

Introduction and Topic

Cities can be considered as central to the transition to a circular bioeconomy. They pose a major problem as they act as aggregators of organic biomaterial, hubs of unsustainable economic activities and consumption, making them significant contributors to contemporary challenges. Simultaneously, cities offer major opportunities for realizing the circular bioeconomy due to their and physical infrastructure, function as a knowledge hub, consumption power, abundance of economic activities and influential actors. Thus, investigating cities provides valuable insights into multi-actor governance processes and the interconnectedness of geographical scales in transitions. This is particularly relevant for the circular bioeconomy, where the flow of biological resources, innovation and knowledge through collaborative networks links urban centres with their surrounding and rural areas (Ellen MacArthur Foundation, 2017). Intermediaries are recently recognized to play a pivotal role in this landscape, as they operate across governance levels, facilitating knowledge transfer, operationalize policy, facilitate coordination as well as network-building through their engagement with various stakeholders (Hodson and Marvin, 2010). Moreover, innovation policies are imperative to create conditions for a circular bioeconomy that goes beyond techno-economic goals and enable a societal transformation.

Objective

To understand the multi-scalar interactions across governance levels in the circular bioeconomy transition, this study adopts a dual approach that integrates the geography of transitions perspective (Hansen and Coenen, 2015).

First, the study explores innovation policy approaches at both the national (Austria) and city (Vienna) levels, analysing how the bioeconomy concept is embedded within these policy frameworks. Given that policies at different governance levels pursue distinct agendas and priorities, this study pays particular attention to how city-level innovation policies diverge from national approaches. Thereby, the paper investigates various policies to analyse the development process.

Second, the study examines the role and function of Vienna-based intermediaries in the transition process towards a circular bioeconomy and how they might serve as crucial links across regions, taking into account multi-scalar networks across levels of governance. This approach highlights the importance of spatial contexts in shaping sustainability transitions and the roles that intermediaries play in bridging geographical scales and governance levels. Additionally, this study explores how intermediaries operationalize different innovation policy approaches by examining their roles and functions in relation to innovation policies. By analysing how intermediaries facilitate policy implementation, coordinate stakeholders, and address systemic challenges, the

study aims to uncover their contribution to advancing and translating innovation policy frameworks within the context of the circular bioeconomy transition.

Accordingly, the study addresses the following research questions:

1. How do national and city-level policies promote the implementation of the (circular) bioeconomy concept from an innovation policy perspective?
2. How do intermediaries based in the city of Vienna discern their role in the transition process and what capabilities do they approach to actively shape this process towards a circular bioeconomy?

Method

This paper employs an empirical analysis based on innovation policy documents and semi-structured expert interviews, adopting a mixed-method qualitative approach. The document analysis yields data through selection, appraisal and synthesis of data, specifically through content analysis and thematic analysis (Bowen 2009). The approach is particularly advantageous to validate theories, in this case innovation policy approaches in promoting a circular bioeconomy. Inductive coding facilitated the reduction and summarization of the data by identifying relevant themes related to (circular) bioeconomy emerging from a preliminary literature review. Deductive coding categorized these themes within the analytical framework based on Diercks et al. (2019) and their conceptualization of the three innovation policy paradigms (innovation for growth, systems of innovation, and transformative innovation systems). This coding scheme was further complemented by Weber and Rohrer's (2012) conceptualization of policy failures. The analytical framework enabled an in-depth analysis and understanding of the policy agenda and innovation processes.

To explore the role of intermediaries in the transition process, semi-structured expert interviews were conducted. The interviews were transcribed and coded following the typology of intermediaries outlined by Kivimaa et al. (2014, 2019). Subsequently the intermediaries could be mapped to the governance levels at which they operate, providing insights into their specific roles and interactions in the multi-scalar governance structure.

Data

The study identifies relevant policy documents and intermediaries through desk research. The dataset includes: four national (Austria) bioeconomy policies, three city-level (Vienna) policies as well as seven intermediaries based in Vienna.

This methodological approach ensures a comprehensive understanding of how policy frameworks and intermediary actors shape the circular bioeconomy transition across governance levels.

Findings and Discussion

At the national level, analysis shows that bioeconomy policies primarily consider linear, supply-side innovation model focusing on economic growth and technological advancements, blending innovation for growth and system of innovation approaches. Throughout the policy development, there is a layering of societal objectives and policy instruments, leading to the consideration of system of innovation and partly of transformative system approaches. This goes along with a broadening of the innovation process, which includes a wider array of actors and innovation activities. However, the dominant emphasis remains on resource efficiency, substitution strategies, and economic competitiveness, reinforcing existing industrial structures rather than enabling systemic change.

At the city level, Vienna's strategies implicitly align with circular urban bioeconomy principles primarily consider a more holistic approach, focusing on the interconnectedness of systems and infrastructures. The city prioritizes self-reliant resource management, enhancing waste recycling, organic food systems, green infrastructure and climate adaptation by outlining a system of innovation and transformative innovation system approach, leveraging public-private partnerships to coordinate stakeholders under shared sustainability visions. The city promotes demand articulation, participatory innovation processes, and challenge-oriented knowledge co-creation. There is a significant emphasis on societal objectives, broadening the innovation process by integrating a diverse range of stakeholders and activities to drive urban transformation and extend these efforts beyond the city borders.

These findings underscore the importance of the scale of governance in shaping bioeconomy transitions, with cities playing a critical role in advancing integrated, place-based approaches to sustainability.

The investigated intermediaries play diverse roles in the transition process, engaging in activities that address market failures, system failures, and transformational system failures.

Process intermediaries are primarily function as neutral facilitators that address knowledge infrastructure failures by managing networks, facilitating information exchange, and coordinating innovation adoption among industry actors. They integrate into the innovation system approach, by supporting and capacity building through technological brokering as well as addressing interaction and network failures by coordinating activities, organizing workshops, and integrating diverse perspectives. Through their projects, they engage with policymakers to advocate for regulatory adaptations, addressing institutional failures arising from their implementation work.

Regime-based intermediaries operate within established socio-technical regimes, these intermediaries align ecological goals with economic stability. While they foster incremental sustainability improvements, their activities reinforce existing industrial structures rather than fostering systemic change. Their core functions include

capability-building, knowledge brokerage, and policy advocacy, ensuring that resource efficiency measures and technological advancements fit within the dominant economic framework. Therefore, regime-based intermediaries primarily address systemic failures by enhancing capabilities, building knowledge infrastructure, and addressing network and infrastructure failures by connecting incumbent actors across sectors.

Systemic intermediaries support the transformative innovation policy as well as innovation system approach by fostering system-level change through multi-scalar engagement. They connect actors across politics, academia, and business, addressing capability, interaction and network failures. They advance directionality by collaborating with policymakers at different governance levels to align efforts, mobilize support, and integrate circular bioeconomy principles into policy frameworks. By building systemic links, they facilitate policy coordination, create synergies across governance scales, and ensure policy adaptability by addressing reflexivity failures.

The findings demonstrate how different types of intermediaries, and their activities can contribute to the three innovation policy paradigms, outlined by Weber and Rohrer (2012). The findings highlight that intermediaries facilitate multi-scalar network-building, fostering collaboration across governance levels and sectors to ensure knowledge exchange, coordinated action, and policy alignment. Intermediaries play a crucial role in linking local initiatives with national and supranational actors, expanding their impact beyond Vienna's borders. By constructing multi-scalar networks and fostering "inter-localization" (Coenen et al., 2012), they enable the diffusion of sustainability innovations across scales. Through these cross-scale partnerships, intermediaries bridge policy gaps, integrate knowledge flows, and align diverse stakeholder interests, ensuring that the bioeconomy transition is effectively implemented and scaled.

Conclusion

This study demonstrates how innovation policies and intermediaries shape circular bioeconomy transitions across governance levels. It examines the innovation policy approaches applied within the bioeconomy concept, exploring their underlying policy agendas and understanding of the innovation processes. The focus is on identifying how innovation policy paradigms are expressed at the national and city levels in Austria and Vienna. It highlights that the city scale can be a fertile ground for studying transformative innovation policies, as this scale is inherently suited to address societal and environmental challenges.

Intermediaries based in Vienna support the bioeconomy through diverse roles and functions that support the bioeconomy transitions across scale and governance levels. In addition, the study shows how intermediaries can adapt their roles and activities to better support the implementation of innovation systems and transformative innovation systems approaches.

The dual approach underscores the pivotal role of cities in socio-technical transitions, illustrating how urban governance can act as a catalyst for innovation and systemic change. It explicates the spatial scale of transition processes, where localized policies, stakeholder interactions, and institutional capacities shape broader transition trajectories. By embedding place-based strategies within multi-scalar governance structures, this approach highlights how cities generate bottom-up policy innovations that can have the potential to influence policy frameworks beyond their own jurisdictions.

Literature

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