TRANSITIONS TO A REGENERATIVE ECONOMY II: AN INPUT-OUTPUT METABOLIC ASSESSMENT

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Abstract:

A regenerative economy is characterised by a specific arrangement of the material flows that go through the economy which is based on two principles (Altimiras-Martin 2012). First, to isolate specific material flows by "strong-recycling" within the economy. Secondly, to integrate the other material flows with the environment by extracting and restoring them to the corresponding biogeochemical cycles. The result is a closed material system that causes minimal perturbation of material cycles in the environment. A regenerative economy can be implemented by using specific materials and technologies, most of which are readily available. It would lead to a sustainable material arrangement of the material flows because it systematically cuts pollutant emissions and mitigates resource depletion. However, to reorganise the material flows of the current economies in a regenerative manner requires a detailed control and management of all of them. The economic consequences of such reorganisation also need to be understood to support and guide the transition towards a regenerative economy.

The problem is that there is no comprehensive framework which can assess the degree of regeneration of an economy and inform its implementation. Assessing the development of a regenerative economy requires a framework able to trace the material flows within the economy, between the economy and the environment, and throughout the environment. It also needs to map those material flows to the corresponding economic activities. It specifically needs to represent accurately the regeneration mechanisms, i.e. the "strong-recycling" and the balanced extraction and emission of materials to the different biogeochemical cycles.

This research takes an inter-disciplinary approach to understand the material structure and requirements of current economies. It combines physical analysis of the material flows of the economies with an Earth-system approach to understand their relationship to the flows in the environment. The material flows consumed and emitted by an economy can be metaphorically described as the material metabolism of the economy. This research develops an input-output analysis framework able to assess how the material metabolism of the economy works and affects the environment. It is also the fundamental tool to simulate the transitions to a regenerative economy and assess how to modify the current infrastructure from an economic and policy point of view.

This paper first explains the specificities of the input-output analysis. The traditional flow structure of the Input-Output analysis is partially hybridised with a Life-Cycle Assessment approach to accurately assess the degree of "strong-recycling" present in an economy. For the same reason, the sectoral disaggregation requires special emphasis on the waste management sector since it is the key sector reallocating the material flows between the economic and environmental sectors. The environment is represented in the framework through including geospheres as input-output sectors. The activity of the different biogeochemical cycles transforms and reallocates materials between the different geospheres.

Secondly, the framework is applied to the case of Brazil for a selection of sectors which are used as a proxy for the metabolism of the entire economy. This section of the paper discusses the choice of the economy's sectors and the data available.

Finally, the degree of regeneration of each sector of the Brazilian economy is assessed and conclusions are drawn for possible transitions to a more fully regenerative economy. The required industrial, infrastructural and consumer changes will be discussed together with their respective economic impact.

This research contributes to the current literature by identifying the required economic and structural changes to transition towards a materially sustainable and regenerative economy. It also reveals the need to gather more accurate data about waste and emissions and integrate those in the System of National Accounts (SNA).

Altimiras-Martin, Aleix. 2012. Transitions to a regenerative economy I: Theory and Implications. In ISEE 2012 Conference - Ecological Economics and Rio+20: Challenges and Contributions for a Green Economy. Rio de Janeiro.