

CONTACT DETAILS: **JOE LANE**
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EDUCATION

PhD - Chemical Engineering (Life-cycle perspectives for the urban water industry); Uni of Qld; 2015
Masters of Environmental Management (Major in Environmental Economics); Uni of Qld, 2005
Bachelor of Engineering (Chemical); Uni of Qld, 1994

PROFESSIONAL EMPLOYMENT HISTORY

Princeton University (2019 – present)	Associate Research Scholar	Energy systems analysis focussed on global and Indian decarbonisation transitions.
University of Queensland (2014 – 2019)	Research Fellow	Multi-disciplinary research with the Dow Centre for Sustainable Engineering Innovation.
University of Queensland (2009 – 2014)	Project Manager; Researcher	Researcher on a number of projects, through the Advanced Water Management Centre and School of Chemical Engineering.
Dept. of Natural Resources & Water (2007 – 2009)	Senior Scientist	Research group for the Queensland State Government
Dept. of Natural Resources & Water (2005 –2006)	Project Officer	Water Resource Planning team of the Queensland State Government
Brisbane Water (2005)	Project Officer	Develop systems for strategic environmental management
Queensland Alumina Ltd (2001-03) CSR Plane Creek Ltd (1995-99)	Engineer	Operations and process engineering

RESEARCH HIGHLIGHTS

Following masters study³³ and experience in the Queensland water sector, the foundational concern for my early research was the integration of environmental issues into decision making. My initial focus was using environmental life cycle assessment (LCA) to critique urban water planning challenges. Through my PhD thesis³², research reports²⁸⁻³¹, and published papers^{9,14-16,18-24}, this work challenged the urban water industry to recognise that a stronger focus on system-wide impacts and systemic analysis will be required, if they are to position themselves in the global debate on environmental sustainability.

That methodological review led to a commentary paper¹⁸ then book chapter¹ in a series on state-of-the-art LCA methodology, demonstrating a disconnect between science and decision making for industries with N₂O as an important component of their GHG emissions profile. My arguments were built on a deep review of atmospheric chemistry and modelling literature, developing a balanced view on the compromises involved in designing simplified metrics that still adequately represent the best-practice in atmospheric sciences.

My focus then expanded into system-level analysis of environmental and socio-economic trade-offs, through involvement in a 10-university collaboration developed a novel software system for compiling monetary multi-region input-output (MRIO) models of the Australian economy. I led the design of environmental data integration into this software, then was one of four primary authors in the journal publication¹⁷ presenting the new product. Following that, I led PhD and funded research projects applying this technique to complement environmental LCA for food systems analysis^{6-7,11-12,26}, supported its application to energy systems analysis^{4,5}, and contributed to ongoing MRIO database improvements¹⁰.

Following an initial discussion paper¹³ arguing that infrastructure development bottlenecks could constrain the rate of global energy system decarbonisation, energy systems analysis has been an important focus of my more recent research. Outputs from this work span energy-economy interactions⁴; the potential for energy technologies to clash with conservation² and airshed pollution objectives⁸; and the performance of a novel biofuels technology²⁵. Most recently, papers are being finalised that call for a rethink on expectations around the decarbonisation contribution that is likely from specific technologies (Carbon Capture and Storage) and developing countries (particularly India).

RESEARCH GRANT HISTORY

2012-14: *'The Industrial Ecology Lab – Integrating data and tools for powerful sustainability analysis'*

This was a collaboration between ten premier Australian research organisations, through a Commonwealth Govt NeCTAR scheme grant of \$1.5million. I played a major role in the collaborative development of the proposal, then was the project manager and primary researcher for the UQ contribution to the collaboration.

2012-13: *'Systemic modelling of energy and greenhouse gas through the drinking water supply system in South East Queensland'*

This project involved direct collaboration between UQ researchers and Seqwater Ltd, a major urban water utility in the South East Queensland region. \$90,000 funding was secured for year 1 of the project, for which I led the scoping and delivery of the primary work package. My involvement ended after successfully scoping the work to support a continuation of the project into year 2.

2010-12: *'Total Water Cycle Planning Framework'*

This 2-year collaboration between UQ, GU & CSIRO secured \$300,000 funding for UQ, from the Qld Govt Urban Water Security Research Alliance (UWSRA). I collaborated with research partners in the other organisations to scope and develop the successful proposal, then took the role of the primary researcher (and project manager) for the UQ contribution.

2009-10: *'LCA for urban water planning'*

My academic career began through securing a contestable funding grant of \$75,000 from the Qld Govt UWSRA, to pursue self-directed research contributing to a broader government sponsored research initiative.

TEACHING EXPERIENCE - Princeton

I recently contributed as one of four co-lecturers to the undergraduate course *ENE 372 – Rapid Switch: The transition challenge to low-carbon energy*, led by Dr. Eric Larson. Through this, I delivered ~20% of the lecture content, but played a major role in designing the project-based assessment system for the course. Students were organised into 4 project teams, working together throughout the semester. I was the lead lecturer contact for two of those project teams, providing a regular source of advice on putting together their progressive assignments and overall project report.

TEACHING EXPERIENCE - prior

Through 2013 and 2014, I delivered a series of guest lectures into various undergraduate and masters-level courses, each focussing on the integration of environmental systems analysis into decision making. Each lecture ran for 2-3 hours, incorporating a session of interactive group work, with the methodological and applied content varying broadly across the different courses. In one of these courses, I subsequently led the student group in the scoping and implementation of a course project that prepared an environmental Life Cycle Assessment for a biofuels technology.

Through this I developed a tutorial approach that focussed on the definition and scoping of research analysis, rather than the quantitative implementation of simplified tools. It is the former that poses the greatest challenge for technical professionals, when expanding their analytical scope to consider environmental sustainability issues.

Course: ENVM7201/7104 – Sustainable Production & Consumption;

Year: 2014

Degree: Bachelor of Environmental Management

Lecture title: *Environmentally-extended Input Output analysis – new opportunities for Industrial Ecology*

Course: CHE4024 –Energy Systems in Sustainable Development

Year: 2014

Degree: Bachelor of Engineering

Lecture title: *Life Cycle Assessment*

Course: WATR7700 –Urban Metabolism

Year: 2014, 2013

Degree: Masters of Integrated Water Management

Lecture title: *Life Cycle Assessment, urban metabolism and the 'magic' of numbers*

Course: ENGG7701 – Engineering Grand Challenges

Year: 2013

Degree: Bachelor of Engineering Honours program

Lecture title: *Environmental assessment for decision making*

Other involvement: Designed, managed & tutored a group project assignment, implementing environmental Life Cycle Assessment for a 2nd generation biofuel production technology

Course: ENGY7201 –Applied Carbon Methods

Year: 2013

Degree: Masters of Energy Studies

Lecture title: *Using LCA for carbon and energy footprinting*

PUBLICATIONS

Book Chapters

[1] Lane, J.(2015) in *Compendium of Life Cycle Assessment* Vol. 4 (eds W. Kloepffer & M. Curran) Ch. 4 - Stratospheric Ozone Depletion, (Springer).

Journals

[2] Rehbein, J., Watson, J., Lane, J., Sonter, L. *et al.* (2020) Renewable energy development threatens many of the world's most important biodiversity areas. *Global Change Biology*.

[4] Lam, KL., Kenway, S., Lane, J. *et al.* (2019) Energy intensity and embodied energy flow in Australia: an input-output analysis. *Journal of Cleaner Production*.

[5] Baynes, T., Crawford, R., Schinabeck, J., Bontinck, P. *et al.* (2018) The Australian Industrial Ecology Virtual Laboratory and multi-scale assessment of buildings and construction. *Energy and Buildings* 164 14-20, doi:10.1016/j.enbuild.2017.12.056.

[6] Dilkes-Hoffman, L. S., Lane, J. L., Grant, T., Pratt, S. *et al.* (2018) Environmental impact of biodegradable food packaging when considering food waste. *Journal of Cleaner Production* 180, 325-334, doi:[10.1016/j.jclepro.2018.01.169](https://doi.org/10.1016/j.jclepro.2018.01.169).

[7] Reutter, B., Lant, P. & Lane, J. (2018) Direct and indirect water use within the Australian economy. *Water Policy*.

[8] Wannaz, C., Fantke, P., Lane, J. & Jolliet, O. (2018) Source-to-exposure assessment with the Pangea multi-scale framework - case study in Australia. *Environmental Science: Processes & Impacts* 20, 133-144, doi:10.1039/C7EM00523G.

[9] Lam, K. L., Stokes-Draut, J. R., Horvath, A., Lane, J. *et al.* (2017) Life-cycle energy impacts for adapting an urban water supply system to droughts. *Water Research*. 127, 139-149, doi:10.1016/j.watres.2017.10.016.

[10] Lenzen, M., Geschke, A., Malik, A., Fry, J. *et al.* (2017) New multi-regional input-output databases for Australia—enabling timely and flexible regional analysis. *Economic Systems Research* 29, 275-295, doi:10.1080/09535314.2017.1315331.

[11] Reutter, B., Lant, P. A. & Lane, J. (2017) The challenge of characterising food waste at a national level—An Australian example. *Environmental Science and Policy* 78, 157-166, doi:10.1016/j.envsci.2017.09.014.

[12] Reutter, B., Lant, P., Lane, J. & Reynolds, C. (2017) Food waste consequences: Environmentally extended input-output as a framework for analysis. *Journal of Cleaner Production* 153, 506-514, doi:10.1016/j.jclepro.2016.09.104.

[13] Lane, J., Smart, S., Schmeda-Lopez, D., Hoegh-Guldberg, O. *et al.* (2016) Understanding constraints to the transformation rate of global energy infrastructure. *Wiley Interdisciplinary Reviews: Energy and Environment* 5, 33-48, doi:10.1002/wene.177.

[14] Bradford-Hartke, Z., Lane, J., Lant, P. & Leslie, G. (2015) Environmental Benefits and Burdens of Phosphorus Recovery from Municipal Wastewater. *Environmental Science and Technology* 49, 8611-8622, doi:10.1021/es505102v.

[15] Kenway, S. J., Binks, A., Lane, J., Lant, P. A. *et al.* (2015) A systemic framework and analysis of urban water energy. *Environmental Modelling and Software* 73, 272-285, doi:10.1016/j.envsoft.2015.08.009.

[16] Lane, J., de Haas, D. W. & Lant, P. A. (2015) The diverse environmental burden of city-scale urban water systems. *Water Research*. 81, 398-415, doi:10.1016/j.watres.2015.03.005.

[17] Lenzen, M., Geschke, A., Wiedmann, T., Lane, J. *et al.* (2014) Compiling and using input-output frameworks through collaborative virtual laboratories. *Science of the Total Environment* 485-486, 241-251.

[18] Lane, J. & Lant, P. (2012) Including N₂O in ozone depletion models for LCA. *The International Journal of Life Cycle Assessment* 17, 252-257, doi:10.1007/s11367-011-0362-y.

- [19] Hall, M. R., West, J., Sherman, B., Lane, J. & de Haas, D. (2011) Long-Term Trends and Opportunities for Managing Regional Water Supply and Wastewater Greenhouse Gas Emissions. *Environ. Sci. Technol.* 45, 5434-5440, doi:10.1021/es103939a.
- [20] de Haas, D., Lane, J. & Lant, P. (2011) Life cycle assessment of the Gold Coast urban water system. *Water* 38, 57-64.
- [21] Lane, J. & Gardner, E. (2009) Life cycle assessment of water cycle alternatives. *Water* 36, 91-97.

Conference Proceedings

- [22] De Haas, D., Lane, J. & Lant, P. (2012) Life Cycle Assessment of an Urban Water System on the East Coast of Australia. in *WEFTEC2012*.
- [23] Lane, J. & Lant, P. (2012) Life Cycle perspectives for Total Water Cycle Planning. in *UWSRA Science Forum*. (SEQ Urban Water Security Research Alliance).
- [24] Lane, J., De Haas, D. & Lant, P. (2010) Life Cycle Analysis of the Gold Coast Urban Water System. in *UWSRA Science Stakeholder Forum #2*. (SEQ Urban Water Security Research Alliance).

Research Reports

- [25] Lane, J., Tabatabaei, M., Greig, C., & Vandt, L. (2018) Techno-enviro-economic analysis for the catalytic depolymerisation of waste to diesel. Technical Report (The University of Queensland, Brisbane).
- [26] Lane, J., Lam, KL. & Elias, S. (2018) Beef supply chain analysis for the Australian IELab. Technical Report (The University of Queensland, Brisbane).
- [27] Bricout, J., Grant, T., Morison, J., Bailey, H. *et al.* (2017) The Potential Benefits of a Circular Economy in South Australia.
- [28] Lane, J., Binks, A. & Kenway, S. (2013) Greenhouse Gas footprints - Seqwater infrastructure, and the broader urban water system. Technical Report (The University of Queensland, Brisbane).
- [29] Lane, J. & Lant, P. (2012) Using Life Cycle Assessment to inform Total Water Cycle Management Planning - an investigation for the Caboolture catchment. Technical Report No. 85, (Urban Water Security Research Alliance, Brisbane).
- [30] Lane, J. & Lant, P. (2012) Application of Life Cycle Assessment to wastewater systems planning. Technical Report No.97, (Urban Water Security Research Alliance, Brisbane).
- [31] Lane, J., De Haas, D. & Lant, P. (2012) Life Cycle Assessment perspectives on wastewater recycling. Technical Report No. 86, (Urban Water Security Research Alliance, Brisbane).

Theses

- [32] Lane, J. (2014) Life-cycle perspectives for urban water systems planning. *Thesis for a Doctor of Philosophy* at The University of Queensland, School of Chemical Engineering.
- [33] Lane, J. (2005) Including environmental factors in non-market mechanisms to improve sugar cane farming practice. *Research Project Thesis for a Master of Environmental Management* at The University of Queensland, School of Geography, Planning & Environmental Management.

Conference Presentations

- Lane, J. (2013) Advancing Sustainability Science using a Virtual IO Laboratory. in *21st International Input-Output Conference*. (International Input-Output Association).
- Lane, J. (2013) Life-cycle toxicity modelling in the Australian context. in *Australian Life Cycle Assessment Conference*. (ALCAS).
- Lane, J., Wiedmann, T. & Lenzen, M. (2013) New capability for hybrid input-output life-cycle assesment - the Industrial Ecology Virtual Laboratory. in *Australian Life Cycle Assessment Conference*. (ALCAS).
- Lenzen, M., Wiedmann, T., Geschke, A., Lane, J. *et al.* (2013) The challenges and opportunities of constructing input-output frameworks in a virtual laboratory: the enw NeCTAR Industrial Ecology Lab. in *MODSIM 2013: 20th International Congress on Modelling and Simulation*.
- Lane, J. & Lant, P. (2012) Beneficial use of biosolids - a Life Cycle Assessment (LCA) perspective. in *AWA Biosolids & Source Management Conference*. (Australian Water Association).
- Lane, J. & Lant, P. (2012) N2O and Ozone Layer Depletion - A new consideration for urban water planners...? in *UWSRA Science Forum*. (SEQ Urban Water Security Research Alliance).
- Lane, J. & Lant, P. (2012) Wastewater Recycling - a Life Cycle Assessment (LCA) perspective. in *Ozwater 2012*. (Australian Water Association).

Lane, J., De Haas, D. & Lant, P. (2011) LCIA - relevance & challenges for the urban water sector. in *Australian Life Cycle Assessment Conference*. (ALCAS).

Lane, J., Grant, T. & Lant, P. (2011) Normalisation for Australian LCA - improving the perspectives. in *Australian Life Cycle Assessment Conference*. (ALCAS).

Lane, J., De Haas, D. & Lant, P. (2010) Life cycle impacts of the Gold Coast urban water cycle. in *Ozwater '10*. (Australian Water Association).

Lane, J., Beal, C., Hood, B. & Gardner, E. (2009) Integration of urine separation with a wastewater reuse system. in *IWA World Congress on Water Reclamation and Reuse*. (International Water Association).

Gardner, E., Beal, C., **Lane, J.,** Hyde, R. *et al.* (2008) Measuring the metabolism of decentralised urban developments - do they demonstrate increased urban sustainability. in *IWA World Congress*. (International Water Association).