

REACHING A SUSTAINABLE CIRCULAR BIOECONOMY

CHALLENGES AND OPPORTUNITIES
FOR RESEARCH AND PRACTICE



SINA LEIPOLD
ANNA PETIT-BOIX
ANRAN LUO
HANNA HELANDER
MACHTELD SIMOENS

SPONSORED BY THE



Federal Ministry
of Education
and Research

ABOUT THE CIRCULUS PROJECT

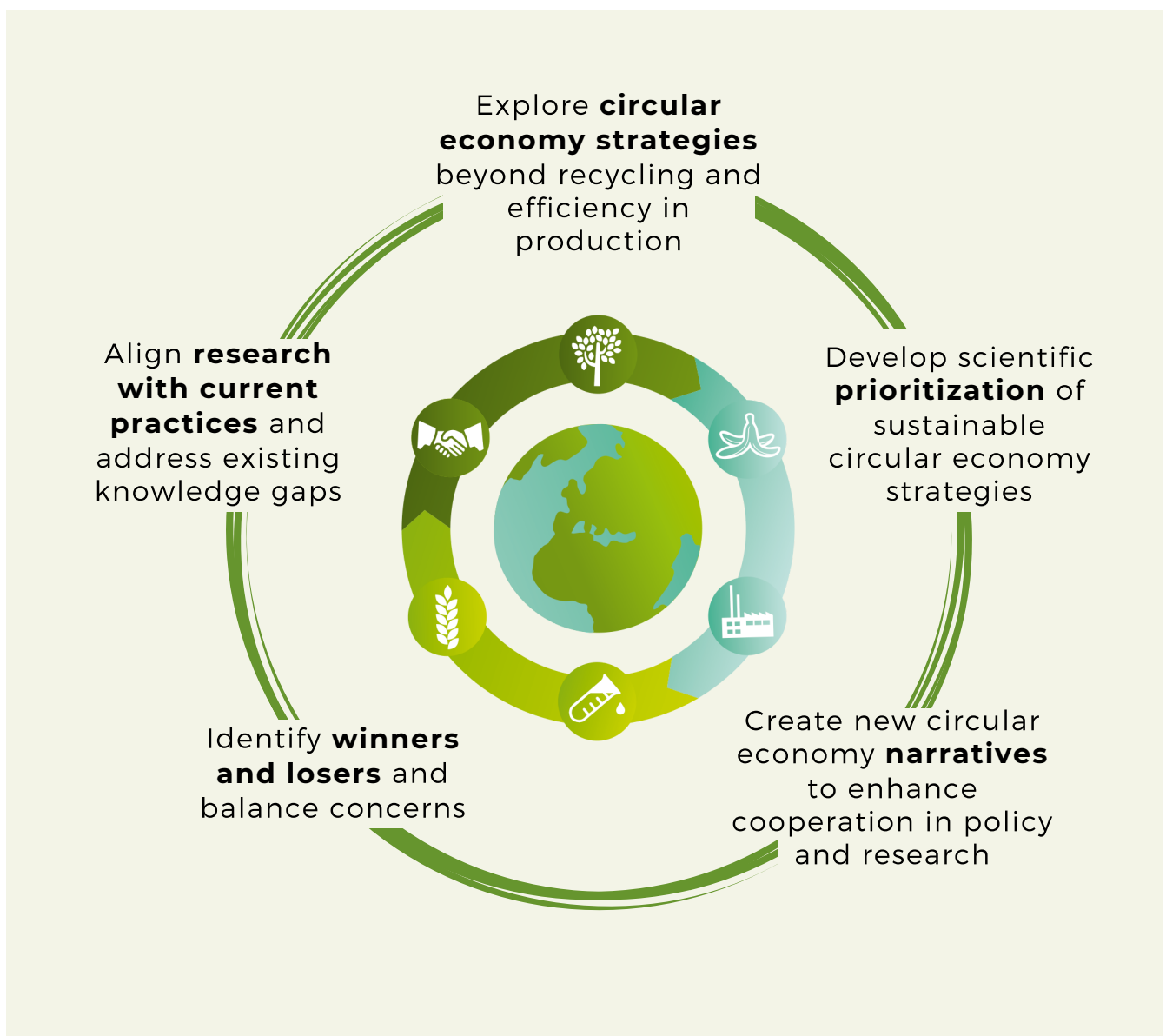


The 'bioeconomy' has gained prominence in our quest for solutions to mitigate and adapt to global environmental change. A bioeconomy is based on the use of renewable instead of fossil raw materials, e.g., for the production of fuel, packaging, and building materials. It uses plant-based raw materials 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.

KEY INSIGHTS

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



21-22.NOV.19

NEW SUSTAINABLE ECONOMIES

WHAT KIND OF SCIENCE-POLICY PROCESS IS NEEDED TO BRING ABOUT THE TRANSFORMATION TO A SUSTAINABLE ECONOMY?

CIVILIC ENLIGHTENMENT
A poster with a circular diagram and text.

SEMINARY
A poster with a circular diagram and text.

LOW-CARBON ECONOMY
A poster with a circular diagram and text.

TAKE-AWAY ROUND DAY 1
A poster with a circular diagram and text.

FISHBOWL
A poster with a circular diagram and text.

CIRCULAR ECONOMY
A poster with a circular diagram and text.

SKILLS
A poster with a circular diagram and text.

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

03

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).



Photo by Agenlaku Indonesia on Unsplash

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.

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.

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](#)



REFERENCES

Helander et al. in preparation

Helander H, Schnepf S, Stetter Th, Ferrara F, Leipold S
Problems without solutions - Why supermarkets resist food system transformation.

Helander et al. 2021

Helander H, Bruckner M, Leipold S, Petit-Boix A, Bringezu S
Eating healthy or wasting less? Reducing resource footprints of food consumption.
2021 Environmental Research Letters, <https://doi.org/10.1088/1748-9326/abe673>

Helander et al. 2019

Helander H, Petit-Boix A, Leipold S, Bringezu S
How to monitor environmental pressures of a circular economy: An assessment of indicators.
2019 Journal of Industrial Ecology, <https://doi.org/10.1111/jiec.12924>

Jarre et al. 2020

Jarre M, Petit-Boix A, Priefer C, Meyer R, Leipold S
Transforming the bio-based sector towards a circular economy - What can we learn from wood cascading?
2020 Forest Policy and Economics, <https://doi.org/10.1016/j.forpol.2019.01.017>

Leipold 2021

Leipold S
Transforming ecological modernization 'from within' or perpetuating it? The circular economy as EU environmental policy narrative.
2021 Environmental Politics, <https://doi.org/10.1080/09644016.2020.1868863>

Leipold et al. 2021a

Leipold S, Petit-Boix A, Luo A, Helander H, Simoens M, Ashton WS, Babbitt C, Bala A, Bening CR, Birkved M, Blomsma F, Boks C, Boldrin A, Deutz P, Domenech T, Ferronato N, Gallego-Schmid A, Giurco D, Hobson K, Husgafvel R, Isenhour C, Kriipsalu M, Masi D, Mendoza JMF, Milios L, Niero M, Pant D, Parajuly K, Pauliuk S, Pieroni MPP, Richter JL, Saidani M, Smol M, Talens Peiró L, Van Ewijk S, Vermeulen WJV, Wiedenhofer D, Xue B
Lessons, narratives and research directions for a sustainable circular economy.
2021 <https://www.researchsquare.com/article/rs-429660/v1>

Leipold et al. 2021b

Leipold S, Weldner K, Hohl, M
Do we need a 'circular society'? Competing narratives of the circular economy in the French food sector.
2021 Ecological Economics. <https://doi.org/10.1016/j.ecolecon.2021.107086>

Leipold et al. 2019

Leipold S, Feindt P, Winkel G, Keller R
Discourse analysis of environmental policy revisited: traditions, trends, perspectives.
2019 Journal of Environmental Policy and Planning, <https://doi.org/10.1080/1523908X.2019.1660462>

Leipold and Petit-Boix 2018

Leipold S, Petit-Boix A

The circular economy and the bio-based sector - Perspectives of European and German stakeholders.
2018 Journal of Cleaner Production, <https://doi.org/10.1016/j.jclepro.2018.08.019>

Luo et al. forthcoming

Luo A

Who has discursive agency to change global environmental narratives? Insights from the China-EU cooperation discourse on circular economy (book chapter) in
The Impossibilities of the Circular Economy. Factor X – Studies in Sustainable Natural Resource Management. Routledge | Taylor & Francis Group

Luo et al. 2021

Luo A, Zuberi M, Liu J, Perrone M, Schnepf S, Leipold S

Why common interests and collective action are not enough for environmental cooperation – Lessons from the China-EU cooperation discourse on circular economy.
2021 Global Environmental Change. <https://doi.org/10.1016/j.gloenvcha.2021.102389>

Luo et al. 2020

Luo A, Rodriguez F, Leipold S

Explaining the political gridlock behind international Circular Economy: Chinese and European perspectives on the Waste Ban.
2020 SocArxiv, <https://doi.org/10.31235/osf.io/uyw5g>

Petit-Boix et al. under review

Petit-Boix A, Apul D, Wiedmann T, Leipold S
Prioritizing circular strategies in cities.

Petit-Boix and Leipold 2018

Petit-Boix A, Leipold S

Circular economy in cities: Reviewing how environmental research aligns with local practices.
2018 Journal of Cleaner Production, <https://doi.org/10.1016/j.jclepro.2018.05.281>

Rufí-Salís et al. 2021

Rufí-Salís M, Petit-Boix A, Villalba G, Gabarrell X, Leipold S

Combining LCA and circularity assessments in complex production systems: the case of urban agriculture.
2021 Resources, Conservation and Recycling, <https://doi.org/10.1016/j.resconrec.2020.105359>

Simoens and Leipold 2021

Simoens M, Leipold S

Trading Radical for Incremental Change: The Politics of a Circular Economy Transition in the German Packaging Sector.
2021 Journal of Environmental Policy and Planning, <https://doi.org/10.1080/1523908X.2021.1931063>