



## **Systems Analysis and Macroeconomic History Reveals Relative Progress Toward Water Sensitive Cities**

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This study examines historical Big Data and industry structure, and employs systems analysis of cities to determine progress of water sensitive urban design in Victoria. The insights from across Australia are compared to Melbourne and Ballarat to determine relative progress towards more water sensitive cities. These regions are subject to strong spatial variation in most parameters including demography, socioeconomics, household water use, rainfall depths and frequency. This variability is best suited to solutions across multiple scales and disciplines.

The impacts of making average centralised assumptions on predictions of water security and distribution patterns were investigated. It is shown that average centralised assumptions lead to substantial differences in predictions that can lead to counterintuitive outcomes. The application of average assumptions of any kind is difficult to support and heavily influences infrastructure investment and policy. The common use of centralised average assumptions provides an illusion of little or no benefits from distributed solutions such as water sensitive urban design and drives increasing centralisation of water and stormwater solutions. Historical demographic, water resources and economic “big” data was included in systems analysis of distributed solutions for household water efficiency, rainwater harvesting and local green infrastructure. Substantial decline in economic efficiency of water utilities, household welfare and waterway health was revealed. There was increasing contributions of WSUD solutions that provide water resources and economic benefits of over 150 GL and \$1.5 billion per annum. Greenhouse gas emissions and nitrogen loads have reduced by over 350 and 200 tonnes per year. Declines in utility viability and household welfare, and benefits are vastly improved by strong state government policies for distributed solutions and greater diversity of contribution.

These methods and insights have broader application for discovering the benefits of WSUD or water sensitive communities. This study reveals that we are progressing towards more water sensitive cities but this progress is hampered by narrowing of the definition of water sensitive over time and traditional analysis methods. The water sensitive movement must resist a definition of water sensitive that is a diminishing solution space remaining after all other vested interests have claimed their water or planning domains.