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

My work has been in the domain of spatially explicit socioeconomic models of urban growth (haven't done much in modeling decline — which, as I will note later, is a major challenge). I use mostly econometric tools based on random utility theory to derive these models (most celebrated in this genre is UrbanSim). I also use a hybrid version of system dynamics with cellular automata to make my models dynamic. My research focus, however, is to apply urban modeling techniques for examining the sustainability aspects of the future scenarios presented. These future scenarios often include issues surrounding water availability, air quality, heat islands, sprawl / compactness, and carbon footprints. The goal of the exercise is to reflect upon the planning options to steer growth towards the more benign scenarios rather than towards the disastrous ones.

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

The key challenges in my domain of urban modeling is the lack of robust theory of socioeconomic processes outside of the fairly limited view of social behavior offered by economists. Another challenge is the extreme complexity that urban areas present in terms of processes that intersect human, social, ecological and natural systems. We have developed our understanding of these processes in different domains using different methodological approaches. Therefore, coupling the systems offer enormous methodological and conceptual challenge. Although we are now trying to develop broader teams to coalesce our resources, our training has been within the silos of our disciplines. We struggle to find the common vocabulary and methodological synergies. Hence one missed opportunity has been in figuring out how to train the next generation of researchers to work across disciplinary borders. Also, as mentioned earlier, few existing models can either account for decline or redevelopment. One exciting and hopeful development in this area has been the growing adoption of urban models as a critical component of metropolitan planning. Many, if not most metropolitan planning organizations have now implemented some flavor of urban modeling for “official” predictions of future developments. Their efforts are triggering rapid development of many applied models of urban growth.

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

Smaller urban areas are typically less complex and have fewer resources. Large scale urban models are probably an overkill in some of these smaller areas. However, “small” is relative since a small city in China or India would be quite large in U.S. context. These are the cities that are expected to grow most rapidly in the developing world and require the most attention.

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

Disaggregated data required for agent-based models is unavailable in the most part. Households by type and location, jobs by type and location need to be estimated or surveyed. Disaggregation also introduces significant errors in the data. The propagation of errors is poorly understood. Especially for long term projections, error propagation is a big issue. There are few approaches to determine how good the model is performing and how to account for uncertainty.

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

The limitations noted above make model development a very slow process often relying on the experience of the developer to determine the validity of the output. In this respect, urban modeling is also a craft that is honed over many years through contextual knowledge and superior intuition. This makes objective evaluation problematic. The trust in the output of these models is based on the trust in the developer. More measures to determine uncertainty and likelihood of scenarios are sorely needed.

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

There are very few case studies dealing with cities in developing countries. These studies pose a particular challenge given that much of the development is informal in nature. We need better models/theories of informal settlement growth. Also, as mentioned earlier, we need measures to assess the likelihood and uncertainty of scenarios generated by urban models.