



# The circular economy and the bio-based sector - Perspectives of European and German stakeholders

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## ABSTRACT

The European Union has recently introduced the 'circular economy' as a high-level strategy to move our societies beyond the limits to growth. In the eyes of European policy makers, we will reach a circular economy through business innovation or the promotion of existing sustainable business models based on circular economy principles. Yet, we know next to nothing about how European businesses perceive or take up this strategy and whether it contributes to business innovation or the promotion of sustainable business models. To fill this gap, this paper analyses the business community's view on the circular economy. It focuses on the bio-based sector as one of the most resource-intensive in Europe and scrutinizes EU level debates as well as business practices in Germany. Based on a document analysis and participant observation data, the results show that business stakeholders currently relate the circular economy predominantly to established practices and to technological business models. This leaves considerable room for innovation in areas like social or organizational business models. Yet, the directions and effects of current activities remain uncertain. Connecting the debates about the circular economy and the bioeconomy could benefit the discussion of these possible directions and their effects. As our results show, exploring the relation between the circular economy and the bioeconomy highlights the need to define which cycles contribute most to a sustainable future economy. Existing guidelines and standards developed for businesses have been criticized for lacking exactly this definition. Hence, strengthening the link between circular economy and bioeconomy debates may provide a crucial step towards defining the sustainability of the circular economy, thereby setting clear priorities for sustainable business practices.

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## 1. Introduction

Given growing resource consumption worldwide, political, industry and civil society organizations are increasingly discussing solutions to the resource 'limits to growth' (Meadows, Meadows, Randers, & Behrens III, 1974). In the European Union, the 'circular economy' has been introduced as a high-level strategy to move our societies beyond these limits (European Commission, 2015). In the eyes of European policy makers, the European business community plays a crucial role in this process. Scholarly work and political programs assume that businesses will take up political ideas and apply new business models and practices based on circular economy principles, thus moving our societies to a circular economy

(Geissdoerfer et al., 2017). This assumption has yet to be scrutinized empirically. We know very little about how the business community takes up the circular economy as a potential strategy and whether and how debates and initiatives towards a circular economy contribute to business innovation.

The bio-based sector, as one of the largest producers and consumers of natural resources in Europe, has become a vocal sector in the context of the circular economy – particularly in Northern and Western Europe (Bio-based Industries Consortium, 2015). Despite its relative importance to the European economy, evidence on the impact of the bio-based sector on the circular economy is still residual. A Google Scholar search for the term "circular" combined with "biobased"/"bio-based" or "bioeconomy"/"bio-economy" in the title delivers five/three or fourteen/one results, respectively. Considering the importance given to business activities in political and academic debates, our objective is to empirically scrutinize the widespread assumption that businesses will take up the concept of a circular economy and act upon it. The results help to understand

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which circular economy ideas bio-based businesses adopt and implement and which remain underdeveloped. This contributes to a better understanding of businesses' perceptions, uptake and implementation of this concept, which is necessary for further policy development towards a circular economy. By focusing on the perspective of the bio-based sector, this paper also aims to integrate the scientific debates on the circular economy and those of the bioeconomy, which have remained largely disconnected so far. To do so, we ask:

- (1) What definitions, principles and scopes do bio-based businesses connect to the circular economy?
- (2) How do bio-based businesses connect the circular economy to their self-understanding and activities?
- (3) What business models do stakeholders relate to a circular economy and what innovation potential exists?

To answer these questions, the paper analyzes the uptake of political discussions about a circular economy by business representatives in the bio-based sector in Europe and Germany. As the bio-based sector is by no means a uniform term in the literature (Bugge et al., 2016) nor among stakeholders, and is often used synonymously with the term bio-economy, this paper applies a perception-based definition. The bio-based sector is characterized based on encompassing businesses and associations that self-identify as bio-based or bioeconomy. The actors included range from businesses turning natural resources into primary goods to businesses creating and marketing consumer goods. Stakeholder documents that use the term bio-based or bioeconomy and refer to the circular economy stretch across biotechnology businesses, manufacturers relying on biomass, and agricultural and forestry operators (Bio-based Industries Consortium, 2015). Taking this broad understanding into account, a recent study estimates the use of 2 billion tons of materials in the EU bio-based sector, generating about € 2.4 billion turnover each year (Scarlat et al., 2015). Germany has been selected as a specific case as it is one of the few countries in Europe that particularly supports the bio-based sector through a "bioeconomy" strategy (Bundesministerium für Ernährung und Landwirtschaft, 2014). Furthermore, the German translation of circular economy, *Kreislaufwirtschaft*, has been informing German business debates and practices since the 1980s (Wagner, 1995). Based on this situation, one would expect the bio-based business community in Germany to be a frontrunner in the uptake of the circular economy. This analysis scrutinizes this hypothesis, using a qualitative content analysis of stakeholder debates in the German and European bio-based sectors. The results are not meant to be conclusive, but to provide an overview of where 'hotspots' of definitions and activities lie. To this end, the paper explores critical aspects relating the circular economy to the activities of the bio-based sector.

## 2. Theoretical background: definition, scope and business practices of a circular economy and relation to the bio(based)-economy

So far, specific scientific literature on business engagement for a circular economy in the bio-based sector does not exist. Thus, we reviewed the most closely related topics and theoretical approaches to analyze the uptake of circular economy by bio-based businesses, including literature on approaches that analyze business engagement on sustainable business models. The literature has been collected based on a Google Scholar search for the terms "circular" and "business" combined with "biobased"/"bio-based" or "bioeconomy"/"bio-economy" in the title. Subsequently, the article's references were used to identify further relevant literature.

Although the EU Circular Economy Action Plan (European Commission, 2015) puts the circular economy high up on the EU political agenda, analyses on the societal perception, uptake and implementation of the circular economy do not exist. At the same time, a number of studies argue that businesses should engage in the promotion of a circular economy (e.g. Gregson et al., 2015; Tukker, 2015; Witjes and Lozano, 2016), but these mainly focus on waste management or recycling. Although some scholars, like Murray et al. (2016), argue that one of the core ideas of a circular economy is to "mimic" biological processes through technological systems, most authors leave out the bio-based sector and focus on the circularity of plastics, minerals, metals, or construction waste (see Geissdoerfer et al., 2017). One explanation may be the popular butterfly graph on the circular economy introduced by the Ellen McArthur Foundation in 2013. This graph makes a clear separation of the "technosphere" and the "biosphere" in the circular economy. Many scholars and stakeholders using this graph, so far, focus on the technosphere. Another explanation may be that only since the late 2000s have the terms bio-based and bioeconomy been discussed by academics, politicians, businesses and civil society; "there seems to be little consensus concerning what the bioeconomy actually implies" (Bugge et al., 2016).

Given the broad variety of definitions of a circular economy found in the literature, the question arises how businesses can engage in meaningful circular economy initiatives. Searching for conceptual and theoretical approaches that may help to find answers to this question in the business literature, one finds an emerging conceptual literature (Hobson and Lynch, 2016; Witjes and Lozano, 2016). Despite this conceptual focus, what a circular economy is and how it differs from other concepts often remains blurry. Of the seventeen papers that cover business models and practices of a circular economy, only half provide a definition of circular economy. The terms "bio-based" or "bioeconomy" do not appear. They are at best indirectly covered by concepts like biological nutrients (Bocken et al., 2014; Roos, 2014) or an emphasis on biodegradable substances (Bocken et al., 2014; Lacy et al., 2014) and the replacement of fossil resources with renewables in circular business models and practices (Lacy et al., 2014; Romero and Molina, 2012). At the same time, most papers establish a clear link between the circular economy and sustainability. Sustainability is seen as the ultimate goal of business engagement in a circular economy for two reasons. It is seen as a necessary business response to global environmental change (Bocken et al., 2014) and as a business opportunity in an era of dwindling resources (Park et al., 2010). In terms of the business engagement needed to move to a sustainable circular economy, business scholars put much less emphasis on technological advancements than the engineering literature does. Instead, a strong focus is on the strategic, logistical and political aspects of doing business (e.g. Deborah Andrews, 2015; Park et al., 2010; Planing, 2014; Preston, 2012; Tukker, 2015; Witjes and Lozano, 2016). Consequently, waste management is considered less important than product design (Andrews, 2015; Lieder and Rashid, 2016; Park et al., 2010), (reverse) logistics, supply chain management (Park et al., 2010), business planning and strategy (Lacy et al., 2014), and business collaboration (Bocken et al., 2014). In addition, authors highlight dematerialization strategies such as pay per use, leasing, refurbishment (Park et al., 2010; Sugawara and Nikaido, 2014; Tukker, 2015), reduced consumption (Ying & Li-jun, 2012), and the extension of product lives (Lacy et al., 2014). Finally, some authors argue that we need new business and policy paradigms (Preston, 2012; Ying & Li-jun, 2012) to realize a circular economy.

Based on this broad conceptual variety regarding the definitions, scopes and business practices of a circular economy and its relation to the bio(based)-economy (Bugge et al., 2016; Geissdoerfer et al.,

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