



Contents lists available at ScienceDirect

## Environmental Innovation and Societal Transitions

journal homepage: [www.elsevier.com/locate/eist](http://www.elsevier.com/locate/eist)

# Narratives of biorefinery innovation for the bioeconomy—Conflict, consensus, or confusion?

Fredric Bauer<sup>a,b,\*</sup><sup>a</sup> Department of Chemical Engineering, Lund University, P.O. Box 124, 22100 Lund, Sweden<sup>b</sup> Centre for Innovation, Research and Competence in the Learning Economy (CIRCLE), Lund University, P.O. Box 117, 22100 Lund, Sweden

## ARTICLE INFO

## Keywords:

Bioeconomy  
Biorefineries  
Transition narratives  
Q methodology

## ABSTRACT

Transition narratives are stories promoting particular pathways for development, promoting specific actions, strategies, and interventions to enable certain outcomes in socio-technical transitions. Narratives centered around biorefineries take a significant role in the growing bioeconomy discourse, yet they express remarkably different visions for the transition. The paper uses Q methodology to identify and analyse transition narratives related to biorefinery innovation, their domains of conflict and consensus, and implications for alternative pathways of development. The analysis shows that the narratives are divided on three aspects: the significance of different kinds of products, the importance of generating new or applying current knowledge, and the need for a comprehensive agenda of state interventions to support a transition towards a bioeconomy. Pathways to very different bioeconomies are indeed open, but policy should remain attentive to the existing conflicts and not presume consensus among actors who claim to support innovation for a bioeconomy.

## 1. Introduction

The bioeconomy concept can be understood as an economy in which “the basic building blocks for materials, chemicals and energy are derived from renewable biological resources” (McCormick and Kautto, 2013, p. 2590) and has its origins in the policy sphere. The concept has however gained traction in different research fields (Bugge et al., 2016) and significant efforts have been made to unpack the bioeconomy as a political economic concept (Birch and Tyfield, 2013; Levidow et al., 2013) and analyse policy strategies for the bioeconomy (de Besi and McCormick, 2015; Meyer, 2017; Ollikainen, 2014; Priefer et al., 2017; Staffas et al., 2013). Although the bioeconomy discourse has emerged in the search for forms of sustainable economic development, researchers disagree on whether the bioeconomy is itself inherently sustainable or rather a threat to sustainability (Pfau et al., 2014) and the concept has been criticised for being a weak form of ecological modernisation aiming for increased exploitation of natural resources through (bio-)technological innovation (Kitchen and Marsden, 2011). Perspectives on innovation for the bioeconomy make up a complex fabric, woven of conflicts regarding the nature of technologies being promoted and different aspects of the utilisation of renewable resources, e.g. related to land use change, intensification of the use of natural resources, and the creation of new natural resource based industries. It becomes clear that the bioeconomy is a politically contested concept regarding the different possible futures and forms of development that are envisioned. Developing a bioeconomy is thus a challenge calling for both social and technological changes, the co-evolution of which has been described as a socio-technical transition towards sustainability (Geels, 2005; Markard et al., 2012). Such a transition requires changing behavior and expectations among consumers, institutional change regarding norms,

\* Corresponding author at: Department of Chemical Engineering, Lund University, P.O. Box 124, 22100, Lund, Sweden.  
E-mail address: [fredric.bauer@chemeng.lth.se](mailto:fredric.bauer@chemeng.lth.se).

<https://doi.org/10.1016/j.eist.2018.01.005>

Received 13 July 2017; Received in revised form 7 December 2017; Accepted 16 January 2018  
2210-4224/ © 2018 Elsevier B.V. All rights reserved.

standards and regulations, as well as technological and organisational innovation throughout supply and value chains.

Biorefineries are new types of technological configurations which could produce the basic building blocks which are necessary for the bioeconomy. Although the concept biorefinery is itself not unambiguously defined (Bauer et al., 2017), its core lies in the processing of biomass resources for the production of fuels, chemicals, and other value-added products (Cherubini and Strømman, 2011), even though the feedstocks and technologies used could be from a wide range of options (Cherubini et al., 2009). As well as biorefineries have the possibility to substitute for existing products based on fossil resources, they could also introduce new products, processes, and services to “pave the way” for the bioeconomy (de Besi and McCormick, 2015; Sillanpää and Ncibi, 2017). It is this central role in the bioeconomy that makes biorefinery innovation a suitable focal point for analysis as tensions and conflicts in the bioeconomy discourse are mirrored in its elements – biorefineries can support and drive the development of very different bioeconomy pathways. Tensions between these pathways are however at risk of being neglected in narratives which argue that inherently biorefineries are “vehicles of sustainable innovation” (Wellisch et al., 2010, p. 277). Although not yet realised, visions for diverging pathways exist and are expressed by many actors. Narratives – stories told by different actors to describe and analyse complex and uncertain issues (Roe, 1994) – are expressions of the political contestation of pathways to a bioeconomy as certain innovations are being developed to fit within or as add-ons to specific industrial contexts that are consequently promoted directly or indirectly in the bioeconomy discourse. Key issues in these narratives are how the emerging bioeconomy balances the needs for economic development with a notion of sustainability, and how to deal with the challenge of a limited supply of resources – not only in terms of substituting biomass for a diminishing supply of petroleum, but also resources such as water, productive land, capital, and competence. However, regarding how to deal with these issues, there are very different expectations connected to the values being integrated into the narratives.

The paper focuses on Sweden where research on biorefinery technologies has been extensive, although their adoption and diffusion has been slow after reaching the pilot and demonstration stage. This has been explained with weaknesses in the innovation system related to fragmented and coordinated policies, especially regarding other biorefinery products than biofuels (Hellsmark et al., 2016; Hellsmark and Söderholm, 2017) and that significant challenges regarding capacity building and collaboration remain to be solved (Palgan and McCormick, 2016). The bioeconomy in the Swedish and Scandinavian context is in contrast to many other contexts, e.g. Europe and the US, more focused on the utilisation of forest resources (Kleinschmit et al., 2014), which has implications for the types of actors and technologies that are relevant for the bioeconomy compared to contexts which are more focused on agricultural resources. Strong industrial actors from the forest industry in Scandinavia have shown interest in biorefinery technologies mainly for fuels and energy production (Hämäläinen et al., 2011) although a few actors have made diverging choices (Karltorp and Sandén, 2012). Conservative organisational cultures and difficulties in collaborating across sectoral borders have however created barriers for strategic change and reorientation for many actors (Hansen and Coenen, 2017; Näyhä and Pesonen, 2014). Overcoming the valley of death in which biorefinery innovation currently finds itself requires both strong individual actors and supporting networks to provide complementary knowledge and resources (Mossberg et al., 2017). The Swedish context thus provides a setting with strong actors and policy support for the emerging bioeconomy, yet it can be questioned whether there is any real progress on the issue. As a concept gaining much attention in different arenas it is an interesting focal point for studying visions and expectations that have been formed, but not yet materialised.

The aim of this paper is to identify and characterise different narratives of innovation in the bioeconomy, their domains of conflict and consensus, and their implications for alternative pathways of development. The narratives are identified and interpreted using Q methodology, which is designed to study aspects of subjectivity such as social perspectives on contested issues. The paper contributes to the understanding of how actors engaged in technological innovation related to the bioeconomy understand their work and the implications it has in forming possible futures, engaging with their potentially very important political implications. In doing this, the study highlights diverging understandings of the role of knowledge and innovation in the contemporary debate about a socio-technical transition towards a low-carbon future. With its focus on actors the paper contributes to the literature on the bioeconomy as earlier contributions have mainly focused on the discourse being expressed in policies and governmental strategies. The paper firstly discusses the role of narratives for innovation and socio-technical transitions, the subsequent section presents the method employed to identify narratives that exist for biorefinery development as part of the transition to a bioeconomy. The fourth section presents and interprets the results obtained, thereafter follows a discussion about the areas of conflict and consensus that have been identified. Finally, the conclusions and implications of the study are outlined.

## 2. Framings and narratives in transitions

In ongoing socio-technical transitions multiple pathways are open, pathways that each one represents a different outcome and a different possible future. The pathways are envisioned by actors with individual values, goals and assumptions which build up a set of system framings and become part of the discourse related to the issue or problem in focus (Leach et al., 2010). Discourses are ensembles of ideas, concepts, and categories (Hajer and Versteeg, 2005), which include imaginaries, “representations of how things might or could or should be” that are enacted through practices, social relations and material artifacts (Chiapello and Fairclough, 2002), as well as narratives that are constituted of discursive elements which are organised and expressed in a certain manner (Urhammer and Røpke, 2013). Narratives are particularly relevant as a focal point for policy analysis for issues which are uncertain, complex and polarising, as in cases like these the stories told by influential actors become forces in themselves and can define the policy outcomes if they gather enough support among policymakers and other actor groups (Roe, 1994; van Eeten, 2006). A narrative analysis can thus be seen as a focused and limited form of discourse analysis, restricted to the stories being told about what type of development is seen as likely and/or wanted by different actors active in the overarching discourse.

Download English Version:

<https://daneshyari.com/en/article/8946668>

Download Persian Version:

<https://daneshyari.com/article/8946668>

[Daneshyari.com](https://daneshyari.com)