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Mapping for the future: Business intelligence tool to map regional housing stock

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Abstract

The amount of data available and the lack of data integration represent an increasing challenge to effective planning for government agencies. Integration of data from multiple sources has the potential to enable a user to draw valuable insights, which can be used to enhance service targeting and delivery, and to improve program evaluation. In recognition of the need to improve data integration the University of Wollongong and the NSW Office of Environment and Heritage (OEH) partnered to create an integrated housing stock database for the Illawarra region. The database serves as the backbone for an online and interactive Housing Stock Mapping Dashboard (HSMD). It assembled multilevel granular information (including at the Statistical Area Level 1 (SA1) and Local Government Area (LGA) level) collected from multiple historical programs by multiple agencies. This centralised, integrated data repository can help agencies understand the existing housing stock, and improve access to information to support evidence-based policy.

This paper presents a model of how data can be integrated from multiple agencies to provide an online collaboration platform. The platform, HSMD, was designed to demonstrate to government, industry, and the research community the opportunity of data integration and advanced analytics. Potential applications of the HSMD include characterisation of the existing housing stock according to a range of building attributes, for instance the presence of ceiling insulation or rainwater tanks. Comparison of these attributes with energy consumption data can indicate the influence of the attribute, or the impact of a specific intervention. This can help policy makers understand uptake and penetration of previous rebate schemes.

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1. Introduction

The massive amounts of data being generated in relation to the built environment represent both an opportunity and a challenge for government agencies. Government agencies can derive substantial value from the amounts of data they collect; they can enable a user to draw valuable insights, which can enhance services, increase operational efficiency, and increase transparency [1]. Government agencies need to make significant decisions regularly, therefore an intuitive, evidence-based approach for optimisation of the decision making processes is necessary. Visualisation of housing stock data is one practical approach to help in this process [2]. Data integration from multiple sources is a fundamental step to provide a holistic visualisation of existing data to help agencies better understand the existing housing stock, and improve access to information to support evidence based policy.

The need for the development of a Housing Stock Database for New South Wales (NSW) has been identified as a key priority for the NSW Office of Environment and Heritage (OEH). The objective of the database is to hold fundamental information about the characteristics of the existing residential building stock and become a comprehensive repository of all energy and water efficiency assessment programs in NSW. OEH partnered with the SMART Infrastructure Facility (SMART) and the Sustainable Building Research Centre (SBRC), at the University of Wollongong (UOW), to develop a back-end integrated Housing Stock Database and a front-end online and interactive Housing Stock Mapping Dashboard (HSMD).

The database assembles information collected from multiple assessment programs completed by various agencies over the last ten years and consolidate them at Statistical Area Level 1 (SA1) and Local Government Area (LGA) levels. The pilot phase presented in this paper focused on the Illawarra region and will be expanded to NSW state-wide. This project built upon previous work undertaken by SMART's researchers, like the SMART Infrastructure Dashboard [3] and the Energy Efficiency Dashboard [4]

This paper presents the methodology used to develop the HSMD, from data profiling and categorisation to data warehousing, reporting and visualisation, elaborating on specific challenges associated with multiple sources, typologies and timelines. This is followed by a demonstration of the reporting and visualization platform. Conclusions from the pilot phase and suggestions for future research are then presented in the final section.

2. Methodology and approach

The project was conducted in a number of stages. The initial stage of the project involved the identification and sourcing of housing stock related data from various sources in the government and non-government sectors. This process of identifying and negotiating access to data sources was conducted in close collaboration with government partners. The collected data was then analysed and evaluated to assess priority information, and the quality of the data. A data model was designed to organise and standardise the collected datasets and support the development of the HSMD through a central database structure. The steps and approach that was followed towards the development of this platform is described in detail in the following sections.

2.1. Data sourcing

To map and characterise the existing residential building stock of NSW, a significant number of data sources were required. The identification and acquisition of suitable datasets was an essential first step for this project. Thirteen datasets were initially identified by OEH for potential inclusion within the Illawarra pilot database. The identification of additional data sources was an iterative process, which involved close collaboration between the UOW project team, OEH, and the NSW Department of Planning and Environment (DPE). The UOW project team was responsible for data profiling and evaluation upon delivery of the dataset, with input from relevant stakeholders. Items were identified to be evaluated from previous experience, through existing networks, from literature review and from web searches. As a starting point, metadata or a sample of the data was requested to assess the usefulness of the data source. Advice was also sought from the data managers on any reliability and quality issues for each data source. For government managed datasets the request for full access was typically sent through OEH, quoting the NSW Government Open Data Framework [5]. For publicly available or privately managed data sources, access may have been negotiated by any of the project partners. Delivery of the data was managed by the UOW project team.

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