, is embedded both in urban life and environment. When approaching the change, we find ourselves situated at the intersection of different research fields: socio-demography (i.e. issues related to ageing society, migration phenomenon, citizens behaviour driven by higher mobility social media addiction, digital literacy), economy and current modes/means of production (i.e. just in time products, global trade and distribution), as well as related working patterns (higher commuting, virtual offices, continuous learning), spatial configuration due to the use and extension of both public space and sphere (i.e. location-based services, public/private urban spaces as hyper-location, adaptive reuse and temporary use of buildings and brownfields), and last but not least, politics and effective governance schemes adoption (i.e. Public-Private-People Partnerships – PPPP). The age of rapid urbanization has quickly resulted in a polarization of population around major urban areas, which led, a few years ago, to a crisis in terms of effective planning instruments and policies related to Russian Urban Agglomerations. Since urbanization provides a huge opportunity for adopting innovative urban options and urban solutions, strategic, smart and integrated urban management is a key tool to promote stable growth and effective processes of innovation. New efforts to modernize the Russian economy and face global issues as well (climate change, migration, sustainability), have taken on an even greater significance since the implementation of Western sanctions.
In this context, CRISALIDE (City Replicable and Integrated Smart Actions Leading Innovation to Develop Urban Economies) tackles the up-to-date topic of innovation-led urban development and it is one of the few projects financed within the ERA NET RUS PLUS programme, supporting the cooperation of EU and Russian Federation. CRISALIDE is experimenting, through joint EU and Russian research and cooperation, the creation of a digital innovative platform aimed at facilitating the renewal and regeneration of brownfields, in the city of Rostov-on-Don. The envisioned platform is abstracting, digitalising and creating a replicable and user-

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friendly tool based on an enlarged participatory planning process grounded on PPPP (Public Private People Partnership) principle. The platform is harmonising the contribution of stakeholders in diverse planning domains and formalize them through KPIs (Key Performance Indicators) providing values at disposal to decision makers linked to grade of smartness and comprehensive quality of life generated by the triggered regenerative planning process.

Keywords:

smart cities, urban regeneration, brownfield redevelopment, strategic planning, urban policy

4306_Methodology and tools for urban renovation: the case study of the Italian city of Merano

Alice Schweigkofler[1], Katrien Romagnoli[1], Dieter Steiner[1], Michael Riedl[1] and Dominik T Matt[1,2]

Abstract

Nowadays, hundreds of cities around the globe are going through an era of smart urbanization: everyone is talking, on a various scale, about smart cities. The agenda for renewing the smart urban landscape is expected to solve a multiplicity of challenges with the ultimate purpose to significantly increase the quality of life in the cities. In this context, an infinite number of policies, innovation projects and stakeholders are potentially included, and the question arises: “How can local authorities, small and medium enterprises and utility providers approach smart urbanization?” The present research aims at providing a solution to answer such a complex question, through the development of both a methodology and an operating tool for the transition towards a smart city.

The assumption is made that holistic enabling tools are crucial to support the smart urban development. Their adoption is necessary to establish new smart city services, for managing processes and data information flows as well as to allow better communication and collaboration among stakeholders. Starting from these observations, the main objective of this work is to develop an operating tool which supports cities in defining a smart city roadmap which can be used as a strategic decision-making tool, in line with a city’s defined Smart vision, and enables the implementation of smart services. The concept has been developed during the research project “OPENIoT4SmartCities”, funded by the Operational Program for European Regional Development Fund ERDF 2014-2020 (CUP: B11B17000720008) in Südtirol/Alto Adige.

The methodology and operating tool have been tested in a city in South Tyrol (Italy), Merano. New ideas for Smart services were brainstormed through various design thinking sessions together with the cities’ key-stakeholders on the important themes for the cities’ development i.e. energy, mobility, security and light, environment and waste and e-governance as transversal topic. In a first screening, all smart services were evaluated, based on (i) the importance of the service assigned by the cities’ stakeholders, (ii) their contribution to the cities’ smart vision, (iii) the service’s smartness and (iv) their estimated potential impact. All services, which passed this screening, were subjected to a pre-feasibility study, where the technical, economical and legal feasibility were evaluated in order while taking the social acceptance of the new smart service into account, to generate a strategic roadmap. The roadmap supports decision makers to plan the transition towards a smart city in a holistic way while the methodology facilitates the creation of the necessary stakeholder-support.

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Keywords:
Roadmap; Co-creation & open data; City dashboard; Urban liveability; Urban Internet of Everything

4307_Governing climate engineering: insights from a public "good or bad" experiment

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Abstract

Climate engineering – the deliberate large-scale manipulation of the Earth's climate system – is a set of techniques for reducing climate change impacts. These strategies are controversial and raise major governance challenges since decisions taken at a local levels have global consequences. Here we study the strategic implications of solar geoengineering. If countries exert effort to engineer climate in a decentralized fashion, conflict can arise from differences in ideal temperatures because any upward and downward deviation generates losses. Global over-provision of effort is a likely scenario: the country with the highest preference for climate engineering cools the planet beyond the socially optimal level at the expenses of others –- a term dubbed as "free-driving". In this paper, we explore this theoretical idea through an economic experiment in the lab to gain insights on the mechanisms and risks. In a Baseline treatment, we test a public "good or bad" game and find evidence of "free-driving": global production exceeds the socially efficient level. In another treatment, we evaluate a possible technological fix, where decision-makers can counteract the climate engineering efforts of others. Results show that counter-geoengineering generates high payoff inequality as well as heavy welfare losses stemming from the instability in the global effort. Finally, we compare strategic behavior in bilateral and multilateral settings. We find that welfare deteriorates even more under multilateralism when counter-geoengineering is a possibility. These results have general implications for governing global "good or bad" commons.

Keywords:

behavioural economics; climate governance; geoengineering; multilateralism; inequality

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4308_The transition towards Merano as Smart City

Diego Zanella[1]

Abstract

During this session, participants can have a look at the ongoing experience of the City of Merano, a medium sized city in South Tyrol in Italy, in its transition towards a smart city. Such a transition process has been undertaken and carried on, in line with the city´s objective of becoming one of the best regional examples of smart city technology. The key challenge is to significantly increase the overall quality of life in the city, for the benefit of its inhabitants and visitors.

The adopted measures and strategies to guide this transition will be presented from the point of view of the public administration by the city´s Council for informatic and innovation. In particular, the actions established through two ongoing projects, will be presented, which were both funded by the Operational Program for European Regional Development Fund ERDF 2014-2020. The first is the "OPENIoT4SmartCities" project, based on the development of an open digital platform to provide new smart city services, especially in the field of public illumination, water management and waste reduction. The second project is called "MERIDIA", aimed at finding solutions for the digital innovation in public administration processes and service areas, based on the effective service needs of the city.

Keywords:

Digital transition; Impact of technologies on people; urban Internet of Everything (IoE)

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4309_The OPENIoT Platform and use cases, running on it!

Günter Wimmer[1]

Abstract

During this intervention, the concept and structure of an open digital platform for smart cities will be described. This platform will be an enabling tool for the smart urban development of a city and will be able to support and encourage the growth of new services for - and with - citizens, companies, tourists, and public administrations. In fact, public administration and service providers of the city offered their assistance for testing a pilot project. The platform has been designed based on the specific service needs of Merano, a city in South Tyrol, within the project 'OPENIoT4SmartCities', funded by the Operational Program for European Regional Development Fund ERDF 2014-2020.

The starting activities for the platform development regard the identification of concrete use cases, which have been selected in cooperation with the municipality of Meran, based on specific problems, wishes and needs. Two pilot actions have been chosen, in the field of monitoring public lighting as well as on reading water meters. Information about the implementation of these use cases will be given i.e. the selection of sensor technology, the device´s installation, the first tests and the creation of an evaluation dashboard. Furthermore, the implementation process of a LoRaWAN-based communication system, planned for the total coverage over the city´s area will be described. To conclude, the conclusion about conducted tests and measurements will be explained together with a final discussion about possible next steps.

Keywords:

digital infrastructures and appliances; city dashboard; urban Internet of Everything (IoE)

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4310_Smart facilities and demand response

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Abstract

Demand response (DR) is a pathway to the future smart grid which enables consumers to actively control their energy usage in response to some type of reimbursement. In this perspective, there is a vast potential of Distributed Energy Resources' exploitation to provide valuable services to the grid while reaching higher levels of Renewable Energy Sources penetration. On the other hand, activating Demand Side Management options such as load shifting, peak clipping and flexible load implies cultural, technological, regulatory and market changes affecting the whole value chain of power generation and supply. Despite the many and complex challenges, DR provides a unique opportunity for the operation of the power grid to become more open to the society and environmentally sustainable. With respect to the main technical challenges, DR is strongly linked with interoperability and high level intelligence in buildings, communities and grids. This is a prerequisite in order to achieve real or near-real time coordination among stakeholders and provide each end with the necessary tools to control their actions in a mutually beneficial way. In this context, various smart facilities are assessed in order to identify the potential benefits and risks with respect to specific DR programs and options. Such facilities include smart near-zero energy buildings and microgrids integrating various type of load flexibility, renewable energy systems and storage. Building and community level demand response capabilities are explored with the aid of several scenarios for facilities of different functionalities integrating a wide range of technologies.
Results from several research projects will be presented to showcase demand response techniques at building and microgrid level. As part of the proposed methodological framework developed, prediction of power generation and consumption for the day ahead using Artificial Neural Network models is thoroughly explored. In addition Genetic Algorithm optimisation models are developed and tested to achieve globally optimum solutions and fast convergence for different building and community level applications. In this context findings are used to demonstrate the effectiveness of the employed methodologies as well as the significant consumer benefits from adopting active management of energy resources using advanced decision making capabilities.

Keywords:

Demand response; smart grid; distributed energy resources; smart & zero energy buildings

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4311_Sharing energy and resources in renewable energy community

Nicola Sorrentino[1], Daniele Menniti [1] and Anna Pinnarelli[1]

Overview

Renewable energy communities involve groups of citizens, social entrepreneurs, public authorities and community organisations participating directly in the energy transition by jointly investing in, producing, selling and distributing renewable energy. Beyond the reduction of greenhouse gas emissions, there are many benefits for the communities involved, including economic development, the creation of new jobs, cheaper energy, self-sufficiency, community cohesion and energy security. Regional authorities can support the emergence of energy communities by providing financing, expertise and advice, and ensuring that regulatory issues can be easily understood and navigated. Community energy projects can involve renewable energy generation technologies alone (with solar, wind or biomass sources being the most frequently used), feeding into existing grids and networks, or can include community run management and ownership of distribution infrastructure, such as local smart grids, or heating networks. Examples also exist of community run small hydropower plants, which have often involved restoring abandoned infrastructure and bringing it to modern environmental and safety standards. Renewable energy projects can vary in scale, and larger scale installations require larger management and maintenance capacity. Larger systems will also require greater capital investment, but once investment is recovered, benefits are higher, and money saved (or even earned) through community energy can be reinvested in new community programmes and infrastructure. In particular, utility-scale projects will face tougher environmental and planning barriers.

Methods

The advantages associated with an energy community are not only economic, but also social welfare and environmental issues have to be pursued. There is therefore the problem to exploit all the advantage of regulating energy exchange relationships within the community and to the outside such as DSO and TSO, which bring these advantages into account. The method that is proposed is to use a cryptocurrency that has validity of exchange of energy and services within the community. This cryptocurrency can be implemented by permissioned blockchain. Renewable Energy projects had offered a perfect growth industry for blockchain, to replace existing cumbersome, lengthy trading and clearing activities with a clean and efficient marketplace. Certificates, RIN credits, tax credits and other guarantees are all mechanisms whose complex data and the cash flows are dealt efficiently by blockchain. Storage has brought with it a potentially complex distribution of cash flows from “value stacking”, a perfect target application for a blockchain. The active participation in terms of efficient use of energy, the increase in self-consumption, the

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response to services requested by external operators allows us to have credits that can be used within the community for the use of other services, for example recharging of electric vehicles, energy efficiency interventions or any other service that allows the community to achieve its sustainability objectives. First results of some case studies, in simulation, carried out in the framework of research projects will be illustrated.

Conclusions

Renewable energy communities is the way to increase the share of energy produced by renewable sources. The benefits of the energy communities go beyond the economic aspects, but involve social and sustainability aspects, so a simple "economic remuneration" may not be adequate to "repay" the Citizen belonging to the community. For this reason, a first cryptocurrency experiment is presented for the members of the community to enhance their virtuous behavior and to take advantage of community services.

Keywords:

renewable energy community, cryptocurrency

4312_A survey on smart meters' penetration at community level

Vasileios Ntouros[1], Nikolaos Kampelis [2], Martina Senzacqua[3], Theoni Karlessi[1], Margarita-Niki Assimakopoulos[1], Dionysia Kolokotsa[2] and Cristina Cristalli[3]

Abstract

The European residential sector is responsible for 24.4% of electricity and 36.9% of gas consumption in the European Union. Because of these high shares there is a significant socioeconomic and environmental interest in understanding and optimizing energy usage in the residential sector. To this end, monitoring energy consumption at a fine granularity in the order of minutes, can give valuable insights into domestic energy usage patterns. Smart meters, one of the crucial enablers of the smart grid concept and cornerstones in smart planning for cities, offer the opportunity to consumers to address their energy consumption effectively through timely and accurate data on their energy usage. The aim of the research presented in this paper is to investigate the penetration of smart meters at community level and explore how the metering system can help people to understand and manage their energy use better. It examines the awareness about smart meters, looks into their presence in current accommodation and focuses on the views people have on smart meters. For this purpose, a survey was conducted among 47 well-educated residents of Ancona province in Italy, all of whom work in the technological sector. Although there was a mass rollout of smart meters in Italy between 2001–2008, the results show low to moderate levels of awareness amongst the respondents and low presence of smart meters in their current accommodation. The general view however expressed by the participants about smart meters is positive. The findings demonstrate that respondents are in need not only of a gauge that measures energy consumption but also of a tool that assists them to manage effectively their energy use. In this regard, readings such as the electricity cost per hour of use of appliances or the total amount of money spent for certain periods of time are considered valuable. Moreover, tailored tips on energy efficiency or credit alert messages sent by energy suppliers based on smart meters' readings, would assist households to better manage their energy use and keep their consumption between affordable limits. Furthermore, mobile phones connected with smart meters, giving consumers the option to check their energy consumption instantly even while they are away from their homes are regarded as helpful. Finally, respondents' receptiveness to mobile applications that use data collected from smart meters implies the potential of smart meters coupled with smartphones to serve as an educating platform aiming to increase energy savings and energy awareness.

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Keywords:
smart meters, residential sector, energy consumption, energy usage,

4313_Solar concentrating systems for polygeneration in building integrated environments

Paredes Filippo[1], Montagnino Fabio Maria[1]

Abstract

This presentation reports about two different technologies and configurations of solar concentrating technologies developed at Idea SRL. Those systems have been developed in order to answer to the growing need of integration of high performance solar generation into a building, settlement and community scale as part of a Distributed Energy Model framework. Solar concentration can support this goal, as the solar source can be converted into useful energy product at a higher level of efficiency and flexibility. Both the solutions have been developed and tested in the context of collaborative European projects, which have supported the different stages from the concept to the effective delivery of the prototypes.

A compact Fresnel Linear Reflector has been designed for integration upon buildings and ground installation in urbanized areas. This solar collector has an optimized optical geometry, composed by a primary optic of 18 curved glass mirrors and a non-imagine secondary optic which focalizes sun beams on a glazed evacuated absorber tube. Diathermic oil is used as transfer fluid in the system. The main purpose the generation of heat at mid temperatures, which can be used for heating and/or cooling applications, both in residential and industrial contexts. The system is completed by an innovative singe tank molten salts heat storage opportunely designed for optimizing the natural thermocline effect of heat stratification. Heat exchangers are opportunely positioned for maximizing the thermal exchange between oil and salts.

A solar Combined Heat and Power (CHP) unit will be also presented, based upon reflectors that are concentrating the solar radiation on a hybrid receiver. The innovative optical design is including high quality dual axis rectangular parabolic mirrors, which allow the ultra-high concentration ratio of 2,000 suns. This primary reflector is combined with a secondary optic, i.e a glass frustum that is positioned at the focus of the primary mirror, being directly glued in optical contact with an InGaP/InGaAs/Ge triple-junction solar cell. This final receiver is in thermal contact with an aluminum heat sink, which is driving a forced water flow on the back of the cell.

The HCPV system reaches an overall conversion efficiency above the 75% as the sum of 30% in solar radiation to electricity conversion and 45% in heat generation. This system can be effectively integrated with low temperature heat driven coolers in a solar tri-generation perspective.

Modules of 2 axis tracker (Alt-Alt type), which are mounting 20 multijunction cells each, have been installed and tested in real field conditions, where the electric and thermal performances have been evaluated.

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Both the systems have been optimized for a better integration in urban areas. They have been included in the 2018 edition of *the EeB PPP Promising Technologies* selection issued by the *ECPT - European Construction, built environment and energy efficient building Technology Platform.*

Keywords:

Linear Fresnel Reflector, thermal energy storage, concentrating PV, hybrid solar systems, solar heating and cooling.

4314_An environmental sustainability assessment of Loccioni Group Company with recommendations for the future improvements: A case study

Valentina Stojceska[1], Maria Kolokotroni[1], Martina Senzacqua [2], Cristina Cristalli[2]

Abstract

This study concerns an assessment of the environmental sustainability of the Loccioni Group Company (LGC) and provides recommendations for its improvements with implementing further use of renewable energy sources. In this context, two different softwares GaBi and RETScreen - Clean Energy Management Software (RCEMS) were used to perform Life Cycle Assessment (LCA) for electricity generation and evaluate financial viability and environmental costs for the proposed renewable technology sources. Three different scenarios were recommended and evaluated, each varying in method and strategy that revolve around the hydroelectric plant, solar PV plant and wind power.

The electricity generation data collected from the company's six renewable energy plants (five Solar PV and one Hydro Power) counts that around 536709.76kWh are produced from the Solar PV and 251000.00 kWh from the hydro power sources. The total energy requirement of the company is 1751137kWh, which means that about 963427.24kWh electricity needs to be sourced from the national grid, which incurs 115996.64 kg CO2 emissions. In total, the company sources 55% of electricity from the national grid and 45% from on-site generation.

The results obtained from the LCA for electricity production include emissions of the six main environmental impact categories, as follows: global warming, eutrophication, acidification, ozone depletion and photochemical ozone creation potentials. For instance, the global warming potential for LGC was estimated to be 67515.21 kg CO2 eq. for solar energy and 38616.9 kg CO2 eq for hydropower sources. Those results were compared with the similar companies, such as YJN (914000.00 kg CO2 eq) and Zhejiang for solar PV (886980.00 kg CO2 eq) and HKT (165500 kg CO2 eq) for hydro power. It was found that LGC performed much better in terms of environmental sustainability.

The results obtained from RCEMS include three recommended scenarios. The first two focus on increasing renewable energy production by analysing and extending of the existing facilities (solar PV and hydropower), defining their improvements and capturing more of the resources while the third scenario introduces a completely new technology (wind power) for the company. It was found that the best recommended scenario for the company was hydropower with capacity of 52.3kW and production of 301 MWh and reduction of the GHG emissions by 47%. The second recommended scenario is ground-mounted Solar PV panels with increasing energy production by 20% and reducing of the GHG emissions by 10.2%. The both scenarios

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demonstrated a short payback period. The results from the wind power demonstrated lower energy production and higher investment cost and was not recommended as a possible option.

Keywords:
Life cycle analysis, renewable energy, hydroelectric, PV, wind power

4316_Housing and Sustainable Development Goals: optimizing housing life cycle through a circular economy approach

Nicola Tollin[1] and Katarzyna Alicja Wieszczeczynska [2]

Abstract

The housing sector is following a linear model of consumption and production with significative environmental and human negative impacts, in relation to excess of consumption of natural resources as water, material, energy and land, and also in relation to the generation of negative externalities and water, air and land contamination.
The paper will focus on defining normative recommendations regarding a circular economy transition in housing sector, in the wider frame of sustainable development goals, considering both production and consumption during the entire life cycle of the house, including the dwellers own consumption habits and patterns.
The article is based on the work realized for the report Housing and Sustainable Development Goals in Mexico*, that was developed by UN-Habitat in partnership with INFONAVIT Instituto del Fondo Nacional de la Vivienda para los Trabajadores (Mexican federal institute for workers' housing) in collaboration with SEDATU Secretaría de Desarrollo Agrario, Territorial y Urbano.(Mexican Office for Agrarian, Land and Urban Development).
The research defined six strategic lines of work to structure the analysis and the recommendations:

1. Promote intraurban social housing
2. Facilitate the access of vulnerable groups to adequate housing
3. Foster social rental housing
4. Improve deficient urban fabrics
5. Reduce the environmental impact of housing and increase its resilience
6. Optimize housing's life cycle

The project defined sixteen strategic proposals and forty-nine action lines , clustered in six thematic groups, representing key enabling conditions for a sustainable transition of housing sector:

Normative frameworks

Governance

Policies and programs

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Public financing
Incentives and instruments
Municipal capacity
Citizen participation

The research and the report started from the prioritization of goals, targets and indicators of the UN 2030 Agenda, from which the six strategic line were derived; the six strategic line were instrumental to structure the data analysis, that included quantitative and qualitative data t understand current and future conditions of key trends and drivers of housing. A full review of national and local housing policies and legislation was also conducted.

The paper presents and discusses the strategic proposals and action lines specifically related to circular economy in housing sector in Mexico, looking at the potential for replications of these recommendations in other countries and contexts.

Specific focus is given to better understand key challenges and key enabling condition for a sustainable transition of housing sector through circular economy approach through governance, specifically vertically integrating (inter)national policies and local actions.

* https://onuhabitat.org.mx/index.php/la-vivienda-en-el-centro-de-los-ods-en-mexico

Keywords:

Circular economy; Housing; Sustainable Development Goals

4318_The era of Positive Energy Districts - How the PED definition shapes PED Concepts

Oscar Lindholm,[1], Francesco Reda,[1] and Hassam ur Rehman[1], Michal Kuzmič[2], Dan Staněk[2], Sofiane Kichou[2], Nikola Pokorný[2]

Abstract

In 2018, there were 1860 cities with at least 300 000 inhabitants and 548 cities with at least 1 million inhabitants[3]. Cities were one of the key actors in the Paris climate summit, COP21. Continuing the momentum generated by the recent IPCC conference[4] and the Global Climate Action Summit[5] at the COP24[6] in Katowice, local and regional governments demanded clear and neat procedures for implementing Paris Agreement rules. The United Nations 2030 Agenda for Sustainable Development Goals (SDG) further defined the aims for global city development, such as SDG 7 for affordable and clean energy, SDG 9 for industry, innovation and infrastructure, SDG 11 to make cities and human settlements inclusive, safe, resilient and sustainable, and SDG 13 for climate action. Cities are the core of trends and transformation. As the number of inhabitants began to proliferate over the years, the cities caught themselves in the sudden expansion and construction of buildings to accommodate the increase in inhabitants, and eventually began facing numerous challenges, such as pollution and lack of adequate energy services. The sudden and dense city expansion puts a constraint on the energy balance of the city and limits substantial energy improvements such as deep renovation, due to the fact that, over the years, the cities have expanded without appropriate planning and regulations. As a response to this issue, Positive Energy Districts (PEDs) are a solution to create low carbon cities. A PED is an area/district that is integrated with the urban and regional energy system, generating an annual surplus of renewable energy while maintaining an annual net zero energy import and net zero CO_2 emissions. Current definitions of PED require clarifications to achieve the desired outcome of energy balance and CO_2 emissions. Authors critically analyse the PED definitions given by renown research network and governmental institutions evaluating the impacts of different PED definitions to district system concepts for the main 4 EU climates from a technical and

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[3] https://www.un.org/en/events/citiesday/assets/pdf/the_worlds_cities_in_2018_data_booklet.pdf

[4] https://www.ipcc.ch/

[5] https://www.globalclimateactionsummit.org/

[6] https://cop24.gov.pl/news/

regulatory points of view. Particularly, qualitative considerations on PED concept architectures, considering the utilization of energy generation, storage and flexible assets, are drawn taking into account climatic differences and urban energy framework. Regulatory analysis focuses on identification of critical PED definition parameters from legislative perspective and their regulatory implications on the EU level. The authors then present a case study showing interaction between the PED concept definition and regulation on Member State level from the Czech Republic. Authors discussed the results of the qualitative analysis of the PED definitions presenting quantitative results of an energy and economic assessment of a Nordic PED.

4323_Analysis of National Research Programmes to Boost Urban Challenges in transnational cooperation.

Gilda Massa[1]

Abstract

The paper presents a compared analysis of 29 National Research and Innovation Programmes related to Urban Topic and was still on going in 2018, in order to highlight the possibility of "Alignment" of 16 European Member States (Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Italy, Latvia, Netherland, Norway, Poland, Romania, Slovenia, Sweden and United Kingdom). According to the GPC (High Level Group on Joint Programming), "Alignment" is the strategic approach taken by Member States to modify their national programmes, priorities or activities as a consequence of the adoption of joint research priorities in the context of Joint Programming, with a view to implement changes to improve the efficiency of investment in research at the level of Member States and the European Research Area.

The Analysis of this study is based on data collected with an online survey among Funding Agencies in the framework of the EXPAND project, that is the Coordination and Support Action to boost the Joint Programming Initiative Urban Europe. The main effort has been made to highlight how the research national programmes are close to each other in order to develop strategies for sustainable and livable cities. The overall approach aims to analyzes the key elements of each program and compare them with the five thematic priorities of Strategic Research and Innovation Agenda – S.R.I.A. The aim of the results is to let the all Funding Agency involved in Urban Europe have a common vision of what is "aligned" beyond the different rules and application at national level. The information were provided and gathered through the web-tool and were collected in order to identify similarities and differences among national programs, relating to their main features: research topics, aims, eligibility and funding criteria. Finally the activity aims to identify suitable tracks and criteria fostering the alignment, thus providing a basis to build on an alignment strategy for the sustainable, resilient and liveable urban area..

Main outcomes of this analysis were:

- national program aims, objectives and results;
- national funders/management;
- programmes name linked with research area or research topic ;
- programme's relations to SRIA thematic priorities.

Keywords:

Public engagement; National Coordination; Alignment;

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4326_Geographic Information Systems for sustainable urban development in weak planning contexts. A Mozambican case study.

Filippo Imberti[1]

Abstract

Based on the experience developed during the preparation of the Structural Plan of five rural cities in Mozambique, this paper describes an integrated approach of GIS-based and participatory planning for the elaboration of long term urban development plans in emerging countries.
The PEUs of the targeted cities have been developed by TSPA in close collaboration with the Mozambican office Vocação Técnica Lda in reaction to a public tender released by in September 2018 by MITADER.
A major contribution of this effort was transparency in decision making and a data driven approach as opposed to traditional Western modernism planning that often tried to impose individual values onto cities in developing countries resulting in aleatory and unimplementable plans.
For a successful implementation of the spatial strategies it was considered essential to enable cooperation across private stakeholders and public sector and to develop an approach based on the findings of the spatial configuration of the cities. This approach encouraged the development of geographical models enabling factual solutions.
The proposed plan has been anticipated by an extensive analytical work aimed at collecting comprehensive information on the current status quo.
Given the fragility of the institutional cities framework and the dearth of existing planning material, this phase relied mostly on the recruitment of open spatial data.
A spatial data repository has been originated by collecting open source data from international humanitarian organizations (The World Bank, UN-Habitat), volunteering open data libraries (OSM) and intergovernmental space agencies (NASA, ESA).
In a context of rapid demographic growth and low institutional capacity to regulate land ownership, the information retrieval on current informal settlements has represented one of the most critical challenges of the project.
To achieve the expected outcome advanced image analysis tools have been introduced in the workflow: satellite images collected from open data libraries have been classified through GIS based image analysis tools. Machine learning processes allowed to iterate the recognition of pixels associated with urban objects within the selected imagery and AI geo-processes have been consequently employed to isolate the selected pixels. The conversion from raster to vector and the consequent regularization of the outcome features finalized the operation.
The proposals of city development scenarios have been outlined on the comprehensive city profiles. In this phase the spatial decisions have been developed upon the data originated in the analytical phase. In this framework, geographic

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information tools have been deployed not only as a cognitive instrument but also as a scientific approach to define design solution as a result of the interpolation and manipulation of geo-data.
The appraisal of the most adequate option has not been made remotely: a series of workshops with city leaders and interest groups have been held in the cities over the entire project. Planning solutions driven by data have been extensively discussed on site in open and participated discourses. The result of this approach led to empirical findings and more direct engagement of public institutions in the decision-making process.
To ensure a more straightforward plan implementation, the strategies developed in the plan have been translated into spatial representations of key areas of the cities. This operation has been carried out with the support of an advanced procedural modeling software (Cityengine). The procedural modelling approach has been highly integrated with the GIS workflow and allowed high level of interoperability with the bi-dimensional. plans. Interactive and immersive scenes have been generated via rule-based systems applied to entire urban environments.

Keywords:

Geographic Information Systems (GIS);Spati al decision Support Tools;Mapping Informalities; Open source data; Participatory planning

4328_A toolbox to support local action plans to improve energy efficiency and renewable energy use in municipal public buildings

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Abstract

Renovation of public buildings is a strategic goal for both the revised Energy Performance of Buildings Directive (EPBD) and Energy Efficiency Directive (EED) included in The Clean Energy for all Europeans policy package and has been included in several National Energy and Climate Plan (NECP) drafts.
Pursuing the policies outlined by these national long-term roadmaps will require coordinated actions at local level in order to overcome existing barriers (e.g., lack of financial resources and technical expertise, low energy awareness), and take advantage of current opportunities (technological innovation, smart energy management, EU/national/regional funding, etc.).
The Interreg MED project "Prioritize energy efficiency measures in public buildings: a

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decision support tool for regional and local public authorities - PrioritEE" (2016-2019) aimed at strengthening the policy-making and strategic planning competences of local and regional public authorities in the energy management of municipal public buildings (MPBs). To this end, a comprehensive methodological approach, the so-called *PrioritEE toolbox*, was developed, tested, refined and transferred in five Mediterranean pilot cases, targeting more than two hundred MPBs (among offices, schools, cultural and social centres, sports facilities and swimming pools) characterized by different built areas and construction dates.
The toolbox includes a *Technology Analytical Database* and a *Decision Support Tool (DST*) developed ad-hoc to prioritize Energy Efficiency (EE) and Renewable Energy Source (RES) investments in MPBs, selecting the best suited measures in terms of energy savings, return of investment, etc. The DST also serves as an online repository of public buildings which gathers and makes available on a common platform all information about buildings commonly split among several documents. A comprehensive set of key indicators is an integral part of the DST and allows to compare different scenarios of interventions and to monitor energy consumption, assessing the effects of the proposed strategies. Moreover, the toolbox includes also *How-to Briefs*, easy-to-use brief guidebooks on a wide range of topics related to the energy-efficient renovation of MPBs, and a *Repository of Good Practices* to enhance sustainable energy awareness and foster behavioural changes in MPBs. All these components are available through the project website which constitutes an easy-to-access *Open data & knowledge access infrastructure*.
The final output of this experience, the so-called PrioritEE toolbox, allowed to define five Local Action Plans to improve EE and RES use in municipal public buildings in line with the Covenant of Mayors format of the Sustainable Energy and Climate Action Plan (SECAP) for this specific sector.
Stakeholders involvement in capacity buildings activities (local workshops, training activities, case study exchange visits) was assured throughout the project activities, and also communication and changing behaviour initiatives (mainly through living labs) specifically focusing users of public buildings (in particular, schools and municipal offices).
The presentation will provide a critical evaluation of the main outcomes of this collaborative effort, describing the main results achieved, the lessons learnt, and the main common strategies and policy recommendations deriving from this experience which focused on the Mediterranean area but can be replicated across all Europe.

Keywords:

Municipal Public Buildings; Energy Efficiency; Methodological Toolbox, Local Action Plan; Mediterranean Countries.

4347_Assessing climate action in 885 European cities: latest results on mitigation and adaptation efforts in urban planning

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Abstract

The IPCC in its *Special Report: Global Warming of 1.5 ºC* has once again confirmed the urgency in undertaking effective actions to limit temperature rise to 1.5 °C or 2 ºC above pre-industrial levels. Recently, the UN Climate Action Summit held in New York has further contributed to the elevated attention of world leaders to climate change, calling for adequate national engagements in line with the 1.5°C target. It largely means defining policies and plans to move towards net zero emissions by 2050.
In these high-level political forums, cities play an increasingly important role, recognizing that this is where most of the world's population lives. Cities are where direct impacts are strongly felt and adaptations efforts are needed, but also where possibly great mitigation potentials do lie. At the end of the UN Climate Action Summit over 100 cities have committed to net zero carbon emissions by 2050. This represents a huge achievement, but what do European cities do and how do they compare?
This study aims to understand how European cities actually respond to the opportunities and threats of climate change. The research focuses on 885 Urban Audit cities across the EU-28 which represents a balanced and regionally representative sample, geographically dispersed and varying in size. The study draws from a detailed assessment of Local Climate Plans (LCPs) in Europe undertaken at the end of 2017. The methodological approach is based on an extended search and content analysis of LCPs, officially adopted and published in each city. A standardized data gathering protocol was used to guide the overall process to ensure consistency and meaningful comparisons. This was supported by the development of an analytical framework to distinguish LCP typologies across the EU-28. The results show two dimensions: the spatial level of policy drivers

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(autonomously developed at urban level, required by national legislation, induced by international climate networks) and level of integration with other local policy instruments (comprehensive and standalone, mainstreamed and inclusive, stand-alone but addressing partial sources and impacts). The research was undertaken by more than 40 researchers from 20 European countries that have worked and are familiar with the language and respective urban and climate policies in each country. Thus this analysis does not rely on self-report measures such as questionnaires and interviews with city officials, which might introduce subjective bias. Instead it is based on actual plans and actions allowing a more accurate and representative analysis of LCPs across the 885 cities.
The presentation will provide an overview of the state of adaptation and mitigation planning across European regions, countries and city size. It will also show whether European cities address climate change issues by way of dedicated or rather mainstreamed LCPs (integrated in sectoral and development planning) and will discuss the relative influence of local, national or international policies and networks on these issues. The latest results obtained by an in-depth content analysis of mitigation LCPs will further highlight the cities ambition level in achieving the climate targets.

Keywords:

Local Climate Plans; Urban mitigation planning; Urban adaptation planning; Urban Audit; EU-28.

4353_Deep Energy Retrofit of Buildings in the EU Med area: the HAPPEN project experience

Roberto Malvezzi[1], Luca Laghi[2] and Marco Padula[3]

Abstract

HAPPEN[4] project tackles the deep-and-beyond energy retrofitting (ER) of the existing residential building stock in the EU Med countries, by proposing a new holistic approach called MedZEB (Mediterranean Zero Energy Building). This approach is aimed at stimulating the ER market uptake in an area characterized by peculiarities which have not received a sufficient focus so far, causing a substantial delay in reaching the EU 2020 policy targets .As a matter of fact, buildings consume approx. 40% of Europe's primary energy, being the residential sector responsible for the 27% of such overall consumptions; while renovation rate across Europe is just around 1%, EU Med countries face a rate up to 2-3 times lower in than the in north-western ones. Basing on these premises, HAPPEN activated an open innovation process across 7 EU Med countries, aimed to pursue the following objectives in the retrofitting market:
- reconnecting the fragmented value chain
- rebuilding a framework of trust around the deep-and-beyond retrofitting processes
- increasing the overall convenience and appeal of refurbishment

To this extent, HAPPEN's MedZEB approach is characterized by the following features:
A Holistic. It aims to integrate the most relevant aspects of the retrofitting supply chain (Technological, Financial, Social).
B. Transparent. It aims to put on the market three novel tools: the MedZEB protocol, offering a guarantee scheme for the good execution of the process; MedZEB Voluntary Certification Scheme, aimed at testifying the compliance of the interventions with the MedZEB protocol; the HAPPEN platform, an assisted digital marketplace aimed to match demand-offer, and to enhance owners and investors trust.
C. Adaptive. It focuses on "soft values" of the retrofitting market, such as flexibility and optimization of the investments, well-being and quality of life, smart integration measures, district scale design, etc.
Within this framework, HAPPEN is running a methodology based on three main parts:
1. A research part, aimed at setting the ground for producing tailored technical solutions for the Med residential built stock: the HAPPEN technical solutions (HTS),

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[4] HAPPEN - "Holistic APproach and Platform for the deep renovation of the Med residential built ENvironment"; Call EE-11-2017; LP: ITC-CNR

developed according to cost-optimal, one-stop-shop and step-by-step logics, by integrating micro-climatic analysis and cost-optimal calculations on a selected set of reference buildings; the HAPPEN financial solution (HFS), fully integrated with the HTSs.
2. A design part, aimed to shape the main outputs (solutions, platform, protocol, VCS and programme) through a structured co-design process among project partners.
3. An experimental part, carried out within 10 pilot sites in the partners countries, by selecting pilot buildings to be retrofitted and by running extensive Living Labs in which all the target groups of the retrofitting supply chain have been engaged, from Clients (e.g. large and small owners), to Makers (e.g. building companies, professionals, providers) and Influencers (e.g. policy makers, media, civil based organizations). HAPPEN Living Labs allowed to open the HAPPEN innovation process to local territories, enabling a systematic feedback mechanism on the main outputs development, as well as on their concrete testing on pilot buildings.
Basing on these results, the HAPPEN programme have been finally outlined, consisting in a framework of actions in which the value proposition of each output will be integrated with the aim of boosting their impact on the market. The Business Model of the programme is also under development and will be nurtured through Living Labs and higher level engagement and networking addressing subjects at Regional, National and EU levels. Regulatory upgrades proposals will also be distilled and brought to the attention of the institutional subjects engaged during the project implementation.

Keywords:

Energy retrofitting; MedZEB approach; HAPPEN programme;; Cost-Optimal solutions; ICT platform.

4363_Co-housing energy communities

Achille Hannoset[1], Nicolas Celis.

Abstract

Co-housing and energy communities present a promising symbiosis for sustainable and smart urban planning in Flanders by merging the social (cohesion) and spatial benefits (efficient use of space) of co-housing with the environmental (climate change mitigation) and potential economic (reduced electricity bills) benefits of distributed energy production and use at the local level. Moreover, the self-governing structure (Moroni et al. 2019)[2] and the pre-existence of a community of like-minded citizens that often characterizes co-housing initiatives may well provide an ideal platform for the adoption of renewable energy-related activities and ultimately the flourishing of co-housing energy communities.[3] These initiatives, however, still face a lot of institutional barriers in Flanders (Vandenbussche et al. 2017).[4] The aim of our research is to trigger debate, inform academic discourse and Flemish policy-makers on the design of an enabling and democracy-oriented legal governance framework, at the level of institutions and governance structures, for co-housing energy communities. Our research is structured into six chapters. The first chapter defines what is understood by a co-housing energy community. The second chapter discusses their added value (social, spatial, environmental and economic). The third chapter identifies the current legal governance framework at the European and regional (Flanders) level for co-housing energy communities. The fourth chapter links the different potential organizational forms (cooperative, association of co-owners, etc.) and governance structures to theory of democracy. The fifth chapter identifies the most prominent institutional barriers these initiatives face when entering and operating on the housing and energy market in Flanders. Finally, the sixth chapter concludes by providing a first insight on a democracy-oriented enabling legal governance framework for co-housing energy communities in Flanders. With regard to chapter six and five, the Local Energy Community Taskforce within the Bridge initiative (which is coordinated by Achille Hannoset) is producing a report on energy communities for the European Commission due to the end of December. Chapter 10

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[2] However, it is important to not romanticize this connection, as the self-governing structure can also present an obstacle for the adoption of energy-related infrastructure. See in this regard: Stefano Moroni, Valentina Alberti, Valentina Antoniucci and Adriano Bisello, 'Energy communities in the transition to a low-carbon future: a taxonomical approach and some policy dilemmas' Journal of Environmental Management (2019), p. 51.

[3] These co-housing energy communities are now starting to emerge in Belgium. See f.ex. De Okelaar CVBA (https://www.okelaar.be/).

[4] The legal and regulatory barriers pertain to various fields of law, including spatial planning law, energy law, tax law and corporate law. See in this regard: Nathalie Vandenbussche, Philippe Thion and Anne Remerie, *Cohousing vandaag en morgen Juridisch in kaart gebracht. Juridische gids voor startende samenhuisprojecten*, HoGent (2017).

and 11 includes an overview of different types of energy communities, including co-housing energy communities and analyzes amongst others the governance structure, legal framework and institutional barriers of co-housing energy communities in the different member states of the EU.

Keywords

Energy communities, co-housing, energy democracy, legal governance.

4369_Transition to low temperature district heating network

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Abstract

One of the main challenges of existing urban areas is the possibility of their conversion and regeneration towards positive energy district and sustainable energy community. This goes through integrated urban planning actions (from building renovation, to new energy infrastructures), the optimization of new energy production systems (smart grids), people awareness on energy behavior, also taking in account effects of climate changes.
The aim of this research is to focus on existing district systems and to analyze the potentiality of their conversion to lower temperature in order to improve the global efficiency of district heating networks (DHNs) and to increase the exploitation of renewable energy sources (HPs, geothermal systems, solar systems).
The development of this strategy provides both the optimization of energy production and operation management according to users' energy needs. This also requires a careful analysis of existing HVAC and domestic hot water (DHW) systems and the possibility of their improvement within building retrofit actions. In many existing buildings, small renovation actions already done (windows replacements, indoor temperature control system) or the possibility to implement deep renovations allow the heating systems (radiators, fan coils, radiating systems) to operate at low temperature.
In this paper, a traditional network with a fossil fuel driven thermal production plant has been considered and compared with a low temperature district heating scenario, including geothermal heat pumps, photovoltaic panels and absorption chillers.
These scenarios have been analyzed and optimized with a developed software, demonstrating the reduction of primary energy consumption and CO2 pollutant emissions achievable with low temperature networks.
The main advantages of low temperature DHNs stand both in the reduction of the heat losses through the network and in the efficiency increase for the production systems. In particular, renewable heat sources, such as HPs, geothermal systems, etc., can achieve important efficiency improvements if the temperature of the network is lowered
To evaluate the possibility of converting existing DHNs into low temperature DHNs for electrical, thermal and cooling energy fulfillment, a network composed by a centralized thermal production and two different users has been considered:

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residential and office buildings with typical hourly energy needs and scheduled profiles. For those buildings two scenario have been considered: existing envelope with modified operation conditions of terminals at low temperature; deep renovation with envelope insulation and windows replacement and radiating heating systems.
The DHN is considered to operate with supply and return temperatures and includes RES (geothermal and photovoltaic), HPs and absorption chillers. This scenario has been compared – in terms of primary energy consumption, network's thermal losses and pumping consumption– with a traditional DHN with natural gas boilers as energy production systems, operating at 90 °C/60 °C.
Results show the primary energy reductions of different scenario and also the technical feasibility and advantages for existing buildings.
Evidently, due to the quite high investment costs related to the DHN conversion, incentives for the installation of renewable generators and carbon taxes related to the pollutant emissions should be considered.

Keywords:

District heating system; low temperature; heat pumps; energy retrofit

4370_Densification for deep renovation in sustainable cities

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Abstract

It is widely acknowledged that Europe's energy efficiency challenge in buildings mainly concerns the energy efficient refurbishment and investments in its existing buildings. In fact, three quarters of the buildings standing today, including the residential stock, are expected to remain in use in 2050. EU energy policies, EPBD and EED contain provisions to increase the energy performance of existing buildings and to encourage Member States (MS) to convert building stock through the development of a marketplace for cost-effective deep renovation. However, today, only about 1% of Europe's existing buildings is renovated every year.
As a consequence, new ways of living and innovative strategies are needed to attract citizens, investors and main stakeholders in this market. Building on top of ABRACADABRA project, this research has provided technologies and financial plans to promote and implement energy efficient buildings in existing built urban areas. The challenging aspect is given by the focus on the existing consolidated urban areas where additional space is possible for the creation of the so-called "Assistant Building" or additional plus energy units able to generate energy and re-generate the built urban environment. The research also investigates, designs and applies selected retrofit options based on green, natural and RES components in existing urban buildings' surfaces, in the effort to achieve energy efficient, safer and attractive urban settings. Those solutions provide a synergy in terms of energy and financial balance for the renovation of surrounding buildings in existing urban extents. In particular this paper focuses on the Athenian urban reality as an excellent case of degraded historical and business city center characterized by a heavy heat island and overheating problems and by a strong vulnerability in terms of seismic hazard. Design concept solutions, have been studied, tested and re-designed considering the optimal combination of available technologies to promote and implement energy plus buildings in existing built urban areas. This research promotes solutions to recreate the character of the urban image and space, and more specifically will focus on the in-between space within buildings, blocks of flats and residences, which are dispersed all over the city areas. Solutions are based on the ABRACADABRA strategy which when adopted at the city scale, may result in the implementation of a punctual densification policy within the built still transformable parts and areas of the cities. In this context, the objective is to provoke a legislative and market change accelerating the revolution towards nearly Zero Energy in existing built environments.

Keywords:

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Energy Efficient Buildings, integration in existing contexts, sustainable urban design, integrated architectural design, urban resilience

4371_Creating Interfaces: Knowledge co-creation and Participation in Urban Food-Water-Energy Nexus Governance

Laborgne, Pia[1], Goszczynski, Wojciech[2], Heyder, Monika[3], Sarzynski, Andrea[4], Ślebioda, Krzysztof[5], Suchomska, Johanna[6]; Wendel, Jochen[7],

Abstract

Major challenges in urban governance concern interlinking food, water and energy systems, making these linkages understandable to all stakeholders (government, science, business, and citizens), and facilitating cooperation and knowledge exchange among them.
In recent years, a strong increase in research on the food-water-energy nexus can be observed, manifesting in literature as well as in research programmes and projects on European and international level. Still, in literature, the concept often stays quite abstract and there is a co-existence of different understandings and uses (Giampietro 2018) as well as persistence of silo thinking in governance practices.
The project “CreatingInterfaces” (JPI Urban Europe and Belmont Forum 2018-2021, co-financed by the Horizon2020 programme under grant agreement No. 830254) aims at making the FWE-linkages better understandable to the stakeholders (city government, science, business and citizens), and to facilitate cooperation and knowledge exchange among them. It develops and tests innovative approaches for local knowledge co-creation and participation through Urban Living Labs and Citizen Science approaches in three mid-size cities on water: Tulcea (Romania), Wilmington (USA) and Slupsk (Poland).
The paper presents the Urban Living Labs as knowledge co-creation approach and shows results from three Urban Living Lab Workshops and knowledge co-creation by an online PPGIS (Public Participation Geographic Information System) tool in Tulcea, Wilmington and Slupsk.
Main questions of the paper are: how are the food-water-energy systems interlinked in urban governance? how can knowledge co-creation be realized linked to a crucial but rather abstract concept as the FEW nexus and embedded into the local communities? How can knowledge co-creation contribute to scientific knowledge building regarding the urban FEW nexus as well as to local sustainability governance?

Keywords:

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FWE Nexus, Knowledge Co-Creation, Local Governance and Participation

4372_A Review of Modeling Tools for the Planning of Sustainable Energy Systems for Cities and Districts

Vicky Albert-Seifried[1] and Gerhard Stryi-Hipp[2]

Abstract

In the face of climate change and environmental pollution, many cities around the world take the decision to transform their energy system from one that is dominated by fossil fuels to a climate neutral energy system based on renewable energy. These sustainable energy systems are characterized by high efficiency and a high share of locally generated energy. They also feature technologies such as energy storage (e.g. battery and thermal storage systems) and sector coupling applications (e.g. power-to-heat) to provide stability and flexibility in order to cope with the intermittent nature of renewable energy sources such as wind and solar.
The increasing complexity of the energy systems requires the introduction of new planning tools to identify cost-optimized solutions with high reliability. To date, a number of energy modeling tools exist that aim to support the development of integrated energy systems. These tools are characterized by different underlying principles, analytical approaches, spatial/ temporal resolutions and technological assumptions. Without a comprehensive overview, it is difficult for energy system planners to decide on the right tools that are fit for the purpose of their tasks.
Fraunhofer ISE as member of the EERA Joint Program Smart Cities is leading a working group, which aims to i) provide an overview on existing modeling tools for the planning of sustainable energy systems that can contribute to the development of positive energy districts and ii) identify gaps in the current tool landscape. To understand the requirements of energy system planners on energy modeling tools, over 20 key criteria for systematically characterizing the tools have been developed. They include purpose of the tool (e.g. forecasting or backcasting), modelling approach (e.g. top-down or bottom-up), underlying methodology (e.g. simulation, optimization), energy sectors covered, handling of energy sector coupling, temporal resolution, etc.
This paper will present an overview of the existing energy modeling tools characterized based on the key criteria developed. Building on this understanding, a tool chain that shows the application of different tools at different stages of the planning process will be described. Furthermore, gaps in the existing energy modeling tools will be identified with the aim to recommend avenues for further development.
The outcome of this study will provide a practical guide for energy system designers in the planning of energy transformation. Additionally, it will shed light in the development of energy modeling tools and identify new opportunities in the field.

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Keywords: Energy Modelling Tools; Energy System Optimization; Sustainable Planning

4375_Image of the City on Social Media:A Comparative Study of the "Big Data" and "Small Data" in the Tri-City Region of Gdansk, Sopot and Gdynia, Poland

Jianxiang Huang[1], Hanna Obracht-Prondzynska[2], Dorota Kamrowska-Zaluska[2], Yiming Sun[1], and Lishuai Li[3]

Abstract

Kevin Lynch (1960) theorized the five elements constituting the images of the city: edge, path, district, node, and landmark. The theory of city images served as a reference for planners, social scientists, environmental psychologists alike for decades, despite sporadic disputes on Lynch's categorization of 5 elements as well as the scientific basis of methods in use. The rise of image-based social media platform offers new opportunities to study the perception of city images in the digital age. A growing body of literature, questions remain as whether geo-coded social media data can be reliable measure of city images held by residents? If yes, what are the theoretical and practical implications for urban planners of the digital age?

We studied the image of the city using social media data, namely Instagram and Twitter collected from the TriCity Region consisted of Gdansk, Sopot and Gdynia in northern Poland. Text-mining, image processing, clustering analysis, and statistical analysis were used for geo-tagged photos, videos, and text collected for a period of calendar year. Findings are evaluated using GIS database and questionnaires conducted in parallel. Imageability, the frequency of a place captured on photo-based social media, is a strong indicator of positive rating of the place from questionnaires. Social media evidence clearly supported the existence of Landmark – geo-tagged buildings, path, channels of continuous movement, and districts, continuity of tweets, which correlate strongly with officially designated monuments, major streets and transit corridors, and administrative boundaries of neighborhoods, while nodes and edges exhibits weak correlation with real-world benchmarks. Social media evidence are leaning towards supported the three elements proposed by Norbert-Schulz: place, path and domain. The city image theory remains relevant in the digital age, and these findings are consistent across residents, visitors, language groups. The new technique enables a verifiable and practical measure of imageability and is therefore of value to planning practitioners in the digital age.

Keywords:

City Image, Social Media, Tri-City Region, Image Processing

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4393_Towards data-driven urban transformation of cultural heritage areas

Pietro Elisei[1], Miruna Draghia[2] and Sabina Leopa[3]

Abstract

Over the last two decades, Cultural Heritage [CH] has become a focal point in international and European policy arena. Consequently, much attention has been given to cities which adopt a strategy for reusing values inherited from the past as a driver for the urban transformation process, leading to new and promising urban futures. This paper overviews the collaborative and data-driven approach for progressive transformation of CH in creative and knowledge cities, developed in the framework of H2020-funded project, ROCK (www.rockproject.eu). Its elementary concept is based on developing an innovative, collaborative and circular systemic approach for regeneration and adaptive reuse of historic city centres, transferring the circular economy model to the transformation process of urban historic environments. The investigation focuses on how the ROCK approach is contextualised in two of the Role Model Cities involved in the project: Cluj-Napoca (Romania) and Turin (Italy). The paper highlights the main envisioned objectives for building a locally-embedded scenario, based on two dimensions: 1) increasing accessibility to specific contextual information on the empty and underused spaces stock (potential new locations for creative and cultural purposes) and 2) integrating technology for monitoring crowd flows in different CH locations and events in the city. The method used follows a matrix-based approach, aimed at comparing potential enablers for effectiveness of the transformation process, stressing on the importance of liaising between different sub-systems of actors (from the governance perspective), processes (such as: planning, policy-making and implementing) and technologies. Finally, the paper showcases a comparison of similar ROCK approaches implemented in two cities with different historical background, while following the same end goal of providing deeper knowledge on the actual and less self-evident situation of cultural heritage use and potentiality within the local community.

Keywords:

Cultural heritage, urban transformation, data-driven knowledge

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4404_Success Factors of City Engagement in Smart City Projects and Programmes

Susanne Meyer[1], Robert Kalcik[2]

Abstract

The aim of this research is to analyse the success factors of a transnational R&I programme (JPI Urban Europe) to engage European cities and design calls, projects and events to deliver dedicated support to cities for transition processes. The findings of this research support national, transnational and European R&I Programme owners to design new-generation R&I programmes putting the problem owners in the center to reach higher societal impact.

The findings of this research are based on interviews with city authorities, a survey to funding agencies in Europe and an analysis of projects with city involvement. Identified success factors for the engagement of cities in R&I projects and programmes are the following: (1) Eligibility of city authorities as project partners in R&I Programmes makes them to co-creators of the projects, influencing the activities and ensuring that project findings are dedicated to city needs. (2) Joint calls must follow challenge driven approach putting the problems of cities in the centre, make it a requirement that involved city authorities are engaged in the proposal development phase from the very beginning, ensuring effective science-city cooperation during the project running time and making sure that results of the projects are relevant to the cities. (3) Trusted relations between city authorities, research organisations and funding agencies are essential to find the right language to understand each other. (4) The design of attractive events for cities is essential. (5) Formats of the programme that address new and smaller cities to the programme as the entry barrier for projects is already high for cities. Recommendations have been derived how to put the success factors into collective action.

Keywords:

city engagement, transition pathways, R&I policy making, challenge-driven

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4405_Defining Smart Sustainable Urbanism Indicators: Professionals Perspective

Fay Al Khalifa[1]

Abstract

The continued growth in the world's urban population and the subsequent environmental concerns have directed governments, scientists and NGOs to focus on the possibilities of using technology to solve some of the world's most complex environmental challenges. Today, the attainment of smart urbanism and sustainable urbanism are amongst the most prevalent topics in international urban research. Evidence in the literature showed that different communities are likely to promote slightly, or even significantly, varying understandings of sustainable urbanism, depending on their environmental, economic, social, political and cultural circumstances and the value judgment of the local community. This study examines the interrelationship between the two concepts of 'smart' and 'sustainable' urbanism within the Bahraini context; a country with an urban population of 89% in 2017 and a 1.77% annual rate of change (2015-20 est.). The research defines Smart Sustainable Urbanism for Bahrain using two of the latest standards published by the International Organization of Standardization as a guideline. The ISO 37120:2018 sustainable cities and communities — indicators for city services and quality of life and the ISO 37122:2019 sustainable cities and communities — indicators for smart cities. Each standard is built around 19 themes, and each theme specifies a number of indicators to measure the smartness and sustainability of communities. This study uses surveys administered to professionals working within fields related to the built environment in Bahrain to rate the importance of the indicators listed under each of the themes in the two standards. The results were analyzed to define core indicators, supporting indicators and profile indicators to report on the achievement of smart, sustainable urbanism for the Bahraini community. The study presents a new methodology that could be used internationally by policymakers to priorities and select the indicators needed to assess the smartness and sustainability of their society and urbanization. The research also suggests that the number of indicators selected and the format for presentation should differ according to the targeted audience: international evaluators, scientists, non-governmental organizations, policymakers or the general public. The research further assessed Smart, sustainable urbanism definitions, targets and indicators in relation to the goals of the Government Plan of Action (GPA) of Bahrain and its urban sustainability reporting in response to the SDGs. It, thus, recommends that the indicators and their targets should be re-valuated biennially and that they should be monitored on a semiannual basis. The research further recommends incorporating the smart, sustainable urbanism indicators to the GPA in Bahrain for more robust attainment of smart sustainability goals.

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Smart Sustainable Urbanism; Smart Urbanism; Sustainable Urbanism; Sustainability Indicators; Bahrain.

4406_PLANHEAT: a new Open-Source and Integrated Tool to support EU public authorities in the development of low carbon heating and cooling plans

Stefao Barberis[1], Matteo Porta[1], Caroina Ferrando[1], the PLANHEAT consortium[2]

Abstract

PLANHEAT project developed and validated in three validation cities (Antwerp, Lecce and Velika Gorica) an integrated and easy-to-use open-source tool to support local authorities in selecting, simulating and comparing alternative low carbon and economically sustainable scenarios for heating and cooling.
The PLANHEAT tool is a Q-GIS based plug-in composed by three modules (Mapping/Planning/Simulation Modules) and it has been designed to support local authorities in:

- mapping the potential of locally available low-carbon energy sources and prioritize their use according to cities energy plans and targets
- mapping the current and forecasted demand for heating and cooling
- defining and simulating alternative environmentally friendly scenarios
- identifying potential for further extension and upgrade of district heating and cooling networks (also optimizing their routing)
- evaluating the benefits in terms of energetic, economic and environmental gains via a specific KPI Panel

The tool has been realized via two different approaches (City/Top-Down and District/Bottom Up) also to enable its use by cities which has a different level of availability of local data and also in order to perform different type of plans. City approach works indeed at yearly level and could be propaedeutic to the realization of new urban plans and visions (like SEAP updates to SECAP) while District approach works at hourly level going into the detail of the simulation of new scenario and potential installation, enabling their evaluation in terms of investments and environmental benefits.
In this presentation PLANHEAT tool will be presented and showcased to the attendees via a step by step approach guiding the attendees in a simple low carbon H&C planning process via the tool.
PLANHEAT project has received funding under the European Union's Horizon 2020 research and innovation Programme under grant agreement 723757.

Keywords:

Heating and cooling; city planning; SEAP; SECAP; low carbon; urban energy transition

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4412_Big Data Analysis Tools to Enhance Regional Innovation Support

Antoni Pastor Juste[1]

Abstract

Segmentation of clients is a strategy widely used by companies and marketing units to sell their process. However, this concept is not so well established in public agencies supporting SME innovation. What are the benefits of designing advanced segmentation strategies for development agencies? Economic development practitioners agree that it's necessary to provide customized innovation services to companies to get a greater impact. This paper presents how nine regional development agencies from seven European countries carry out their segmentation strategies to provide tailored initiatives of SMEs' innovation support. The analysis also identifies common challenges RDA face, and how introducing Big Data Analysis can help them enhance innovation support in their regions.

Regional Development Agencies are public entities created to provide economic, legal and innovation support to Small and Medium Enterprises in a given region. To optimize these services, RDAs should apply objective standards to select a particular company or sector to promote and decide how and when to do so. Traditionally, development agencies have used other methods, like non-specialized spreadsheets or non-structured financial information, to support the decision process.

Currently there are many tools available that can be easily implemented to enhance the support provided to SMEs and increase the success ratio of the policies deployed. Modern technology has allowed a new science to arise, Data Science, that relies on data mining and big data analysis to extract knowledge and insights from both structured and unstructured data. Unfortunately, this big data analysis technology is not yet widespread within regional development practice.

Advanced innovation support agencies should use big data analysis to provide customized services to their local companies. To provide effective support, development agencies have no other choice but to send the right message and provide the right innovation support measure to the right company at the right time via the right channel. Leading development agencies are the ones that have already implemented customized marketing and support services approach to provide impact in the companies.

Following up on this idea, the H2020-supported project *OaSIS - Optimizing Support for Innovating SMEs* developed a software tool based on the collaboration with 21 RDAs that decided to become involved with the project in different degrees, with 9 of them sharing their full databases of SMEs. With all data collected from two pilot regions combined into a single platform, a total of 239,968 records were produced. An algorithm was then developed to classify the different companies into their RIS3 categories by extracting data from their web page. This algorithm takes into

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consideration the number of keyword repetitions in the textual content of the sites and is specially designed for the industry and applied R&D. This web-keyword identification was then combined with data extracted from other sources to create an online software tool capable of ranking the companies of a given region by revenue, revenue growth, employees, employee growth, and even RIS3 category and degree of innovation.
This information can be extremely useful for regional practitioners, as they can understand if a particular policy implemented to aid a certain company or sector is giving appropriate results, or track companies that have not received yet support and determine if they are in urgent need for it or not. Development agencies will enjoy the benefits of a good segmentation ranging from improving the public image of the policies implemented to show congruence with the concept of marketing and provide a greater impact in targeted companies. Modern tools powered by current technology, such as Big Data analysis, must be used by RDAs to keep up to present challenges and provide the best service possible to the SMEs in their region, the purpose they were created to serve.

Keywords:

Regional Development, Big Data, SMEs, Innovation programmes, Marketing

4414_Towards a Smart Urban Planning: The Co-production of Contemporary Urban Citizenship in the Era of Digitalization

Enza Lissandrello[1]

Abstract

This oral presentation is based on a paper that aims to investigate the tension between the dispositives for the mediated-negotiations of 'smart city' experimentalism that often aim to align data gathering with evidence-based planning towards a social collective process design of community building as based on values, facts and actions through technology-driven and digital urban democracy. Citizens are becoming in the idea of smart city, the human resources of community capacities and co-production of urban ecological systems of knowledge that offer potential for planning through technology-and-participation for the public commons and deliberative democracy. The vocabulary of the city and the political economy of state restructuring have situated urban planning in global dynamics of planetary urbanization; issues of climate change and air quality are taking the urban-as-global problems of human survival; global market-driven trends transform the very urban planning idea beyond the unique nation-state framework of policy interventions; future perspetives of global migration warn municipalities to find new strategies for urban development. Cities are at the centre of the challenge bu are also hubs for planning innovation. However, the 'smartmentality' that guides the current techno-scientific solutiolism over individuals as claimed as an active citizenship and citizen-empowerment, reflects more often a technocratic planning model that takes the city away from its politicization and accountability to citizens' participation and deliberative governance. Critical research has been developing in various EU, the UK, and global academic contexts around the type of 'cityness' underpinning technology-and-participation of smart cities. New claims and language of citizen focused or people-centered in urban policy documents is becoming part of the smart cities discourse. Smart citizenship opens up a new research agenda on the implementation of smart city experiences through participative urban planning processes to pervasive technologies. This oral presentation elaborates on the cases derived by the MUV2020, a Horizon 2020 innovation and reserach project (2017-2020), lead with six EU neighbourhood communities, to analyse the planning idea underpinning such a process design, drawing lessons on potentials and constraints for a reflexive re-design of deliberative spaces. The oral presentation contributes to a progressive planning idea to unfold planning as knowing across contested and challenged flows of urban politics and governance for the co-production of contemporary citizenship in the era of digitalization. The conclusions open a new perspective for a new 'smart urban planning' method for the next city to come.

Keywords:

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urban planning; deliberative governance; smart city; citizens participation

4503_Smart city governance as foundation of integrated approaches to planning and implementation of smart city projects

Borsboom-van Beurden, Judith[1] and Costa, Simona[2]

Abstract

Both from practice and from research, it is widely known that new governance methods and novel business cases are crucial for the transition to smart, low-carbon cities for a multitude of reasons. At first, this transition must take place in often complex constellations with different groups of end-users, different owners of buildings and infrastructures, and a mosaic of legal responsibilities and contractual obligations, which must be respected. The mutual interdependencies between all stakeholders engaged, makes that usually not one stakeholder (group) can achieve smart, low-carbon districts or cities on its own, and might lead to lengthy negotiations and preparations of plans. Secondly, present evidence suggests that substantial investments and considerable co-financing is needed from many stakeholders to realise this transition, whereas most pilots and living labs so far depended quite heavily on subsidy. Often, business cases of smart and energy-efficient solutions are profitable in the mid to long-term but might be considered as less attractive compared to regular investments and perceived as riskier. Furthermore, the lack of proper and generally accepted method of accounting for the so-called co-benefits, which might be as important to the involved stakeholders as the energy savings and avoided GHG emissions, means that negotiations usually focus predominantly on financial aspects. Thirdly, new governance methods play a key part in a systemic, holistic perspective on smart and energy-efficient cities, which is often lacking when plans are mainly technology-oriented. Such a holistic perspective will ensure that short term decisions are placed within the long-term framework of the full life-span of the built environment, that interdisciplinary, cross-silo approaches are deployed, that all stakeholders in the quadruple helix are included, and upcoming opportunities for decarbonisation in the entire city jurisdiction are identified. Recently, the European Innovation Partnership on Smart Cities and Communities published a method which helps city administrations to develop and execute smart city and energy-efficiency plans in an integrated manner, as the need for such a planning tool was clear, but it existed so far only in partial forms. This paper describes this tool and outlines how smart city governance has been included into its overall holistic approach to planning and implementation of smart city solutions, with the aim of fostering co-creation and co-realisation with a wide variety of stakeholders. The structure of this paper is as follows. After a brief summary of how this integrated approach was developed and tested within the European Partnership on Smart Cities and Communities and how the material has been collected, its main features are described. Following, the paper focuses on the proposed actions supporting smart city governance during various

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stages of integrated planning and implementation, and their relevance for planning policies. Subsequently, these practice-based recommendations are positioned towards an overview of current literature on smart city governance, and it is discussed where these are aligned or not, and where more insight and research are needed. Finally, the paper highlights the next steps in further development of this planning tool and gives recommendations for further research.

4700_Implementation of an application on open source QGIS platform for the analysis of the energetic characteristics of Friuli Venezia Giulia Region (Italy) buildings

Miche Savron[1], Raffaela Cefalo[2] Marco Manzan[3], Angela Sanchin[4] and Agostino Tommasi[5]

Abstract

The presented project is relative to the implementation of a georeferenced database and a GIS (Geographic Information System) application on Quantum GIS open source platform, finalized to the analysis and visualization of some strategic parameters for energy use and production on Friuli Venezia Giulia (Italy) regional territory. The study, developed during a stage experience at INSIEL SpA with the cooperation and support of the Office responsible of Energy Services, was born with the aim of implementing the values contained inside the PER (Regional Energetic Plan) and analyzing the data contained into APE (Energetic performance certificate) Cadaster. In particular, the fundamental parameters describing the energy use on regional territory and present inside APE have been identified. Then they have been geo-referenced and the spatial correlations have been analyzed in order to highlight the state of the art from the point of view of the energetic performance of the buildings inside Friuli Venezia Giulia Region and provided of proper certifications.
To reach this aim, a big data quantity was collected. This was obtained from different queries to regional databases. These are relative to the aspects that equate the analysis presented inside the PER and the ones that can be extracted from the cadaster: these data sets were imported inside QGIS platform.
The implemented application allows to query a single point or an extended area extracting all the relative data and/or the related parameters in the form of a numeric table or a thematic map. With the geo-referenced database it is possible to compare different geographic areas belonging to Friuli Venezia Giulia Region and analyze more overlapped layers evaluating the correlations between the related energetic parameters.
The implemented methodology allowed to pass from a serie of data not directly related to each other to an organized database that can be queried also using the geographic location.
The indicators extracted from APE cadaster represent the energetic parameters deriving from an analysis, carried out by qualified professionals, who compute, following the national norms, the energetic class of a single real estate unit belonging to a building.
At the end, a geo-referenced db and a GIS application on open source platform were

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implemented, allowing to review and catalogue the energetic parameters of different digital layers and to study them individually or overlapped.
Considering the different source of the collected data, an affinity in the different macro areas of the Region, can be noticed.
The obtained product demonstrates to be a very good aid in the strategic energy management activities in the Friuli Venezia Giulia Region territory and how the research findings can be directly imported into planning policies for an energy management improvement.
This GIS application could be implemented also for the study of other themes, as seismic vulnerability of buildings, considering the recent adoption of seismic certification, in order to prepare a document of the building able to relate its operability inside the macro analyses of GIS for a detailed planning derived from BIM (Building Information Model)

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4705_The STARDUST project, towards the Trento smart city

Adriano Bisello[1], Daniele Vettorato[2],

Abstract

STARDUST is an H2020 project co-financed by the EU under the call smart cities and communities. Started in October 2017, it is now halfway through its expected lifespan.
The STARDUST project brings together advanced European cities and citizens of Pamplona (ES), Tampere (FI) and Trento (IT) willing to act as lighthouse cities by testing and implementing groundbreaking energy solutions. Lighthouse cities closely cooperate with the associated follower cities of Derry (UK), Kozani (GR) and Litomerice (CZ) and together with relevant industrial partners, including a variety of innovative local SME, and supported by academia and research centres will deploy intelligent integrated measures, test and validate technical solutions and innovative business models, and deliver blueprints for replication throughout Europe and abroad.
The objective of STARDUST project is to pave the way towards the transformation of the carbon supplied cities into Smart, high efficient, intelligent and citizen-oriented cities, developing urban technical green solutions and innovative business models, integrating the domains of buildings, mobility and efficient energy through ICT, testing and validating these solutions, enabling their fast roll out in the market
Actually, in Trento, the project is entering into the implementation phase, having done the necessary design phase of the interventions on buildings and innovative heating systems, while the feasibility studies on advanced mobility and green logistics have been accomplished. The presentation will focus on how to tackle the next challenges at the urban level, thus binging innovation from theory to practice, translating the ambition from the proposal into the real world (including its bureaucracy, social behaviors and habits, the need to find multi stakeholders management modes, making economic sense) end driving Trento towards its ambition of becoming a smart, sustainable, and energy efficient city

Keywords:

STARDUST project, smart city, multiple benefits, urban energy transition

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4710_Information & Communication Technologies (ICT) are invading the cities! What does “massive digitization” in all aspects of human activities mean for the Real Estate Industry?

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Abstract

Digital technologies are infiltrating all our areas of life at a rapid rate, and we see this development in the cities particularly intensively. Cities still consist of bricks, mortar, concrete, steel, glass (and an increasing proportion of plastics and man-made materials), they offer living and working space, public and private space, transport and supply&disposal infrastructures connect all the places and hold everything together. The term "SMART CITY" is frequently used when it comes to systematic use of ICT in the urban environment. But WHAT IS A "SMART CITY"?

There is no clear, generally accepted definition of "Smart City". What a "SMART CITY" is - or how it is seen - strongly depends on WHO is looking at it, HOW you are looking at it, WHERE you are / what your CULTURAL BACKGROUND is - there are fundamental differences in the pictures if you look at it from the perspective of “improving quality of life”, “using technology as much as possible”, seeing “endless business opportunities” or if there is a “political agenda” to become a Smart City.

The massive intrusion of ICT into Cities has (massive) impacts on everything going on in cities, Real Estate Industries are facing fundamental changes, as the slide illustrates.

Some of the impacts of “Urban Digitization” on Real Estate Industry (this list is far from complete): 1.) Digitization in all core aspects of Real Estate Business (i.e. BIM) 2.) Data Availability and Acquisition: public information systems, commercial data, remote sensing, … 3.) 3D- / 4D-Modelling - the “Real World” will have a “Digital Twin” 4.) Massive changes are going on in the building and construction industry (CAM; robots, drones, …) 5.) A „mobility revolution“ is going on, and changes in mobility, traffic, transport and logistics do have significant impacts on Urban and Real Estate development 6.) Climate change adoption and mitigation can only be successful if there is a holistic / coordinated approach including Real Estate and Construction industries – adoption and anticipatory planning 7.) Green space management and “Urban Farming” (with high tech support) 8.) „Underground Space“ can be seen as a “new exploration/expansion area of dense cities” 9.) “Knowledge- and Information Society”, “Creative Industries”, “Maker Spaces” change requirements 10.) Virtual Reality (VR) and Augmented Reality (AR)

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11.) IoT (Internet of Things), Clean Tech, Blockchain, Artificial Intelligence (AI), Big Data.
Data- / Information- / Knowledge-Systems have become CRITICAL KEY INFRASTRUCTURE for Smart Cities & Regions and thereby for Real Estate Industry. The prerequisites for successful implementation of ICT in urban management and development and especially in real estate industry in the best sense of a "Smart City" are seen in RELIABLE • Legal System: Laws, Rules, Guidelines, …; rules of conduct; legal certainty, • Government, Governance, Administration, • Data & Information Systems, (Geo-)Information Infrastructures (i.e. digital cadaster) Smart“ does not necessarily mean „Digital“ or „ICT“ – there are also numerous “High-Tech Solutions” in the “real physical world”, i.e. a Roman Aqueduct is a very smart and intelligent solution.

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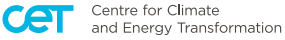

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