

My research in relation to circular economy

My PhD project belongs to the research program *Mistra REES - Resource-efficient and effective solutions based on circular economy thinking*. As such, circular economy is a quite central topic of my research. I see circular economy as a potential means towards more sustainable production systems. However, I am also concerned that it may just be a treatment of a symptom, instead of a remedy to an underlying problem. In that sense, I very much sympathize with the narrative in the description of this course and welcome the opportunity to read literature on degrowth, since it is very rarely talked about in Swedish academia.

So far in my PhD project, I have used methods such as life cycle assessment (LCA) and material flow analysis (MFA) to study the environmental effects of resource-efficiency strategies predominantly from the circular economy discourse. I have for example conducted an LCA of laptops and compared the use of secondhand laptops with newly produced ones. I have also studied the material flows resulting from CE measures such as repairing smartphones, reusing laptops and long-lived design incentivized by new business models. Some results from those studies included that some CE measures may well be resource-efficient in general but at the expense of some materials prevalent in often replaced components.

I have also taken part in research that has systematically reviewed life cycle based comparative assessments of strategies aiming for resource efficiency. There we aimed to draw general conclusions about when strategies for resource-efficiency actually pays off in environmental terms, based on the combination of product characteristics, environmental life cycle impact patterns and measures for resource efficiency.

My particular focus is on metal resources. Within LCA, I have therefore become interested in the discussion on the area of protection of natural resources at large, and more specifically, metal resources. There are differing perceptions in the LCA community on what actually constitutes the environmental problem with regards to metal resource use. Simply put, the environmental issue of metal resource use can be formulated as being a question of physical depletion or that availability is limited by economic cost, energy use or environmental impacts of extraction and production. Depending on which life cycle impact assessment method, and the problem perception it is based on, the effects of resource-efficiency strategies may change considerably.

Currently, I am taking a step away from my empirical field of CE measures to make a more methodological contribution. As previously mentioned there is no consensus on which life cycle impact assessment method that is most appropriate in LCA. Recently, there has also been attempts to include the concept of criticality into LCA since availability of materials for human use may be constrained by geopolitical and economic factors in addition to the more environmental constraints. Therefore, I am currently studying different life cycle impact assessment methods for metal resource use/depletion, methods for criticality assessment and other valuation methods applicable to metals more in depth, studying the underlying assumptions and value judgements. The idea is to return to CE as an empirical field after this

methodological contribution and apply the insights to practical cases. I hope that this can show interesting tradeoffs between metal resources which could have implications for how the CE vision can be approximated.