

# REACHING A SUSTAINABLE CIRCULAR BIOECONOMY

CHALLENGES AND OPPORTUNITIES  
FOR RESEARCH AND PRACTICE



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# ABOUT THE CIRCULUS PROJECT



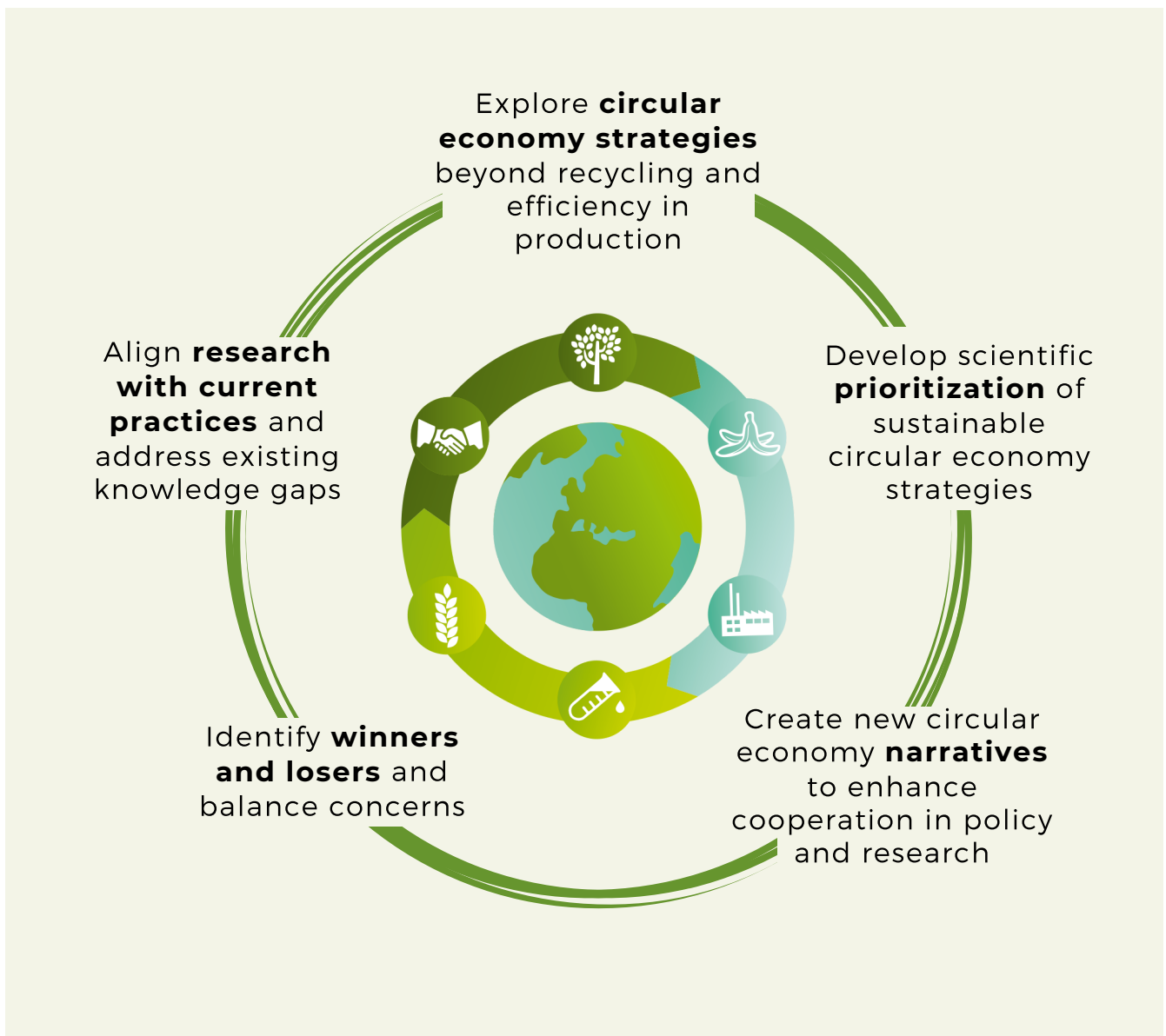
The 'bioeconomy' has gained prominence in our quest for solutions to mitigate and adapt to global environmental change. A bioeconomy is based on the use of renewable instead of fossil raw materials, e.g., for the production of fuel, packaging, and building materials. It uses plant-based raw materials such as corn, which can also be the basis of our food. In order to counter the possible conflict between food and raw materials, many representatives of the bioeconomy support a circular economy. The idea is to save, reuse or recycle (renewable) bio-based materials as much as possible in order to limit the environmental impacts of production and consumption, from raw material extraction to waste management.

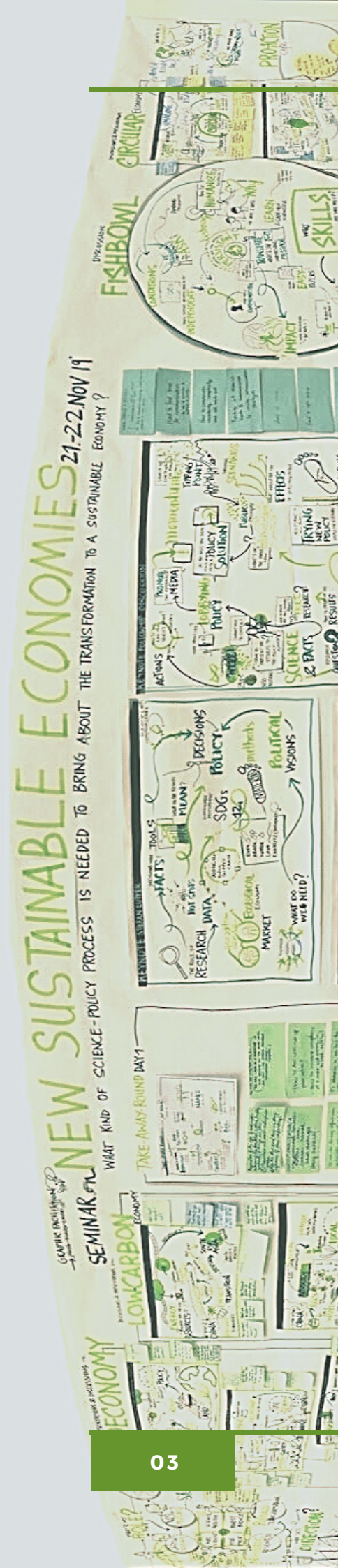
This document seeks to deliver guidance for research and practice pursuing a sustainable circular bioeconomy. It summarizes the Circulus research group's (2016-2022) main findings. All results presented here are based on extensive empirical evidence as well as insights from hundreds of scientific publications that our team reviewed. They emerged from integrating social science analyses of circular economy's political visions and strategies with environmental science assessments of related resource flows.

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# KEY INSIGHTS

TO REACH A SUSTAINABLE BIO-BASED CIRCULAR ECONOMY, THE CIRCULUS PROJECT RECOMMENDS THE FOLLOWING:





# EFFECTIVE STRATEGIES

## EXPLORING CIRCULAR ECONOMY STRATEGIES BEYOND RECYCLING AND EFFICIENCY IN PRODUCTION

EU political debates emphasize that business opportunities and engagement are key to achieving a bio-based circular economy. Yet, Leipold and Petit-Boix (2018) show that the bioeconomy sector in the EU sticks to well-known stories of recycling and resource efficiency in production when it comes to the circular economy. Innovative strategies such as reusing or sharing goods to save raw materials are less popular, although these strategies could make a significant contribution to the bioeconomy. Consequently, bioeconomy policies

are not based on the most effective measures leading to continued challenges and potential frustration of the actors involved. For instance, Helander et al. (2021) show that, in the food sector, political strategies for more sustainable diets would be significantly more effective for limiting environmental pollution than current strategies that aim to reduce food waste. Therefore, research and policy should address the innumerable strategies that the circular economy has to offer and assess their ecological benefits and applicability for the bioeconomy.

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# PRIORITIZATION

## DEVELOPING PRIORITIZATION OF SUSTAINABLE CIRCULAR ECONOMY STRATEGIES

Many current scientific studies and monitoring tools focus on barriers and enablers for specific circular economy strategies. A prioritization of the myriad strategies based on their ecological benefits and context-specific practicability remains underdeveloped. For example, Petit-Boix and Leipold (2018) found 21 different types of strategies that cities have labelled as circular in their discussions about circular cities – with no clear priorities. Given their limited administrative resources, there is a need to prioritize the strategies maximizing resource efficiency and environmental benefits. One of the main challenges is the lack of a systems approach to monitoring the effects of circular economy strategies on resource use and the application of the so-called “circularity indicators”, which often lack a systematic environmental assessment (Helander et al. 2019, Petit-Boix and Leipold 2018, Rufi-Salís et al. 2021). In other words, measuring circularity is not equivalent to measuring

environmental impacts and using one approach or the other can oftentimes lead to conflicting and/or inconclusive results that do not support decision-making. In line with this, Rufi-Salís et al. (2021) show the benefits of holistic monitoring of circular strategies applied to urban farming. A prioritization of the myriad strategies along ecological benefits and context-specific practicability could be done by integrating established measurement tools for ecological footprints into circular economy indicators (Helander et al. 2019). More importantly, such indicators and measurement tools need to be developed, prioritized and implemented based on the needs and requirements of local communities (Petit-Boix and Leipold 2018). Such prioritization could be supported through transdisciplinary frameworks and efforts that bring various disciplines together with people from policy and practice (Petit-Boix and Leipold 2018, Petit-Boix et al. under review).



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# NARRATIVES

## CREATING NEW CIRCULAR ECONOMY NARRATIVES TO ENHANCE COOPERATION IN POLICY AND RESEARCH

Political narratives have a major impact on countries' sustainability policies and business activities (Leipold et al. 2019). For instance, the dominant political narratives on the circular economy, shared by the EU and other global actors like China, emphasize economic growth, business opportunities, market creation and expansion, and reconciling economic and environmental goals through (efficient) technology (Luo et al. 2021, Leipold 2021). Although these narratives are convenient for incumbent actors in business, policy and civil society, they also create problems for these actors as well as for actors aiming to transform the economy. These narratives prevent transformative cooperation between global players like the EU and China (Luo et al. 2020, 2021). They create struggles over power, responsibilities and resource access at the national and international level (Simoens and Leipold 2021, Luo et al. 2020, 2021). Most importantly, they lead to

policy outcomes that many stakeholders from business, policy, and civil society (both incumbent and transformative) evaluate as mostly ineffective or creating new problems (Simoens and Leipold 2021, Leipold 2021). Although we find narratives that challenge the status quo in some sectors, their policy implications have much less prominence than the dominant narratives' promise of technological efficiency improvements and business opportunity (Helander et al. in preparation, Leipold et al. 2021b). Leipold (2021) and Luo et al. (forthcoming) provide suggestions on how new narratives could be developed that enable transformative policy and cooperation outcomes. Suggestions include making normative positions explicit when possible in exchanges, giving emphasis to trust building over competition, and providing space for contestation, negotiation and mutual understandings of differences.



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# WINNERS & LOSERS

## IDENTIFYING WINNERS AND LOSERS AND BALANCING CONCERNS



The potential of circular economy for societal transformation towards sustainability largely depends on the actors and their practices involved. Simoens and Leipold (2021) and Leipold (2021) find that strong resistance of perceived 'losers' of policies for a circular economy lock-in political processes and perpetuate the transnationally shared circular economy narrative (see previous section on narratives). Without addressing

the sources of this resistance, new circular economy measures will hardly be enforceable or become undermined by its opponents, e.g. fossil-based companies or parts of the manufacturing industry. A fair distribution of costs and benefits is key. Hence, a successful transformation towards a circular bioeconomy requires new narratives and strategies that address actors' fears and conflicts and take also the 'losers' of change into account.

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# RESEARCH & PRACTICES

## ALIGNING RESEARCH WITH CURRENT PRACTICES AND ADDRESSING EXISTING KNOWLEDGE GAPS

The concepts, strategies and environmental assessments covered in the scientific literature do not necessarily match the needs and expectations of circular economy stakeholders. At the urban scale, Petit-Boix and Leipold (2018) show that the environmental performance of certain initiatives has been over-researched, while others hardly receive attention from scholars. For example, there is extensive literature on the environmental impacts and benefits of waste management, whereas the effects of circular urban planning are yet to be quantified. In parallel, Jarre et al. (2020) show that the meaning and implementation pathways of

a circular bioeconomy often remain vague and ambiguous and could benefit from integrating past knowledge into their circular action plans. In particular, bio-based industries have a long history of discussing and partly realizing 'wood cascading', a concept strongly overlapping with circular economy ideas. These experiences have hardly been integrated into circular economy research up to now. Furthermore, to support this alignment, research should address various knowledge gaps regarding the circular bioeconomy's social dimensions, ecological impacts and distributions of costs and benefits (Leipold et al. 2021a).

## MORE INFORMATION...

...ON THE OUTCOMES OF THE CIRCULUS PROJECT CAN BE FOUND:

- IN OUR [CIRCULAR ECONOMY SERIES](#)
- ON OUR [BLOG](#)
- AND IN OUR [PUBLICATIONS](#)





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