# Daniel D. Moran

Senior Scientist
dmor@nilu.no

Citizenships:
Norwegian, USA


## Positions

| | | |
|---|---|---|
| Senior Scientist – The Climate and Environment Institute NILU<br>Working to link empirical measurements from the EU Copernicus observation infrastructure to carbon accounting and climate analytics. | Trondheim, Norway | 2022-present |
| Research Professor – NTNU<br>PI and research scientist. Provided graduate teaching and supervision. | Trondheim, Norway | 2013-2022 |
| Co-founder, Director – KGM & Associates Pty. Ltd.<br>Consultancy specializing in carbon analytics. Clients include Amazon.com, McKinsey, Deloitte, KPMG, EY, Accenture, S&P Global, UNCTAD, IMF, and the World Bank. | Sydney | 2012-present |
| Visiting Scholar, Yale University | New Haven, CT | Winter 2016 |
| Visiting Scholar, Kyushu University | Fukuoka, Japan | Autumn 2015 |
| Visiting Scholar, Tohoku University | Sendai, Japan | Summer 2012 |
| Responsible Investment Association of Australasia<br>Authored courses on carbon accounting. | Sydney | 2007 – 2009 |
| Senior Analyst – MSCI, Inc.<br>Financial modeling of ESG risk. | New York | 2007 – 2009 |
| Program Director – Global Footprint Network<br>Footprint modeling. Co-authored the WWF Living Planet Reports. | San Francisco | 2003 – 2005 |
| Cengage Learning<br>Assistant to Nobel prize-winning economist Paul Romer writing an economics MOOC. | San Francisco | 2001 – 2002 |

## Education

| | | |
|---|---|---|
| PhD, School of Physics – The University of Sydney | Sydney | 2013 |
| MS, Environmental Studies and Sustainability – Lund University | Lund, Sweden | 2007 |
| BA, Philosophy – Whitman College | Walla Walla, WA | 2001 |

## Grants and projects (total: €14.2; as PI: €4.4)

- 2023. PI. Strategic Institute Initiative funding (**€450,000**, Funder: NILU)
- 2022. Partner. Actionable Data Indicators for Consumption-Based Emissions: London and New York City (**$110,000**; Funder: C40 Cities)
- 2020. Partner. The Economics of Planetary Boundaries (**$2,080,000**, Funder: Sweden/FORMAS)
- 2019. PI. Young Research Talent Grant (**$900,000**, Norwegian Research Council)
- 2018. PI. Development of the UNCTAD-Eora Global Value Chain database (**$25,000,** UNCTAD)
- 2018-2019. Invited contributor. National Center for Ecological Analysis & Synthesis (NCEAS) working group on footprinting food.
- 2018. PI. Value-at-risk to global supply chains from ecosystem services (**$50,000**, UNEP)

- 2017. The Carbon Loophole in Climate Policy: Quantifying the Embodied Carbon in Traded Products (PI, **$100,000**, ClimateWorks Foundation)
- 2016. FOOTPRINTS2.0: Linking Spatial GIS Data to MRIO Global Economic Models (**$700,000**, Norwegian Research Council) (Conceived and wrote the proposal, and worked as lead researcher)
- 2015-2019. Contributing researcher. PRINCE: Policy-relevant indicators for national consumption and environment (total budget **$1,500,000** Funder: Sweden/MISTRA)
- 2013-2016. Contributing researcher. CARBON CAP project on demand-side emissions reductions strategies (total budget **€3,500,000**, funder EU FP7)
- 2011-2014. Contributing researcher. CREEA project on environmental and economic accounting practices (total budget **€4,400,000**, funder EU FP7)

## Awards and Memberships

Research.com Ranking: Top 10 Economists in Norway 2023
Clarivate/Web of Science - Highly Cited Researcher 2023 (awarded to 0.1% of working scientists)
Clarivate/Web of Science - Highly Cited Researcher 2022
Clarivate/Web of Science - Highly Cited Researcher 2021
Clarivate/Web of Science - Highly Cited Researcher 2020
Clarivate/Web of Science - Highly Cited Researcher 2019
Stanford/Elsevier/Scopus: Highly cited researcher during 2021
Top 1.26% percentile in Environmental Sciences; top 3% in Economics
Stanford/Elsevier/Scopus: Highly cited researcher during 2020
Top 1.52% percentile in Environmental Sciences
Stanford/Elsevier/Scopus: Highly cited researcher during 2019
Top 1.55% percentile in Environmental Sciences

Member of the International Input-Output Association since 2012
Member of the International Society for Industrial Ecology since 2015.
Member of the European Geophysical Union since 2022.

## Peer-reviewed Publications

I have authored and coauthored 81 peer-reviewed papers, 35 of those as first or second author. According to Google Scholar my H-index is 46 and my papers have been cited over 13,000 times.
Full reference: https://scholar.google.com/citations?user=oFdEV-gAAAAJ&hl=en

I have provided scientific peer reviews for, among others, *Science*, *PNAS*, European Research Council Consolidator Grants, *Nature Climate Change*, *Nature Food*, *Conservation Letters*, *Energy Policy*, *Ecological Economics*, *Environmental Science and Technology*, the Austrian Science Fund, BELSPO, Swiss National Science Foundation, ClimateWorks, and the UK National Institute of Economic and Social Research.

Since 2022 I have served as an Advisory Board member for *Environmental Research Letters*
Since 2014 I have served as a Board member for *Energy, Ecology and Environment*
From 2017-2021 I served an Editorial Board member for *Sustainability*, in the Economic, Business and Management Aspects of Sustainability section.

*ORCID:* 0000-0002-2310-2275
*Scopus ID:* 12801754000

1. Hoang, N.; Taherzadeh, O.; Ohashi, H., Yonekura, Y.; Nishijima, S., Yamabe, M., Matsui, T.; Matsuda, H.; Moran, D.; Kanemoto, K.. Reply to Bawa and Liu: Want sustainable food? Embrace complexity. 2023.

**Proceedings of the National Academies of Science**. 10.1073/pnas.2317233120

2. Halpern, B. S., Frazier, M., Rayner, P. E., Clawson, G., Blanchard, J. L., Bouwman, A. F., Cottrell, R.S., Froehlich, H. E., Gephart, J.A., Jacobsen, N. S., Kuempel, C. D., Moran, D., Nash, K. L., Williams, D. R.. Reply to: The environmental footprint of fisheries. 2023. **Nature Sustainability.** 10.1038/s41893-023-01223-4.
3. Starr, J., Nicolson, C., Ash, M., Markowitz, E. M., Moran, D.. Income-based US household carbon footprints (1990–2019) offer new insights on emissions inequality and climate finance. 2023. **PLOS Climate** 10.1371/journal.pclm.0000190 Covered by MSNBC, Forbes, CNN, The Hill, Washington Post. Altmetric score of 1029.
4. Többen, J., Pichler, P.P., Jaccard, I.S., Kratena, K., Moran, D., Zheng, H., Weisz, H. Unequal carbon tax impacts on 38 million German households: assessing spatial and socio-economic hotspots. 2023. **Environmental Research: Climate** 10.1088/2752-5295/aceea0
5. Hoang, N.T., Taherzadeh, O., Ohashi, H, Yonekura, Y., Nishijima, S., Matsui, T., Matsuda, H., Moran, D., Kanemoto, K. Mapping potential conflicts between global agriculture and terrestrial conservation. 2023. **Proceedings of the National Academies of Science**. 10.1073/pnas.2208376120.
6. Zheng, H., Wood, R., Moran, D., Feng, K., Tisserant, A., Jiang, M., Hertwich, E. Rising carbon inequality and its driving factors from 2005 to 2015. 2023. **Global Environmental Change**. 10.1016/j.gloenvcha.2023.102704
7. Kuempel, C., Frazier, M., Verstaen, J., Rayner, P. E., Blanchard J. L., Bouwman, A. F., Cottrell, R. S., Froehlich, H. E., Gephart, J. A., Jacobsen, N. S., McIntyre, P. B., Metian, M., Moran, D. Nash, K. L., Többen, J., Williams, D. R., Halpern, B. S. Environmental footprints of farmed chicken and salmon bridge the land and sea. 2023. **Current Biology** 10.1016/j.cub.2023.01.037
8. Starr, J., Nicolson, C., Ash, M., Moran, D., Markowitz, E.M. Assessing U.S. consumers' carbon footprints reveals outsized impact of the top 1%. 2023. **Ecological Economics**. 10.1016/j.ecolecon.2022.107698 This paper went viral on Twitter with 700,000 views.
9. Halpern, B. S., Frazier, M., Verstaen, J., Rayner, P. E., Clawson, G., Blanchard, J. L., Bouwman, A. F., Cottrell, R.S., Froehlich, H. E., Gephart, J.A., Jacobsen, N. S., Kuempel, C. D., McIntyre, P. B., Metian, M., Moran, D., Nash, K. L., Többen, J., Williams, D. R.. The environmental footprint of global food production. 2022. **Nature Sustainability.** 10.1038/s41893-022-00965-x Covered in The Washington Post and Anthropocene.
10. Gurney, K., Kilkis, S., Seto, K., Lwasa, S., Moran, D., Riahi, K., Keller, M., Rayner, P., Luqman, M.. Greenhouse Gas Emissions from Global Cities Under SSP/RCP Scenarios, 1990 to 2100. 2022. **Global Environmental Change**. 10.1016/j.gloenvcha.2022.102478
11. Moran, D., Pichler, P.P., Zheng, H., Muri, H., Klenner, J. Diogo, K., Többen, J., Weisz, H., Wiedmann, T., Wyckmans, A., Strømman, A.H., Gurney, K.R. Estimating CO2 Emissions for 108,000 European Cities. 2022. **Earth Syst. Sci. Data** 10.5194/essd-2021-299
12. Zheng, H., Long, Y., Wood, R., Moran, D., Zhang, Z., Meng, J., Feng, K., Hertwitch, E., Guan, D. Ageing Society in Developed Countries Challenges Carbon Mitigation. 2022. **Nature Climate Change**. 10.1038/s41558-022-01302-y Covered by The Hill, Anthropocene Magazine, South China Morning Post, Daily Mail, and The Times (UK)
13. Zheng, H., Többen, J., Dietzenbacher, E., Moran, D., Meng, J., Wang, D., Guan, D. Entropy-based Chinese City-level MRIO table Framework. 2021. **Economic Systems Research**. 10.1080/09535314.2021.1932764
14. Cottrell, R. S. Metian, M., Froehlich, H. E., Blanchard, J. L., Jacobsen, N. S., McIntyre, P. B., Nash, K. L., Williams, D. R., Bouwman, A. F., Gephart, J. A., Kuempel, C. D., Moran, D., Troell, M., Halpern, B. S. Time to rethink trophic levels in aquaculture policy. 2021. **Reviews in Aquaculture** 10.1111/raq.12535
15. Weber, S., Gerlagh, R., Mathys, N., Moran, D. $CO_2$ embodied in trade: Trends and fossil fuel drivers. 2021. **Environmental Science and Pollution Research.** 0.1007/s11356-020-12178-w
16. Kanemoto, K., Shigetomi, Y., Moran, D., Nguyen H., Keijiro, O. Spatial variation in Consumption-Based GHG Inventories for 1,200 Japanese Cities. 2020. **Environmental Research Letters** 15(11) 10.1088/1748-9326/abc045
17. Moran, D., Giljum, S., Kanemoto, K., Godar, J. From Satellite to Supply Chain. 2020. **One Earth** 3(1) 10.1016/j.oneear.2020.06.007
18. Kuempel, C., Frazier, M., Nash, K. L., Jacobsen, N. S., Williams, D. R., Blanchard, J., Cottrell, R. S., McIntyre, P. B., Moran, D., Bouwman, L., Froehlich, H. E., Gephart, J. A., Metian, M., Többen, J., Halpern, B. S. Integrating life cycle and impact assessments to map food's cumulative environmental footprint. 2020. **One Earth** 3(1) 10.1016/j.oneear.2020.06.014
19. Koslowski, M., Moran, D., Tisserant, A., Wood, R. Quantifying Europe's biodiversity footprints and the role of urbanization and income. 2020. **Global Sustainability** 3(1) 10.1017/sus.2019.23
20. Casella, B., Bolwijn, R., Moran, D. Kanemoto, K., Improving the analysis of global value chains: the new UNCTAD-Eora Database. 2019. **Transnational Corporations** 26(3).

21. Kanemoto, K, Moran, D., Shigetomi, Y., Reynolds, C., Kondo, Y. Meat consumption does not explain differences in household food carbon footprints in Japan. 2019. **One Earth** 1(4). 10.1016/j.oneear.2019.12.004
22. Bruckner, M; Wood, R.; Moran, D.; Kuschnig, N.; Wieland, H.; Maus, V.; Börner, J. FABIO – The Construction of the Food and Agriculture Biomass Input-Output Model. 2019. **Environmental Science & Technology** 10.1021/acs.est.9b03554
23. Kanemoto, K., and Moran, D.. Carbon Footprint Accounting for the Next Phase of Globalization: Status and Opportunities. 2019. **One Earth** 10.1016/j.oneear.2019.08.006
24. Anenberg, S., Achakulwisut, P., Brauer, M., Moran, D., Apte, J., Henze D. Particulate Matter Mortality in Cities Worldwide: A Challenge and an Opportunity. 2019. **Scientific Data** #11552 10.1038/s41598-019-48057-9
25. Halpern, B. R. Cottrell, J. L. Blanchard, L. Bouwman, H. E. Froehlich, J. A. Gephart, N. S. Jacobsen, C. D. Kuempel, P. B. McIntyre, M. Metian, Moran, D., K. L. Nash, J. Többen, D. R. Williams. Putting all food on the same table: Achieving sustainable food systems requires full accounting. 2019. **Proceedings of the National Academy of Sciences**. 10.1073/pnas.1913308116
26. Smetschka, B., Wiedenhofer, D., Egger, C., Haselsteiner, D., Gaube, V., Moran, D.. Time matters: the carbon footprint of everyday activities in Austria. 2019. **Ecological Economics** 10.1016/j.ecolecon.2019.106357
27. Wood, R., Moran, D. Stadler, K., Rodrigues, J.F.D. Variation in trends of consumption based carbon accounts. 2019. **Scientific Data** 10.1038/s41597-019-0102-x
28. Wood, R., Neuhoff, K., Moran, D., Simas, M., Grubb, M., Stadler, K. The structure, drivers, and policy implications of the European carbon footprint. 2020. **Climate Policy** 10.1080/14693062.2019.1639489
29. Wood, R; Grubb, M; Anger-Kraavi, A; Stadler, K; Pollitt, H; Rizzo, Ben; Alexandri, E.; Stadler, K.; Moran, D.; Hertwich, E; Tukker, A. Beyond peak emission transfers: historical impacts of globalisation and future impacts of climate policies on international emission transfers. 2019. **Climate Policy** 10.1080/14693062.2019.1619507
30. Moran, D., Petersone, M., Verones, F. Do amphibian species and cash crops compete for scarce water? 2019. **Sustainability** 10.3390/su11061822
31. Pendrill, F., Persson, M., Godar, J., Kastner, K., Moran, D., Schmidt, S., Wood, R. Agricultural and forestry trade drives large share of tropical deforestation emissions. 2019. **Global Environmental Change** 10.1016/j.gloenvcha.2019.03.002
32. Geschke, A., Ugon, J., Lenzen, M., Kanemoto, K., Moran, D. Balancing and Reconciling Large Multi-Regional Input-Output Databases Using Parallel Optimisation and High-Performance Computing. 2019. **Journal of Economic Structures** 8, #2(2019) 10.1186/s40008-019-0133-7
33. Moran, D., Wood, R., Hertwich, E., Matteson, K., Tukker, A., Rodriguez, J., Schannes, K., Barrett, J. Quantifying the potential for consumer-oriented policy to reduce European and foreign carbon emissions? 2018. **Climate Policy** 10.1080/14693062.2018.1551186
This paper was a "Research Highlight" in Nature Climate Change and covered in The Economist (https://www.economist.com/special-report/2020/09/17/directing-the-disruption)
34. Dawkins, E., Moran, D., Palm, V., Wood, R. Björk, I., The Swedish Footprint: A Multi-model Comparison. 2019. **Journal of Cleaner Production** 10.1016/j.jclepro.2018.11.023
35. Többen, J., Wiebe, K., Verones, F., Wood, R., Moran, D. A novel maximum entropy approach to hybrid monetary-physical supply-chain modelling and its application to biodiversity impacts of palm oil embodied in consumption. 2018. **Environmental Research Letters**. 10.1088/1748-9326/aae491
36. Akizu, O., Wiedmann, T., Bueno, G., Lopez-Guede, J.M., Arto, I., Hernandez, P., Moran, D. Decoupling Between Human Development and Energy Consumption within Footprint Accounts. 2018. **Journal of Cleaner Production** 202, 1145-1157. 10.1016/j.jclepro.2018.08.235
37. Moran, D., Kanemoto, K, Jiborn, M., Wood, R., Többen, J., Seto, K. C. Carbon footprints of 13,000 cities. 2018. **Environmental Research Letters** 13, #064041. 10.1088/1748-9326/aac72a
This paper was widely reported on, including by **Scientific American** and the **World Economic Forum**. The paper has an **top 5% Altmetric score** of 325 and has been downloaded >30,000 times. The project website citycarbonfootprints.info has received **>30,000 visits**.
38. Rodrigues, J., Moran, D., Wood R., Behrens, P. The uncertainty of consumption-based carbon accounts. 2018. **Environmental Science & Technology.** 10.1021/acs.est.8b00632
39. Hamilton, H., Ivanova, D., Stadler, K., Merciai, S., Schmidt, J., van Zelm, R., Moran, D., Wood, R. Trade and the role of non-food commodities for global eutrophication. 2018. **Nature Sustainability** 1 (314-321). 10.1038/s41893-018-0079-z
40. Jiborn, M., Kander, A., Kulionis, V., Nielsen, H., Moran, D. Decoupling or delusion? Measuring emissions displacement in foreign trade. 2018. **Global Environmental Change**. 10.1016/j.gloenvcha.2017.12.006

41. Nakaoka, M., and 16 co-authors including Moran, D., TSUNAGARI: a new interdisciplinary and transdisciplinary study toward conservation and sustainable use of biodiversity and ecosystem services. 2018. **Ecological Research**. 10.1007/s11284-017-1534-4
42. Wood, R., Moran, D., Stadler, K., Ivanova, D., Steen-Olsen, K., Tisserant, A., Hertwich, E. Prioritizing Consumption-Based Carbon Policy Based on the Evaluation of Mitigation Potential Using Input-Output Methods. 2017. **Journal of Industrial Ecology**. 10.1111/jiec.12702
43. Lenzen, M, A. Geschke, M. Rahman, Y. Xiao, E. Dietzenbacher, S. Inomata, K. Kanemoto, B. Los, Moran, D., R. Reyes, H. Schulte in den Bäumen, A. Tukker, T. Walmsley, T. Wiedmann, R. Wood, N. Yamano. The Global MRIO Lab – Charting the world economy. 2017. **Economic Systems Research** 29 (2). 10.1080/09535314.2017.1301887
44. Moran, D., Wood, R., Rodrigues, J. F. D. A Note on the Magnitude of the Feedback Effect in Multi-Region Input-Output Tables. 2017. **Journal of Industrial Ecology**. 10.1111/jiec.12658
45. Moran, D., Kanemoto, K. Identifying the Species Threat Hotspots from Global Supply Chains. 2017. **Nature Ecology & Evolution**. 1 (1). 10.1038/s41559-016-0023
    This paper was widely covered in the press, including by **National Geographic**, **Scientific American**, TIME, **The New York Times**, **The Washington Post**, Discover Magazine, Le Monde, FAZ, El Mundo, and many others. The paper has an **Altmetric score of 1028.**
46. Nagashima, F; Kagawa, S; Suh, S; Nansai, K; Moran, D.. Identifying critical supply chain paths and key sectors for mitigating primary carbonaceous PM2.5 mortality in Asia. **Economic Systems Research** (29) 1. 20167 10.1080/09535314.2016.1266992
47. Verones, F., Moran, D., Stadler, K., Wood, R. Kanemoto, K. 2017. Resource footprints and their Ecosystem Consequences. **Nature Scientific Reports** 7 (#40743). 10.1038/srep40743
48. Moran, D., Kanemoto, K. Tracing Global Supply Chains to Air Pollution Hotspots. 2016. **Environmental Research Letters** 11 (9), 094017. 10.1088/1748-9326/11/9/094017
49. Kander, A., Jiborn, M., Moran, D., Wiedman, T. O. Consistency of technology-adjusted consumption-based accounting Reply. 2016. **Nature Climate Change**. 10.1038/nclimate3060
50. Kanemoto, K., Moran, D., Hertwich, E. Mapping the Carbon Footprint of Nations. 2016. **Environmental Science and Technology** 50 (19), 10512-10517. 10.1021/acs.est.6b03227
    This paper was highlighted as an Editor's Choice in **Science** (10.1126/science.354.6309.193-e
51. Moran, D., Lenzen, M., Kanemoto, K., Geschke, A. Can EEMRIO analyses establish the occurrence of ecologically unequal exchange? Response. 2015. **Ecological Economics** 119. 10.1016/j.ecolecon.2015.09.003
52. Stadler, K., Lonka, R., Moran, D., Pallas, G., Wood, R. The Environmental footprints Explorer: A Database for Global Sustainability Accounting. **Proceedings of the 29th EnviroInfo and 3rd ICT4S Conference 2015** Copenhagen, Denmark. http://enviroinfo.eu/sites/default/files/pdfs/vol9073/0001.pdf
53. Moran, D., Petersone, M., Verones, F. On the Suitability of Input-Output Analysis for Calculating Product-Specific Biodiversity Footprints. 2016. **Ecological Indicators**. 10.1016/j.ecolind.2015.06.015
54. Kander, A., Jiborn, M., Moran, D., Wiedmann, T. National Greenhouse Gas Account for Effective Climate Policy on International Trade. 2015. **Nature Climate Change**. 10.1038/NCLIMATE2555
55. Geschke, A., Wood, R., Kanemoto, K., Lenzen, M., Moran, D.. Investigating Alternative Approaches to Harmonise Multi-Regional Input-Output Data. 2014. **Economic Systems Research**. 26(3). 54-385. 10.1080/09535314.2014.937069
56. Alsamawi, A., Murray, J., Lenzen, M., Moran, D., Kanemoto, K. The Inequality Footprint of Nations: A Novel Approach to Quantitative Accounting of Income Inequality. 2014. **PLOS One**. 9(10). 10.1371/journal.pone.0110881
57. Schulte in den Bäumen, H., Moran, D., Lenzen, M., Cairns, I., Steenge, A. Global Economic Impacts of Severe Space Weather. 2014. **Nat. Hazards Earth Syst. Sci.,** 14, 4463-4486. 10.5194/nhess-14-2749-2014
58. Moran, D., Wood, R. Convergence between the Eora, WIOD, EXIOBASE, and OpenEU's consumption-based carbon accounts. 2014. **Economic Systems Research**. 26(3), 245-261. 10.1080/09535314.2014.935298
59. Moran, D., D. McBain, K. Kanemoto, M. Lenzen, A. Geschke. Global Supply Chains of Coltan. 2014. **Journal of Industrial Ecology**. 10.1111/jiec.12206
60. Wiedmann, T., Schandl, H., Moran, D.. The footprint of using metals – new metrics of consumption and productivity. 2014. **Environmental Economics and Policy Studies** 85. 10.1007/s10018-014-0085-y
61. Lenzen, M., Geschke, A., Wiedmann, T., Lane, J., Anderson, N., Baynes, T., Boland, J., Daniels, P., Dey, C., Fry, J., Hadjikakou, M., Kenway, S., Malik, A., Moran, D., D., Murray, J., Nettleton, S., Poruschi, L., Reynolds, C., Rowley, H., Ugon, J., Webb, D. and West, J.. Compiling and using input-output frameworks through collaborative virtual laboratories. 2014. **Science of the Total Environment**. 485–486, pp241-251. 10.1016/j.scitotenv.2014.03.062

62. Lenzen, M., Moran, D., A. Geschke, K. Kanemoto. A non-sign-preserving RAS variant. 2014. **Economic Systems Research**, 26 (2), p. 197-208. 10.1080/09535314.2014.897933.
63. Wiedmann, T., H. Schandel, Moran, D., J. West, M. Lenzen, K. Kanemoto, S. Suh. The Material Footprint of Nations – Reassessing Resource Productivity. 2014. **Proc. Nat. Acad. Sci.** 10.1073/pnas.1220362110
Covered in: **BBC** News, Businessweek, ABC News, The Conversation, and others. **900+ citations.**
64. Kanemoto, K. Moran, D., M. Lenzen, A. Geschke. International Trade Undermines National Emissions Targets: New Evidence from Air Pollution. 2014. **Global Environmental Change**, 24, pp.52-59. 10.1016/j.gloenvcha.2013.09.008
65. Lenzen, M., Moran, D., K. Kanemoto, A. Geschke. Building Eora: A global multi-region input-output database at high country and sector resolution. 2013. **Economic Systems Research**, 25(1), 10.1080/09535314.2013.769938
66. Lenzen, M, Moran, D., et al. International Trade of Scarce Water. 2013. **Ecological Economics**, 94, pp. 78-85. 10.1016/j.ecolecon.2013.06.018
67. Moran, D., M. Lenzen, K. Kanemoto, A. Geschke. Does Ecologically Unequal Exchange Occur? 2013. **Ecological Economics**, 89, pp. 177-186. 10.1016/j.ecolecon.2013.02.013
68. Lenzen, M, M. Moura, Geschke, A., Kanemoto, K., Moran, D. A CYCLING METHOD FOR CONSTRUCTING INPUT-OUTPUT TABLE TIME SERIES FROM INCOMPLETE DATA. 2012. **Economic Systems Research**, 24 (4), 10.1080/09535314.2012.724013
69. Moran, D., A. Geschke. Tracing Embodied $CO_2$ in Trade using High Resolution Input-Output Tables. 2016. Chapter in *Computationally Intelligent Data Analysis for Sustainable Development*. Ed. T. Yu. ISBN 9781138198692.
70. Kanemoto, K., M. Lenzen, G. Peters, Moran, D., A. Geschke. Frameworks for comparing emissions associated with production, consumption, and international trade. 2012. **Environmental Science & Technology**, 46 (1) 172-179. 10.1021/es202239t
71. Lan, J, Lenzen, M, Dietzenbacher, E, Moran, D., , Kanemoto, K, Murray, J, Geschke, A. Structural change and the environment: A case study of china's production recipe and carbon dioxide emissions. 2012. **Journal of Industrial Ecology**, 16(4), 623-635. 10.1111/j.1530-9290.2012.00518.x
72. Lenzen, M, Moran, D., K. Kanemoto, B. Foran, L. Lobefaro, A. Geschke. International trade drives biodiversity threats in developing nations. 2012. **Nature**, 486 (7401). (Editors List Best Papers 2012) 10.1038/nature11145
This paper was widely covered in the press, including by **Scientific American**, **BBC**, **Reuters**, AFP, **Le Monde**, and many national magazines and newspapers. **700+ citations.**
73. Lenzen, M., K. Kanemoto, Moran, D., A. Geschke. Mapping the structure of the world economy. 2012. **Environmental Science & Technology**. 46(15) pp. 8374–8381. 10.1021/es300171x
74. Moran, D., M. Wackernagel. "Measuring Sustainability" in ***The Educator's Guide to Sustainability***. Ed. J. Murray, C. Dey, C. Andrews. 2012.
75. Moran, D., M. Wackernagel, J. Kitzes, M. Murray, B. Heumann, D. Phan. Trading Spaces: Embodied Ecological Footprints in Trade. 2009. **Ecological Economics**, Vol. 68 Issue 7. 10.1016/j.ecolecon.2008.11.011
76. Kitzes, J. Moran, D., Galli, A., Wada, M., Wackernagel, M. Interpretation and application of the Ecological Footprint: A reply to Fiala. 2008. **Ecological Economics** 68 (4), 929-930.
77. Moran, D., M. Wackernagel, J. Kitzes, S. Goldfinger, A. Boutaud. Measuring Sustainable Development – Nation by Nation. 2007. **Ecological Economics**, Vol. 64 Issue 2. 10.1016/j.ecolecon.2007.08.017
78. Wackernagel, M., Moran, D., S. White, and M. Murray. Ecological Footprint Accounts for Advancing Sustainability: Measuring Human Demand on Nature. 2006. **Chapter in Lawn, P. (ed.), Sustainable Development Indicators and Public Policy: Assessing the Policy-Guiding Value of Sustainable Development Indicators**. Edward Elgar: London.
79. Wackernagel, M., J. Kitzes, Moran, D., S. Goldfinger, M. Thomas. The ecological footprint of cities and regions: comparing resource availability with resource demand. 2006. **Environment & Urbanization**, Vol. 18, No. 1, 103-112. 10.1177/0956247806063978
80. Wackernagel, M., Moran, D., Goldfinger, S. L'impronta Ecologica. 2005. **Equilibri** 9(1) 157-168. 10.1406/19401
81. Wackernagel, M., S. White, Moran, D., Using Ecological Footprint Accounts: From analysis to applications. 2004. **Int. J. Environment and Sustainable Development**, Vol. 3, Nos. 3/4, pp. 293-315. Geneva. 10.1504/IJESD.2004.005077

Other publications

WWF Sweden. 2011. **Urban Solutions for a Living Planet**. Co-author.
WWF International. 2008. **Living Planet Report 2008**. Contributing author.
WWF International. 2004. **Living Planet Report 2004**. Contributor author.
Wackernagel, M., C. Monfreda, Moran, D., S. Goldfinger, D. Deumling, and M. Murray, 2005. **National Footprint and Biocapacity Accounts: The underlying calculation method.** Global Footprint Network: Oakland.
Wackernagel, M., Moran, D., et al., 2005. **Europe 2005: The Ecological Footprint**. WWF International.
Wackernagel, M., Kitzes, J., Cheng, D., Goldfinger, S., Espinas, J., Moran, D., Monfreda, C., 2005. **Asia/Pacific 2005: The Ecological Footprint and Natural Wealth**. WWF: Surrey, UK.
New Economics Foundation. 2006. **UK Interdependence Report**. Contributing author.

## Papers in revision/review stage

82. Shah, H. A., Moran, D., Luck, A., Maynard, E., Murray, K. The Hidden Burden of Infectious Disease Linked to International Trade of Agriculture. Under review at **The Lancet**

## Papers in preparation

83. Moran, D. Estimating Scope 1 and Scope 3 Emissions For 386,000 Global Jurisdictions

## Teaching

Input-Output Analysis, Trade, and Environment (TEP4222, 7.5 ECTS credits), main teacher. 2021. 2020. 2019. Co-instructor in 2022.
Industrial Ecology and Input Output Analysis (EP8119, 7.5 ECTS credits, doctoral seminar), course lecturer. 2021, 2022.
Lecturer at Environmental Diplomacy and Geopolitics (EDGE) Summer School, Bratislava School of Economics, August 2017.
Invited as one of six instructors on the 14-day Lund University "SAIL" sustainability course for undergraduate and masters students held at sea aboard a working square-rigged brig. My student group developed and ran a paper-based version of the Club of Rome World3 model as a classroom game.
Completed NTNU's 'Uni-Ped' university pedagogics certification (200 hours) in 2020. This certification is offered for NTNU faculty seeking promotion to full professor.
*Constructing MRIOs*. Delivered full-day course at 19th International Input-Output Association Conference, Alexandria, VA USA. 2011.

## Supervision

Postdoc Heran Zheng, 2020-2022
*Heran is a productive and skilled researcher. He has pioneered new tools for MRIO construction using maximum entropy methods. Since completing his PhD in 2020, Heran has accumulated an H-index of 22 and 53 publications in high-ranked journals, including 3 in Nature-family journals.*
Postdoc Johannes Többen, 2018-2021
*After completing his postdoc at NTNU, Johannes went to a dual position, 50% with a leading econometrics consultancy in Germany, and 50% with the Potsdam Institute for Climate Research. Johannes has an h-index of 18 and 36 scientific publications. He has a competency in using maximum entropy methods to combine high-dimensional datasets.*
PhD student Kajwan Rasul at NTNU (expected graduation spring 2024).
PhD student Daniel Daniel Itzamna Avila Ortega at Stockholm Resilience Center (expected completion 2025)
PhD student Francis Barre at NTNU (expected completion 2026)
Supervised Master's student Milda Petersone (resulted in two papers; see above)
Supervised Master's student Max Koslowski (resulted in one paper; see above)

## Public Outreach (in addition to interviews noted above)

Editorial in The Washington Post, "The glaring loophole in our climate policies". September 13, 2018.

https://www.washingtonpost.com/news/theworldpost/wp/2018/09/13/carbon-emissions-2/

With four masters students, designed a museum exhibit "The Carbon Footprint of Cities" which featured interactive wooden cubes and digital content on the drivers of carbon footprints and practical action tips for students and adults. The exhibit was part of a year-long installation at the Trondheim Science Museum. The Norwegian Prince, Prince Haakan, visited our exhibit at the FUTURUM science festival.

## Lectures and presentations

1. Moran, D. Toward a High Spatial Resolution Value Added and Employment Satellite Account for Norway. 29th International Input-Output Association Conference, **Alghero**, June 25-30, 2023
2. Moran, D. From Satellite to Supply Chain: Connecting earth observations to economic decisions. Guest Lecture at the Bartlett School of Construction, University College London, **London**, Feb 9, 2023.
3. Moran, D. OpenGHGMap. 11th International Conference on Industrial Ecology, **Leiden**, July 1-5, 2023.
4. Moran, D.Invited lecturer at Amazon Sustainability. **Online**. January 15, 2023.
5. Moran, D. Input Output Analysis and Industrial Ecology. Guest lecture for industrial ecology masters students at the University of Southern Denmark, **Online.** November 11, 2020.
6. Moran, D. From Satellite to Supply Chain: Connecting earth observations to economic decisions. The Alan Turing Institute, **Online.** October 28, 2020.
7. Moran, D. From Satellite to Supply Chain: Connecting earth observations to economic decisions. Leiden University Triple E Lecture Series, **Online.** October 27, 2020.
8. Moran, D. From Satellite to Supply Chain: Connecting earth observations to economic decisions. International Society of Industrial Ecology – Socioeconomic Metabolism chapter meeting. **Online.** September 9, 2020.
9. Moran, D. Keynote Address: The Carbon Footprint of Cities. EcoCity Builders Conference 2020. **Online.** September 8, 2020.
10. Moran, D. From Satellite to Supply Chain: Connecting earth observations to economic decisions**.** Job talk at Yale School of Forestry and Environmental Studies, **New Haven**, January 28, 2020.
11. Moran, D. Calculating the Carbon Footprints of 13,000 Cities. 2019 International Society of Industrial Ecology Conference, **Beijing**. China. July 11, 2019.
12. Többen, J., Wiebe, K. S., Verones, F. Moran, D. & Wood, R.: Comparing global land-use and biodiversity impacts of palm oil embodied in final product consumption. 26th International Input-Output Conference, 25.06-29.06, **Juiz de Fora/Brazil** – Special Session: Input-Output Analysis of land use change and agriculture.
13. Többen, J., Wiebe, K. S., Verones, F. Moran, D. & Wood, R.: Land-use and biodiversity footprints of palm oil embodied in final product consumption. Input-Output Workshop 2018, 15.03.-16.03., JpGU-AGU Joint Meeting 2017; **Bremen**, Germany.
14. Kanemoto, Keiichiro; Moran, Daniel. Mapping the Carbon, Air Pollution, and Biodiversity Footprints of Nations: A GIS + Global Supply Chains. 15th Annual Asia-Oceania Geosciences Society (AOGS) **Honolulu.** 2018-06-03 - 2018-06-08.
15. Stadler, Konstantin; Wood, Richard; Moran, Daniel; Jorgensen, P; Marques, Alexandra; Tukker, Arnold. Tracking National Environmental Performance Relative to Planetary Boundaries: A Consumption Based Indicator Framework. ISDRS Conference; **Messina, Italy.** 2018-06-13 - 2018-06-13
16. Kanemoto, Keiichiro; Moran, Daniel. Mapping the carbon, air pollution, and biodiversity footprints of nations: A GIS + global supply chains. JpGU-AGU Joint Meeting 2017; **Chiba, Japan**. 2017-05-01 - 2017-05-02
17. Kanemoto, Keiichiro; Moran, Daniel. Spatial footprint analysis. The 12th Meeting of the Institute of Life Cycle Assessment; **Kyoto.** 2017-03-01 - 2017-03-01
18. Lenzen, Manfred; Geschke, Arne; Abd Rahman, Muhammad Daaniyall; Xiao, Yanyan; Reyes, Rachel; Dietzenbacher, Erik; Fry, Jacob; Inomata, Satoshi; Kanemoto, Keiichiro; Los, Bart; Moran, Daniel; Schulte in den Baumen, Hagen; Tukker, Arnold; Walmsley, Terrie; Wiedmann, Thomas O; Wood, Richard; Yamano, Norihiko. The Global MRIO Lab - final outcomes from Project Réunion. 25th International Input-Output Conference; **Atlantic City.** 2017-06-19 - 2017-06-23

19. Moran, Daniel. Ecological and Spatial Footprints: An Overview (Welcome lecture). EDGE 2017 Summer School; **Bratislava.** 2017-09-11 - 2017-09-11
20. Moran, Daniel. Future Developments of the Eora MRIO. Guest Lecture at the International Monetary Fund; **Washington, DC.** 2017-06-12 - 2017-06-12
21. Moran, Daniel. Mapping the Structure of the Global Economy. Stockholm Resilience Conference 2017; **Stockholm.** 2017-08-21 - 2017-08-23
22. Moran, Daniel. Spatial Footprinting. 25th Annual International Input--Output Association Conference; **Atlantic City.** 2017-06-12 - 2017-06-16
23. Moran, Daniel. Special Session: Data Needs for Sustainability Assessments. ISIE-ISSST 2017: Science in Support of Sustainable and Resilient Communities; **Chicago.** 2017-06-26 - 2017-06-30
24. Moran, Daniel; Kanemoto, Keiichiro; Verones, Francesca; Wood, Richard. Mapping the carbon, air pollution, and biodiversity footprints of nations: A GIS + MRIO approach. ISIE-ISSST 2017: Science in Support of Sustainable and Resilient Communities; **Chicago**. 2017-06-26 - 2017-06-30
25. Moran, Daniel; Kanemoto, Keiichiro; Wood, Richard; Jiborn, Magnus; Seto, Karen C. The Carbon Footprint of Global Cities - Special Session on City Footprinting. 25th Annual International Input-Output Association Conference; **Atlantic City.** 2017-06-12 - 2017-06-16
26. Moran, Daniel; Verones, Francesca; Stadler, Konstantin; Wood, Richard; Kanemoto, Keiichiro. Environmental pressure footprints vs. impact footprints: which is the better proxy? 25th Annual International Input--Output Association Conference; **Atlantic City.** 2017-06-12 - 2017-06-16
27. Többen, Johannes Reinhard; Verones, Francesca; Moran, Daniel; Wood, Richard; Stadler, Konstantin; Bruckner, Martin. A Maximum Entropy Approach to the Hybridization of MRIOs for the Estimation of Biodiversity Footprints. 25th Annual International Input-Output Conference 2017; **Atlantic City.** 2017-06-19
28. Verones, Francesca; Moran, Daniel; Stadler, Konstantin; Kanemoto, Keiichiro; Wood, Richard. What are the ecosystem consequences of resource footprints? 25th Annual International Input-Output Conference; **Atlantic City**. 2017-06-19 - 2017-06-23
29. Moran, Daniel. Mapping the Structure of the World Economy. Yale School of Forestry Seminar Series; N**ew Haven.** 2016-01-15 - 2016-01-15
30. Moran, Daniel. Spatial Footprinting: Introducing the FOOTPRINT2.0 Project. NFR 2016 MILJØFORSK Startup seminar; **Oslo.** 2016-09-20
31. Moran, Daniel. Spatially Explicit Biodiversity Footprints. Yale School of Forestry Seminar Series; **Yale**. 2016-12-04 - 2016-12-04
32. Moran, Daniel; Kanemoto, Keiichiro. Mapping the Environmental Footprint of Nations. EcoBalance Conference 2017; **Kyoto**. 2016-10-03 - 2016-10-07
33. Moran, Daniel; Verones, Francesca. Identifying the Species Threat Hotspots from Global Supply Chains: Report for TSUNAGARI. TSUNAGARI Project Meeting; **Kyoto**. 2016-10-07 - 2016-10-09
34. Moran, Daniel; Wood, Richard. Embodied Carbon and Value-Added in Trade: A Calculation Method. Ecofys/Generation Foundation workshop; **London.** 2016-07-20 - 2016-07-21
35. Verones, Francesca; Moran, Daniel; Stadler, Konstantin; Kanemoto, Keiichiro; Wood, Richard. Environmental pressure footprints vs. impact footprints: which is the better proxy? Ecobalance conference; **Kyoto**. 2016-10-03 - 2016-10-06
36. Moran, Daniel. An Overview of the NTNU Industrial Ecology Department. PAPAIOS2015 The 26th Conference; **Kyoto.** 2015-10-30
37. Moran, Daniel. How to identify potentially suitable clubs? Machine learning techniques. 2015. COP21 **Paris.** 2015-12-01 - 2015-12-01
38. Moran, Daniel. Linking climate policy, industrial structure, and GHG emissions in a global framework. 2015. COP21; **Paris.** 2015-12-01 - 2015-12-01
39. Moran, Daniel. The empirical basis for consumption-based accounting. 2015. COP21. **Paris**. 2015-12-01 - 2015-12-01
40. Moran, Daniel; Verones, Francesca. Overview of LCA and Input-Output models for Biodiversity Footprinting. TSUNAGARI Belmont Forum Project Workshop; **Kyoto** 2015-05-16

41. Moran, Daniel; Wood, Richard. The empirical basis for consumption based accounting. **Bonn Climate Change Conference** - June 2015; 2015-05-01 - 2015-05-11
42. Stadler, Konstantin; Lonka, Radek; Moran, Daniel; Pallas, Georgios; Wood, Richard. The Environmental Footprints Explorer - a database for global sustainable accounting. ICT4S and EnviroInfo; **Copenhagen** 2015-09-06 - 2015-09-09
43. Stadler, Konstantin; Lonka, Radek; Moran, Daniel; Pallas, Georgios; Wood, Richard. The Environmental Footprints Explorer - a database for global sustainable accounting. I: EnviroInfo & ICT4S, Adjunct Proceedings (Part 2). : University of Copenhagen, **Copenhagen**, Denmark 2015 ISBN 978-87-7903-712-0. p. -
44. Verones, Francesca; Moran, Daniel; Stadler, Konstantin; Wood, Richard. Resource footprints and their ecosystem consequences. Taking Stock of Industrial Ecology - ISIE Conference 2015; **Surrey, UK** 2015-07-06 - 2015-07-10
45. Verones, Francesca; Wood, Richard; Moran, Daniel; Stadler, Konstantin. Quantifying the ecosystem impacts of resource footprints. Transformations -11th Annual meeting; **Surrey, UK.** 2015-06-30 - 2015-07-03
46. Moran, Daniel; Wood, Richard. Convergence between the Eora, WIOD, EXIOBASE, and OpenEU's consumption-based carbon accounts. 22nd IIOA Conference in **Lisbon**; 2014-07-14 - 2014-07-17
47. Moran, Daniel; Wood, Richard. Getting carbon footprint accounts ready for the prime-time. CarbonCAP- Expert Workshop; **Bonn**. 2014-10-06 - 2014-10-08
48. Moran, Daniel; Wood, Richard; Hertwich, Edgar G. Convergence between the Eora, WIOD, EXIOBASE, and OpenEU's consumption-based carbon accounts. 22nd IIOA Conference in **Lisbon**; 2014-07-14 - 2014-07-17
49. Kanemoto, Keiichiro; Moran, Daniel. Resolving the International Trade Asymmetry. 22nd Annual International Input-Output Association Conference; **Lisbon**. 2014-07-14 - 2014-07-18
50. Moran, Daniel. Global MRIO Databases - An Overview. Guest Lecture in Environmental Economics program at **Lund University**; 2014-12-03 - 2014-12-03
51. Moran, Daniel. Mapping the Ecological Footprint of Nations. 20th Annual International Sustainable Development Research Conference: Resilience; **Trondheim**. 2014-06-19 - 2014-06-19
52. Moran, Daniel. The Eora MRIO Database. Postgraduate School of Industrial Ecology; **Trondheim.** 2013-08-19
53. Kanemoto K, Lenzen M, Geschke A, Moran, D., Construction and application of global multi-region input-output model. Delivered at the 6th Meeting of the Institute of Life Cycle Assessment, **Sendai**, **Japan**, March 2011.
54. Moran, Daniel; Lenzen, M.; Kanemoto, Keiichiro; Geschke, Arne. The Global Carbon Footprint of Consumption: Findings from the Eora Model. 2011 International Society of Industrial Ecology Conference, **Berkeley, CA**. 2011.
55. Moran, Daniel; Lenzen, M.; Kanemoto, Keiichiro; Geschke, Arne. The Eora MRIO. 19th International Input-Output Association Conference, Alexandria, VA USA. 2011.
56. Moran, Daniel. Embodied Ecological Footprints in International Trade. Stepping Up the Pace: New Developments In Ecological Footprinting Methodology, Policy and Practice conference, **Cardiff**, May 2007.
57. Moran, Daniel. Ecologically Unequal Exchange: Why Mind? Guest Lecture, Lund University Human Ecology Department. **Lund, Sweden**. 2006.
58. Moran, Daniel. Wackernagel, M. How the Ecological Footprint is Calculated. Invited Lecture, University of **Lausanne**. 2006.
59. Moran, Daniel; Wackernagel, M. Accelerating Urban Sustainability using the Ecological Footprint. UN Habitat Conference, **Barcelona**. 2004.

## Programming Languages

The languages I have used include: Ada, C/C++, Java, Javascript, Julia, MATLAB, MPI, OpenMP, PBS/Torque, Perl, Python, SQL, WebGL, XML. Experience building serverless, responsive, and containerized web

applications. Experience administering and developing for HPC, cluster, and cloud systems.