

Institute for Ecological Economics – Research Group ‘Global Resource Use’ (GRU)

Topics for bachelor and master theses

December 2018

Notes: All bachelor and master theses supervised by our research group need to relate directly to at least one of the ongoing research projects (for general information on our group, visit <https://www.wu.ac.at/en/ecolecon/research/global-resource-use>).

For master theses, the target is to jointly elaborate – based on the thesis – an article for publishing in a peer-reviewed, international journal, with the candidate serving as first author and one or several researchers of our group (and possibly beyond) as co-authors. For the master level, experiences in writing English texts are therefore important.

Overview table of possible topics:

Level	Topic taken	Supervisor	Topic	Short description
Bachelor/ Master		Mirko Lieber (Stefan Giljum)	Use of primary vs. secondary raw materials	Investigate how patterns of selected primary vs. secondary (i.e. recycled) raw material use changed over time; what are main uses of these materials and what future projections are made in the literature; which countries are role models of recycling and a circular economy and why?
Bachelor/ Master		Mirko Lieber (Stefan Giljum)	Structure and patterns of global metal/mineral/fossil fuel extraction	Investigate the global structure of the mining industry and its trends over time (geographical patterns; company structure; etc.), focusing on one or a few specific raw materials as an example (e.g. iron ore, bauxite, lithium, rare earths, coal, oil, gas etc.). The analysis would be based on databases on the national and mine-specific level.
Bachelor/ Master		Mirko Lieber (Stefan Giljum)	Environmental impacts of raw material extraction	The candidate would select one renewable or non-renewable raw material as an example to investigate the following question: In scientific literature, what are the most important environmental impacts associated with the extraction of specific raw materials? Why are these considered as important? What different implications/consequences do these environmental impacts bear, e.g. for natural ecosystems, for human society. Provide a comprehensive overview.
Bachelor/ Master	X	Stefan Giljum	Environmental impacts of bauxite extraction in Brazil	This theses investigates the environmental impacts associated with the mining of bauxite in Brazil. It will provide an overview of the structure and trends in the Brazilian bauxite mining sector and will review the literature on impacts, for example, with regard to deforestation and water pollution.
Bachelor/ Master		Mirko Lieber (Victor Maus)	Environmental impacts of metal/mineral/fossil fuel extraction	Investigate the environmental impacts of raw material extraction, focusing on selected raw materials and/or a selected country/region as an example; e.g. patterns of material extraction over the last two decades, which might be responsible for changes in environmental circumstances of the same area. Possible environmental impacts include water scarcity, deforestation, biodiversity

Level	Topic taken	Supervisor	Topic	Short description
				loss, or pollution, among others. What environmental impacts can be considered as most relevant in the selected area and what data is available for these? What conclusions can be drawn from this data? What results have other studies achieved based on this data?
Bachelor/ Master		Victor Maus & Stefan Giljum	Mining and deforestation in developing countries	Investigate the impacts of expanding mining activities on forest (and biodiversity) loss, with a focus on developing countries; possibly selecting one raw material (coal, iron ore, etc.) and one country as an example.
Bachelor/ Master		Mirko Lieber (Stefan Giljum)	Efficiency of different raw materials in comparison	Analyse, for example, the production efficiency of palm oil vs other oil crops per land area (and the associated damage to landscape/ecosystem). Or, focusing on non-renewable resources, investigate possible substitutions of metals/minerals with others based on available reserves and future technologies (e.g. materials for solid-state batteries vs. lithium-based batteries)
Bachelor		Stephan Lutter	Water input in the mining industry	Country case studies on water use in mining and its economic/political/ecological/social circumstances and implications
Master	X	Stephan Lutter	Water input in the mining industry in Brazil	Assess the water requirements of mining activities in Brazil, in close cooperation with the Brazilian national institute responsible for environmental accounting.
Master		Stephan Lutter	Environmental accounting in Brazil and its applicability to the SDGs	Assess available environmental accounts and their applicability to the SDGs. Analysis to what extend in particular SDG No. 12 could be monitored with the data already available.
Master		Martin Bruckner	Global flows of timber and wood products	Set up national physical supply and use accounts for timber and wood products, including e.g. panels, pulp and paper. Trace carbon embodied in timber from forests to final consumption through international processing chains.
Master		Martin Bruckner	Land footprint of food waste	Set up national waste accounts for crop (and forestry) residues, food waste, and industrial biomass waste. Calculate the footprint of food waste and potential land savings of avoidance strategies.
Master	X	Martin Bruckner	Land footprint of organic agriculture	Calculate the global land footprint in an organic agriculture scenario, and how additional land requirements could be offset, e.g. by reduced meat consumption.
Master		Martin Bruckner	Material uses of biomass in global value chains	Evaluate the past and current use of biomass for material uses and investigate the substitution potentials, e.g. in the chemical industry. Evaluate positive and negative environmental trade-offs of bio-materials.
Master		Martin Bruckner	Energy uses of biomass in global value chains	Evaluate the past and current use of biomass for energy uses, capturing biogas, biodiesel and ethanol. Calculate the land footprint of bioenergy.
Master	X	Martin Bruckner & Victor Maus	Tracking land use change emissions through global value chains	Calculate the carbon emissions related with land use, land use change and forestry (LULUCF) and calculate the Carbon footprint of LULUCF for food and non-food consumption using the FABIO model.
Master		Martin Bruckner & Victor Maus	Carbon sequestration in 2030	Which trade structures would allow meeting the INDC targets of C sequestration in 2030 or would get us as close as possible? Investigate the labour and GDP effects on countries.

Level	Topic taken	Supervisor	Topic	Short description
Master		Martin Bruckner & Victor Maus	Deforestation footprint	Allocate deforestation, e.g., from the Hansen et al. maps to crops and timber and calculate the deforestation footprint for food and non-food consumption using the FABIO model.
Master		Martin Bruckner & Victor Maus	Eutrophication footprint	Calculate the eutrophication related with crop production and animal husbandry and calculate the eutrophication footprint for food and non-food consumption using the FABIO model.
Master		Martin Bruckner & Victor Maus	Climate adaptation strategies	Link the FABIO model with crop-specific data on water requirements and temperature tolerance in order to study climate adaptation strategies for trade structures and consumption patterns.
Master	X	Martin Bruckner & Hanspeter Wieland	Drivers of food and non-food biomass consumption	Apply a Structural Decomposition Analysis to the FABIO model in order to investigate the effects of population and GDP on the level of food and non-food biomass consumption. Hypothesis: GDP drives non-food consumption while population drives food consumption.
Master		Martin Bruckner	Subnational metabolic networks	Investigate the metabolic networks of a country (e.g. for agriculture and food products, or of metals and mining products) at the subnational level.
Master		Hanspeter Wieland (Martin Bruckner)	Processing of metallic minerals	Provide an overview of efficiencies (in material and/or energetic terms) of contemporary processing technologies (e.g. best vs. worst practices) regarding metallic minerals and discuss this in the context of global trade. Focus required with regard to raw material (iron, copper...) and/or region (South America, USA, Europe, China...) as well as specific products/supply chains.
Master		Hanspeter Wieland (Martin Bruckner)	Industrial use of metallic mineral products	For selected economic sectors (such as car manufacturing, construction, electronics, etc.), provide an overview of the typical metal demand/use and discuss theoretical sustainability strategies for this sector.
Master		Hanspeter Wieland (Martin Bruckner)	Global trade and markets of metal scrap	Investigate global trends in the trade of metal scrap (i.e. metals left over from product manufacturing and consumption, such as parts of vehicles or building supplies) and how scrap markets have developed in recent years.
Master		Hanspeter Wieland & Martin Bruckner	Transport costs and biophysical trade patterns	Theoretical or empirical work on transport costs as a driver of global (biophysical) trade flows.
Master		Hanspeter Wieland & Stefan Giljum	Raw materials in international trade agreements	Review and discuss recent bilateral or international trade agreements from the perspective of global raw material trade.