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Reducing Energy-Use & GHG Emissions in Buildings – Whole-System and Whole-Life Design and Future Building Stock Scenarios

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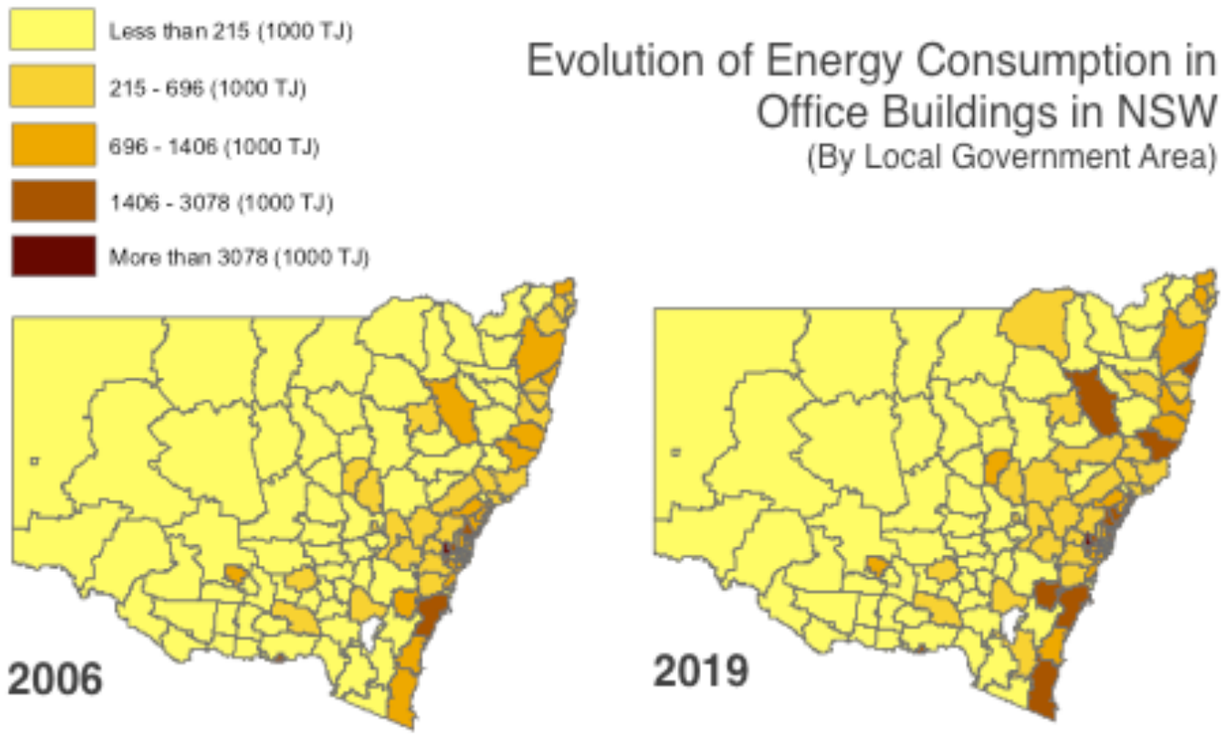
Summary



Buildings account for 40% of the world's energy consumption and a third of global greenhouse gas (GHG) emissions. This sector is one of the fastest growing emission sources and considered the “lowest hanging fruit” in terms of carbon abatement potential. Federal and state governments target this potential through a range of policy initiatives and intervention schemes to accelerate the adoption of low or zero-carbon technologies The range of direct and indirect intervention schemes to promote energy efficiency and reduce GHG emissions in the building sector has been broadly categorised by UNEP as “sticks” (regulations and legal mandatory requirements), “carrots” (incentives, rebates, fiscal instruments, etc.) and “tambourines” (awareness and education). Current modelling approaches have been limited by: (a) top-down sector-level analysis, which does not allow identification of very specific cost-effective actions/decisions; (b) simplistic treatment of voluntary schemes (i.e. carrots and tambourines); and (c) simplified analysis of geo-spatial variables related to the nature of the building stock and their occupants including their behaviour and decision priorities. This presentation summarises current research efforts at Australia’s national science agency – the CSIRO – to address these challenges. These include:

- developing design tools to balance the life cycle carbon footprint (i.e. embodied carbon and operating carbon) of individual buildings, both new and existing, including a new design tool for low-emission or net-zero emission housing;
- modelling the future energy and GHG emission scenarios in the residential building stock in the states of Victoria and NSW to 2020 and the commercial building stock in NSW to 2030; and
- modelling the uptake of incentive or rebate schemes such as solar hot water and solar photovoltaic panels in Brisbane, Queensland and NSW to 2030.

The enhanced diffusion model enables explicit consideration and balancing of the impacts of technology cost, financial benefits, demographic suitability and household income on the likelihood of adoption. Case study results reveal new insights and important context-relevant trends that could assist policy makers and power utility companies to improve the effectiveness of intervention schemes to achieve environmental goals within desired budgets. Future research challenges and directions are identified.

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*About Prof. Dr.-Ing. Greg Foliente

Prof. Foliente is currently a DAAD Visiting Professor at Technische Universität Braunschweig, Faculty of Architecture, Civil Engineering and Environmental Sciences, and the 2012-2013 Wilhelm Klauditz Fellow at Fraunhofer WKI in Germany. In his permanent work at CSIRO, Australia’s national science agency, he leads and manages the Urban Systems Engineering and Dynamics capability, and develops and applies systems-based approaches to climate mitigation and adaptation, sustainability of the built environment, and transitions to urban sustainability.

He was the organiser and co-chair of the 2008 World Sustainable Building Conference (SB08 Melbourne), the leader of the Australian Zero Emission Housing (AusZEH) program, the Program Coordinator and Director of the CIB Proactive Program on Performance Based Building, the initiator of the Australian Life Cycle Inventory Database Initiative (AusLCI), and the facilitator and primary author of the *Smart Grid R&D Roadmap for Australia* and the *Performance Based Building R&D Roadmap* for the European Commission. He has received a number of prestigious international awards, including the 2003 James Croes Medal from the American Society of Civil Engineers (ASCE), the SWST George Marra Award of Excellence in the USA and the STA Fellowship from Japan. He often serves as an expert consultant to industry, government and international organisations, including the United Nations (UN). He was a member of the Australian Government’s Built Environment Industry Innovation Council.

Prof. Foliente received his PhD and two Masters of Science degrees at Virginia Tech in the USA, and advanced leadership training at the MIT Sloan School of Management in Boston. He previously worked at the University of California in Berkeley, and has co-supervised PhD students and post-docs in Europe, North America, Asia and Australia. He has an extensive scientific publications record – including as co-author and editor of three books and an article in the Elsevier *Encyclopedia of Materials: Science and Technology* – and serves on the Editorial Board/Committee of four international peer-reviewed academic journals. He is often invited to speak on innovation and sustainability.