AURIN What If?: Decision Support for Projections of Land Use Allocations

Marcos Nino-Ruiz, Christopher Pettit, Martin Tomko, Robert J. Stimson and Richard O. Sinnott
Australian Urban Research Infrastructure Network (AURIN), The University of Melbourne, 3052 VIC
Corresponding author: marcosnr@unimelb.edu.au

INTRODUCTION
It is increasingly important to understand land use issues to fully assess the effects of environmental change and urban regeneration scenarios. Land use decisions may have a profound impact on biodiversity, reduced land productivity due to soil degradation, and contribute to land and water shortage (Searchinger et al., 2008). A scenario-based Land Use Allocation (LUA) is one strategy for understanding land use options (Bryan et al., 2011; Fiorese and Guariso, 2010). LUA can be broadly defined as the medium to long-term strategic planning process by which land managers consider diverse environmental, social and economic factors, before choosing how land should be allocated and used in a given region. In LUA, an assessment is typically made to identify the most appropriate multidimensional pattern to achieve a desirable goal incorporating spatial, biophysical, economical and political dimensions (Malczewski, 2004). Frequently, environmental models and research tools that attempt to support these projections of land use allocations are built upon frameworks and programming languages which are tailor-made for a particular purpose, and not easily extended to support a wider sharing of resources and collaborative work (Li, 2007). The AURIN project has enhanced one leading scenario optimization based tool: What If?” (Klosterman, 1999), and made this a core part of its e-Infrastructure. This paper describes the What If? tool and demonstrates its application in AURIN.

AIMS
The Australian Urban Research Infrastructure Network (AURIN - www.aurin.org.au) is a $20m SuperScience initiative established across Australia that seeks to create an advanced e-Infrastructure that provides seamless access to a wide range of data sets including geospatial data and rich array of associated tools. At the heart of AURIN is to allow researchers to conduct collaborative research through a security-enabled, browser-based environment providing seamless and transparent access to the distributed data and computational resources across Australia. One component of AURIN is a targeted module that supports state of the art land use allocation analysis and provides a variety of scenario-based solutions with targeted outcomes. This has been achieved through re-engineering a standalone application: What If?, into a web based, service-oriented architecture environment.

APPROACH
The What If? module allows users and planners to supply relevant information for future land use population and employment patterns, and to stipulate the relative suitability of the information gathered and the allocation guidelines that they wish to project as an alternative future. These includes demand allocation processes, employment factors, land preservation and user selected public policies (land use plan, zoning ordinance, or infrastructure expansion plan). This approach dovetails and leverages the AURIN distributed computing platform, especially the geospatial data sets made available. We describe the initial design stages of the What If? AURIN model from a technical perspective. We illustrate the utility of the approach taken based on an initial set of conditions exploring a range of What If? scenarios developed for a case study around Hervey Bay in Queensland. These stages include the exploration of current conditions, evaluation of land suitability accommodating different land uses, projecting the future demand for these land uses and project future alternative scenarios of land use allocation according to user-defined assumptions. All these stages are developed based on loosely-coupled modules orchestrated together through standard communication protocols.

DISCUSSION
The approach chosen delivers a complete land use allocation analysis solution. It also enables scientists, stakeholders and modelers alike to follow a comprehensive yet easy-to-use procedure to implement alternative future scenarios of land use demand and allocation. Equally important, this modular implementation for the study of different land use allocation scenarios is built upon aggregation of modules according to their services offered, thus allowing for seamless integration of land use allocation analysis and e-research infrastructure. This encourages the evolution of land use allocation e-infrastructures by facilitating the integration, reuse and sharing of model resources. All of this is presented and accessible in a transparent and cohesive manner.
leveraging the AURIN federated infrastructure, augmenting a range of existing capabilities to offer a complete spectrum of data and analysis tools to planners and modelers alike. Figure 1 highlights the typical scenarios in driving the AURIN What If? tool, where a variety of land use priorities are given (left including importance of slopes, coastal wetlands, ...) for a particular area: Hervey Bay. The results of this selection are shown at a broad/aggregated level (top right) with finer grained suitability shown (lower right).

**Figure 1: AURIN What If? Land Use Allocation Decision Support Tool**

**REFERENCES**


**ABOUT THE AUTHORS**

Marcos Nino-Ruiz is a geospatial e-Enabler in the AURIN project at the University of Melbourne. He has over 10 years of experience as an IT professional in diverse fields such as geospatial, financial, health and advanced research services for Australian and overseas agencies. He holds a B.Eng. of Computer and Information Systems and a B.Sc. of Biology from the Universidad de los Andes, Colombia.

Dr. Martin Tomko is the Senior Project Manager in charge of the Information Infrastructure Design of AURIN, and Lecturer at the Faculty of Architecture at the University of Melbourne. He has a background in spatial information science, with experience in geospatial infrastructures and data handling.

Assoc. Prof. Chris Pettit is the Strategic Implementation Coordinator of the AURIN project.

Prof. Robert J Stimson is the Director of AURIN and Professor Emeritus in the School of Geography, Planning and Environmental Management, The University of Queensland, fellow of the Academy of Social Science in Australia and the Regional Social Science Association International, and former Convenor of the ARC Research Network in Spatially Integrated Social Sciences.

Prof. Richard O. Sinnott is Director of eResearch at the University of Melbourne. Before this he was the Technical Director of the National e-Science Centre at the University of Glasgow; Deputy Director of the Bioinformatics Research Centre (also in Glasgow) and the Technical Director of the National Centre for e-Social Science. He is the Technical Architect of the AURIN project. He has been involved in an extensive portfolio of e-Science projects in the UK, Europe and now in Australia.