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Driving the sustainable transition: battery material dynamics and emission assessments of EU electric mobility

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Propositions accompanying the dissertation:

Driving the Sustainable Transition: Battery Material Dynamics and Emission Assessments of EU Electric Mobility

1. Growing demand for battery materials during the EU's transition to electric mobility is expected to increase dependence on primary resource extraction, which can be mitigated through circular strategies from the early 2030s (Chapters 2, 4 and 5, this thesis).
2. An accelerated phase-out of internal combustion engine vehicles together with EV uptake and grid decarbonization can expand the operational GHG emission savings of the passenger vehicle sector and enable an earlier offsetting of manufacturing-related emissions in the EU electric mobility transition (Chapter 3, this thesis).
3. Although an extended battery lifespan slows the return of battery materials through end-of-life recycling, it remains crucial for reducing overall material demand and waste generation as well as increasing the overall greenhouse gas savings in the 2030s (Chapters 3 and 5, this thesis).
4. Sustainable battery production in the EU is likely to be constrained by insufficient secondary materials supply, stemming from an underdeveloped domestic recycling system (Chapter 5, this thesis).
5. Region-specific material demand assessments provide essential starting points for informing the responsible expansion of mineral extraction required for transitioning toward a low-carbon economy (Chapter 2, this thesis).
6. Minimizing material extraction in the lithium-ion battery value chain is limited in the absence of cross-regional cooperation in environmental governance, technological development, and regionally tailored circular economy policies.
7. The credibility of climate commitments relies not on the ambition of targets but on whether scientifically informed targets translate into concrete actions that lead to emission reductions.
8. Reducing greenhouse gas emissions through EV promotion and integration with renewable energy systems may be undermined by behavioral, economic, and social factors, highlighting the limits of relying solely on technology-driven solutions for transport decarbonization.
9. As AI tools play an expanding role in assisting research, having domain knowledge, practical experience, and the ability to think critically become even more important.
10. Safeguarding the sleep schedule is the most critical, although often undervalued, method required for completing a Ph.D.

by Chen Tang
Leiden, May 19, 2026