

SUME – Sustainable Urban Metabolism for Europe

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1 ABSTRACT

Urban development is running environmental risks, consuming huge amounts of resources and putting strains on the environmental system. The FP 7-funded SUME project (Sustainable Urban Metabolism for Europe), is focusing on the way how future urban systems can be designed to be consistently less damaging to the environment than in the present.

The concept of urban metabolism helps to understand and analyze the way how societies – in large parts located in urban areas – use resources, energy and land, all elements of the environmental system, for maintaining and reproducing themselves.

Based on the urban metabolism approach, the flows of resources, energy and waste used to maintain the urban system are being analyzed. The built environment – in a systems logic the stocks of the urban system – is using a substantial portion of flows to be built. Moreover, the spatial qualities of built urban systems, the “urban forms”, have an impact on the qualities and quantities of resources needed to maintain them subsequently.

The SUME project started in November 2008. It will analyse the impacts of existing urban forms on resource use and estimate the future potential to transform urban building and spatial structures in order to significantly reduce resource/energy consumption, thereby taking into account differences in urban development dynamics.

2 THE SUME ANSWERS

The outcome of the SUME project should provide answers to the following central questions:

- What are the most adequate assessment approaches to deal with the territorial dimension of sustainability in collaborative decision-making frameworks?
- How far do different types of urban forms and of growth and decline patterns which can be found in Europe determine sustainable use of material and energy and allow for efficient transport patterns ?
- To what extent can urban planning and demand management incorporate and influence stakeholders' values in order to re-direct current patterns of space consumption and infrastructure utilization towards sustainable development?
- What shall a good practise guide, based on the on urban metabolism approach contain for the assessment of the impacts of various urban forms?

3 PROJECT ORGANISATION

In order to organise the extensive research and development effort, SUME is organised along 7 work packages (WP):

- WP 1 Scenarios of urban development: Dynamics of Urban development in Europe
- WP 2 Urban metabolism and resources
- WP 3 Impact of urban forms and structures on resource use
- WP 4 Transforming urban planning policies and strategies
- WP 5 Synthesis and outlook
- WP 6 Dissemination
- WP 7 Project management

SUME research activities and interfaces of the eight European and one Asian partner are pictured in Figure

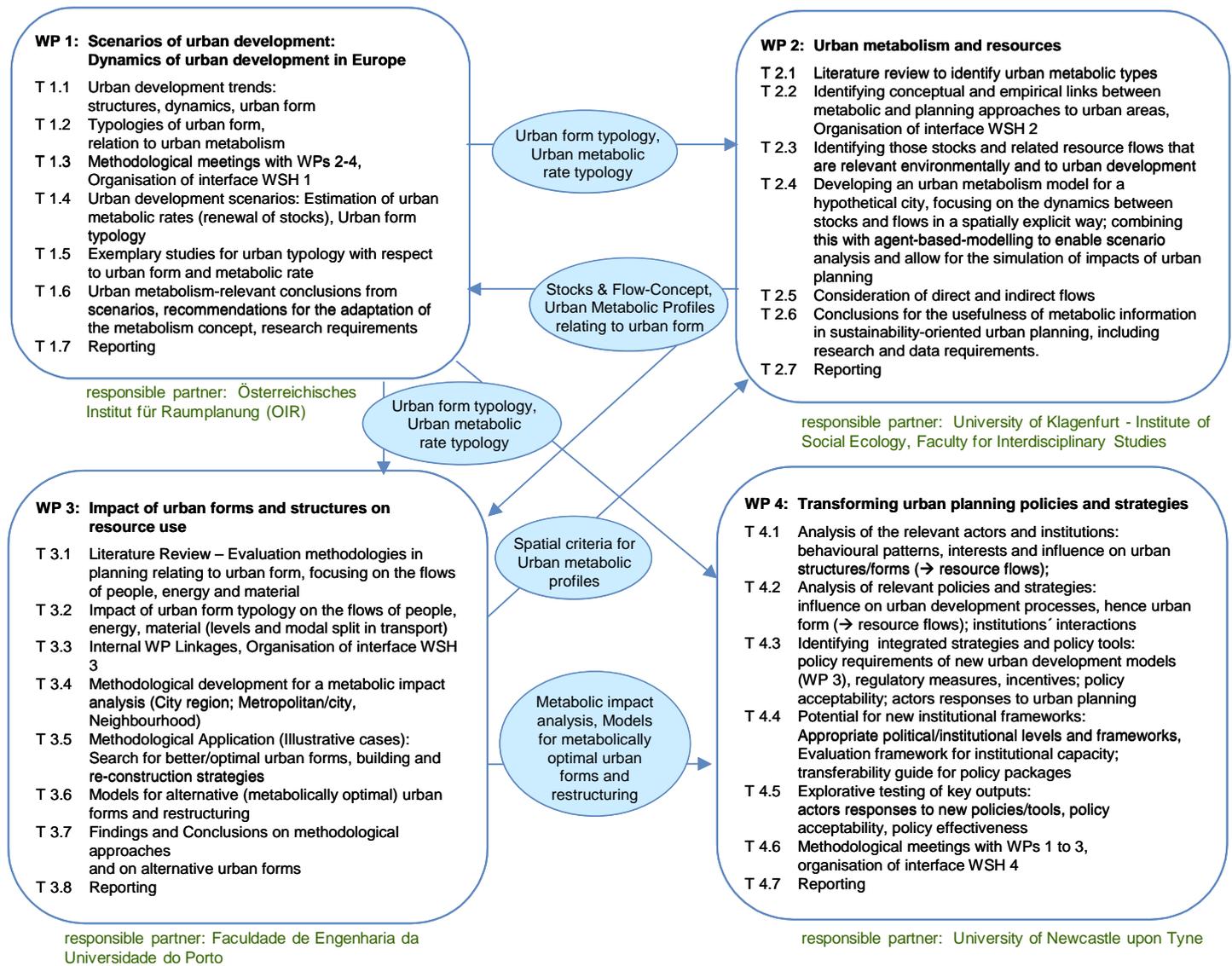


Fig. 1: SUME project structure, tasks and links

4 URBAN DEVELOPMENT AND URBAN METABOLISM

4.1 Future dynamics of urban development (WP 1)

Europe is one of the most urbanised continents in the world, with some 75% of its population living in cities. The continuing expansion of urban areas into surrounding countryside ("urban sprawl"), effected with little planning and driven by market forces, is fast becoming one of the main 'ignored' challenges facing Europe.

Increased consumption of energy, land and soil as well as the need for more transport infrastructure lead to serious environmental problems. Sprawling cities are also a source of increasing greenhouse-gas emissions.

In the first phase of the project, the driving forces behind the trends of future urban development will be analysed, using a typology of urban forms (densities, spatial patterns etc.) and a typology of transformation patterns (fast or slow growth, expansion or inner-city development etc.). The understanding of the variety of urban development is essential as a systematic background in which urban metabolic modeling and the design of alternative urban development strategies will be applied in the future. It will be important to know, what type of urban development is of great (quantitative) relevance among European urban areas, and also which of the suggested development strategies is appropriate in which kind of urban development pattern. This shall be analyzed by developing a number of mid- to long-range scenarios for selected European urban regions which will allow to quantitatively estimate the potential to restructure existing urban forms.

4.2 Modeling urban metabolism (WP 2)

Decisions made in urban planning have an important impact on the sustainability of Europe's cities. A dynamic, spatially explicit model of urban metabolism – which will be developed within SUME – can enable planners and other relevant actors to approximate how changes in urban structure will effect future material and energy flows, both qualitatively and quantitatively. Thus, it would constitute a useful basis for decision-making.

The present day form and structure of most major European cities is not the result of continuous planning efforts but rather of incremental and often unchecked development processes. The proposed urban metabolism model can take this particular situation into account by allowing for the assessment not only of material and energy flows but also of stocks and their specific contribution to the urban area's metabolic throughput across scales of space and time. Based on this knowledge of environmental impacts, future planning and restructuring of elements within a city can be more precisely targeted at increasing sustainability.

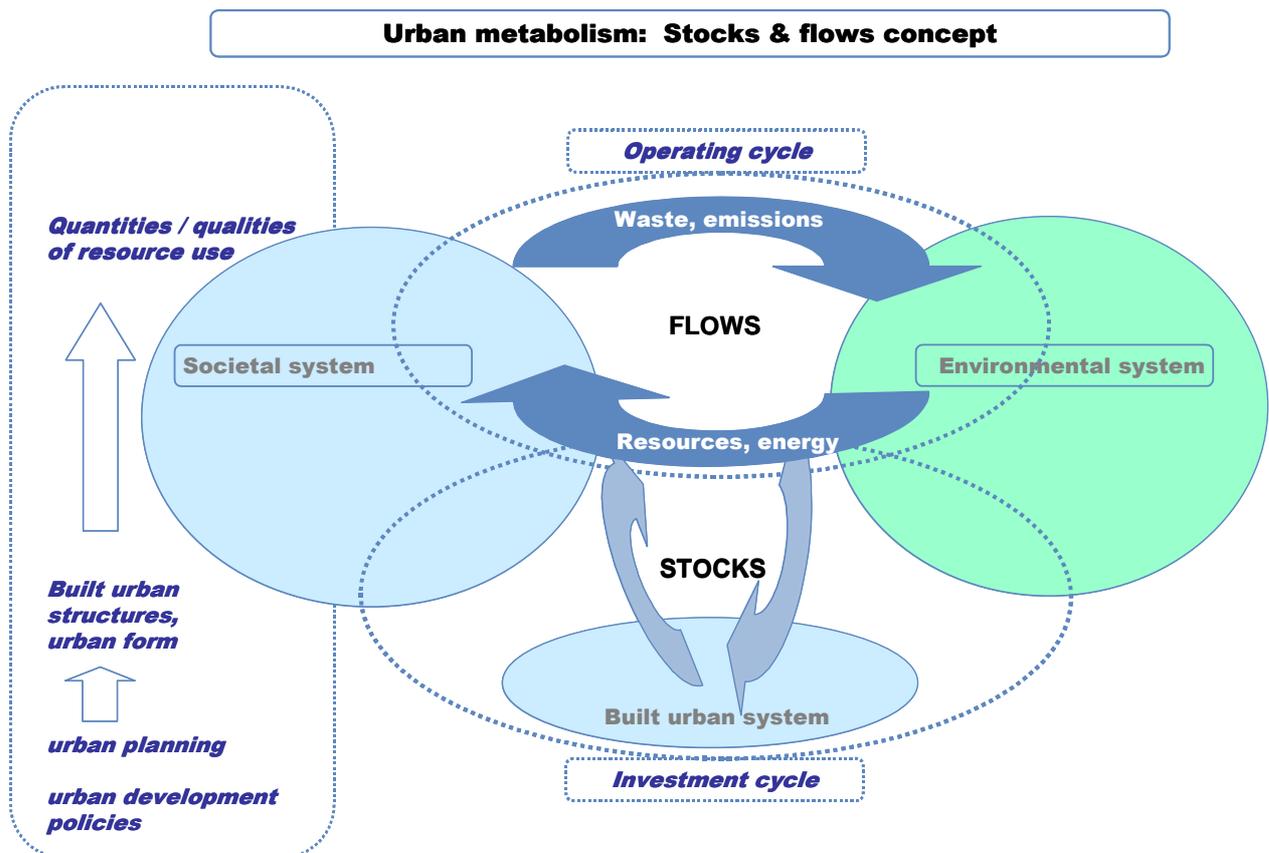


Fig. 2: Stocks and flows concept within the SUME project

However, urban planning for sustainability is clearly not as straightforward as simply making decisions that might lead to the reduction of material and energy throughput. Instead, urban planners and other relevant actors face a number of explicit and implicit constraints under which they must make their decisions. The proposed urban metabolism model proposes to integrate these circumstances into the analyses of possible trajectories of urban development by combining the accounting of stocks and flows with an agent-based approach.

In order to develop a model that could thus positively support decision-making in urban planning, it is necessary to pull together what currently seem to be the loose ends in urban metabolism research into a joint European fabric: On the one hand, we can build upon the research on urban metabolism that has been done to date and make use of the associated empirical findings. On the other hand, making urban metabolism assessment into a powerful decision-making tool requires strong cooperation between the urban planning and the social metabolism communities.

4.3 Impact of (future) urban forms and structures on use of resources and energy (WP 3)

SUME will provide an overview of the situation of urban growth at the European scale (in WP 1), as well as at a more local scale, that of cities and neighbourhoods in WP 3. The research will use the background of a global perspective in which we will look at the different trends and drivers across Europe and include a number of case studies which are intended to provide a validation bed for the different research experiments being undertaken.

Looking at the European territory, the wide variety of urban growth patterns not only across vast European Regions, but also across urban and metropolitan areas within the same region is evident. Is this territory a unified one with a prevalent culture or are we in the presence of an embedded multiculturalism with specific and diversified spatial representations? Despite all the recent demographic trends and migration flows, within an increasingly globalized world, Europe still maintains its own cultural identity. And yet, it is an identity made of diversities. In this context - is it possible to search for a European path to sustainable urban growth and rural enhancement?

4.4 Transforming urban planning policies and strategies towards sustainable metabolisms (WP 4)

The aim of this research effort is to develop new strategies, policy tools and a transferability guide for achieving sustainable urban settlement structures. The outputs will be communicated with and of direct benefit to key actors in urban development processes particularly urban planners and policy makers. In this respect, the research helps facilitate the decoupling of the demand for accommodating urban growth from the excessive consumption of finite resources including land. Its focus on application and knowledge transfer fills a major gap between knowledge and action and between policy and implementation. This is particularly important with regard to the implementation of the EU Directives on environment as well as the Thematic Strategies on Urban Environment; Sustainable Use of Natural Resources; Prevention and Recycling of Waste and Soil Protection. Its key deliverables, which consist of new strategies, policy tools and the transferability guide, will provide practical mechanisms for implementing the policy frameworks which have been developed by the Thematic Strategies “to reduce the environmental impacts of resource use in a growing economy” (CEC, 2005). The aim is to identify the ways in which “more value – less impact – better alternatives” can be truly achieved in urban development processes. What are the appropriate institutional frameworks; what combinations of policy packages are most effective; what is the right balance between regulatory measures (sticks) and positive incentives (carrots) for motivating sustainable behaviour in the use of resources? While there are several examples of attempts being made for addressing these questions, their transferability and acceptability has remained a major challenge. Hence, the outputs from this work package are aimed at developing not only new strategies and policy tools, but also guidelines on the whether and how such tools can be transferred from one place to another in Europe and beyond.

4.5 What will be different after the SUME project?

The approach of the SUME project overall is designed

- to raise the level of understanding about the interrelationship between the spatial forms of urban built structures (“urban forms”) and the levels of resources and energy being used to maintain these existing urban systems (at given levels of economic performance and consumption patterns)
- to set these currently existing spatial structures in a comparative perspective (defining types of urban forms) and in a dynamic, temporal perspective (types of urban restructuring and growth/decline)
- to develop a spatially explicit, agent-based urban metabolism model, which can be used to estimate the influence of various urban forms and urban development strategies on the quantity levels and the qualities of resources being used in maintaining the modeled urban system
- to estimate, model based, various strategies of transforming the existing urban systems into future, metabolically better forms (by investing in built structures), and setting this transformation effort into relation to the resources saved in the operational phase after the investment phase

- to develop application-oriented impact assessment methods for urban forms and also alternative models of future urban forms, which can be used by urban planners and policy makers to adapt their existing development models to metabolically improved forms
- to evaluate and adapt current urban development strategies and actors' behavior and to find alternative development strategies, thereby taking into account the incentive structures guiding individual actors' behavior

and, finally

- to evaluate the state of the art research in the fields of urban metabolism, urban development and planning and policy analysis with respect to resource use, energy and land consumption and to suggest a number of advancements and further enquiries for future research.

One of the potentially most fruitful impacts is the improved communication between until now rarely linked research communities -- if the suggested, innovative approach is producing new and applicable results as envisioned here, a strong impulse for future research and development activities across these communities' boundaries will be given.

The communication of the suggested approach and of the results produced to policy makers, stakeholders, urban planners, social networks will be an important impulse for deriving results of high quality and also will improve the tools to be used for future dissemination to a wider public.

5 THE SUME PROJECT AT A GLANCE

Title: Sustainable Urban Metabolism for Europe

Acronym: SUME

EU-funding: Seventh Research Framework Programme – CP FP7 (Collaborative Research Project, Area 6.2.1.5 Urban development, ENV.2007.2.1.5.1 Urban metabolism and resource optimisation)

Total Cost: 3,629,965.00 €

EC Contribution: 2,867,250.00 €

Duration: 36 months

Start Date: 01/11/2008

Consortium: 9 partners from 8 countries and 2 continents (Europe and Asia)

Project website: www.sume.at

Project Coordinator: ÖIR – Austrian Institute for Regional Studies and Spatial Planning (Vienna, Austria)

Key words: urban planning, urban form, metabolism, built environment, energy / material consumption

6 REFERENCES

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