Focus on CSIR Built Environment Key Projects

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Urban Dynamics Laboratory: Enhanced service delivery in urban areas

Enhanced service delivery has been identified as a key requirement to enable government to meet its core social and economic objectives of halving the country's rates of poverty and unemployment by 2014. The Urban Dynamics Laboratory (UDL), an ambitious, multi-year research initiative by the CSIR, is set to provide support for this process by working towards an improved understanding of the dynamics of urban and regional social-ecological systems.

The CSIR will be contributing R9 million towards the programme, over a period of three years, while collaborative research partners, such as the Department of Science and Technology, are expected to invest up to R8 million over the same period.

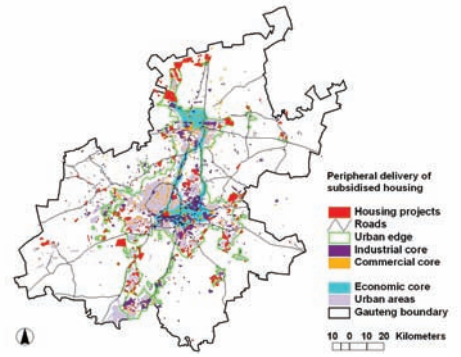
Cities, as the engines of national growth, competitiveness and global connectivity, face many complex issues, including competing in the global economy, providing and maintaining high-quality services to millions of people amidst huge urban poverty, high levels of crime and enormous levels of environmental degradation. It is estimated that by 2030, 54 % of the population in Africa will be living in cities; urbanisation on the continent is currently growing at 4 %, twice as high as that in Asia and Latin America. In the top 21 urban economies in South Africa, 5,8 million people are living below the minimum living level.

Recent evaluations of national planning products and processes have identified a number of difficulties relating to trade-offs and prioritisation on the basis of credible, accessible and comparable information.

A key element in improved spatial planning is a thorough understanding of development dynamics. Demographic patterns (particularly migration and household), as well as the social, economic and spatial dynamics of these settlements, have generally been lacking in current planning initiatives. A lack of understanding of these aspects could mean that the type of infrastructure and services provided is not necessarily appropriate to the local situation. In addition, planning for infrastructure has generally been poorly integrated into spatial plans.

One of the most difficult aspects of urban research is to find appropriate experimental space within which to test theories. Developments in geomatics and 3-D computer-based modelling and simulation with intelligent properties that can be linked to real-time data, as well as agent behaviour patterns based on data captured through traditional sociological observation methodologies, are now enabling the development of such experimental space.

The overall objective of the new laboratory is to bring together a trans-disciplinary, cross-institutional team and a package of tools and methodologies



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in a numerical modelling and simulation capability that looks at cities, regions and their their development trajectories as complex, adaptive social-ecological systems.

The laboratory is envisaged as a workbench to support research that will lead to a better understanding of the dynamics of urban and regional social-ecological systems in order to:

- assess the possible impacts of existing and emergent 'drivers' such as changing demographic patterns, crime, insecurity, increasing ambient intelligence, resource consumption or climate change, on the resilience of the system;
- model various types of value chains and flows (including flows of ecosystem services), and how people or human activity/ livelihood systems compete to control these;
- map the flows and balances of resources in the system to understand how changes in the system or different developmental pathways will affect these flows, and what the affect of these changes in flow will be on the system. Being able to map these will help decision-makers to choose the optimum development pathway;
- identify those points in the system where a small change or action can cause the system to undergo major changes, even jumping to a different state. Knowing where these points are and how to best leverage them, can prevent decisions that would lead to eventual systems collapse, or be used to kick-start positive system change at a place where the multiplier effect of feedback loops will provide the most momentum.

The facility will be used both as a vehicle for developing, refining and validating numerical models and software, and as a practical workbench that can be used for a wide range of research applications, from testing theories developed in urban sustainability science, to providing science-based decision support in urban planning and design to all tiers of government. It will include a range of data sets, tools for modelling and simulation of systems interactions and spatial changes, and the necessary hardware to support these tools.

While a lot of work has been done on modelling land-use, transportation and environmental change, relatively few institutions have attempted to model social and ecological systems (with temporal and spatial dimensions) while at the same time grounding the work in whole-systems thinking, complexity theory and sustainability science.

Key outcomes envisaged for the research programme include:

- advanced strategic spatial planning systems, methodologies and frameworks with a specific focus on support for infrastructure investment decisions; and
- information and data on spatial forms and arrangements that are more conducive to the achievement of objectives regarding democratic nation-building, and social and economic inclusion.

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