

3S2 Monitoring and modelling the transition from linear to circular production chain in the bio-economy

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Regeneration of the natural system is central to the concept of circularity and is also an objective that the EC links to the transition to a biobased economy. However, whether this will happen per definition in a transition to a bioeconomy is a question. A recent assessment of the status and potentials of the circular economy in the EU (EEA 2019) Theme 3: Overview sessions/page 6 concludes that potential synergies between circular material use, climate change mitigation and the halting of biodiversity loss are increasingly recognised, but that such synergies require further integration within and between climate-neutral, bio- and circular economy policies. The report also concludes that the monitoring of progress needs further investment because many relevant data are not readily available in established information systems (e.g. statistical systems) that support such policies. The transition from a linear to a circular production in the bioeconomy needs effort in all segments of the economy and society from local, regional, national and supranational level. Circularity needs to be introduced in production and consumption systems. Beside the overarching sustainability principle there are aspects that define circularity and that need to be addressed when monitoring it. The first aspect links to efficient use of resources. The second aspect is based on the coupling of the circular economy concept to a low carbon growth as is proclaimed in the EC Circular Economy Package (EC, 2015), The Bioeconomy vision, the EEA view on circularity and the Dutch 2050 circular economy vision. The third building block is related to the principle that circular systems can only be effective if socio-economic and environmental sustainability is increased (Giantolli et al., 2020 and Robert et al., 2020).

Monitoring: In this conference session we therefore want to review on what aspects the circular bioeconomy needs to be **monitored**, how this can best be done, what indicators are most relevant to develop, what methods are useful in this respect, what data are available and which are missing and how can we fill these data gaps and on what levels do we need to monitor circular bioeconomy transitions and impacts.

Modeling: The transition has to be mirrored by a transition in **modelling**. Existing (economic) almost completely ignore material cycles and recycling, as well as co- and by-production of products and materials. An improved representation of physical material cycles (material flows) in models helps to increase their policy support relevance with regards to biomass availability, sustainability of bioenergy as well as reduction of food losses and waste. Sound material flow data in physical and monetary are essential. Can we create macroeconomic models for sustainability that include material and energy flows, emissions and resource use in both biophysical and monetary terms? The key challenge is how can we improve existing economic models to better address circularity.