Romain BILLY

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RESEARCH TOPICS:

- Material Flow Analysis (MFA) and Dynamic Material Flow Analysis.
- Systemic decarbonisation of the aluminium and steel cycles through new technologies and increased circularity.
- Critical raw materials, circularity of battery minerals and material constraints of the energy transition.
- Nutrient balances for a circular bio-economy and sustainable food systems.
- Climate-smart solutions and strategies to increase the use of underutilised wood resources in construction.

WORK EXPERIENCE

Since 2023 — **Norwegian University of Science and Technology (NTNU),** Trondheim, Norway
Postdoctoral Fellow and Researcher, Program for Industrial Ecology.

- HyInHeat*: Hydrogen technologies for decarbonization of industrial heating processes.*
- GreenHood*: Nutrient management strategies for regional ecosystems across Europe.*
- WoodStock*: Climate-smart use of wood in construction.*

2017-2022 — **Norwegian University of Science and Technology (NTNU),** Trondheim, Norway
PhD Candidate, Program for Industrial Ecology

- SFI Metal Production: *Resource efficient metal production from a clean industry.*
- BATMAN*: Sustainable end-of-life management, reuse and new material streams for Li-ion batteries.*
- MinFuture *Global material flows and demand-supply forecasting for mineral strategies.*

2013-2017 — **Sia Partners** (Strategy and Management Consulting), Paris, France
Senior Consultant, Energy, Environment and Data Science

2011 - 2012 (10 months) — **Norwegian University of Science and Technology (NTNU),** Trondheim, Norway
Student Assistant for the courses Material Flow Analysis and Industrial Ecology

2011 (3 months) — **Xyntéo** (Sustainable development consulting), Oslo, Norway
Part-Time Analyst, conducted surveys on environmental impacts of infrastructure development in Asia.

2010 (3 months) — **Mairie de Paris** (Townhall of Paris), France, Division of Environment and Green spaces
Traineeship in the office of the Scientific and Technical Advisor. Environmental performance, ISO 14001.

EDUCATION

2017-2022 — **PhD in Industrial Ecology, NTNU Trondheim, Norway**
SFI Metal Production and Industrial Ecology Program. Main supervisor: Prof. Daniel B. Müller
Thesis: Monitoring and simulating material cycles and emissions at multiple scales – Case studies for aluminium

2010-2012 — **M.Sc. in Industrial Ecology, NTNU Trondheim, Norway**
TIME (Top Industrial Managers for Europe) double degree between ECN and NTNU
Major in Environmental Systems Analysis: Life Cycle Analysis, Corporate Social Responsibility, Material Flow Analysis, Input-Output, Environmental Management, Climate Change).
Master Thesis with Norsk Hydro ASA: *Material Flow Analysis of extruded aluminium in French buildings*

2008-2010 — **M.Sc. in Engineering, Ecole Centrale de Nantes, France**
A top 10 French engineering school, Equivalent to a M.Sc. **Major in New Energy Systems.**

2006-2008 — Student in Classes Préparatoires at **Lycée Saint-Louis, Paris**:

Teaching Experience

2024-2025 **Course responsible and lecturer** for the courses Material Flow Analysis (TEP4285) and Built environment: Stock dynamics and climate change (TEP4290).

2024 **Co-creation of the online course** (MOOC) *Aluminium Unveiled: A Comprehensive Journey from History to Sustainability* in collaboration with the European Aluminium Association and the University of Padova.

2017-2020 **Teaching Assistant** for the courses Material Flow Analysis and Built environment: Stock dynamics and climate change. Developed and corrected teaching exercises and exams, animated tutorials, gave lectures.

Mentoring Experience

PhD Students co-supervision
Since 2025: Zoé Cord'homme, Marceau Cormery
Since 2023: Moritz Langhorst

MSc Students co-supervision
2025: Olav Kvåle Gissinger, Magdalena Anna Paluszynska, Sigurd Hernes Berre
2024: Marita Meier Nilsen
2023: Francis Isidore Barre, Loïs Lozach
2022: Marceau Cormery, Brent McNeil, Moritz Langhorst, Anna Eide Lunde, Sofia Genovesi
2021: Eric Young, Håvard Fossum
2020: Giulia Pristerà, Fride Müller, Heidi Grande
2019: Louis Monnier, Valentin Gentile

Research Grants

I actively participated in the development of several European and Norwegian research proposals, leading to the financing of my 4-years postdoc and its extension to a permanent researcher position, as well as 5 PhD positions:

- 7 Horizon EU projects (3 funded, 2 first position in waiting list)
- 1 MSCA Doctoral Network (under consideration)
- 1 Norwegian Centre for Environment-friendly Energy Research (ZeMe centre, funded)
- 3 Norwegian Centres for Research-based Innovation (1 funded)
- Various smaller projects with public bodies and industry associations (European Aluminium, Nickel Institute, JRC…)

Community Service

2025-2026 **Board member** (Web Editor and Communication Strategist) of the Socio-Economic Metabolism section of the International Society for Industrial Ecology (ISIE-SEM).

2023-2025 **Member of the Circularity Working Group of the Aluminium Stewardship Initiative**.

2024 **Member of the expert group** of the Norwegian Academy of Science and Letters on sustainable batteries. Co-organised the Science for Policy Advice workshop *Sustainable Batteries – What is the way forward?*

24 reviews for the journals *Resources, Conservation and Recycling, Journal of Industrial Ecology, Nature Climate Change, Environmental Science & Technology, Nature Sustainability, Nature Reviews Clean Technology, Journal of Cleaner Production, Journal of Sustainable Metallurgy, Matériaux & Techniques, Humanities & Social Sciences Communications.*
Grant review for the Dutch Research Council (NOW).

Other Skills

Languages

French: Native Speaker
English: Fluent, TOEIC 990/990
Norwegian: C1/C2 level

Computer Skills

Programming: Python, SQL, Matlab/Simulink, Git
Data visualization: Tableau (expert level), Power BI, e!Sankey
Data capture and management: Oracle, SQL Server, Google Analytics
Software: Advanced knowledge of MS Office (including Access, Project, Visio and VBA), Photo and Video editing (Gimp, Adobe CS)

List of Scientific Publications

Journal Publications

1. **Approaching building lifetimes and hazard rates through demolition patterns: Case studies for a historical city center.** Zoe Cordhomme, Nils Dittrich, Kristina Bringedal Gedde, Romain G. Billy, and Daniel B. Müller. 2024. *Journal of Industrial Ecology.* DOI: 10.1111/jiec.13604
2. **Clean Energy Demand Must Secure Sustainable Nickel Supply**. Ravi Basuhi, Karan Bhuwalka, Elizabeth A. Moore, Isabel Diersen, Rameen H. Malik, Eric Young, Romain G. Billy, Robert Stoner, Gerbrand Ceder, Daniel B. Müller, Richard Roth, and Elsa A. Olivetti. 2024. *Joule; 8 (11), 2960-2973.* DOI: 10.1016/j.joule.2024.10.008
3. **Limits to Graphite Supply in a Transition to a Post-Fossil Society**. Francis Isidore Barre, Romain G. Billy, Fernando Aguilar Lopez, and Daniel B. Müller. 2024. *Resources, Conservation and Recycling;* 208:107709. DOI: 10.1016/j.resconrec.2024.107709
4. **Inertia of Technology Stocks: A Technology-Explicit Model for the Transition toward a Low-Carbon Global Aluminum Cycle**. Moritz Langhorst, Romain G. Billy, Christian Schwotzer, Felix Kaiser, and Daniel B. Müller. 2024. *Environmental Science & Technology;* 58 (22): 9624–35. DOI: 10.1021/acs.est.4c00976.
5. **Mapping Plastic and Plastic Additive Cycles in Coastal Countries: A Norwegian Case Study**. Ahmed Marhoon, Miguel Las Heras Hernandez, Romain G. Billy, Daniel B. Müller, and Francesca Verones. 2024. *Environmental Science & Technology;* 58 (19): 8336–48. DOI: 10.1021/acs.est.3c09176
6. **Mobilizing Materials to Enable a Fast Energy Transition: A Conceptual Framework**. Harald Desing, Rolf Widmer, Ugo Bardi, Antoine Beylot, Romain G. Billy, Martin Gasser, Marcel Gauch, Daniel Monfort, Daniel B. Müller, Marco Raugei, Kirsten Remmen, Vanessa Schenker, Hauke Schlesier, Sonia Valdivia, and Patrick Wäger. 2024. *Resources, Conservation and Recycling;* 200:107314. DOI: 10.1016/j.resconrec.2023.107314
7. **Aluminium use in passenger cars poses systemic challenges for recycling and GHG emissions.** Romain G. Billy, and Daniel B. Müller. 2023. *Resources, Conservation and Recycling* 190:106827. DOI: 10.1016/j.resconrec.2022.106827
8. **Evaluating strategies for managing resource use in lithium-ion batteries for electric vehicles using the global MATILDA model**. Fernando Aguilar Lopez, Romain G. Billy, and Daniel B. Müller. 2023, *Resources, Conservation and Recycling;* 193: 106951. DOI: 10.1016/j.resconrec.2023.106951
9. **A product-component framework for modelling stock dynamics and its application for electric vehicles and lithium-ion batteries**. Fernando Aguilar Lopez, Romain G. Billy, and Daniel B. Müller. 2022. *Journal of Industrial Ecology;* 26: 1605– 1615. DOI: /10.1111/jiec.13316
10. **Systemic Approaches for Emission Reduction in Industrial Plants Based on Physical Accounting: Example for an Aluminum Smelter**. Romain G. Billy, Louis Monnier, Even Nybakke, Morten Isaksen, and Daniel B. Müller. 2022. *Environmental Science & Technology;* 56 (3), 1973-1982. DOI: 10.1021/acs.est.1c05681
11. **A general framework for stock dynamics of populations and built and natural environments**. Dirk Lauinger, Romain G. Billy, Felipe Vásquez, and Daniel B. Müller. *Journal of Industrial Ecology* 2021; 25: 1136–1146. DOI: 10.1111/jiec.13117
12. **Pathways toward a carbon-neutral Swiss residential building stock**. Marta Roca-Puigròs, Romain G. Billy, Andreas Gerber, Patrick Wäger, and Daniel B. Müller. 2020. *Buildings and Cities;* 1(1):579–93. DOI: 10.5334/bc.61

Reports / Book Chapters / Policy Briefs

1. **Towards circular regional value chains: a material flow analysis of Aluminium and its alloying elements in the European Union.** Romain G. Billy, Moritz Langhorst, and Daniel B. Müller. 2024. *Science for Policy report to the Joint Research Centre of the European Commission, Contract JRC/IPR/23/VLVP/2159.*
2. **Maps of the physical economy to inform sustainability strategies.** Daniel B Müller, Romain G Billy, Mark U Simoni, Evi Petavratzi, Gang Liu, Helmut Rechberger, and Jonathan Cullen. 2024. In *Handbook of Recycling: State-of-the-Art for Practitioners, Analysts, and Scientists;* 27–44. DOI: 10.1016/B978-0-323-85514-3.00038-5
3. **Towards an EU Battery Regulation 2.0?** Fernando Aguilar Lopez, Romain G Billy, Daniel B. Müller, Terese Birkeland, and Stina Torjesen. 2022. *BATMAN Policy Brief*
4. **Reducing the carbon footprint of battery materials - a case of problem shifting?** Romain G Billy, Terese Birkeland, Daniel B. Müller, Fernando Aguilar Lopez, and Stina Torjesen. 2022. *BATMAN Policy Brief*
5. **Lithium in the EV battery expansion: How bad is the supply constraint?** Romain G Billy, Terese Birkeland, Daniel B. Müller, Fernando Aguilar Lopez, and Stina Torjesen. 2022. *BATMAN Policy Brief*

Preprints / Under review

1. **Climate stability hinges on energy-material feedback dynamics: aluminum perspectives.** Harald Desing, Marinella Passarella, Romain G. Billy, Alexander Griebler, Moritz Langhorst, Stefan Pogatscher, Dierk Raabe, Kirsten Remmen, Sebastian Samberger, Hauke Schlesier, Daniel B. Müller, and Michael Tost
2. **Norway's electric vehicle revolution: Unveiling greenhouse gas emissions reductions of passenger cars across space and time.** Lola S. A. Rousseau, Jan Sandstad Næss, Marine Lhuillier, Romain G. Billy, Peter Schön, and Edgar G. Hertwich
3. **Navigating the Nickel Network: Insights from a Ten-Year Global Supply Chain Study.** Simone Della Bella, Marceau Cormery, Burak Sen, Romain G. Billy, Ciprian Cimpan, Daniel B. Müller, and Gang Liu.
4. **Integrating MRIO Network Analysis in Assessing Nickel Supply Risks: A Multidimensional Approach.** Simone Della Bella, Marceau Cormery, Burak Sen, Romain G. Billy, Ciprian Cimpan, Daniel B. Müller, and Gang Liu.
5. **Insufficient Lithium Supply is Likely to Slow Down the Transition to Electrified Transport.** Brent McNeil, Romain G. Billy, Fernando Aguilar Lopez, Evi Petavratzi, and Daniel B. Müller DOI: 10.2139/ssrn.4662605

Oral Presentations

Presentations in Scientific Conferences

1. **Feedback loops in the Material-Energy-Transport nexus - Examples for aluminium and the case for low-demand transition scenarios.** *18th Society and Materials Conference,* Jönköping (Sweden), 14/05/2024
2. **Securing raw materials supply for electric vehicles** – Hosted two special sessions at the *ISIE 2023 - 11th International Conference on Industrial Ecology*, Leiden (The Netherlands), 05/07/2023
3. **Limited lithium supply is likely to slow down the electrification of the transport sector.** *ISIE 2023 - 11th International Conference on Industrial Ecology*, Leiden (The Netherlands), 05/07/2023
4. **Applying industrial ecology methods to fictional words - The spice and water cycles on the planet Arrakis from Frank Herbert's Dune.** *17th Society and Materials Conference,* Karlsruhe (Germany), 09/05/2023
5. **Aluminium and Nickel uses in electric vehicles pose challenges for recycling and GHG emissions.** *16th Society and Materials Conference,* Online, 08/11/2022
6. **The transformations of the passenger car market - Effects on the demand for aluminium and its carbon footprint.** *14th ISIE-SEM Conference,* Vienna (Austria), 20/09/2022
7. **Benefits of plant-level Substance Flow Analysis Application to carbon reporting in an aluminium smelter.** *ISIE 2019 - 11th International Conference on Industrial Ecology*, Beijing (China), 09/07/2019
8. **Feedbacks between in-use and technology stocks - Effects on new technology development in Aluminium production.** *13th ISIE-SEM Conference,* Berlin (Germany), 14/05/2019
9. **The influence of stock dynamics on new technology penetration - Effects on new technology development in Aluminium production.** *13th Society and Materials Conference,* Pisa (Italy), 09/05/2019

Invited Seminar Presentations

1. **Technological Trends in Scrap Sorting - Towards a future-proof end-of-life system.** *Fastmarkets Aluminium Conference,* Athens (Greece), 11/09/2024
2. **Material Flow Analysis and Industry – Academia collaboration.** *CIR-CO-WAY workshop,* Trondheim (Norway), 29/02/2024
3. **Fostering a low-carbon circular economy: Insight from top-down and bottom-up material flow accounting models.** *Aluminium Stewardship Initiative 45 minutes on webinars,* Online, 17/10/2023
4. **Secondary Aluminium Markets, Scrap, Recycling, and Innovation.** *Panel discussion, Fastmarkets Aluminium Conference,* Barcelona (Spain), 13/09/2023
5. **Modelling the effects of transport electrification on mineral supply chains.** *Climate Compatible Growth Modelling Transport Demand Workshop*, Paris (France), 28/03/2023
6. **Introduction to Material Flow Analysis and applications to battery materials.** *HyProS Geminisenter Seminar,* Trondheim (Norway), 09/11/2022
7. **Carbon footprint & circularity challenges for electric vehicles - Main outcomes from the BATMAN project.** *SALEMA Workshop - Driving sustainable aluminium: recycling and critical raw materials for aluminium alloys in e-mobility,* Online, 08/11/2022
8. **Getting a vision through dynamic MFA: The aluminium case.** *European Aluminium Innovation Hub Workshop*, Trondheim, 12/06/2019

POSTER PRESENTATIONS

1. **Limited lithium supply is likely to slow down the transition to electrified transport.** *Industrial Ecology Gordon Research Conference*, Les Diablerets (Switzerland) 30/05/2024
2. **Evaluating the strategies for managing resource use in lithium-ion batteries using the global MATILDA model.** *IRTC24: Raw materials in a changing world*, Torino (Italy), 22/02/2024
3. **Industrial Ecology in fictional worlds: The spice and water cycles on the planet Arrakis from Frank Herbert's Dune.** *ISIE2023 - 11th International Conference on Industrial Ecology*, Leiden (The Netherlands), 04/07/2023
4. **Aluminium in cars: highway for decarbonising the transport sector or new climate bottleneck?** *Industrial Ecology Gordon Research Conference*, Sunday River, ME (USA), 13/06/2022