

## **Brief note about issues for the UGEC Land use forecasting workshop**

Richard Dawson, Newcastle University & Tyndall Centre for Climate Change Research

### **1. What are the key urban remote sensing/urban modeling and forecasting issues that you represent?**

I am particularly interested in simulating the main processes of long term change at the scale of whole cities. Recent work has seen the development of an 'Urban Integrated Assessment Framework' (UIAF) that couples a series of simulation modules within a scenario and policy analysis framework. The UIAF is driven by global and national scenarios of climate and socio-economic change, which feed into models of the regional economy and land use change. Simulations of climate, land use and socio-economic change inform analysis of carbon dioxide emissions (focussing upon energy, personal transport and freight transport) and the impacts of climate change (focussing on heat waves, droughts and floods). The final component enables a number of adaptation and mitigation options to be explored within a common framework.

This modelling has used a substantial amount of remotely sensed data to identify infrastructure networks (e.g. transport links from mapping data), building heights (e.g. for estimating solar exposure), ground elevation (for flood modelling) and multi-spectral imaging to identify landuses and analyse the urban heat island.

### **2. What are the key challenges, missing opportunities, and exciting developments in your theme and region?**

The main focus of this activity has been London (UK), although we have undertaken limited aspects of the analysis in Manchester and Newcastle (a new initiative should see the Newcastle case study grow substantially in the coming year or so). I have the data in place to do some interesting work in Durban (South Africa) but currently we have not had a person/time to do this work.

The UIAF work is currently evolving to look more broadly at disruptions to the economy and resource flows such as materials, water, energy.

### **3. Why are we not seeing more studies on smaller urban areas?**

A number of possible reasons:

- There is a certain kudos of operating in big, well known, cities
- Large cities often pose larger and more diverse sustainability challenges
- Smaller cities often have less capacity to analyse the problem themselves, contribute to research projects with data and/or provide stakeholder input
- Local priorities are often different in smaller cities, and regional interactions can be key - so a multi-small city approach may be necessary

### **4. What platform/data/access limitations do you currently/frequently encounter?**

The main limitation is the spatial resolution and frequency of data points. A particular issue is a lack of data on the interdependencies between sectors. Any information on informal settlements and processes is limited at best.

Another issue of data access for me relates to data owned or acquired by commercial organizations. A large amount of mapping data has been purchased collectively by UK universities so is readily accessible. However, getting data owned by utilities and some other commercial organizations can be a problem.

### **5. How do these limitations affect our ability to monitor, model and forecast urban areas?**

Cities are complex systems, with flexible boundaries in time and space, operating at many levels simultaneously, so studies involving single sectors (water, transport, economics) over relatively short timescales, or focusing on a single spatial scale, cannot capture their interdependencies and dynamics. Yet most urban land use models replicate at best a handful of processes. Transport is usually addressed, but there's much more that determines location preferences, and of course legacy of development and the inertia associated with change.

Without data at a high spatial and temporal resolution, and in particular capturing the interdependencies across processes, we are unlikely to get a real understanding of the dynamics and emergence of phenomena.

#### **6. What do you see as missing in terms of case studies and methods?**

A few developments that I think would be useful:

Our case studies and methods need to take a long term, multi-scale, multi-sector view. As a community, we need to construct and share our case studies in a more intelligent manner to try and build up a broader understanding of issues as well as a repository of case study sites. Perhaps we could even create an international synthetic example 'AnyCity', which has features that might be expected in many cities, that might be used as an international benchmarking tool.

We need to make a much more concerted effort to map the relationships between different drivers, processes and responses and then start to quantify these interdependencies.

We need to understand the value of information sources, in terms of their ability to reduce uncertainties and help us make more informed planning decisions.

We need to couple developments in urban modelling with tools to improve our capacity to make long term planning decisions under conditions of intensifying global change and high levels of uncertainty.