

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

Allocations

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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?TM (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



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