



Socio-metabolic transitions during the 20th century and their impacts on the scale of human resource use

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By talking about socio-metabolic transitions, we focus on changes in the energetic base of socio-economic systems, leading to fundamental changes in social and environmental relations. This refers to the historical shift from a biomass-based (agrarian) economy to a fossil fuel based (industrial) economy just as much as to a future shift from fossil fuels to renewable energy carriers.

The classic example for the historical transition is the United Kingdom, where the increasing use of fossil fuels over the last 250 years follows a perfectly S-shaped curve, with a declining importance of biomass over the same period. In the course of this transition, population increased seven-fold, energy and materials use per capita tripled and income rose by a factor of 19. Today the UK, as other mature industrial economies, has reached a certain metabolic saturation – which indicates that it has finished its transition into the fossil fuel based economy. In our presentation,

- We will first show that this pattern of a socio-metabolic transition can be identified for most high income industrial countries: the later the transition started, the faster it proceeded. The turning point for the stabilization of metabolic rates in all of them happened in the early 1970ies.
- Next, we will show that this was not just a “historical” transition, however. Currently, a substantial number of countries comprising more than half of the world’s population are following a similar transitional pathway at an accelerating pace. Based on empirical data on physical resource use we can show that these so-called emerging economies are currently in the take-off or acceleration phase of the very same transition.
- Finally, we will show how the currently observed global trend of increasing annual resource extraction (biomass, fossil fuels, metals and minerals) is a result of a superposition of processes in countries which are in the stabilization and in the acceleration phase of this transition process, while the next transition (away from fossil fuels) is yet barely visible. A continuation on this global pathway, by recent UNEP scenarios, would lead to a tripling of annual resource extraction by 2050.

This urgently calls for a next socio-metabolic transition away from fossil fuels and away from wastefully high metabolic rates – a transition on a par with the grand transitions between socio-metabolic regimes in human history.