

# IELab Newsletter September 2018

## Issue 3

### Dear IELab Community

Many exciting developments have taken place in the last year on the IELab and it is high time for another newsletter to let everyone know about it. Read below about new and updated **datafeeds**, new **tools** on the IELab Portal, new **publications** and much more!

We hope you enjoy reading this newsletter and we'd love to get your feedback through the [IELab Forum on the Hub](#).

Yours sincerely, The IELab Steering Committee

### IELab Webinar on 3rd October 2018

IELab researchers from The University of Queensland will hold a webinar on IO/IELab material, water and energy analysis with the aim to inform about recent developments and connect other IELab researchers working in similar areas. IELab researchers from UNSW Sydney, The University of Sydney, Griffith University, and the Commonwealth Scientific and Industrial Research Organisation (CSIRO) will present some recent developments and research outcomes from the IELab.

The webinar will be held on 3rd October 2018 from 2-4:30pm AEST.

For details please contact [Noyon Nazmul Islam](#)

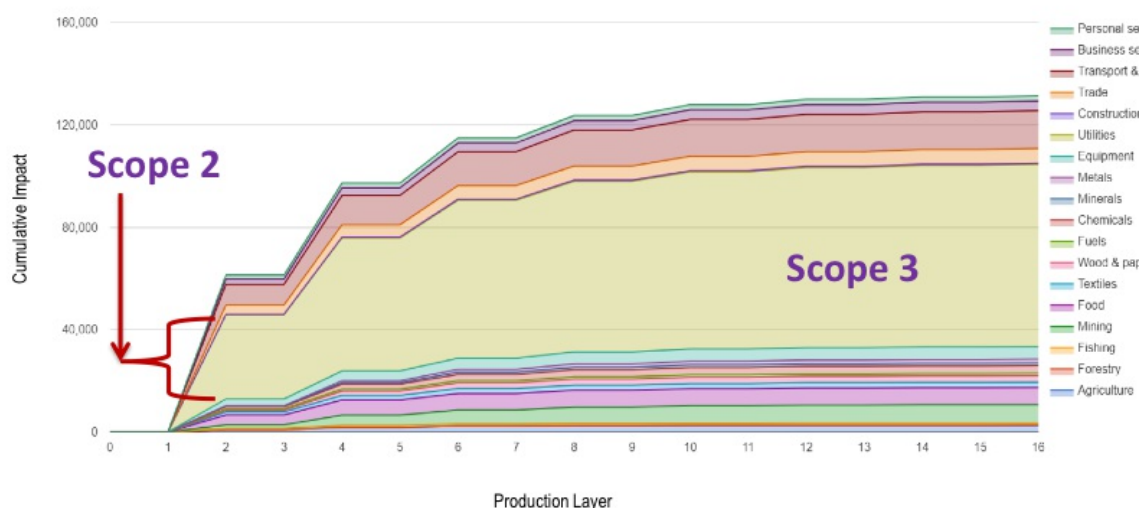
### ECE Tool

The Federal Department of the Environment recently released the [National Carbon Offset Standard \(NCOS\) for Precincts](#) with new guidelines for carbon neutral precincts. To date, there are no tools in the market directly targeting assessments under the NCOS Precincts (though certifications can be obtained through NABERS and GBCA). Furthermore, accounting for the multitude of contributions from supply chains is usually a complicated and a time-intensive task using the bottom-up approach. Alternatively, a top-down approach can quantify Scope 3 emissions easily and rapidly by using Australia-specific input-output data, making it a more efficient technique.

Based on the top-down approach, the **Embodied Carbon Explorer (ECE)** online tool has been developed specifically to enable a rapid evaluation of embodied (Scope 3) carbon emissions for a project at any level (e.g. precinct, building, organisation, material, etc.). It is well suited for a quick screening assessment before full, detailed assessments are undertaken. The ECE tool i) quantifies the total impacts related to project life, ii) identifies main contributors to the total impacts and iii) provides National Carbon Offset Standard-suitable functionality. Any contributor (e.g. product or service) can be tested for its Scope 3 emissions in accordance with the NCOS materiality threshold, and those playing a relevant role can be selected to be reported.

The ECE tool supports the realisation of the NCOS standard and has the theoretical potential to realise carbon neutrality for all new precinct developments and refurbishments. The ECE tool was developed by the Integrated Carbon Metrics (ICM) project (RP2007) and is hosted on the

[IELab Portal](#)



A step-by-step tutorial for ECE Tool Analysis was developed and the tool will soon be rolled out for testing by industry users.

## Updated Analysis on the IELab Portal

The Analysis capability on the IELab Portal has been updated with IO and greenhouse gas emissions data to 2015. The updated version of the underlying base table is now available for use - it's titled **ECE 2014-2015 AUS**. To use it, create a new Analysis in your respective project, search for **ECE** and then select it in the table.

The 2015 GHG data for the 344 sectors of this table were updated by Soo Huey Teh and are also available as a CSV file on request.

## Household expenditure datafeed completed

Two important datafeeds for household expenditure data were recently completed by Futu Faturay from ISA at the University of Sydney.

### ABS6530HESr\_StateGCCA.m

This data feed writes constraints for data from the ABS Household Expenditure Survey (HES) for 2009/10 and 2015/16 (Catalogue Number 6530.0, <http://www.abs.gov.au/ausstats/abs@.nsf/mf/6530.0>). It is a very important feed for any MRIO base table and analysis including states/territories and larger cities. Raw data are taken from "65300DO013\_201516 Household Expenditure Survey, Australia: Summary of Results" and include Detailed expenditure items for Greater Capital City Areas (Table 13.3A) and for States (Tables 13.9A). The data feed also processes relative standard error data from the ABS files (Tables 13.3B and 13.9B).

### ABS6530HESr\_SA4.m

This data feed writes constraints for data from the ABS Household Expenditure Survey (HES) for 2009/10 and 2015/16 at the level of SA4 regions (Catalogue Number 6530.0). It is a very important feed for any MRIO base table and analysis including SA4 regions. Raw data for this feed were purchased from the ABS and include 2009/10 and 2015/16 Detailed expenditure items based on 87 SA4s regions, covering all of Australia (ASGS 2011). The data feed also processes relative standard errors for these data.

The completion of the HES datafeeds was sponsored by UNSW Sydney.

## Greenhouse Gas datafeed updated (ANZSIC)

UQ researchers Ka Leung Lam and Joe Lane updated the GHG datafeed on the IELab. This data feed provides constraints data from the Australian Greenhouse Emissions Information System (AGEIS) database. The ANZSIC-classified greenhouse gas emissions data are available at the state and national levels from 2000 to 2015 for carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O) and carbon dioxide equivalents (CO<sub>2</sub>-eq).

## IELab used to develop a semi-automated hybrid LCI model

Researchers at The University of Melbourne have recently developed a model enabling semi-automation of the path exchange method of hybridisation. The model, which automates various components of the approach, is described in a recent journal paper published in the International Journal of LCA (available [here](#) or [here](#)). It includes a series of inter-related modules developed using object-oriented programming in Python. Individual modules have been developed for each task involved in compiling a hybrid LCI, including data processing, Structural Path Analysis, and path exchange or hybridisation.

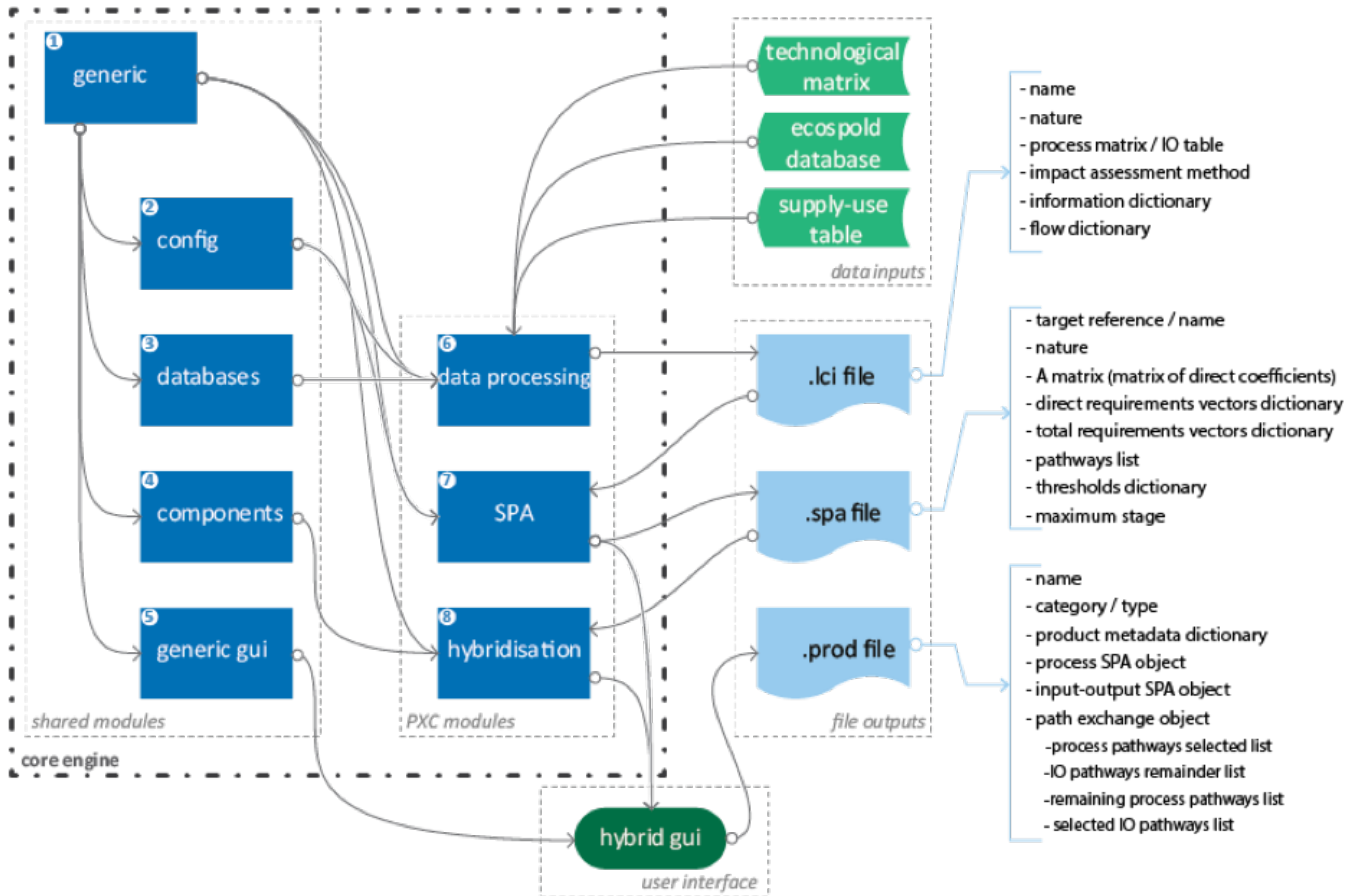


Figure: General wire diagram of the automated path exchange hybrid model

The model is currently being used to develop a comprehensive database of hybrid coefficients for building materials, using input-output data in the form of a supply-use table collected from the IELab, and AusLCI as its process database. Full automation of the node correspondence process, where nodes relating to identical processes across process and input-output data are identified, remains a challenge. This is due to varied dataset coverage, different levels of disaggregation between data sources, and lack of detail of activities and coverage for specific processes. However, by automating other aspects of the compilation of a hybrid LCI, the comprehensive supply chain coverage afforded by hybrid analysis can be made more accessible to the broader LCA community. A detailed video walkthrough of the model is available in open-access on [Figshare](#). This work shows some of the broad potential of the IELab as well as its critical importance to the development of various LCI approaches beyond pure input-output analysis.

## IELab for teaching: Student Assignments entering 2nd year

The IELab Portal is increasingly being used for teaching by UNSW and the Universities of Sydney and Queensland. The Analysis function on the IELab allows for a quick and complete assessment of carbon footprints (scope 3 emissions) and other indicators, based on expenditure data. Currently about 200 students are using the IELab for an assessed assignment which is worth a considerable share of their total course mark.

## IELab publications

IELab researcher have now produced more than 50 publications, most of them journal papers! These publications are either about IELab developments or have used IELab data.

The full list of IELab publications is appended at the end of this newsletter and is also available online at the hub's [citations](#) and [publications](#).

From there, all citations can be **exported in BibTex or EndNote format!**

## Featured publication

Very recently, this study about the economic impacts of Cyclone Debbie has been published, demonstrating the exemplary capability of the IELab to cater for sub-national IO analyses.

Lenzen, M., Malik, A., Kenway, S., Daniels, P., Lam, K. L. and Geschke, A. (2018) Economic damage and spill-overs from a tropical cyclone. *Nat. Hazards Earth Syst. Sci. Discuss.*, **2018**, 1-28. <https://www.nat-hazards-earth-syst-sci-discuss.net/nhess-2017-440>

*Abstract:* Tropical cyclones cause widespread damage in specific regions as a result of high winds, and flooding. Direct impacts on commercial property and infrastructure can lead to production shortfalls. Further losses can occur if business continuity is lost through disrupted supply of intermediate inputs from, or distribution to, other businesses. Given that producers in modern economies are strongly interconnected, initially localised production shortfalls can ripple through entire supply-chain networks and severely affect the regional and wider national economy. In this paper, we use a comprehensive, highly disaggregated, and recent multi-region input-output framework to analyse the impacts of Tropical Cyclone Debbie. In particular, we show how industries and regions that were not directly affected by storm and flood damage suffered significant job and income losses. Our results indicate that the disaster resulted in the direct loss of about 7,000 full-time equivalent jobs and 2 billion AUD of value added, and an additional indirect loss of 5,000 jobs and 1 billion AUD of value added. We are able to conduct this assessment so rapidly due to the timely data provision and collaborative environment facilitated by the Australian Industrial Ecology Virtual Laboratory (IELab).

## Upcoming publications

These IELab-related papers are forthcoming (first author and draft title):

- Rachel Reyes: Gender Footprint study
- Futu Faturay: TaiwanLab earthquake and cyclone disaster study
- Takako Wakiyama: Food waste & loss study for Japan (Japan IELab)
- Elijah Tyedmers: Cook Islands sustainability study

## Australia-Indonesia Virtual Lab

[IT News](#) reports on ISA's [DFAT](#) grant to promote the [Australia-Indonesia Virtual Lab](#) developed by Futu Faturay and Manfred Lenzen at the University of Sydney, in collaboration with the Indonesian Ministry of Finance. The virtual lab will be a collaborative online environment in which Indonesian and Australian researchers and analysts can share their data, tools and insights on sustainable development issues of interest to both countries.

## IELab as a data platform for researchers

Are you planning your next research project? Are you advising research students considering their project or PhD options? The comprehensive datasets and analytical tools from the IELab can give you a head start, providing access to data and allowing researchers to get straight into analysis, rather than spending time getting data from scratch or chasing permissions for existing datasets.

One example are the official greenhouse gas emissions data from the [Australian Greenhouse Emissions Information System \(AGEIS\) from the Federal Department of the Environment](#). Retrieving data from this platform is notoriously labour intensive and can be one of the most time consuming and frustrating data collection tasks environmental researchers in Australia may face.

IELab software engineer and IT specialist Daniel Micevski developed an algorithm that allows for GHG data to be scraped automatically from the AGEIS website. Using this tool, it was possible to retrieve time series of Australian GHG data from 1990 to 2016 in both ANZSIC and NGGI classification. The datasets are available to registered IELab users on request through the [ticket system](#). The data resources of the IELab are giving researchers and students access to the numbers they need to answer their research questions. Check out the possibilities that [IELab](#) offers. Register on the website, contact us if you have specific questions or [submit a ticket](#) if you encounter a problem.

## IELab user fees

Operating and maintaining the IELab is associated with considerable costs. Even though the managing teams at UNSW Sydney and the University of Sydney manage to internalise some of these costs or compensate them with project funds, there still is a large funding gap which prevents us from operating IELab as professionally and smoothly as it should be. We therefore want to say a big **Thank You** to all users who have paid their user fee! For those who haven't done so yet, please pay at any time – your access will be **valid for 12 months from the date you pay the fee**.

Fees are at a very low level and remain unchanged this year:

- Individuals \$100 for one year
- Universities \$500 for one year for 1-5 users; then \$100/yr for each additional user
- Consultancies/companies \$2000 for one year, independent on the amount of usage

**Researchers should please continue to include future IELab user fees in any funding proposals they prepare!**

## User photos

The IELab is faceless without your photo! Communication via the [IELab Forum](#) becomes much more human when members upload their photos. Please upload yours today on your IELab profile.

**All users, please make sure you are subscribed to the [IELab Forum](#)!**

## Receiving the IELab Newsletter

If this newsletter was forwarded by someone else to you and you would like to receive it directly, then please register on the [IELab Hub](#). Set the rules of your email account so that it allows emails from [...@ielab.info](#) to avoid the newsletter going into your Junk folder.

## APPENDIX – All IELab-related Publications

The full list of IELab publications is also available online at the hub's [citations](#) and [publications](#).

- Akizu-Gardoki, O., Bueno, G., Wiedmann, T., Lopez-Guede, J. M., Arto, I., Hernandez, P. and Moran, D. (2018) Decoupling between human development and energy consumption within footprint accounts. *Journal of Cleaner Production*, 202, 1145-1157. <http://www.sciencedirect.com/science/article/pii/S0959652618325848>
- Baynes, T. M., Crawford, R. H., Schinabeck, J., Bontinck, P.-A., Stephan, A., Wiedmann, T., Lenzen, M., Kenway, S., Yu, M., Teh, S. H., Lane, J., Geschke, A., Fry, J. and Chen, G. (2018) The Australian industrial ecology virtual laboratory and multi-scale assessment of buildings and construction. *Energy and Buildings*, 164, 14-20. <https://doi.org/10.1016/j.enbuild.2017.12.056>
- Bontinck, P.-A., Crawford, R. H. and Stephan, A. (2017) Improving the Uptake of Hybrid Life Cycle Assessment in the Construction Industry. *Procedia Engineering*, 196, 822-829. <http://www.sciencedirect.com/science/article/pii/S1877705817331338>
- Chen, G., Hadjidakou, M. and Wiedmann, T. (2017) Urban carbon transformations: unravelling spatial and inter-sectoral linkages for key city industries based on multi-region input–output analysis. *Journal of Cleaner Production*, 163, 224-240. <http://dx.doi.org/10.1016/j.jclepro.2016.04.046>
- Chen, G., Hadjidakou, M., Wiedmann, T. and Shi, L. (2018) Global warming impact of suburbanization: The case of Sydney. *Journal of Cleaner Production*, 172, 287-301. <https://doi.org/10.1016/j.jclepro.2017.10.161>
- Chen, G., Wiedmann, T., Hadjidakou, M. and Rowley, H. (2016a) City Carbon Footprint Networks. *Energies*, 9, 602. <http://dx.doi.org/10.3390/en9080602>
- Chen, G., Wiedmann, T., Wang, Y. and Hadjidakou, M. (2016b) Transnational city carbon footprint networks – Exploring carbon links between Australian and Chinese cities. *Applied Energy*, 184, 1082-1092. <http://dx.doi.org/10.1016/j.apenergy.2016.08.053>
- Crawford, R. H., Bontinck, P.-A., Stephan, A. and Wiedmann, T. (2017) Towards an Automated Approach for Compiling Hybrid Life Cycle Inventories. *Procedia Engineering*, 180, 157-166. <https://doi.org/10.1016/j.proeng.2017.04.175>
- Crawford, R. H., Bontinck, P.-A., Stephan, A., Wiedmann, T. and Yu, M. (2018) Hybrid life cycle inventory methods – A review. *Journal of Cleaner Production*, 172, 1273-1288. <https://doi.org/10.1016/j.jclepro.2017.10.176>
- Ely, R. N., Carneiro, D., Chen, G. and Wiedmann, T. (2015) Carbon Footprinting the Gold Coast City consumption of goods and built environment products. 23rd International Input-Output Conference of the International Input-Output Association (IIOA), 22-26 June 2015. Mexico City. <https://www.iioa.org/conferences/23rd/papers.html>
- Faturay, F., Lenzen, M. and Nugraha, K. (2017) A new sub-national multi-region input–output database for Indonesia. *Economic Systems Research*, 29, 234-251. <http://dx.doi.org/10.1080/09535314.2017.1304361>
- Fry, J., Lenzen, M., Baynes, T., West, J. and Geschke, A. (2017) Constructing a time-series of physical input-output tables for Australia. *Economic Systems Research*, Revision stage.
- Fry, J., Lenzen, M., Giurco, D. and Pauliuk, S. (2016) An Australian Multi-Regional Waste Supply-Use Framework. *Journal of Industrial Ecology*, 20, 1295-1305. <http://dx.doi.org/10.1111/jiec.12376>
- Fry, J., Lenzen, M., Giurco, D. and Pauliuk, S. (2018a) Australian Regional Waste Footprints. In, *Unmaking Waste in Production and Consumption: Towards the Circular Economy*, 179-190. <https://www.emeraldinsight.com/doi/abs/10.1108/978-1-78714-619-820181015>
- Fry, J., Lenzen, M., Jin, Y., Wakiyama, T., Baynes, T., Wiedmann, T., Malik, A., Chen, G., Wang, Y., Geschke, A. and Schandl, H. (2018b) Assessing carbon footprints of cities under limited information. *Journal of Cleaner Production*, 176, 1254-1270. <https://doi.org/10.1016/j.jclepro.2017.11.073>
- Geschke, A., Wood, R., Kanemoto, K., Lenzen, M. and Moran, D. (2014) Investigating alternative approaches to harmonise multi-regional input-output data. *Economic Systems Research*, 26, 354-385. <http://dx.doi.org/10.1080/09535314.2014.937069>
- Lenzen, M., Geschke, A., Abd Rahman, M. D., Xiao, Y., Fry, J., Reyes, R., Dietzenbacher, E., Inomata, S., Kanemoto, K., Los, B., Moran, D., Schulte in den Bäumen, H., Tukker, A., Walmsley, T., Wiedmann, T., Wood, R. and Yamano, N. (2017a) The Global MRIO Lab – charting the world economy. *Economic Systems Research*, 29, 158-186. <http://dx.doi.org/10.1080/09535314.2017.1301887>
- Lenzen, M., Geschke, A., Malik, A., Fry, J., Lane, J., Wiedmann, T., Kenway, S., Hoang, K. and Cadogan-Cowper, A. (2017b) New multi-regional input–output databases for Australia – enabling timely and flexible regional analysis. *Economic Systems Research*, 29, 275-295. <http://dx.doi.org/10.1080/09535314.2017.1315331>
- Lenzen, M., Geschke, A., Wiedmann, T., Lane, J., Anderson, N., Baynes, T., Boland, J., Daniels, P., Dey, C., Fry, J., Hadjidakou, M., Kenway, S., Malik, A., Moran, D., Murray, J., Nettleton, S., Poruschi, L., Reynolds, C., Rowley, H., Ugon, J., Webb, D. and West, J. (2014) Compiling and using input–output frameworks through collaborative virtual laboratories. *Science of The Total Environment*, 485–486, 241-251. <http://dx.doi.org/10.1016/j.scitotenv.2014.03.062>
- Lenzen, M., Malik, A., Kenway, S., Daniels, P., Lam, K. L. and Geschke, A. (2018) Economic damage and spill-overs from a tropical cyclone. *Nat. Hazards Earth Syst. Sci. Discuss.*, 2018, 1-28. <https://www.nat-hazards-earth-syst-sci-discuss.net/nhess-2017-440/>
- Lenzen, M. and Reynolds, C. J. (2014) A Supply-Use Approach to Waste Input-Output Analysis. *Journal of Industrial Ecology*, 18, 212-226. <http://dx.doi.org/10.1111/jiec.12105>
- Malik, A. (2016) Reply to Lenzen, 2008, *JCLEPRO* 16, 2018–2035: input–output analysis for island economies. *Journal of Cleaner Production*, 112, Part 5, 4890-4895. <http://dx.doi.org/10.1016/j.jclepro.2015.06.034>
- Malik, A., Lenzen, M., Ely, R. N. and Dietzenbacher, E. (2014) Simulating the impact of new industries on the economy: The case of biorefining in Australia. *Ecological Economics*, 107, 84-93. <http://dx.doi.org/10.1016/j.ecolecon.2014.07.022>
- Malik, A., Lenzen, M. and Geschke, A. (2016) Triple bottom line study of a lignocellulosic biofuel industry. *GCB Bioenergy*, 8, 96-110. <http://dx.doi.org/10.1111/gcbb.12240>

- Malik, A., Lenzen, M., McAlister, S. and McGain, F. (2018) The carbon footprint of Australian health care. *The Lancet Planetary Health*, 2, e27-e35. <https://www.sciencedirect.com/science/article/pii/S2542519617301808>
- Malik, A., Lenzen, M., Ralph, P. J. and Tamburic, B. (2015) Hybrid life-cycle assessment of algal biofuel production. *Bioresource Technology*, 184, 436-443. <http://dx.doi.org/10.1016/j.biortech.2014.10.132>
- Reyes, R. C., Geschke, A., Koning, A. d., Wood, R., Bulavskaya, T., Stadler, K., Schulte in den Bäumen, H. and Tukker, A. (2017) The Virtual IELab – an exercise in replicating part of the EXIOBASE V.2 production pipeline in a virtual laboratory. *Economic Systems Research*, 29, 209-233. <http://dx.doi.org/10.1080/09535314.2017.1317237>
- Reynolds, C. (2015) Chapter 16: Sleep. In: D. McBain, J. Murray and T. Wiedmann, *The Sustainability Practitioner's Guide to Social Analysis and Assessment*, 174-184, Common Ground Publishing, On Sustainability, Champaign, Illinois, USA. <http://onsustainability.cgpublisher.com/product/pub.197/prod.20>
- Reynolds, C., Agrawal, M., Lee, I., Zhan, C., Li, J., Taylor, P., Mares, T., Morison, J., Angelakis, N. and Roos, G. (2018) A sub-national economic complexity analysis of Australia's states and territories. *Regional Studies*, 52, 715-726. <https://doi.org/10.1080/00343404.2017.1283012>
- Reynolds, C., Geschke, A., Piantadosi, J. and Boland, J. (2015a) Estimating industrial solid waste and municipal solid waste data at high resolution using economic accounts: an input–output approach with Australian case study. *Journal of Material Cycles and Waste Management*, 1-10. <http://dx.doi.org/10.1007/s10163-015-0363-1>
- Reynolds, C. J., Piantadosi, J. and Boland, J. (2014) A Waste Supply-Use Analysis of Australian Waste Flows. *Journal of Economic Structures*, 3. <http://dx.doi.org/10.1186/s40008-014-0005-0>
- Reynolds, C. J., Piantadosi, J., Buckley, J. D., Weinstein, P. and Boland, J. (2015b) Evaluation of the environmental impact of weekly food consumption in different socio-economic households in Australia using environmentally extended input–output analysis. *Ecological Economics*, 111, 58-64. <http://dx.doi.org/10.1016/j.ecolecon.2015.01.007>
- Ridoutt, B. G., Hadjikakou, M., Nolan, M. and Bryan, B. A. (2018) From Water-Use to Water-Scarcity Footprinting in Environmentally Extended Input–Output Analysis. *Environmental Science & Technology*, 52, 6761-6770. <https://doi.org/10.1021/acs.est.8b00416>
- Robson, E. and Dixit, V. (2016) Accounting for Transport Impacts on the Economy: An Integrated Computable General Equilibrium and Transport Model. Paper 16-5035. Proceedings of the 95th Transportation Research Board Annual Meeting, 10-14 January 2016. Washington D.C., USA. <http://amonline.trb.org>
- Rodríguez-Alloza, A. M., Malik, A., Lenzen, M. and Gallego, J. (2015) Hybrid input–output life cycle assessment of warm mix asphalt mixtures. *Journal of Cleaner Production*, 90, 171-182. <http://dx.doi.org/10.1016/j.jclepro.2014.11.035>
- Schulte in den Bäumen, H., Moran, D., Lenzen, M., Cairns, I. and Steenge, A. (2014) How severe space weather can disrupt global supply chains. *Nat. Hazards Earth Syst. Sci.*, 14, 2749-2759. <http://www.nat-hazards-earth-syst-sci.net/14/2749/2014/>
- Schulte in den Bäumen, H., Többen, J. and Lenzen, M. (2015) Labour forced impacts and production losses due to the 2013 flood in Germany. *Journal of Hydrology*, 527, 142-150. <http://dx.doi.org/10.1016/j.jhydrol.2015.04.030>
- Stephan, A., Crawford, R. H. and Bontinck, P.-A. (2018) A model for streamlining and automating path exchange hybrid life cycle assessment. *The International Journal of Life Cycle Assessment*. <https://doi.org/10.1007/s11367-018-1521-1>
- Teh, S. H., Wiedmann, T., Castel, A. and de Burgh, J. (2017a) Hybrid life cycle assessment of greenhouse gas emissions from cement, concrete and geopolymer concrete in Australia. *Journal of Cleaner Production*, 152, 312-320. <http://dx.doi.org/10.1016/j.jclepro.2017.03.122>
- Teh, S. H., Wiedmann, T. and Moore, S. (2018) Mixed-unit hybrid life cycle assessment applied to the recycling of construction materials. *Journal of Economic Structures*, 7, 13. <https://doi.org/10.1186/s40008-018-0112-4>
- Teh, S. H., Wiedmann, T., Schinabeck, J. and Moore, S. (2017b) Replacement Scenarios for Construction Materials Based on Economy-wide Hybrid LCA. *Procedia Engineering*, 180, 179-189. <https://doi.org/10.1016/j.proeng.2017.04.177>
- Teh, S. H., Wiedmann, T., Schinabeck, J., Rowley, H. and Moore, S. (2015) Integrated Carbon Metrics and Assessment for the Built Environment. *Procedia CIRP*, 29, 480-485. <http://dx.doi.org/10.1016/j.procir.2015.02.169>
- Többen, J. and Kronenberg, T. H. (2015) Construction of Multi-Regional Input–Output Tables Using the Charm Method. *Economic Systems Research*, 27, 487-507. <http://dx.doi.org/10.1080/09535314.2015.1091765>
- Wang, Y. (2017) An industrial ecology virtual framework for policy making in China. *Economic Systems Research*, 29, 252-274. <http://dx.doi.org/10.1080/09535314.2017.1313199>
- Wang, Y., Geschke, A. and Lenzen, M. (2015) Constructing a Time Series of Nested Multiregion Input–Output Tables. *International Regional Science Review*. <http://dx.doi.org/10.1177/0160017615603596>
- Wiedmann, T. (2017) An input–output virtual laboratory in practice – survey of uptake, usage and applications of the first operational IELab. *Economic Systems Research*, 29, 296-312. <http://dx.doi.org/10.1080/09535314.2017.1283295>
- Wiedmann, T., Crawford, R., Seo, S. and Giesekam, J. (2013) The Industrial Ecology Virtual Laboratory and its application to sustainability and environmental engineering – the case of low carbon living. Sustainable Engineering Society (SEng) 2013 Conference, 18-20 September 2013 National Convention Centre, Canberra, ACT. <https://www.engineersaustralia.org.au/ssee-2013-conference>
- Wiedmann, T. O., Chen, G. and Barrett, J. (2016) The Concept of City Carbon Maps: A Case Study of Melbourne, Australia. *Journal of Industrial Ecology*, 20, 676-691. <http://dx.doi.org/10.1111/jiec.12346>
- Wolfram, P. and Wiedmann, T. (2017) Electrifying Australian transport: Hybrid life cycle analysis of a transition to electric light-duty vehicles and renewable electricity. *Applied Energy*, 206, 531-540. <https://doi.org/10.1016/j.apenergy.2017.08.219>
- Wolfram, P. and Wiedmann, T. (2018) Potentials to decarbonize electricity consumption in Australia. In: Ó. Dejuán, M. Lenzen and M. Á. Cadarso, *Environmental and Economic Impacts of Decarbonization - Input-Output Studies on the Consequences of the 2015 Paris Agreements*, Routledge.

<https://www.routledge.com/Environmental-and-Economic-Impacts-of-Decarbonization-Input-Output-Studies/DeJuan-Lenzen-Cadarso/p/book/9780415787406>

Wolfram, P., Wiedmann, T. and Diesendorf, M. (2016) Carbon footprint scenarios for renewable electricity in Australia. *Journal of Cleaner Production*, 124, 236-245. <http://dx.doi.org/10.1016/j.jclepro.2016.02.080>

Yu, M., Wiedmann, T., Crawford, R. and Tait, C. (2017) The Carbon Footprint of Australia's Construction Sector. *Procedia Engineering*, 180, 211-220. <https://doi.org/10.1016/j.proeng.2017.04.180>

\*) The IELab Steering Committee currently includes Tommy Wiedmann, Manfred Lenzen, Steven Kenway, Tim Baynes, Robert Crawford, Peter Daniels, Christopher Dey and Khanh Hoang.

---

Share this newsletter



Visit us on the web at <https://ielab.info>

The IELab was created by:  THE UNIVERSITY OF SYDNEY 

The IELab is operated by:    SUSTAINABILITY ASSESSMENT PROGRAM

Copyright © 2018 HUB. All Rights reserved.

[Contact Us?](#) If you no longer want to receive our newsletter, please [unsubscribe](#).