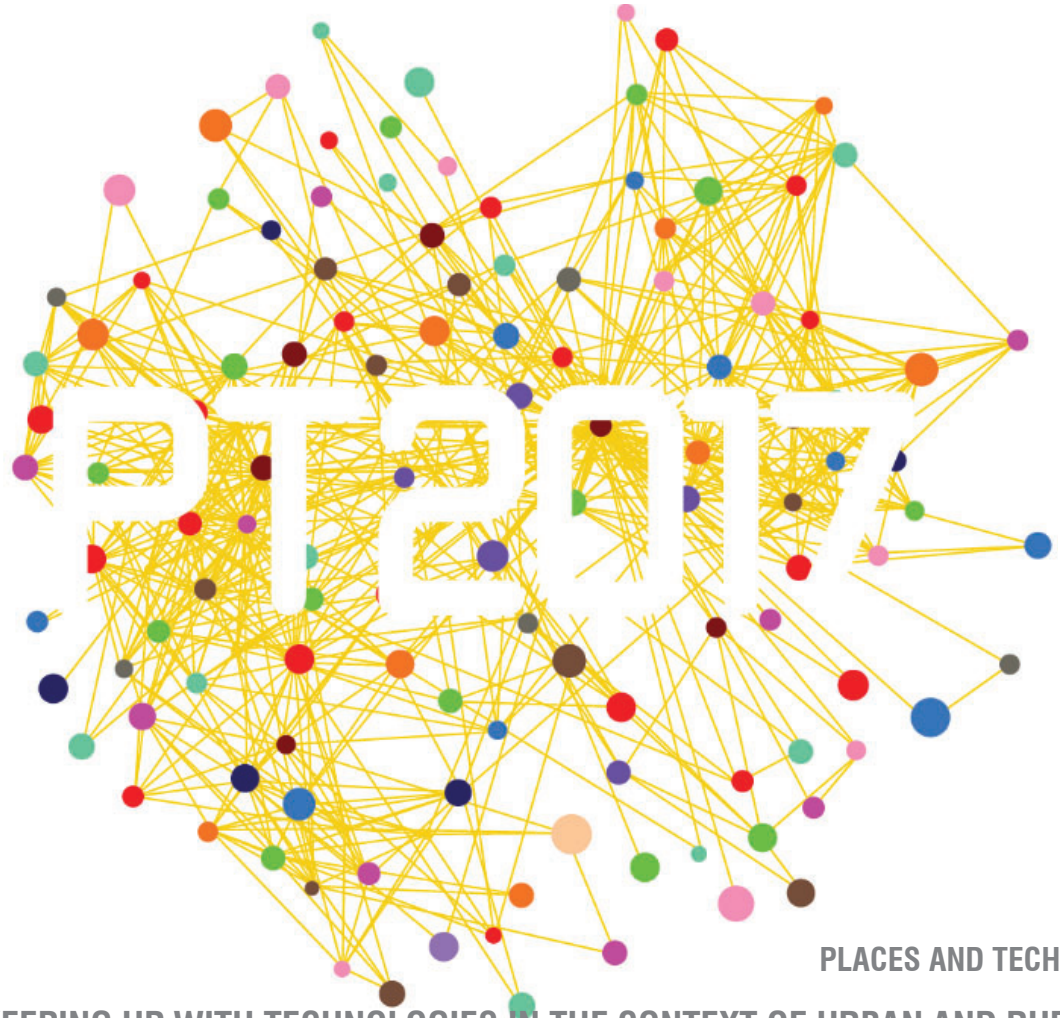
4th International Academic Conference



PLACES AND TECHNOLOGIES 2017

KEEPING UP WITH TECHNOLOGIES IN THE CONTEXT OF URBAN AND RURAL SYNERGY

Book of Conference Proceedings

Sarajevo, Bosnia and Herzegovina, June, 08th - 09th, 2017

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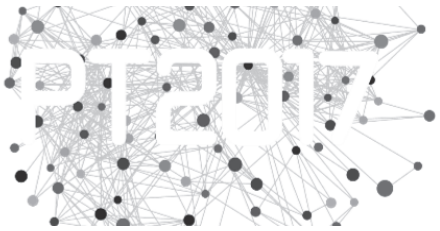
KEEPING UP WITH TECHNOLOGIES IN THE CONTEXT OF URBAN AND RURAL SYNERGY

BOOK OF CONFERENCE PROCEEDINGS

Editors:

Dženana Bijedić, Aleksandra Krstić-Furundžić, Mevludin Zečević



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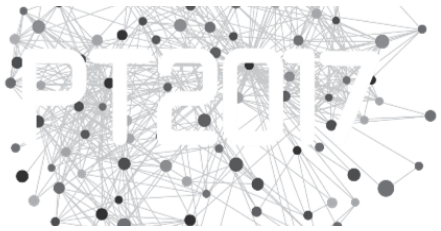

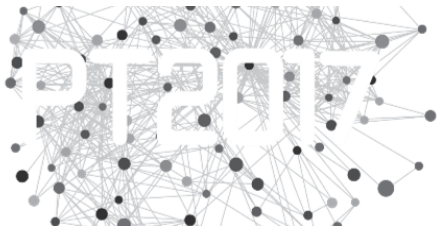

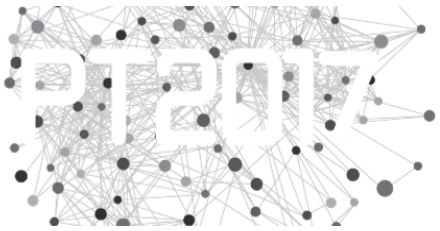

PLACES AND TECHNOLOGIES 2017

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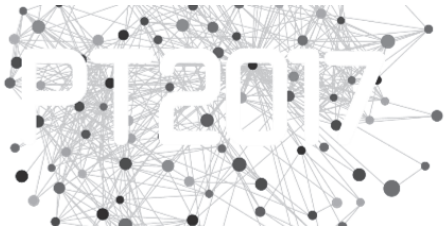

TOPIC VI:
CLIMATE CHANGE

(R)URBAN SYNERGY RECONSIDERED: THE ROLE OF INFORMATION NETWORKS IN CLIMATE CHANGE ADAPTATION AND MITIGATION

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ABSTRACT

The paper is focused on the relationship between urban and rural settlements, established via information networks and oriented towards climate change adaptation and mitigation. The first part of the paper provides a review of emerging ideas and innovations related to the (un)conventional use of information networks in reducing the consequences of climate change, while the second part examines the strategic role of networks in the exchange of data and knowledge. Two levels are especially emphasized - the domain of public communication of climate change, and the level of connectivity within (r)urban hybrid systems (i.e. their effectiveness, accessibility and low-carbon outcomes). In accordance with recent environmental and technological trends, as well as the possible spatio-functional flexibility of (r)urban hybrid settlements, the paper indentifies and analyses three areas of networks applicability, targeting main challenges of the anticipated climate-friendly development - human behaviour, ecological awareness and general efficiency.

Keywords: climate change adaptation and mitigation, (r)urban systems, information networks, environmental quality.

INTRODUCTION

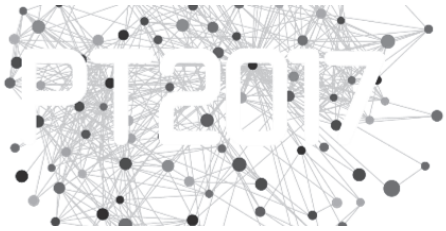
The beginning of the 21st century has increased global awareness related to the problems of climate change and global warming, underlining a necessity of reducing GHG emissions (IPCC, 2007c, 2013). Adaptation to climate change, as the ability of environment to support change without creating hazardous situations (Giddens, 2009), has become an important ideological issue between the neoliberal and green perception of future development. The global

scale of climate change has also stirred up a hyper-production of studies, discussions and theories tackling a number of issues related to nature, mechanisms, causes and effects of this process. Although the emphasis has mostly been on mitigation, the importance of adaptation becomes more important after the adoption of the Cancun Adaptation Framework (2010) which supports the development of national adaptation plans and strategies. All these steps have generated some improvements, especially on the level of urban settlements, addressing the issues of energy, carbon-neutral environment, green modes of living, sustainable mobility and urban systems, although their impact has been very limited (European Commission 2013a, 2013b).

Nowadays, cities represent main nodes of global comprehension targeted by numerous adaptation and mitigation strategies. At the same time, the role and character of rural areas is significantly redefined - the expansion of urban activities and the decreasing share of agriculture in overall economy of rural areas have instigated their transformation and altered their traditional characteristics. Stressing the role of green urbanism and cohesion (via social and technical networks), the efficient relationship between urban settlements and their rural 'backup' is identified as a base for higher overall sustainability (Beatley, 2000; Pflieger and Rozenblat, 2010; Simic i Mihajlov, 2016; Wood, 2007). Simultaneously, the characteristics of (r)urban hybrid systems, such as diversity, sustainable transportation, density, land use, passive solar design, greening and compact form (Jabareen, 2006), represent important factors in achieving the necessary dynamic of urban-rural relationship.

Since the influence of growing urbanisation is visible both on the morphological level and on the level of urban-rural connectivity, rural areas have to be considered in the process of climate change adaptation and mitigation. Therefore, the climate sensitive rural development policies have been created within the EU framework, dealing with the wide range of economic, environmental and social challenges instigated by climate change. Sharing a number of objectives with other European Structural and Investment Funds (ESIF), the EU Framework for rural development programmes promotes resource efficiency, supports the shift toward a low-carbon and climate-resilient economy and emphasizes the importance of social inclusion, poverty reduction and economic development in rural areas (European Commission 2013a, 2013b). Obviously, the higher level of connectivity between urban and rural areas, recognized as an important element of the Common Agricultural Policy (CAP), gradually becomes a necessity which might be achieved by stimulating a hybrid character of urban-rural systems supported by information networks.

Underlining the strategic role of material and digital information networks in the process of climate mitigation and adaptation, the paper will focus on a relationship between (r)urban systems, information networks and climate change, manifested both in the domain of public communication of climate change and on the level of (r)urban synergy. Based on the review of key literature and Internet searches, it provides an overview of current trends and practices, discussing the possibilities and effects (un)conventional use of ICT flows in understanding and reducing the consequences of climate change. The selected literature covers three main topics - the effects of climate change; adaptation and mitigation strategies/policies; and information networks in (r)urban areas. Internet searches were directed to three major areas of networks applicability in the process of climate adaptation and mitigation - human behaviour, ecological awareness and general efficiency. The results of the analysis were classified according to web-site content, mode of use and anticipated impact/audience.



TOPIC VI:
CLIMATE CHANGE

ICT NETWORKS VS. CLIMATE CHANGE

The simultaneous and interlinked existence of the material/physical environment and its electronic/digital counterpart represents an inevitable element of modern comprehension, which has been analyzed by different authors (Aurigi and De Cindio, 2008; Bucher and Finka, 2011; Drewe, 2000; Fusero, 2009; Graham and Marvin, 1996; Light, 1999; Mitchell, 2000 etc.). New modes of communication transform the nature of our interactions and structure of our needs, creating a different kind of life and work which reflects in different spatial patterns and typologies (Castells, 2004). On our way toward climate-friendly environment, we have to be aware that anticipated transformations have to follow the logic of global networking, as a prerequisite for an efficient multi-sectoral response to climate shifts.

From the perspective of climate change, information networks could be seen as a unique data resource, available to different groups of consumers. However, in order to increase their usability, their flows should be transparent (Booher and Innes, 2002). Furthermore, the produced data have to be easily interpreted, understood and incorporated into decision-making processes oriented toward climate adaptation and mitigation (Lemos et al., 2012).

Describing the so-called E-topia, Mitchell (2000) envisioned the development path of a green human settlement with smart elements, which we gradually accept and follow. He distinguished several principles - dematerialization, demobilization, mass customization, intelligent operation and soft transformation - which would stimulate life with a minimized production of waste and reduced traffic and pollution (enabled by ICT networks). E-reinforcement would lead to an intelligent adaptation, automated personalization and the creation of efficient, responsive markets for available resources, while soft transformation would enable adaptation of existing spatial structures by inserting ICT networks with minimal physical change. The current development paths of urban and rural settlements demonstrate the application of numerous elements proposed by Mitchell, while their elaboration could be found in different documents, emphasising the importance of low carbon economy and smart solutions.

For example, 'SMART 2020 report' by The Climate Group (2008) promotes 'Clean revolution' enabled by ICT and focused on the SMART framework. The report also recognized basic steps/imperatives - standardize, monitor, account, rethink and transform - necessary for reducing the carbon footprint and GHG emissions. Similarly, the ARUP's report suggests smart solutions for low-carbon cities in which the reduced emission should be achieved simultaneously with increased living standard and economic success (Hill et al., 2009). Both documents suggest that information and communications technologies could provide new users' experience and smart behavioural change also influencing the development of low carbon urban economies. Consequently, the increased intensity and extent of connections are underlined as important factors in providing a continuous communication/feedback related to different activities and services, while smart interfaces enable efficient and personalized experience.

Obviously, the synergy of information and technology, integrated in both urban and rural systems via ICT networks, could play a significant role in the mitigation of climate risks and adaptation to changing conditions. The main task is to connect environment and people by supporting an efficient exchange through learning and understanding of environmental processes and (r)urban systems.

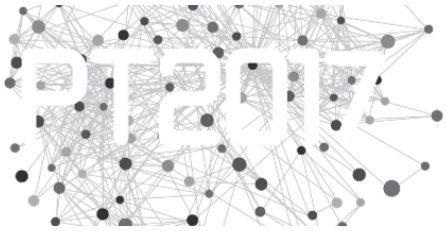
NETWORKS OF/FOR 'GREEN' INFORMATION

The digital form enables better (and instant) detection of changes, increases the efficiency of data transmission and analyses, and provides a better understanding of processes, their potentials and setbacks. Therefore, the modern technologies directly influence the ability of both urban and rural settlements to be resource-efficient and oriented toward reduction of GHG, while open information play a significant role in minimising the carbon footprint. Information networks also support communication and cooperation between all levels of governance and stakeholders, which is very important for raising awareness (Kousky and Schneider, 2003), identification of potential climate risks and adaptation priorities (Bulkeley, 2010), management of complex ecosystems (Bodin and Crona, 2009) and implementation of collaborative planning (Healey, 2006). Information flows reinforce formal and informal social networks, especially on a local level which represents an optimal scale for creating and implementing adaptation strategies (Kern and Alber, 2008) and developing adaptive capacity (Pelling and High, 2005). The use of readily-available technologies and real-time systems for information transparency, monitoring and decision-making is increasing, and this process creates a promising setting for new trends of environmental responsibility, eco-oriented economic development, energy efficiency and community support.

Connecting social, technological and natural systems, while targeting sectors of services, mobility and government, new technologies influence built environment and society through different media, systems, tools, gadgets and applications able to detect, collect, analyze and process different kinds of data. The impact of widely available information becomes visible in our everyday life - from a perception of environment and improvement of (r)urban performances, to communication and movement of individuals, groups and goods.

Changing the behaviour

The delicate consequences of our carbon-intensive activities certainly influence gradual modifications of our behaviour, determining a new global comprehension of environmental problems. Playing an important role in dissemination of information and knowledge numerous projects and trends have been conceived, discussed and implemented during the last few decades (Balaban, 2012; Castán Broto and Bulkeley, 2012, Hunt and Watkiss, 2011; Stupar and Mihajlov, 2016), while advanced technological performances of information systems have frequently facilitated these processes. The variety of target groups, as well as local socio-cultural, economic and technologic circumstances demand and/or generate different possibilities of access, data-processing, decision-making and acting. Communication, transmission and exchange of information, therefore, have to be conducted via both physical and electronic networks, in order to provide wider and deeper coverage of climate problems. Consequently, we can identify two basic approaches for raising eco- and climate- consciousness, differing in transmission/reception method and anticipated initial scale and timing of impact (Stupar and Mihajlov, 2016) - digital gateways (online resources of innovative approaches and cases) and real-time diffusion (education programs and projects conducted in-situ). The first approach, completely based on new modes of communication, allows global visibility of presented examples fostering accumulation of world-wide knowledge and skills, as well as their mediation and transmission



towards unknown recipients. These 'gateways' usually act as passive inductors of behavioural changes and climate-friendly trends, although they include a certain level of interactivity between their creators, administrators and users. In general, they tackle issues of environmental changes, sustainability, resilience, transition and/or transformation of life styles. The second approach to developing climate-awareness and changing carbon-intensive behavioural patterns is based on interchange in real space, exclusively demanding an active response of already defined users. Usually conceived as a part of a specific project, with an estimated timeline and detectable outcome, the real-time diffusion actually 'produces' case-studies which could be overlapped, combined or just transmitted via digital 'gateways'.

One of the most inspiring examples, highly applicable within urban-rural systems, represents the project 'The new climate generation', launched by the Municipality of Copenhagen in 2009, as part of Copenhagen's climate plan 'Carbon neutral in 2025' (2012). Inspired by the important global event COP15, the project included 1500 school students, their teachers and nurseries, in order to raise general awareness about climate and to train so-called 'climate ambassadors' able to transmit and use new knowledge ('Copenhagen: The New Climate Generation', 2014). The Information Network Village project (INVIL, 2017), initiated in Korea during the 1990s, is another good example, although specifically focused on the urban-rural relationship. Fostering self-sufficiency of settlements, this project supports the sustainable growth of rural communities via the high-speed internet access and education. Similarly, the Causeway Rural & Urban Network (CRUN, 2016), which enables the sustainability of local communities, provides different services, trainings and collaboration. These activities are used for raising environmental consciousness, organizing the climate-sensitive (r)urban projects and supporting the exchange of ideas and knowledge applicable both in urban and rural realm.

Sensing the environment , protecting the resources

On our way to climate-friendly behaviour, digital systems are recognised as key-elements of our raising awareness due to their capability to detect environmental data (via sensors) and make them broadly and immediately visible and available (via networks). Using two basic types of interfaces - personal (smart phones, notebooks, tablets etc.) and public (wi-fi nodes, urban touch-screens, info-beamers) citizens are able to have an insight into urban and natural resources, processes and activities influencing their attitude toward environmental protection. Besides global leaders in this filed (IBM, Cisco, CH2M HILL), a number of smaller multi-professional firms and non-profit groups (MySociety, Code for America, Open Knowledge Foundation etc.) also deal with similar activities, creating software, web-services and applications focusing on environmental conditions, transportation, urban services and resources.

Monitoring the environment has become an important issue in the age of climate change since it provides a better understanding of atmospheric processes and their influence on our lives. Although the focus of climatological observations is nowadays shifted to urban areas covered by denser networks of sensors, the continuously collected data are used on global level for further research of climate impacts - from spatial patterns and infrastructural systems, to social and health issues. Furthermore, the applicability of interactive web service, such as 'Urban EcoMap' (implemented in Amsterdam and San Francisco), could be extended to (r)urban settlements and areas since it displays

environmental footprints for selected zones. The data includes average annual emissions per household, as well as a share of energy, waste and transportation.

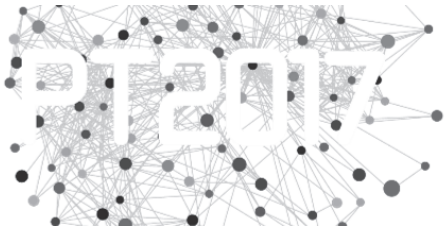
Considering that transportation sector represents one of major emitters of GHG (IPCC, 2007a), reducing its negative impact on environment has become an imperative. The relation between ICT networks and transportation has been frequently used for increasing the efficiency of movement, providing a higher visibility of real-time information (about choices, availability and surrounding activities), enabling multimodality and monitoring the condition. In the context of cities and its surrounding/complementing rural areas, this aspect demands special attention. Currently, there is a number of web-services and applications combining sensors, public displays and smart mobile phones (e.g. 'CalTrans Quick Map' in San Francisco), which is also a win-win combination in the domain of services. Dealing with problems of maintenance, management, quality or accessibility of (r)urban infrastructure and activities, they enable real-time interaction with users affecting their environmental awareness and participation. Good examples of this practice are projects 'TrashTrack' - related to waste management, or 'City Sourced' - a platform for identifying and reporting to urban problems, which could be used in complex hybrid systems of (r)urban settlements. In line with these initiatives, it is interesting to mention an application - 'Personal action plan calculator'. Its role is to measure ecological footprint and carbon emissions of every user, providing a personalised action plan which includes practical tips for reducing negative impact on the environment.

Having in mind that the global share of energy sector in total GHG emissions is more than a quarter (IPCC, 2007b), a growing number of policies and strategies is oriented toward energy transition, reduction of energy consumption and possible vulnerabilities and risks which should be identified and mapped (Burton et al., 2002; Satterthwaite et al., 2009). The IBM's weather modelling technology 'Hybrid Renewable Energy Forecasting' (HyRef) certainly fits well into this category, since it increases the reliability of renewable energy resources providing data related to wind and solar forecasting (one month in advance, or in 15-minute increments). Simultaneously, it enables higher level of data integration into the power grid and influences reduction of carbon footprint (IBM, 2013).

Apart from these application and projects, there is a number of initiatives specifically related to rural development simultaneously targeting the issues of resources/environment, networking, innovation, collaboration, funding and program implementation. The main European digital platform represents The European Network for Rural Development (ENRD, 2017), while numerous national portals additionally elaborate this issue (e.g. UK rural networks, Rural Development Program of Croatia etc.).

Managing the efficient life

The imperative of efficiency influences information services and applications, as well as the physical features of settlements and their interconnectivity. From transportation, energy and infrastructure, to food production/consumption and solid waste management, this kind of challenge has generated a number of creative solutions with different territorial and (cross)sectoral impacts. Oriented toward individuals, specific groups or raised



to a level of municipal, regional or transnational systems they facilitate or complement management, directly or indirectly contributing to the reduction of GHG emission.

The initiatives related to transportation, especially important in the context of complex (r)urban systems, include carpooling/rideshare networks and freight transport, potentially rationalizing transport costs, lowering fuel usage, decreasing traffic volume and congestion. A good example of this practice is a web-service 'RoadSharing.com', which emphasises its cross-European, environmental, economic and social dimensions. It enables travellers to arrange share rides for free, while saving money, polluting less and socializing. Similar services could be found on regional and national level, mirroring the increased interest in this model of time/resource management (e.g. 'timskavoznja.com' - focused mostly on countries of ex-Yugoslavia). Simultaneously, there are networks aiming for the rationalisation of freight/cargo transport (e.g. 'Cargo Shipping Networks' or 'Fixemer portal').

The imperative of energy efficiency could be found in many projects focused on smart grid concept (for ex. the case of 'Model City Mannheim'), which connects different networks, energy companies, producers and every household in order to improve the efficiency of energy supply, reduce energy consumption and carbon-footprint (MOMA, 2014). Furthermore, the contemporary society has created several concepts targeting interlinked aspects of production, transport, consumption and waste, comprising problems of carbon emission and energy efficiency while focusing on food. Initiatives such as 'Food miles', consider the environmental impact of food systems, while some (e.g. 'Philadelphia Fair Food Project', 'San Francisco's farmers' markets') stimulate more interaction between urban and rural settlements, local farmers and restaurants, stimulating and developing solar-based and organic agriculture.

Unfortunately, the limited scope of these initiatives still cannot influence a significant environmental impact, but its global popularity might improve the current situation. Meanwhile, the globally accepted trend of urban farming represents another stream of (r)urban activation. In all these cases the role of information networks is significant - either in the form of digital gateways or as a mean of real-time diffusion.

CONCLUSIONS

The latest technological trends of Open Network Environment, Internet of Things (IoT) or Cloud Computing, combined with the Open Data approach, Big Data challenge and environmentally friendly, low/no-carbon concepts, have generated a number of innovative solutions for sensing the actual condition and environmental changes. Connecting the different realms and users, while merging the knowledge and needs of the contemporary society, they facilitate intensified flows of valuable data which are analysed and processed in order to guide our behaviour, actions and decisions toward climate mitigation and adaptation. The integral approach to urban and rural development, frequently emphasized as a preferred option for the climate-friendly future, represents a multi-disciplinary reaction to growing environmental concerns. Based on material and digital information networks, the concepts and tools created within this framework directly influence emerging visions.

Adapting to changing climate, mitigating negative effects and breeding highly wired and eco-conscious generations might indeed have a positive effect on our environment. However, the global attention still has to reach its peak finally

enabling humanity to erase a boundary between intellectualization and action. Multiplying the points of information access and upgrading their performances, while simultaneously extending their reach and real impact, is certainly a next challenge for developing built environment and its digital alter-ego. Therefore, the options analysed in this article - due to their high accessibility, development flexibility and usability - should be considered as a starting point for a further integration of available approaches and tools into new strategies of climate-responsible (r)urban development.

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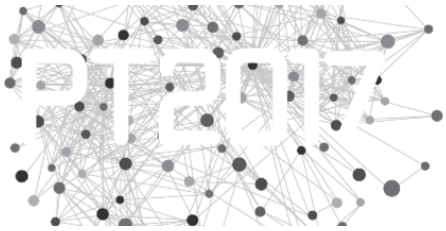

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