Towards more just and responsible innovation in the bioeconomy? A multiple-case study on German bioeconomy innovations

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Abstract

We contribute to the integration of dimensions of responsible (research and) innovation (RRI) with dimensions of justice (following recent literature on just sustainability transitions) at the organization level to better account for and potentially govern responsible bioeconomic innovations for transitions towards more ecologically sustainable and just innovation systems.
The "bioeconomy" remains a contested concept. Depending on the underlying worldview (e.g., see De Witt et al., 2017; Schlaile et al., 2022), it still holds the promise of facilitating an innovation system transformation contributing to the overall shift towards regenerative, resilient, and sustainable social-ecological systems, while its notion also becomes blurred and diluted by the prevalence of conventional mechanistic innovation paradigms with their overemphasis on technological solutionism and ecomodernist narratives (e.g., Biber-Freudenberger et al., 2020; Blok, 2021, 2023; Bogner & Dahlke, 2022; Friedrich et al., 2021; Schlaile et al., 2017, 2022, 2024; Veraart et al., 2023; Vivien et al., 2019). In the same vein, despite advances in the literature on responsible (research and) innovation (RRI) (e.g., Stilgoe et al., 2013) – also in the particular context of innovation processes in and for the (circular) bioeconomy (e.g., Inigo & Blok, 2019; Sonck et al., 2019) – the following assessment still holds: "The bioeconomy is on the rise as it is, but whether it will guide us the way towards an equitable, environmentally sound, and future-proof economy, heavily depends on the normative guardrails imposed by science, society, and business" (Urmetzer et al., 2022, p. 1).

Ranging from perpetuating existing inequalities (e.g., with regard to non-inclusive value chains and the unfair distribution of burdens and benefits) to aggravating land use conflicts, the transition towards a bioeconomy involves multiple (potential) moral issues that raise questions of (in)justice – be it distributive, procedural, recognitional, epistemic, spatial, or temporal – and connected questions of responsibility (e.g., Bastos Lima, 2022; Blok, 2023; Schlaile et al., 2017, 2024; Veraart & Blok, 2021). Against the backdrop of the urgency of these normative questions, innovation types in and for the bioeconomy (e.g., Bröring et al.,

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2020) appear to require even more integration with normative frameworks such as RRI (e.g., Rosemann & Molyneux-Hodgson, 2020, on a related note) in order to better capture and systematically integrate their (potentially transformative) social-ecological impact (Friedrich et al., 2021).

Hence, there is a gap in the research on the normative dimension of innovation systems, especially from a bioeconomy perspective: (Design) principles for more just and responsible innovation processes seem to be insufficiently considered and integrated (by both researchers and practitioners). Our study aims to address this gap and uses a qualitative multiple-case study design to explore the question: *How are issues of (in)justice and dimensions of responsible (research and) innovation perceived, discussed, acknowledged, and embraced/implemented in bioeconomy innovation projects in Germany?* Preliminary results from 16 expert interviews (e.g., with winners of bioeconomy innovation awards and other innovators in "flagship" projects) suggest limited to no explicit implementation of RRI in practice, although some dimensions (e.g., anticipation and inclusion/deliberation) are discussed more prominently. Moreover, both explicitly and implicitly, potential conflicts and injustices (e.g., resource conflicts, land use conflicts, exploitation) are addressed but also reveal the need for more support from policymakers and intermediary organizations for the polycentric governance of transitions towards more just and responsible innovation systems.

The following example quotes illustrates the different, often competing, normative guardrails found in our interviews:

1) Example quote concerning the trade-off between sustainability and profitability "... if I now produce a shoe that is partly made from bio-based materials, but which is still produced in overproduction and with unfair production methods and not even regionally, but is still based on the exploitation of ... people living in other countries, I don't really see the progress that the bioeconomy should bring us." (BioInno16)

2) Example quote for how distributive justice is addressed: "Now I'm talking about the fashion industry. ... We have a big sustainability problem because there is way too much product produced. ... It's very hard to recycle. It puts a big strain on the resources and on the people that make them and ... the systems that need to take care of these after use. (But) ... if we're looking at production and fast fashion ... it has a lot of problems, but it also enables people ... that don't really have the access ... to dress up well. It makes it easier for people to access, for example, environments where they otherwise wouldn't really be able to come in. I think this is a positive aspect of affordable fashion that ... shouldn't be disregarded." (BioInno07)

3) Example quote for the RRI dimension of "anticipation": "... for our product, ... we have certain regulatory consultants that we consult. But ... It's not like a general purpose AI that's gonna launch some nuclear missiles or something." (BioInno01)

4) Example quote for the RRI dimension of "inclusion/deliberation": "Well, as far as our core processes ... are concerned, that's in-house. In other words, we really only do this here. As far as further downstream processing is concerned, we also work a lot with partners. That has also proved effective." (BioInno02)

5) Example quote for the RRI dimension of "reflexivity": "Erm ... Values ... That's also a difficult word. ... I can't really think of anything off the top of my head." (BioInno06)

6) Example quote for the RRI dimension of "responsiveness": "That will only ever happen step by step, and I believe that there will still be enough opportunities to adapt things. Right now, it is simply important that we optimize and improve our research in this respect." (BioInno04)

7) Example quote for the RRI dimension of "transparency": "As far as the actual technology is concerned, we are not so transparent, simply because as a young company with

limited resources, you are not in a position to secure all aspects of innovation with patents at the beginning ..." (BioInno02)

In summary, our (preliminary) results offer a new integrative perspective on the interconnections between justice and responsibility in the transition towards an ecologically sustainable bioeconomy.

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