

Momentum 2019

Title: Quantifying the material stocks of the United States of America from 1870 to 2017 and analysing their connection to sustainable resource use

Abstract:

More than half of all extracted materials worldwide are currently used to build and maintain in-use material stocks of manufactured capital in infrastructures, machinery and durable goods (Krausmann et al., 2017). These material stocks provide services to societies but also contribute to socio-ecological challenges like climate change (Haberl et al. 2017, 2019). Understanding stock dynamics is thus of paramount importance for reconciling societal wellbeing and ecological sustainability. Here, we employ a dynamic mass-balanced input-driven stock-flow modelling approach (Wiedenhofer et al., 2018), fully consistent with the principles of economy-wide material flow accounting (ew-MFA), to estimate stocks, waste and recycling for the United States of America (USA) from 1870 to 2017. The USA are currently the biggest economy in the world and the second largest emitter of global greenhouse gas emissions. We analyse the relationship between stocks, flows, services and climate change and discuss various strategies, intended to shift the USA towards a higher level of sustainability.

We find that in-use stocks increased 150-fold, from 0.6 Gigatonnes in 1870 to 96 Gt in 2017. No clear signs of total stock saturation can yet be observed, although growth rates significantly declined after the global financial crisis in 2007. The existing in-use stock in the USA provides a broad range of services to society, but the production, maintenance, use and disposal of stocks is currently incompatible with the goal of keeping global warming below 2 degrees until the end of the 21st century. Stocks likely need to be reduced, transformed and redistributed to jointly achieve different types of sustainability. This will require systemic changes towards new patterns of production and service-provisioning.

Keywords: economy-wide material flow accounting, in-use material stocks, manufactured capital, waste and emissions, sustainable resource use, socio-economic metabolism, climate change

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