

UNRAVEL - Towards enhancing the carbon stocks in forests: Unravelling the wood production potentials under sustainability conditions for Austria

Karlheinz Erb¹, Sarah Matej¹, Julia LeNoë², Nicolas Roux¹, Rupert Seidl³, Ulrike Tappeiner⁴, Erich Tasser⁴, Simone Gingrich¹

¹University of Natural Resources and Life Sciences Vienna, Austria, Institute of Social Ecology (SEC)
²Institute of Ecology and Environmental Sciences of Paris – French National Research Institute for Sustainable Development
³Technical University of Munich, Germany
⁴Eurac Research – Institute for Alpine Environment, Bolzano, Italy



Aims & Objectives

UNRAVEL aims to:

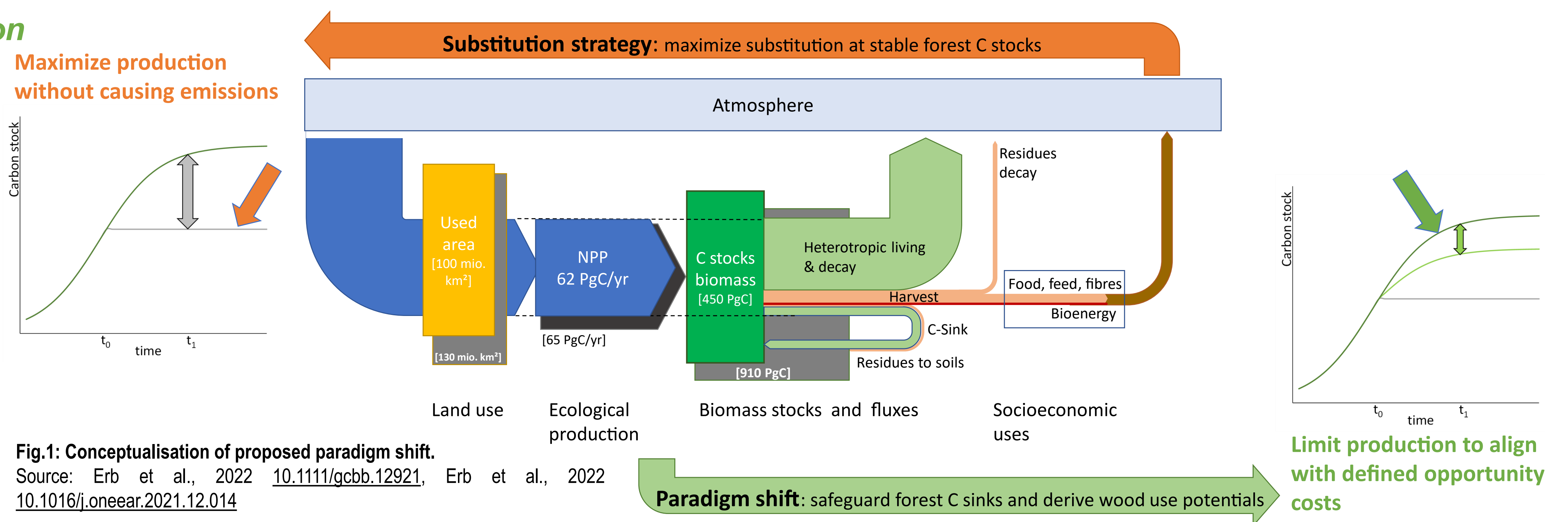
- Quantify the wood supply potentials compatible with C-sequestration targets for forests and preserving biodiversity, based on novel and improved forest C modelling
- Assess trade-offs between forest C sequestration and wood provision, dead-wood use or conservation, or wood for energy vs. wood for products, and their interlinkages with other ecosystem services bundles
- Delineate the biophysical option space for sustainable wood use in Austria
- Provide information on sustainable forest biomass use in the context of climate change to stakeholders

Project structure & Methodology

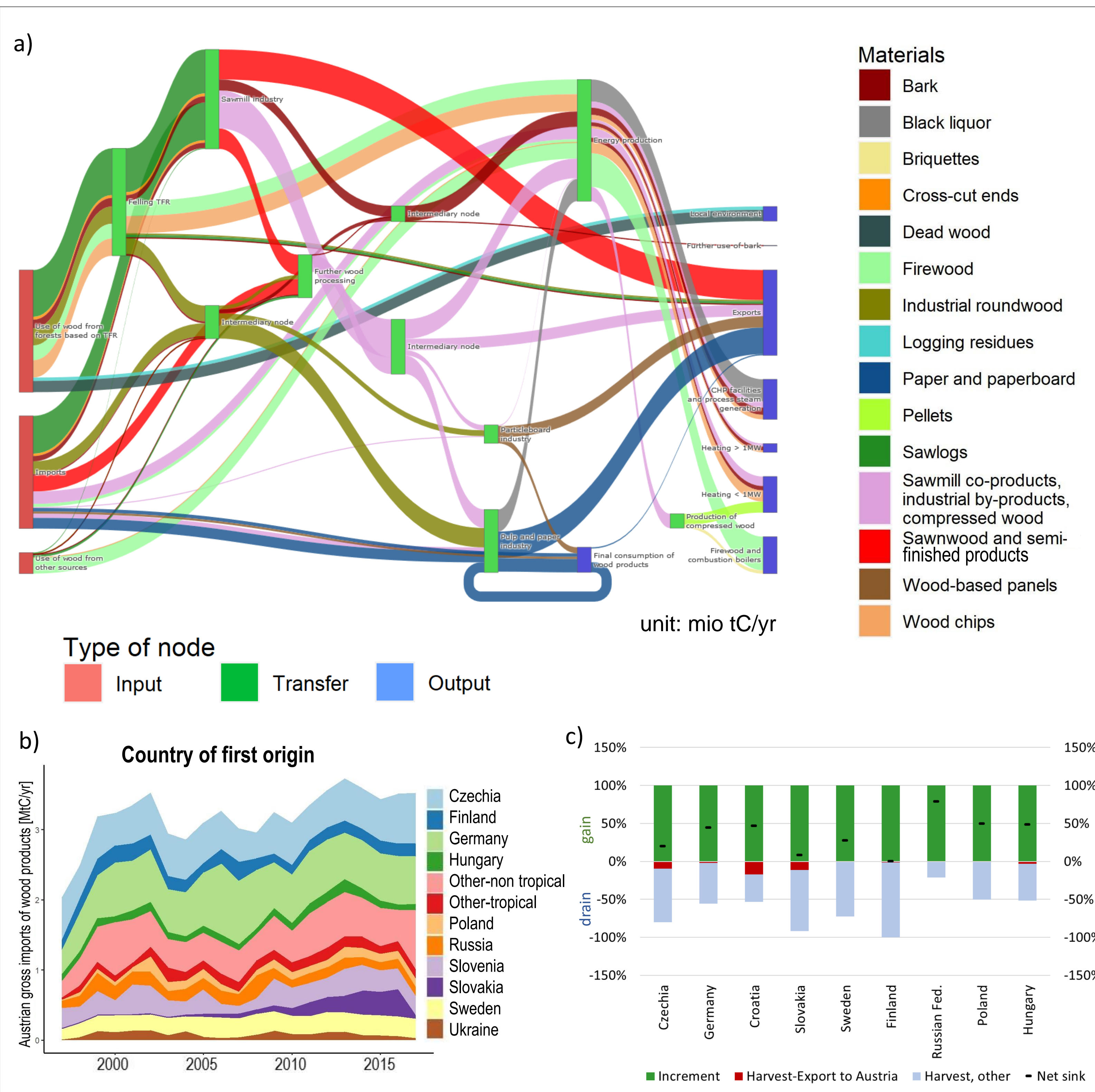
- WP1:** Establishing a comprehensive biophysical database of Austrian wood flows from production to consumption, explicitly considering international trade and C-dynamics implications of imported wood
- WP2:** Modelling forest C-sequestration potentials under climate change, building upon a model-based conceptualisation of C-opportunity costs of forest use strategies
- WP3:** Scenarios of C sequestration targets for Austria under different rationales of emission allocation
- WP4:** Exploring interlinkages between wood provision, C-sequestration and other ecosystem services
- WP5:** Knowledge co-production and knowledge re-integration

Paradigm Shift of Research Direction

UNRAVEL proposes a paradigm shift in the conceptualization of sustainable wood use: away from the focus of wood-for-fossil substitution towards acknowledging the need for C-sequestration and biodiversity conservation in forests and deriving compatible wood supply potentials. This way no-regret forest-based climate change mitigation strategies can be developed.



Results: Wood Flows in and to Austria



Preliminary Conclusions

- Only 11% of the average annual increment remains as a sink in Austria's forests
- 50% of Austria's wood supply end up in energy production, i.e. directly emitting Carbon into the atmosphere. This supply for energy uses is equivalent to 94% of wood harvested in Austria.
- Of the wood supplied to Austria in 2019 17% were used for long-lived products (builder's joinery and carpentry). 64% were used for short-lived products, e.g. paper and paperboards.
- Wood imports to Austria represented 105% of the wood extracted from Austrian forests, excluding dead-wood and logging residues. Austria is the world's second-largest importer of roundwood, after China. Preliminary results suggest that Austrian imports of wood seem to be increasingly driven by energy uses.
- The sharp increase in wood imports since the late 1990s was mainly linked to direct imports from neighbouring EU countries. However, correcting for re-export reveals the countries of first origin and allows Austria's wood supply to be traced back to more distant source regions.
- Austrian wood imports are large when compared to the forest C-flux (sinks, emissions) in countries of origin (relevant opportunity-C-costs)

Next Steps

- Assess wood-related C-flows from a territorial, consumption-based and income-based perspective
- Improve modelling of dead-wood, soil C-dynamics and disturbances
- Explore sustainable wood use scenarios

← Fig.2:a) Wood flows in Austria in 2019, and b) Austrian gross imports of industrial roundwood and derivated products from 1997 to 2017, by countries of origin (corrected for reexports). The values are in MTC/yr of wood below bark, and do not include imports of fuelwood, c) Top-nine wood imports in relation to the C-sink in originating countries. The 10th country is Brazil (not shown), with a strong net-C-emission. The "Austrian share" of harvest in Brazil is 60ktC/yr.

References

- Erb, K.-H., Haberl, H., Le Noë, J., Tappeiner, U., Tasser, E., Gingrich, S., 2022. Changes in perspective needed to forge 'no-regret' forest-based climate change mitigation strategies. *GCB Bioenergy*. <https://doi.org/10.1111/gcbb.12921>
- Erb, K.-H., & Gingrich, S. (2022). Biomass—Critical limits to a vital resource. *One Earth*, 5(1), 7–9. <https://doi.org/10.1016/j.oneear.2021.12.014>
- Roux, N., et al, forthcoming. Assessing the global carbon dynamics related to Austria's wood processing chain
- Erb, K.-H., Gratzner, G., Haberl, H., Tappeiner, U., Tasser, E., & Gingrich, S. (2023). Energie aus Holzbiomasse: Begrenzte Klimaschutz-Potenziale. *CCCA Factsheet*, 41. https://ccca.ac.at/fileadmin/00_DokumenteHauptmenue/02_Klimawissen/FactSheets/41_FS_holzbiomasse_202303.pdf



This project is funded by the Austrian Climate and Energy Fund [ACRP13-UNRAVEL-KR20AC0K18081]

