

Stefan Pauliuk

Personal details

Date of birth: March 1st, 1982

Place of birth: Herzberg (Elster), fmr. German Democratic Republic

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Present position

Since 2021: Professor for *Sustainable Energy and Material Flow Management* and head of the research group *Industrial Ecology Freiburg* at the Faculty of Environment and Natural Resources, University of Freiburg, Germany.

Links

[Blog](#)

[Homepage](#)

[Google Scholar](#)

[Twitter](#)

[Teaching](#)

[Github \(software\)](#)

[Figshare \(data\)](#)

[Youtube](#)

Research interests

- **Industrial ecology** and **socio-metabolic research**, in particular the study of global supply chains, sustainable material cycles, sustainable consumption, and environmental footprints of consumption
- **Prospective assessment** of sustainable development strategies
- **Scenario analysis** for material cycles and consumption patterns
- **Indicator and policy development** for resource efficiency, circularity, and sustainability
- **Method and theory development** for material flow analysis (MFA), life cycle assessment (LCA), supply and use tables (SUT), and multiregional input-output analysis (MRIO).

Method competence

- **Industrial ecology methods**, including material flow analysis (MFA), life cycle assessment (LCA), and multiregional input-output analysis (MRIO)
- **Scenario modelling** and prospective assessment
- **Software and database development** for industrial ecology (Python and SQL)
- **Statistical analysis**: regression analysis, statistical inference, and data reconciliation

Teaching

- **‘Nachhaltiges Energie- und Stoffstrommanagement’** (Sustainable energy and material flow management), (MSc level, 5 ECTS), annually.
- **‘Research methods in industrial ecology’**, (MSc level, 5 ECTS), annually.
- **‘Life cycle management’**, together with Rainer Grießhammer, (MSc level, 5 ECTS), annually.
- **‘Energy and Sustainability’**, together with Ernst Ulrich von Weizsäcker (MSc, 5 ECTS), annually.
- **‘Master thesis project in industrial ecology’** (Research skills, science ethics, and scientific writing at the MSc level, 5 ECTS), annually.
- **‘Industrial Ecology open online course (IEooc)’**, free online course at MSc level available under <http://www.teaching.industrialecology.uni-freiburg.de/>
- **‘Umweltphysik’** (Environmental Physics) for bachelor students (5 ECTS), annually.

Education and professional experience

2015–2021: Assistant professor (‘Juniorprofessor’) for *Sustainable Energy and Material Flow Management* and head of the research group *Industrial Ecology Freiburg* at the Faculty of Environment and Natural Resources, University of Freiburg, Germany.

2013–2015: **Post-doctoral researcher in the group of Prof. Edgar Hertwich (environmental systems analysis, industrial ecology) at NTNU Trondheim.** My main focus during that time was to contribute to the integration of different systems analysis methods including MFA, IO, LCA, and integrated assessment modeling. I also contributed to the work with physical, mixed unit, and hybrid multiregional IO tables.

2009–2013: **PhD in industrial ecology at the Norwegian University of Science and Technology (NTNU) in Trondheim.** Thesis advisors: Professor Daniel B Müller and Professor Helge Brattebø (both at the Industrial Ecology Programme). Main working areas: material flow analysis; the steel cycle; sustainable buildings and transportation; climate change mitigation; decoupling; method and database development. **Thesis title:** ‘The Role of Stock Dynamics in Climate Change Mitigation’. The Phd committee

(Professor Ernst Worrell, Utrecht; Lecturer Dr. Julia Steinberger, Leeds; and Lecturer Dr. Jonathan Cullen, Cambridge, UK) assessed the thesis as “internationally outstanding”.

2007–2008: Scientific employee at Deutsches Elektronensynchrotron (DESY).
Development of control and measurement software.

2007: University Diploma (MSc equivalent) in physics, University of Jena, Germany.
Graduated under Professor Reinhard Meinel with a diploma thesis on the topic
‘Constructive uniqueness proofs of stationary vacuum black hole spacetimes including the
case of degenerate horizons’ with final grade „sehr gut“.

2004–2007: Study of physics, University of Jena, Germany

2001–2004: Study of physics, Chemnitz University of Technology, Germany

**2001: Qualification for university entrance (Abitur), Max-Steenbeck-Gymnasium
Cottbus, Germany**

Research stays and other professional exchange

2019: Institute of the Urban Environment, Chinese Academy of Sciences, Xiamen, PRC.
Collaboration on material flow analysis of critical raw materials

2019: Monash University, Melbourne, Department of Mining Engineering. Collaboration on
prospective supply and demand models for metals

2014: Waseda University, Tokyo, Department of Economics. Collaboration on the prospective
material tracing model for steel

2014: University of Sydney, Department of Physics. Collaboration on input-output analysis of
waste management

2013: Centre for Environmental Science, CML, Leiden University, the Netherlands.
Collaboration on prospective scenarios for critical metal demand

2012: Cambridge University, Department of Engineering. Collaboration on the global steel
cycle scenario model

Language skills

German: native speaker; **English:** fluent; **Norwegian:** fluent; **French:** basic.

Leadership experience, committee work, and institutional responsibilities

2023-2024: Chair of the board of the section for socioeconomic metabolism (material flow analysis) of the International Society for Industrial Ecology (ISIE).

2021: Co-chair of the Industrial Ecology Day, a global 24 hr online conference of the International Society for Industrial Ecology (ISIE).

<https://is4ie.org/events/event/international-industrial-ecology-day-2021>

Since 2020: Co-chair of the industry/materials modelling working group of the international consortium on ‘Energy Demand changes Induced by Technological and Social Innovations’ (EDITs), hosted by the International Institute for Applied Systems Analysis (IIASA):

<https://iiasa.ac.at/web/home/research/researchPrograms/Energy/Research/EDITs/EDITs.html>

2019-2022: Co-chair of the board of the section for socioeconomic metabolism (material flow analysis) of the International Society for Industrial Ecology (ISIE).

2019-2021: Member of the Committee for Environmental Protection (Ausschuss für Umweltschutz) of the University of Freiburg, Germany.

Since 2017: Academic director of the MSc programme ‘Renewable Energy Engineering and Management’, University of Freiburg

2018-2021: Member of the Nominating Committee of the International Society for Industrial Ecology (ISIE).

2017–2019: Member of the working group „Material- und Energieeffizienz“, an advisory body for German federal ministries regarding the utilisation of wood and wood products in the German economy

2016–2018: Member of the ‘Data Transparency Task Force’ of the International Society for Industrial Ecology (ISIE).

2013–2014: Co-organiser of the IndEcol Forum, an extracurricular activity for Industrial Ecology MSc students

2008–2010: Member of the board of the Industrial Ecology Programme at NTNU

2002–2004: Member of the board of physics students at Chemnitz University of Technology

Dissemination and community service

- I tweet, blog about my research, and contribute to the Wikipedia on a regular basis.
- I created and maintain the industrial ecology dashboard on GitHub, which is an inventory of open software repositories that are relevant for industrial ecology researchers. (<https://github.com/IndEcol/Dashboard>)
- I created and maintain the industrial ecology open online course (IEooc), which is the most comprehensive collection of industrial ecology teaching material available on the web. (<http://www.teaching.industrialecology.uni-freiburg.de/>)

- I created and maintain the Industrial Ecology Data Commons (IEDC), an online catalogue for socioeconomic and engineering data that are used across the industrial ecology methods. (<http://www.database.industrialecology.uni-freiburg.de/>)
- I regularly serve on scientific committees for academic conferences, including the Biannual International Conference of the International Society for Industrial Ecology (ISIE), the International Input-Output Conference, the International Conference on Resource Sustainability (icRS) 2018, the Bioeconomy Congress 2017, the Ecobalance conference in Japan, and the socioeconomic metabolism section conference of the ISIE.
- I frequently (ca. 2 times per month) serve as reviewer for scientific journals, organisations, and funders, including Ecological Economics, Economic Systems Research, Energy and Buildings, Energy Strategy Reviews, Renewable and Sustainable Energy Reviews, Environmental Science and Technology, the International Energy Agency (IEA), The International Journal of Life Cycle Assessment, the IPCC, Climate Policy, the Journal of Cleaner Production, the Journal of Industrial Ecology, Nature Climate Change, Nature Scientific Data, PLOS ONE, PNAS, Resources Conservation and Recycling, Science, Transportation Research Part D, the European Research Council (ERC), and more.
- As a member of the ‘Data Transparency Task Force’ of the International Society for Industrial Ecology (ISIE), I contribute to the development of standards and best practice guidelines for data sharing as part of the peer review publication process (<https://is4ie.org/data>)
- In 2017, I organised the 2-day “Young researcher seminar on Material Flow Analysis and sustainable material cycles” in Freiburg with 15 participants from the wider region.

Conference presentations, talks

I present posters, give presentations, and am invited for seminars and plenary talks at workshops and conferences worldwide. Conferences that I regularly attend include the biannual conference of the International Society for Industrial Ecology (ISIE), the Gordon Research Conference for Industrial Ecology, the Ecobalance conference (Japan), and the International Meeting of the Socioeconomic Metabolism Section of the ISIE.

Selected invited talks:

- “Global life cycle impacts of wood products use and cascading”, Plenary talk at the 2022 Gordon Research Conference for Industrial Ecology, Newry, Maine, USA.
- Webinar on “Reductions in material production induced by demand-side strategies: Implications for sustainable development” in September 2022 as part of the Energy Demand changes Induced by Technological and Social innovations (EDITS) initiative.
- “Climate Change and Resource Efficiency – Current Knowledge Situation and Research Needs”, plenary talk given at both the conference on resource-efficient decarbonisation

pathways, organized by the German Federal Environmental Agency, Berlin, Nov 4-5, 2019, and during the EU Raw Materials Week, Brussels, Nov 18-22, 2019.

- “Circular Metabolism and Climate“, joint plenary talk with Arnold Tukker, Xuemei Bai, and Vered Blass at the 2019 Biannual Conference of the International Society for Industrial Ecology (ISIE), Beijing, China.
- “The role of in-use stocks for circular economy and climate change mitigation“, plenary talk at the International Symposium of the Christian Doppler Laboratory for Anthropogenic Resources, TU Vienna, September 2018.
- “Politische und ökonomische Steuerung nachhaltiger Stoffkreisläufe“, Plenary talk at the annual working group meeting „Operations Research in Environmental Science“ und „Supply Chain Management“ of the Gesellschaft für Operations Research e.V. (GOR) and the Netzwerk Industrial Ecology, Ulm, March 2018.
- “Ökologische Fußabdrücke und Ressourcenrucksäcke: Wieviel Wald brauchen wir für die nachhaltige Gestaltung unserer Energie- und Materialversorgung?“ Plenary talk about the Land footprint of German final consumption, given at the 37th Congress of the German forest scientists and forest associations in Freiburg, 2017
- “Between Accuracy and Relevance on the Large Scale: How to Make IE Models Fit for the Future.” Plenary talk at the 2016 Gordon Research Conference for Industrial Ecology, Stowe, Vermont, USA.
- “Prospective Models of Society's Future Metabolism: What Industrial Ecology has to Contribute.“ Plenary talk at the 2015 Biannual Conference of the International Society for Industrial Ecology (ISIE), Surrey, UK.

Membership

- International Society for Industrial Ecology

Honours and Awards

2020: “Resources, Conservation & Recycling 2020 Most Cited Paper Award” and “Resources, Conservation & Recycling 2020 Most Downloaded Paper Award” for "Critical appraisal of the circular economy standard BS 8001:2017 and a dashboard of quantitative system indicators for its implementation in organizations" (DOI 10.1016/j.resconrec.2017.10.019)

2019: Best Paper Award for 2018 in “Resources, Conservation & Recycling” for "Critical appraisal of the circular economy standard BS 8001:2017 and a dashboard of quantitative system indicators for its implementation in organizations" (DOI 10.1016/j.resconrec.2017.10.019)

2016: Thomas E. Graedel Prize of the Journal of Industrial Ecology for the best paper published by a junior author in 2015 (DOI 10.1111/jiec.12306).

2001-2007: Scholarship from the German National Merit Foundation (Studienstiftung des Deutschen Volkes)

Selected projects

2022-2026: CIRCOMOD: circular economy modelling for climate change mitigation, EU Horizon, Work package leader

2019-2022: Holzhybrid: Design and environmental assessment of a modular and multi-functional wooden building, federal ministry funding, as, Work package leader

2019-2022: PROSET: prospective assessment of emerging technologies, Stihl Foundation, Work package leader

2018-2021: OASES: Open Assessment of the Swiss Economy, Swiss National Science Foundation, Work package leader

Journal publications

2023

A review of methods to trace material flows into final products in dynamic material flow analysis - from industry shipments in physical units to monetary input-output tables (part I), Jan Streeck, *Stefan Pauliuk*, Hanspeter Wieland, and Dominik Wiedenhofer, Journal of Industrial Ecology, published online, <http://doi.org/10.1111/jiec.13380>

A review of methods to trace material flows into final products in dynamic material flow analysis - comparative application of six methods to the USA and EXIOBASE3 regions (part II), Jan Streeck, Hanspeter Wieland, *Stefan Pauliuk*, Barbara Plank, Kenichi Nakajima, and Dominik Wiedenhofer, accepted for publication in the Journal of Industrial Ecology.

2022

Co-design of digital transformation and sustainable development strategies - What socio-metabolic and industrial ecology research can contribute, *Stefan Pauliuk*, Maximilian Koslowski, Kavya Madhu, Simon Schulte, and Sebastian Kilchert, Journal of Cleaner Production, Volume 343, 2022, 130997. DOI 10.1016/j.jclepro.2022.130997

Required displacement factors for evaluating and comparing climate impacts of intensive and extensive forestry in Germany, Christian Buschbeck and *Stefan Pauliuk*, Carbon Balance and Management 17 (14), 2022. DOI 10.1186/s13021-022-00216-8

Sector-specific scenarios for future stocks and flows of aluminum – An analysis based on shared socioeconomic pathways, Julien Pedneault, Guillaume Majeau-Bettez, *Stefan Pauliuk*, Manuele Margni, Journal of Industrial Ecology 26(5), Pages: 1728-1746, DOI:10.1111/jiec.13321

Modelling Hazard for Tailings Dam Failures at Copper Mines in Supply Chains of Final Consumption, by Sören Lars Nungesser and *Stefan Pauliuk*. Resources, 2022, 11(10), 95; DOI: 10.3390/resources11100095

Exploring the global trade networks of the tungsten supply chain: Insights into the physical and monetary mismatch among countries, Linbin Tang, Peng Wang, Zijie Ma, *Stefan Pauliuk*, Wei-Qiang Chen, Tao Dai, Zipeng Lin, Journal of Industrial Ecology 27(1), pages 323-335, DOI 10.1111/jiec.13333

2021

Global Scenarios of Resource and Emission Savings from Material Efficiency in Residential Buildings and Cars, *Stefan Pauliuk*, Niko Heeren, Peter Berrill, Tomer Fishman, Andrea Nistad, Qingshi Tu, Paul Wolfram, and Edgar G Hertwich, Nature Communications 12 (2021), 5097. DOI: 10.1038/s41467-021-25300-4

Understanding environmental trade-offs and resource demand of direct air capture technologies through comparative life-cycle assessment, Kavya Madhu, *Stefan Pauliuk*, Sumukha Dhathri, and Felix Creutzig, Nature Energy, DOI 10.1038/s41560-021-00922-6

Carbon pricing of basic materials: Incentives and risks for the value chain and consumers, Jan Stede, *Stefan Pauliuk*, Gilang Hardadi, and Karsten Neuhoff, Ecological Economics, in press. DOI 10.1016/j.ecolecon.2021.107168

Life cycle carbon emissions of different land conversion and woody biomass utilization scenarios in Indonesia, Rio Aryapratama and *Stefan Pauliuk*, Science of the Total Environment, accepted for publication. DOI: 10.1016/j.scitotenv.2021.150226

Price variance in hybrid-LCA leads to large uncertainty in carbon footprint, Arthur Jakobs, Simon Schulte, *Stefan Pauliuk*, Frontiers in Sustainability, DOI 10.3389/frsus.2021.666209

Relaxing the Import Proportionality Assumption in Multi-Regional Input-Output Modelling, Simon Schulte, Arthur Jakobs, *Stefan Pauliuk*, Journal of Economic Structures, DOI 10.1186/s40008-021-00250-8

Quantifying longevity and circularity of copper for different resource efficiency policies at the material and product levels, Stefanie Klose and *Stefan Pauliuk*, Journal of Industrial Ecology 25(4), p 979-993, DOI 10.1111/jiec.13092.

A comprehensive set of global scenarios of housing, mobility, and material efficiency for material cycles and energy systems modelling, Tomer Fishman, Niko Heeren, *Stefan Pauliuk*, Peter Berrill, Qingshi Tu, Paul Wolfram, and Edgar G. Hertwich, Journal of Industrial Ecology, DOI 10.1111/jiec.13122.

2020

Material efficiency and its contribution to climate change mitigation in Germany – A deep decarbonisation scenario analysis until 2060, *Stefan Pauliuk* and Niko Heeren, Journal of Industrial Ecology, 25(2), pages 479-493, DOI 10.1111/jiec.13091

Linking Service Provision to Material Cycles – A New Framework for Studying the Resource Efficiency-Climate Change Nexus (RECC), *Stefan Pauliuk*, Tomer Fishman, Niko Heeren, Peter Berrill, Qingshi Tu, Paul Wolfram, Edgar G. Hertwich, Journal of Industrial Ecology, DOI 10.1111/jiec.13023, available online.

Implications of the Distribution of German Household Environmental Footprints across Income Groups for Integrating Environmental and Social Policy Design, Gilang Hardadi, Alexander Buchholz, and *Stefan Pauliuk*, Journal of Industrial Ecology, DOI 10.1111/jiec.13045, available online.

Material efficiency and climate change mitigation of passenger vehicles, Paul Wolfram, Qingshi Tu, Niko Heeren, *Stefan Pauliuk*, and Edgar G. Hertwich. Journal of Industrial Ecology, DOI: 10.1111/jiec.13067, available online.

Multi-objective Optimization Identifies Trade-offs Between Self-sufficiency and Environmental Impacts of Regional Agriculture in Baden-Württemberg, Germany, Christian Buschbeck, *Stefan Pauliuk*, Christian Hauenstein, and Larissa Bitterich. Journal of Agriculture, Food Systems, and Community Development, DOI 10.5304/jafscd.2020.101.003.

Refining the understanding of China's tungsten dominance with dynamic material cycle analysis, Linbin Tang, Peng Wang, Thomas E. Graedel, *Stefan Pauliuk*, Keying Xiang, Yan Ren, Wei-Qiang Chen. *Resources, Conservation & Recycling*, Volume 158, p 104829, DOI 10.1016/j.resconrec.2020.104829.

ODYM - An Open Software Framework for Studying Dynamic Material Systems - Principles, Implementation, and Data Structures, by *Stefan Pauliuk* and Niko Heeren. *Journal of Industrial Ecology*, 24(3), 446-458, DOI 10.1111/jiec.12952.

2019

Contributions of sociometabolic research to sustainability science. Haberl, Helmut, Wiedenhofer, Dominik, *Pauliuk, Stefan*, Krausmann, Fridolin, Müller, Daniel B, and Fischer-Kowalski, Marina. *Nature Sustainability*, 2019 (2), 173-184, DOI 10.1038/s41893-019-0225-2.

A General Data Model for Socioeconomic Metabolism and its Implementation in an Industrial Ecology Data Commons Prototype. *Stefan Pauliuk*, Niko Heeren, Mohammad Mahadi Hasan, and Daniel B Müller, *Journal of Industrial Ecology*, 23(5), 1016-1027, DOI 10.1111/jiec.12890.

Material efficiency strategies to reducing greenhouse gas emissions associated with buildings, vehicles, and electronics – A review, by Hertwich, Edgar; Ali, Saleem; Ciacci, Luca; Fishman, Tomer; Heeren, Niko; Masanet, Eric; Nojavan Asghari, Farnaz; Olivetti, Elsa; *Pauliuk, Stefan*; Tu, Qingshi; Wolfram, Paul. *Environmental Research Letters*, 2019, Vol. 14, 043004, DOI 10.1088/1748-9326/ab0fe3

Estimating in-use wood-based materials carbon stocks in Indonesia: towards a contribution to the national climate mitigation effort *Resources*, by Rio Aryapratama and *Stefan Pauliuk*, *Resources Conservation & Recycling*, 2019, Volume 149, pp 301-311.

Prospective Cost and Environmental Impact Assessment of Battery and Fuel Cell Electric Vehicles in Germany, by Kai Bekel and *Stefan Pauliuk*, *International Journal of Life Cycle Assessment*, 2019, 24, 2220–2237, DOI 10.1007/s11367-019-01640-8

Integrating Dynamic Material Flow Analysis and Computable General Equilibrium Models for Both Mass and Monetary Balances in Prospective Modeling: A Case for the Chinese Building Sector Zhi Cao, Gang Liu, Shuai Zhong, Hancheng Dai, and *Stefan Pauliuk* *Environmental Science and Technology*, 53 (1), pp 224–233, 2019.

Integrating Life Cycle Assessment into the Framework of Environmental Impact Assessment for Urban Systems. Framework and Case Study of Masdar City, Abu Dhabi. Kavya Madhu and *Stefan Pauliuk*. *Environments*, 2019, 6 (9), 105.

Physical and Monetary Methods for Estimating the Hidden Trade of Materials. Wei-qiang Chen, Zi-jie Ma, *Stefan Pauliuk*, and Tao Wang. *Resources*, 2019, 8(2), p. 89.

2018

Critical appraisal of the circular economy standard BS 8001:2017 and a dashboard of quantitative system indicators for its implementation in organizations *Stefan Pauliuk* *Resources Conservation and Recycling*, Volume 129, 2018, pages 81-92.

Scenarios for demand growth of metals in electricity generation technologies, cars and electronic appliances. Sebastiaan Deetman, *Stefan Pauliuk*, Detlef P. van Vuuren, Ester van der Voet, and Arnold Tukker *Environmental Science and Technology* 52(8), 2018, pages 4950-4959.

Bio-electrochemical Conversion of Industrial Wastewater combined with downstream Methanol Synthesis – An Economic- and Life Cycle Assessment. Jan Streeck, Christoph Hank, Michael Neuner, Laura Gil-Carrera, Marika E Kokko, *Stefan Pauliuk*, Achim Schaadt, Sven Kerzenmacher and Robin J White *Green Chemistry* (20), 2018, 2742. DOI: 10.1039/c8gc00543e

2017

Industrial ecology in integrated assessment models.

Stefan Pauliuk, Anders Arvesen, Konstantin Stadler, and Edgar G. Hertwich
Nature Climate Change 7, 2017, pages 13–20.

Solid Waste and the Circular Economy - A Global Analysis of Waste Treatment and Waste Footprints.

Alexandre Tisserant, *Stefan Pauliuk*, Stefano Merciai, Jannick Schmidt, Jacob Fry, Richard Wood, and Arnold Tukker. Journal of Industrial Ecology 21(3), 2017, pages 628-640.

Choice of Allocations and Constructs for Attributional or Consequential Life Cycle Assessment and Input-Output Analysis. Guillaume Majeau-Bettez, Thomas Dandres, *Stefan Pauliuk*, Richard Wood, Edgar Hertwich, Réjean Samson, and Anders Hammer Strømman. Journal of Industrial Ecology, in press. DOI: 10.1111/jiec.12604

Correlation between production and consumption-based environmental indicators: The link to affluence and the effect on ranking environmental performance of countries. Moana Simas, *Stefan Pauliuk*, Richard Wood, Edgar G Hertwich, and Konstantin Stadler. Ecological Indicators 76, 2017, pages 317–323.

Regional distribution and losses of end-of-life steel throughout multiple product life cycles—Insights from the global multiregional MaTrace model.

Stefan Pauliuk, Yasushi Kondo, Shinichiro Nakamura, and Kenichi Nakajima.
Resources, Conservation and Recycling 116, 2017, pages 84-93.

Quantifying Recycling and Losses of Cr and Ni in Steel Throughout Multiple Life Cycles Using MaTrace-Alloy.

Shinichiro Nakamura, Yasushi Kondo, Kenichi Nakajima, Hajime Ohno, and *Stefan Pauliuk*.
Environmental Science and Technology 51(17), 2017, pages 9469-9476.

On the boundary between economy and environment in life cycle assessment.

Bo Pedersen Weidema, Jannick Schmidt, Peter Fantke, and *Stefan Pauliuk*. The International Journal of Life Cycle Assessment, 23, 1839-1846, 2018. DOI 10.1007/s11367-017-1398-4

2016

Commentary: Balance issues in input–output analysis: A comment on physical inhomogeneity, aggregation bias, and coproduction. Guillaume Majeau-Bettez, *Stefan Pauliuk*, Richard Wood, Evert A. Bouman, and Anders Hammer Strømman. Ecological Economics 126, 2016, 188-197.

Matching global cobalt demand under different scenarios for co-production and mining attractiveness
Alexandre Tisserant and *Stefan Pauliuk*. Journal of Economic Structures 5:4, 2016.

Toward a Practical Ontology for Socioeconomic Metabolism. *Stefan Pauliuk*, Guillaume Majeau-Bettez, Edgar G Hertwich, and Daniel B Müller. Journal of Industrial Ecology 20(6), pages 1260-1272.

An Australian Multi-Regional Waste Supply-Use Framework. Jacob Fry, Manfred Lenzen, Damien Giurco, and *Stefan Pauliuk*. Journal of Industrial Ecology 20(6), pages 1295-1305.

2015

Socioeconomic metabolism as paradigm for studying the biophysical basis of human societies.

Stefan Pauliuk and Edgar G Hertwich. Ecological Economics 119, 2015, pages 83–93.

A General System Structure and Accounting Framework for Socioeconomic Metabolism.

Stefan Pauliuk, Guillaume Majeau-Bettez, and Daniel B Müller. Journal of Industrial Ecology 19(5), 728-741.

Lifting Industrial Ecology Modeling to a New Level of Quality and Transparency - A Call for More Transparent Publications and a Collaborative Open Source Software Framework. *Stefan Pauliuk*, Guillaume Majeau-Bettez, Christopher L. Mutel, Bernhard Steubing, and Konstantin Stadler. Journal of Industrial Ecology 19(6), 937-949.

2014

Global Carbon Benefits of Material Substitution in Passenger Cars until 2050 and the Impact on the Steel and Aluminum Industries. Roja Modaresi, *Stefan Pauliuk*, Amund N. Løvik, and Daniel B. Müller. *Environmental Science and Technology* 48(18), pages 10776-10784.

Dynamic Models of the Fixed Capital Stock and Their Application in Industrial Ecology. *Stefan Pauliuk*, Richard Wood, and Edgar G Hertwich. *Journal of Industrial Ecology* 19(1), pages 104-116.

The Role of In-Use Stocks in the Social Metabolism and in Climate Change Mitigation. *Stefan Pauliuk* and Daniel B. Müller. *Global Environmental Change* 24, 2014, pages 132-142.

Exploring Urban Mines: Pipe Length and Material Stocks in Urban Water and Wastewater Networks. *Stefan Pauliuk*, G Venkatesh, Helge Brattebø, and Daniel B. Müller. *Urban Water Journal* 11(4), 2014, pages 274-283.

2013

Carbon Emissions of Infrastructure Development. Daniel B. Müller, Gang Liu, Amund N. Løvik, Roja Modaresi, *Stefan Pauliuk*, Franciska S. Steinhoff, and Helge Brattebø. *Environmental Science and Technology* 47(20), 2013, pages 11739-11746.

The Steel Scrap Age. *Stefan Pauliuk*, Rachel L. Milford, Daniel B. Müller, and Julian M. Allwood. *Environmental Science and Technology* 47(7), 2013, pages 3448-3454.

The Roles of Energy and Material Efficiency in Meeting Steel Industry CO₂ Targets. Rachel L. Milford, *Stefan Pauliuk*, Julian M. Allwood, and Daniel B. Müller. *Environmental Science and Technology* 47(7), 2013, pages 3455-3462.

Steel all over the world: Estimating in-use stocks of iron for 200 countries. *Stefan Pauliuk*, Tao Wang, and Daniel B. Müller. *Resources, Conservation and Recycling* 71, 2013, pages 22-30.

Transforming the Norwegian Dwelling Stock to Reach the 2 Degrees Celsius Climate Target. *Stefan Pauliuk*, Karin Sjöstrand, and Daniel B. Müller. *Journal of Industrial Ecology* 17(4), 2013, pages 542-554.

2012

Moving Toward the Circular Economy: The Role of Stocks in the Chinese Steel Cycle. *Stefan Pauliuk*, Tao Wang, and Daniel B. Müller. *Environmental Science and Technology* 46(1), 2012, pages 148-154.

Reconciling Sectoral Abatement Strategies with Global Climate Targets: The Case of the Chinese Passenger Vehicle Fleet. *Stefan Pauliuk*, Ni Made Arya Dhaniati, and Daniel B. Müller. *Environmental Science and Technology* 46(1), 2012, pages 140-147.

2010

Iron and steel in Chinese residential buildings: A dynamic analysis. Mingming Hu, *Stefan Pauliuk*, Tao Wang, Gjalt Huppes, Ester van der Voet, and Daniel B. Müller. *Resources, Conservation and Recycling* 54(9), 2010, pages 591-600.

Other selected publications: Reports, forum pieces, comments, reviews

2022

Lessons, narratives and research directions for a sustainable circular economy, by Sina Leipold, Anna Petit-Boix, Anran Luo, Hanna Helander, Machteld Simoons, plus ca. 30 other co-authors, including *Stefan Pauliuk*. *Journal of Industrial Ecology* 27(1), pages 6-18, <http://doi.org/10.1111/jiec.13346>

Carbon Neutrality Needs a Circular Metal-Energy Nexus, Peng Wang, Heming Wang, Wei-Qiang Chen, and *Stefan Pauliuk*. Fundamental Research (2022), DOI: <https://doi.org/10.1016/j.fmre.2022.02.003>

Where is my footprint located? Estimating the geographical variance of Hybrid-LCA footprints, by Arthur Jakobs, Simon Schulte, and *Stefan Pauliuk*. Preprint on ResearchSquare, DOI: <https://doi.org/10.21203/rs.3.rs-1442198/v3>

2021

Guidelines for Data Modeling and Data Integration for Material Flow Analysis and Socio-Metabolic Research. Compiled by *Stefan Pauliuk* and issued by the Board of the Topical Section for Research on Socio-Economic Metabolism (SEM) of the International Society for Industrial Ecology (ISIE). Industrial Ecology Freiburg (IEF) Working Paper 2(2021), University of Freiburg, Germany, DOI 10.6094/UNIFR/217970

The Impact of Sectoral Aggregation on Elasticities of Substitution Using Translog Cost Function, by Gilang Hardadi and *Stefan Pauliuk*. Preprint for the Journal of Economic Structures, <https://www.researchsquare.com/article/rs-965035/v1>

Carbon Pricing of Basic Materials: Incentives and Risks for the Value Chain and Consumers. Jan Stede, *Stefan Pauliuk*, Gilang Hardadi, and Karsten Neuhoff, 2021. DIW Discussion paper 1935, German Institute for Economic Research, Berlin.

Treibhausgasbilanz der Universität Freiburg im Breisgau 2017. *Stefan Pauliuk*, Marcel Eichler, Benjamín Elizalde Durán, Andrew Bonneau, Arthur Jakobs, Jürgen Steck und Heiner Schanz (2021). Industrial Ecology Freiburg (IEF) Working Paper 1(2021), Universität Freiburg im Breisgau. DOI 10.6094/UNIFR/176419

2020

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