Final Session Program

Conference "Sustainable Urban Energy Systems – Technological prospects, citizen involvement and governance arrangements" TU Delft (8/9 November 2018)

Session Title: The food, energy, water (FEW) nexus in urban areas – infrastructural and institutional challenges

Session Organizers: Carolin Märker, Holger Schlör, Forschungszentrum Jülich, 52428 Jülich, Germany, c.maerker@fz-juelich.de

Special Session: Friday, 9 November, 13:45h – 15.15h, Chair: Carolin Märker & Holger Schlör

Session Abstract:

Global challenges, such as climate change, population growth and resource shortages, increasingly touch upon basic human needs: the availability of adequate food, safe and sufficient fresh water, and affordable and clean energy. These dynamics become especially pressing in urban areas, where the population density concentrates the pressures as if in a 'burning glass'. In order to achieve a secure and sustainable provision of these resources and to avoid trade-offs, the food-energy-water (FEW-) nexus has been introduced as a concept to account for interlinkages and synergies.

Currently a wide range of different authorities are endowed with sectoral mandates that often neglect interconnections among the FEW resources. By involving various public, private as well as non-state actors and institutions the decision-making landscape in urban resource management is highly fragmented and complex. Especially in highly industrialized economies, the resource infrastructure is embedded in a mass network of further critical infrastructures (e.g. information and communication infrastructures) that is vulnerable to technogenic (e.g. power blackouts), natural (e.g. hurricanes, floods) or intentional (e.g. terrorism) disruptions. Hence, resilient urban infrastructures and institutions constitute an important precondition not only for the sustainable management of but also for socially equitable access to the FEW resources. To balance trade-offs and maximize synergies, significant transitions in urban governance structures will become necessary. Therefore, feedbacks and interlinkages within the urban FEW systems need to be fully understood.

Given this complexity and the diverse challenges, this session will both focus on (a) the dynamics of decision-making in the urban FEW-nexus including questions about the role of actors and institutions, and (b) viable data- and model-driven methodical approaches for the integrated assessment of socio-ecological urban FEW-nexus systems.

Keywords: FEW-nexus, urban nexus, integrated governance, resource management

Schedule:

Time	Speaker	Title
13.45 – 13.55	Carolin Märker, Holger Schlör	Introduction
13.55 – 14.15	Carolin Märker	Governance of the FEW nexus – Insights from current German resource management
14.15 – 14.35	Fabian Heitmann	Unfolding multi-level complexity in strategies for sustainable development – Connecting requirements of urban and national decision-making plans – A case study in Germany
14.35 – 14.55	Daphne Keilmann-Gondhalekar	NEXUS CITY: Operationalizing the urban Water-Energy-Food Nexus for effective climate change action in Munich, Germany
14.55 – 15.15	Holger Schlör	The meaning of cities – Challenges of the urban age

Speakers' Abstracts:

Governance of the FEW-nexus – Insights from current German resource management

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Increasing impacts of climate change put major pressures on natural resources, not only in developing, but also in industrialized countries. This necessitates a coherent and coordinated way of using critical resources, such as water, land or energy resources. Especially, since their usage is highly interconnected. However, due to a historically grown institutional setting and sectoral mandates natural resource governance is often isolated. On the international level, the SDGs call upon developing as well as industrialized countries to implement a more coherent policy design in order to deal with future challenges. Against this backdrop, this paper analyzes the food-energy-water (FEW) nexus for Germany. In order to assess the current state of the FEW nexus in German policy making a comprehensive qualitative document analysis is conducted. The results not only show differences in the consideration of interconnections between the sectors, but also regarding the importance of the respective sector itself. It becomes apparent that the energy sector receives most of the attention. Furthermore, the analysis shows that the importance of resource interconnections is determined by policy preferences rather than their actual biophysical interrelations. However, most legal documents still follow a sectoral path whereas most of the cross-references can be found in sustainable development strategies and action plans. A clear step in the direction of FEW nexus thinking happened through the revised sustainable development strategy in 2016, which was adopted against the backdrop of the UN SDGs.

Keywords: Germany; Nexus; Resource governance; Document analysis

Unfolding multi-level complexity in strategies for sustainable development – Connecting requirements of urban and national decision-making plans – A case study in Germany

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The German sustainable development strategy "Agenda 2030" is the German masterplan to cope with climate change adaptation, sustainable transformations, as well as many more future questions. Several German cities, such as Berlin and Hamburg, have traditions in designing and implementing their own sustainability agendas. However, strategies from different governance levels – and related measures, decision-making plans and other activities – cannot be implemented separately but depend on each other's success. Consequently, this complex nexus calls for a design of local solutions that fit the requirements of the national strategy and vice versa.
This talk presents the methodology and results of an exploratory case study in Germany which investigates requirements for implementing urban sustainability strategies that are embedded in an overall national strategy. We collected our data by conducting individual interviews with key experts from the energy sector. This included stakeholders from consulting organizations and urban governmental bodies such as senate members and political parties at the urban and national level. We used an advanced participatory modelling approach and merged all interview data in causal loop diagrams. This allowed us to reveal causal relationships among the various requirements and to get a holistic multi-level perspective on the different strategies. We present, how we analyzed the requirements and show how (1) the different strategies relate to each other, (2) how requirements analysis can be used to overcome coordination deficits among decision-makers, and (3) how more effective, realistic and sustainable measures and decision-making plans can be developed in our case.

Keywords: Nexus; Strategy design; Requirements Analysis; Participatory Modelling

NEXUS CITY: Operationalizing the urban Water-Energy-Food Nexus for effective climate change action in Munich, Germany

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With on-going economic growth, demand for natural resources continues to grow worldwide, especially in cities. Over-consumption of water, energy and food in the past decades has dangerously altered the climate. Radical new approaches that serve to close resource loops linked to a paradigm shift need to be implemented by 2030 to avert

disastrous climatic change and realize the SDGs. Integrated urban planning utilizing the Water-Energy-Food (WEF) Nexus approach can help cities exploit potential synergies between climate change mitigation and adaptation approaches to act on climate change more effectively. Urban wastewater recycling, better termed water reclamation and reuse is a key synergy opportunity. In this study, a neighbourhood of the City of Munich, Germany, is taken as a case study. Using the Water-Energy-Food Nexus approach as a model, the study finds that intensive urban agriculture could provide for 66 % of local demand for fruit and 246 % of local demand for vegetables; urban water reclamation and reuse coupled with rainwater harvesting can save 26 % of current freshwater supply; biogas generation from human sewage mixed with organic waste can contribute 20 % of current electricity supply; and the cost of decentralized wastewater management may be lower than the planned renovation of the centralized sewage system. The study advocates more in-depth research in this regard and implementation of pilot projects to study the effectiveness of such an approach that is relevant to cities worldwide.

Keywords: Water-Energy-Food Nexus; Water reclamation with resource recovery; Climate change; Cities; Germany

The meaning of cities – Challenges of the urban age

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The world is moving towards an urban age, especially in developing countries, where most of the industrial growth occurs in urban centers. Urban areas will become the central organization form for nearly all human societies. Their dynamic and intense vitality transforms these areas into centers of prosperity. However, this development also comes with an increasing number of people living in slums. In urban areas, the inequality challenges of the globalized world are concentrated as if in a 'burning glass'. Hence, this paper argues that governance structures are needed that direct urban development, especially with respect to the management of the FEW resources towards resilient urban systems as demanded by the UN Habitat III new urban agenda. To provide the necessary information, a resilient management concept should account for changes in any specific place but should also be able to detect feedback responses elsewhere in the socio-economic-ecological system. The proposed urban management concept delivers such data about urban development. We developed the Nexus City Index (NXIcity) for the resilient management concept to measure the prosperity and sustainability of the FEW nexus of 69 cities and their regions. Measurability of sustainability constitutes the core objective of our assessment approach and the implementation of a sustainable management concept for the FEW nexus sectors

Keywords: Urban areas; Cities; Nexus City Index; Resilience