The GLOBE Project: accelerating global synthesis of local studies in land change science

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Global understanding of land change processes requires synthesis of observations and models across local and regional scales. The GLOBE project, newly funded by a grant from the US National Science Foundation, is working closely with the GLP and others to build an online scientific collaboration environment designed to enhance and accelerate the process of cross-scale collaboration and global knowledge synthesis from local and regional studies of land change.

Global understanding of local and regional land change processes is essential to global change science and Earth stewardship. While remote sensing and global climate modeling have revolutionized our ability to observe and model the global patterns and dynamics of biophysical systems, the human systems that cause land change are not directly observable from space nor can they be modeled successfully at global scales without understanding how they function locally and regionally and are built from multidisciplinary case study observations and models made at local and regional scales (Turner II et al. 2007).

Land change scientists have made great progress in generating global knowledge from local and regional case studies by acquiring and combining sets of published studies using a variety of methods that have become increasingly quantitative and powerful (e.g. Rudel 2008, van Vliet et al. 2012). Yet these studies still suffer from serious not quantified geographical biases in the study site selection process ("interesting locales", logistical concerns) and in the availability of case study results (languages, publication access, social networks, etc.). Researchers conducting global and regional meta-studies must also overcome major logistical and technical challenges in collecting and integrating large sets of studies for meta-analysis and other methods to produce quantitative global estimates (Rudel 2008, Ellis et al. 2009, van Vliet et al. 2012). As a result, global collaborative studies of local and regional land change processes remain all too rare and offer much room for improvement.

To address this situation, the GLOBE project is now working together with the GLP and others in the land change science (LCS) community to develop and implement an online social-computational system designed to enhance and accelerate the processes of cross-scale collaboration, data sharing and global knowledge synthesis from local and regional case study observations, models and expertise.

The idea for GLOBE emerged at a GLP-endorsed global land use workshop in Vienna, Austria in May, 2008, from discussions on the need to better link the efforts of local, regional, and global land change researchers. The central idea was to create an online community for sharing and synthesizing case studies built around a "Global Comparison Engine" (GCE; See Figure 1) that would leverage existing global data, such as temperature, land cover, terrain and/or human population density, together with an advanced geocomputational system to rapidly identify similar study sites, biases, and observational needs in the selection of sets of case studies for global meta-analysis. Such a system would enable local case study researchers to work across spatial scales more easily by helping them to locate and communicate with researchers at other sites globally similar to their own. For those interested in conducting global meta-studies, the system would rapidly search for globally-representative sets of case studies and weight each study in relation to its global representativeness of a given global variable or set of variables (such as population and agricultural land), thereby speeding up the meta-study process while improving the strength of predictions by reducing geographic biases. The system would also rapidly determine where the greatest global knowledge gaps were located and help identify those best placed to fill them. A full suite of tools enabling rapid global mapping together with other global data visualizations and social networking would be made available online, together with a large searchable database of LCS case studies to which researchers could contribute by adding their own studies.

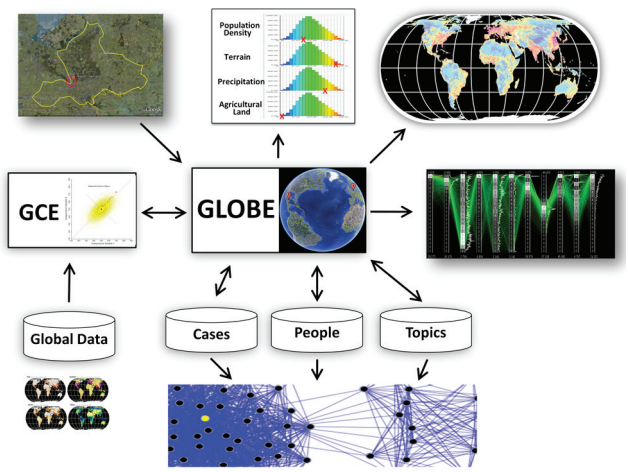

Figure 1. GLOBE model showing a full suite of tools enabling rapid global mapping together with other global data visualizations and social networking.

The GLOBE project is now progressing rapidly towards making these capabilities available online, thanks to a $1.8M grant from the US NSF's Cyber-enabled Discovery and Innovation (CDI) Program, which began on September 15, 2011. The project is led by the author and teams of faculty, postdoctoral researchers, graduate students and undergraduate students across the Departments of Geography & Environmental Systems, Computer Science & Electrical Engineering, and Information Systems at the University of Maryland, Baltimore County (UMBC). The project is being conducted in close collaboration with the GLP together with the Coupled Human and Natural Systems Research Collaboration Network (CHANS-Net), and a host of collaborators across the social, natural and computational sciences. Development of the online system is just the centre piece of a four year effort that also includes: an assessment of the "state of the art" of global meta-study methods in LCS; a study of the structure of the LCS community and its embrace of global synthesis and data sharing, and changes in this resulting from GLOBE implementation; an investigation of LCS site selection processes and their impacts on global knowledge generation in LCS; and the development of advanced computational systems to optimize the knowledge generation workflows of its users.

Currently, the GLOBE team is developing a survey of global synthesis and data sharing practices in LCS (expect to be contacted for this Spring!), building a database of georeferenced case studies, and developing the GLOBE online system, with the objective of putting the first version online for public beta testing in December of this year. Together with the GLP and your help, our goal is to make land change science more effective and globally relevant than ever.

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