

## **Achieving Sustainable Urban Form for Rapidly Growing Cities: An Intelligent Systems Approach in**

With more than half of the world's population now living in urban areas, achieving sustainable urban development is essential for global sustainability. The physical form of cities has been shown to have a significant impact on urban sustainability. Achieving sustainable urban development in rapidly growing countries like India and China will be critical in global efforts to achieve sustainability and combat climate change. Much of the evidence upon which existing theories and best practices for sustainable urban development and sustainable urban form are based is from the developed countries. Findings from such research are often not easily transferable as the challenges of urbanisation in developing countries are different.

It is generally agreed that to achieve urban sustainability, cities need to be economically viable, environmentally sustainable, liveable, socially vibrant, and should have institutional frameworks in place to deliver social equity, long-term vision and viable services. However, the debates on urban sustainability over the last two decades have been particularly focused on environmental and economic issues, largely ignoring the role of social aspects in achieving urban sustainability. As a result many of the proposed technical and urban planning concepts are not viable solutions. There is a need to approach the problem in a more integrated way. However, one of the biggest challenges to achieving this is the lack of tools and methods to permit such an integrated approach.

Therefore the aim of this project is: 1) to develop an intelligent systems-based analytical model to investigate the complex relationships of urban systems; 2) to use this new method to investigate the most sustainable urban forms for the rapidly growing cities in India; and, 3) to build a planning decision making system that is based on Intelligent System.

The research will focus on Indian cities because of their increasing global impact due to the growing urban population size of India. Furthermore, the variety and diversity of social, cultural, climatic and governance contexts in India offer a base to develop and test the IS based model and the it allow the project to make effective use of the existing research network, CityForm-India, to better develop the evidence base. Ten rapidly growing cities in the North, South, East West and Central regions of India, which each have over a million residents, will be selected for the study.

The research will draw on existing data sources and new empirical evidence to establish micro and macro scale data on social, environmental, economic and institutional and spatial aspects of the city. Intelligent systems (ISs)-based algorithms will be used use to perform data mining of large complex datasets of micro- and macro-scale data. For example combining Artificial Neural Networks; Fuzzy Logic and Evolutionary Algorithms will be used to develop what is referred to here as the Intelligent Nero-Fuzzy Urban System Model. This theoretical system model will then be 'trained' to self generate rules and quantify the nature of relationships between parameters within the datasets. By characterising the modelling and experimental data and by using data mining algorithms focusing on ISs it should be possible to extract meaningful conclusions and hence make it possible to create practical design guides and planning strategies for developing sustainable urban pathways. The technique will use a large number of simulations concerning each different parameter set (e.g. social, environmental, economic) in this process.

### **PhD follow on project**

This project is highly suitable for development into a PhD project depending on the interests and

aptitude of the student.