Introduction to Panel 5
A smart new start for sustainable communities

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Introduction

55 % of the world's and 74 % of Europe's population live in urban areas and by 2050 the numbers are expected to increase to 68 % and 84 %, respectively. The last few years (and especially 2020) have shown us that the way we live in cities will change in the future. For this reason, a new start to the creation of sustainable cities and communities is a great opportunity.

SUSTAINABLE URBAN COMMUNITIES

Cities generate great opportunities for simultaneous environmentally and social sustainable development and economic development, employment and wealth generation. However, in order to reach this the risks and the conflicts of interests in exponential growth haves to be handled very carefully. Although cities worldwide only occupy 2 % of the land area, they consume 75 % of global energy and generate 80 % of the greenhouse gas emissions. Thus, sustainable development of urban areas and multidisciplinary planning is a challenge of key importance.

In order to be able to manage urban areas in a sustainable manner, the local governments in partnerships with the local business life and civil society, the citizens and all the relevant stakeholders need to work more closely together on making cities smarter. Also important is the planning of cities, as this decides today how we want to live in cities in the future. In this context, new innovative systems can be used to enhance the typical provider-consumer model, leading to the higher energy consumption awareness on both sides, with consumers being able to assist the energy service providers in their processes of integration of renewable generation.

Smart urban technologies can provide an important contribution to the sustainable development of cities, with Information and Communication Technologies (ICT) offering new interdisciplinary opportunities to improve services while reducing energy consumption and emissions. ICT is also a key for implementing new roles along the energy value chain, where traditional business models are rapidly becoming outdated, with more demanding consumers and sustainability policies. However, it is of utmost importance to design the smart solutions, so their added value exceeds the resources necessary for implementing the measure. Sustainable is always smart, but smart is not necessarily sustainable.

Panel 5 reflects the whole range of sustainable urban issues: we are having an eye on goals and pathways in general as well as on new planning approaches and methods to achieve those, we reflect the role of municipalities in this transition, bring the role of the building sector in centre of the discussion and examine the human factor in terms of behaviour as a crucial factor for a successful transition towards sustainable cities.

Goals and Pathways for Sustainable Cities

Zulliger et al (extended abstract 5-187-21) raise *the* three questions every city has to answer on its transition pathway towards a fully renewable energy provision: **How** much will it cost? **Who** is of need to get the process started and make it successful? And **how** to align with municipal development needs and goals? Regarding a sustainable solution they also consider the necessity to base all this on local energy resources. In order also to answer all these questions they introduce their participatory multi-step-tool enabling urban stakeholders to close the gap between common goals and common action.

Constabile (extended abstract 5-079-21) addresses the energy transition needs in order to reduce our cities' carbon footprints. She introduces us to the results of a 2021 survey of cities of the global north and south, raising questions on achieved carbon reduction progresses, has a view on the role(s) of city officials and gives in inside in the challenges, options and chances the Covid-pandemic brought to cities in this context. A special view lays on the changes which happened due and starting during the Covid-19 pandemic.

Brunzema et al (peer-reviewed paper 5-188-21) bring in the perspective of social innovations in the energy sector and introduces the initial results of a study examining the role of policy networks, their key players and their influence on social innovations in the field. They explain the imbalance (and the way out!) between the motivation of key players interacting on a basis of power and trust – which hampers social innovations in the field, which in turn could enhance the system's efficiency considerably.

Amon et al (extended abstract 5-082-21) introduce a best practice project of "Village Homes" in Davis, California, which was able to realize the implementation of a "living Water–Energy-Nexus". The lessons learnt from a several year experience offers insights how design and the adoption of smart green-codes and standards in planning can pave the way towards more sustainable urban communities – from a technical as well as from a participatory view.

The Role of Municipalities as Pathmakers to Sustainability

Cities and municipalities take on the role of pathmaker to a sustainable society, most of all governments. Hansen et al (peer-reviewed paper 5-073-21) investigate concrete concepts for smart energy communities within real case studies in Europe. For example, we should have a clear look at the specific meaning of the terms "smart" and "communities", as these can be interpreted in different ways. Similarly, there is also an interpretation difference between the terms "smart" and "intelligent". It is important, however, that cities and municipalities use 'smart' to facilitate effective steps towards sustainable action. Hampton et al (peer-reviewed paper 5-096-21) work on the realisation of a zero carbon future of the region of Oxfordshire. He developed various scenarios ranging from BAU, over a social and technological transformation to a path in which Oxfordshire is at the forefront. There is a big difference in approach between the rural areas, where there are opportunities for wind turbines and biomass, and the urbanized areas with options for solar panels, flexibility measures and shared electric vehicles. Sciullo et al (peer-reviewed paper 5-112-21) examine the readiness of the country of Italy for the development of energy communities. The European directive has laid down the guidelines for this. He sees a development that will require a great deal of voluntarism from citizens within energy cooperatives in collaboration with the authorities of the cities and municipalities. Alsheimer et al (peer-reviewed paper 5-118-21) discuss its role as pathmaker for a sustainable future. Are they leaders or followers? The author believe that they should in any case be pioneers and that they evolve into a role as local businesses and develop this together with citizens.

What is the Contribution of Buildings for Sustainable Cities?

To achieve the goal of sustainable cities, the building stock plays a major role. Buildings must be renovated to reduce energy demand and renewable energies must be expanded to supply the remaining energy demand. With this in mind, we have papers dealing with the question of how to increase the renovation rate and the potential for integrating solar energy into the building stock. Pardalis et al (peer-reviewed paper 5-110-21) evaluate public-driven and private-driven delivery mechanisms of One-Stop-Shops to increase the rate of residential building renovations. They identify repetitive patterns, commonalities, and differences between them. They show that the examined OSSs are still in a developing stage, struggling to achieve enough scale, which indicates the need to lower their costs, reorganize their models and streamline the value chain to become attractive to their targeted customer segments. Sula et al (peer-reviewed paper 5-184-21) identify the challenges of scaling up retrofitting initiatives from a single-building approach to stock-based analysis based on a literature review. They discuss the literature from three main aspects, motivation to initiate large-scale renovation initiatives and drivers & barriers influencing the entire renovation process in the context of the EU environment. They note that the district scale is a much more complex model compared to individual buildings, but unlike individual buildings, it also has many advantages. For example, the range of renewable energy technologies, financial feasibility, and smart and innovative planning tools. Away from building renovation, Ürge-Vorsatz et al (extended abstract 5-204-21) look at the potential for building-integrated solar energy. They analyze regions where net zero energy buildings are feasible. The results show that a significant fraction of the total energy demand could potentially be satisfied by buildings as energy suppliers. But the feasibility of a climate neutral building stock highly depends on the overall building energy demand and efficiency.

New Planning and Evaluation Methods for Sustainable Cities

A holistic view is crucial in urban planning, so that all aspects are taken into consideration and the correct balance between all of the integrated features is achieved. Vlassopoulou & Persson (peer-reviewed paper 5-063-21) deal with the concept of garden cities in the urban scale. They conduct a life cycle assessment comparison of the carbon footprint between two imaginary urban-form configurations: a contemporary garden city and a dense compact city. Furthermore, the paper proposes a city planning configuration where an interchange between high density city centres and adequately dense garden cities is applied. Bagheri & Dütschke (extended abstract 5-176-21) also deal with the concept of garden cities. Acknowledging the relationship between the environmental and social sustainability aspects, this paper takes the garden city as an example to develop the indicators of a sustainable community. The review has identified around 15 definitions and 30 assessment methods for social sustainability, and analyzed around 50 indicator sets proposed in different studies.

In addition to planning, evaluation and visualization methods also play an important role in cities to achieve their goals.

Community engagement in the planning and delivery of smart local energy initiatives is essential for their long-term success. Gupta et al (peer-reviewed paper 5-133-21) describe the development and trial of an online and interactive smart local area energy mapping tool for planning smart local energy neighbourhoods. Participatory mapping was found to enrich the tool and engage communities to provide local data through online surveys and highlight any discrepancies in the public and private data through local data interpretation.

Local Energy Systems and the Influence of our Behaviour

Local energy systems have been rolled out by local grid operators. These ensure that supply and demand are matched. An important factor in this is the behavior of citizens and how the energy system responds to this. Shaviv et al (extended abstract 5-066-21) look at the current functioning of the energy grids from the local context in Israel. He is investigating a possible task for new stakeholders to realize the energy transition that will evolve towards decentralized and "Smart". Banks & Darby (peer-reviewed paper 5-105-21) from Oxford take it a step further, whereby energy networks must not only be "smart", but also take into account "fair" networks. How can we keep the networks accessible to everyone in a social way and how can we keep the implementation as simple as possible? Sasidharan et al (peer-reviewed paper 5-085-21) give us insight into the functioning of the energy networks in India. The focus is on the role of "Demand Response" for the grid operators. They also provide insight into the difference in interpretation between tariffs and effective network costs. Devendran et al (peer-reviewed paper 5-136-21) conduct research into the influence of land use on surface temperature, with densification and building increasing temperature. This research can be an approach for the city of Växjö, Sweden, and the policy makers for developing policy in the field of spatial planning.