# Integrated assessment of bioeconomy sustainability through an accounting system for societal metabolism: quantitative storytelling (QST) for robust policymaking

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**Abstract**

This presentation demonstrates a novel approach to generating and assessing the robustness of bioeconomy policy scenarios using a **quantitative storytelling** platform and accounting framework based on insights from **societal and ecosystem metabolism**. The work is developed within the European Commission's Integrated Bioeconomy Land Use Assessment project(1), which aims to develop a deliberation support system for more informed discussions on bioeconomy futures.
The presentation starts off with a detailing of the **'diagnostic setup'** of the platform, commenting on theoreticalities and practicalities of the setup. The diagnosis involves a **biophysical approach to scientific accounting**, emphasizing the importance of understanding the **state-pressure relation** expressed by the bioeconomy. It applies a **flow-fund accounting logic**, distinguishing between transient flows of materials and energy and the stable elements (funds) of the system. The framework considers not just the quantity of resources, but also their functional requirements, acknowledging that different resources serve different functional purposes and therefore cannot be reductively aggregated simply because they share a common unit of accounting. We apply this framework to evaluate the metabolic patterns of some distinct bioeconomy configurations expressed across Member States of the European Union.

We further present, as part of the diagnostic setup, the concept of **metabolic processor**, a key component of the platform. Metabolic processors are agents of change, in their formal implementation they express an archetypical profile of inputs and outputs. Libraries of such processors, dutifully organized in a well-structured data warehouse, cover the representation of a wide variety of activities (past, current, future) within the bioeconomy, covering both social-economic and ecosystem aspects.

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Following the diagnostic setup the presentation then demonstrates how the platform can be deployed in relation to a set of **bioeconomy storylines**. These storylines represent different visions, or social-technical imaginaries, of the future. By rearranging the set of metabolic processors describing the bioeconomy system under assessment, the storylines are given quantitative referent. The platform allows users to explore various 'what-if?' hypotheses, assessing their feasibility, viability, and desirability, in this way moving beyond a focus on siloed economic or environmental impacts to consider the wider implications of bioeconomy futures. With the help of a **social multi-criteria evaluation module**, the platform allows for tighter integration of the concerns, values, and preferences of persons involved in the deliberation process, highlighting challenges and opportunities in relation to coalition formation.

Ultimately, the platform offers a relatively transparent and modular approach, allowing for easy modification and expansion as new data become available. It offers the opportunity for wider involvement in the co-creation of knowledge related to bioeconomy decision-making. Considering more broadly, the quantitative storytelling platform may provide a robust foundation for advancing deliberative methodologies in sustainability policy, supporting decision-makers in navigating the range of complexities related to bioeconomy transformation, hopefully leading to quality-gains in policy interventions.

(1) https://knowledge4policy.ec.europa.eu/projects-activities/integrated-bioeconomy-land-use-assessment_en

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