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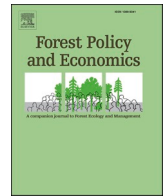
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From pro-growth and planetary limits to degrowth and decoloniality: An emerging bioeconomy policy and research agenda[☆]

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ABSTRACT

In 2012, the European Commission (EC) introduced the new bio-based economy or bioeconomy policy project, since adopted by about 50 countries. Alongside politicians, various research and other interest groups have promoted the bioeconomy as inevitable, apolitical, and a triple-win strategy for nature, people, and the economy. Recently, bioeconomy is also actively promoted and framed as transformative. Yet what is transformative or even new in the EU bioeconomy policy, and why is it important to critically engage with the concept of bioeconomy, especially but not only in the so-called Global South? To address these questions, we revisit the discursive field of the bioeconomy, outlining two dominant yet opposed visions that focus on economic growth and planetary limits respectively. We term them 'pro-economic growth' and 'pro-planetary limits' bioeconomy visions. Drawing on the literature and our own empirical research in market-based, 'green', 'climate friendly', and 'bio-based' economy policy approaches and initiatives, we highlight the EU bioeconomy's embeddedness in colonial and neocolonial logics of domination and green extractivism. While our examples are drawn from the Global South they connect and resonate with the wider European bioeconomy project. We argue that the existing EU bioeconomy visions are poorly suited to address multidimensional and intertwined existential and civilisational challenges, including overconsumption, extractivism, and global socioecological inequalities and injustices. Employing the decolonial environmental justice, feminist political ecology and degrowth literature we outline the missing narratives, ideas and logics and their potentials for fundamental and systemic change in and beyond the bioeconomy project. Finally, we highlight gaps in policy and research that warrant further attention, including: self-reflexivity in identifying policy problems and solutions; historical contextualisation of the EU's role in global environmental governance; silencing and (mis)representation; and reprioritisation of multiple existences and life-supporting practices, together with the relevant epistemologies and ontologies that support them.

1. Introduction: Who speaks of the bioeconomy, and why do we need critical engagement with the concept?

Fifteen years ago, in 2006, the Organisation for Economic Cooperation (OECD) started promoting a new policy initiative – 'The Bioeconomy to 2030' (OECD, 2006). Global actors have since enthusiastically promoted it in follow-up publications, especially the European Commission (EC), and the European Union (EU) member

states and other countries have adopted their own bioeconomy policies and strategies (IACGB, 2020). The EU adopted its first bioeconomy strategy in 2012, followed by its member states, initially Austria, Germany, the Netherlands, Finland, and Sweden. Other countries – all economically and politically influential global actors such as the United States (US), Canada, and Australia¹ – also adopted their own bioeconomy strategies. In the last 10 years, governmental actors and research organisations active in the science–policy interface in the EU

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¹ The title of the strategy does not contain the term 'bioeconomy', and the focus is agriculture and technology, but the document defines and refers to the bioeconomy, and it is considered the Australian bioeconomy strategy (Staffas 2013).

have portrayed the bioeconomy as inevitable, apolitical, and a triple-win strategy for nature, people, and the economy (e.g. *CBA Circular Bioeconomy Alliance, 2022; SITRA, 2011; Palahi and Adams, 2020*). Most recently, the (circular) bioeconomy has also been probed and portrayed as 'transformative', referring to its underlying assumption of a transition from linear to circular and from fossil to renewable resources and energy sources (e.g. *CIFOR Center for International Forestry Research, 2022; Palahi et al., 2020; Holmgren et al., 2022; Leipold, 2021; Ramcilovic-Suominen, 2022*). The performativity of the EU bioeconomy is already remarkable, both in the EU member states and globally. New initiatives have emerged, including national and international, governmental and non-governmental, formal and less formal ones (see *IACGB, 2020; CBA, 2022; TNI and Hands on the Land, 2015; UNOSSC, 2019*). This is no surprise given the significant role traditional natural resource sectors such as forestry in the Nordics (*Luke, 2019*) and agriculture elsewhere in Europe and globally play in national economies (*FAO, 2018; Mamonova and Franquesa, 2020; Kröger, 2022; Clapp, 2020*).

Despite the bioeconomy political project's prominence, the answer to the question of what the bioeconomy is depends on the preferences, political agenda, and ideologies of those that one asks (*Malkamäki et al., 2022*). Initial enthusiasm among a wide range of actors and citizens concerning the potential of the bioeconomy meant different visions, narratives, and discourses were at stake at the EU bioeconomy project's inception (*Bugge et al., 2016; Kleinschmit et al., 2017; Levidow et al., 2012; Pülzl et al., 2014*) – from the bioeconomy as a nature neoliberalisation project through biotechnology (*Birch et al., 2010, 2019*) to the bioeconomy as a support for agroecology (*Levidow et al., 2012*), the environment, and biodiversity (*Ollinaho and Kröger, 2022* this volume). Nevertheless, *some* of those visions have gained more political support, lobbying, and resources than others (*Lühmann, 2020*). Pro-industry, pro-growth, and pro-biomass visions and discourses in which biological resources are considered the 'engine of the economy' have therefore triumphed, emerging as the dominant bioeconomy discourse and vision across EU policy levels (*Bugge et al., 2016; Giurca, 2020; Korhonen et al., 2018; Lühmann, 2020; Pülzl et al., 2022*). Research and think tank organisations, among other interest groups, have also aligned their interests with the bioeconomy, strategically positioning themselves as indispensable actors with the expertise required for the (circular) bioeconomy both in Europe and in the Global South (*CBA, 2022; CIFOR 2022; Palahi et al., 2020; Luke and VTT, 2022; SITRA, 2011; ZEF, 2017*). The wide promotion and adoption of bioeconomy might have led to sidelining of more radical visions and agendas, further distancing it from transformations (*Halonen et al., 2022; Holmgren et al., 2022; Leipold, 2021; Ramcilovic-Suominen, 2022*).

We approach the bioeconomy as a political project and a policy domain characterised by competing agendas between policy actors and societal groups, who are differently positioned to influence and be influenced by the policy (*Ahlqvist and Sirvio, 2019; Goven and Pavone, 2015*). We contend that the bioeconomy is a political investment in and outgrowth of deepening neoliberal economic motives and practices (*Birch, 2019; Ollinaho and Kröger, 2022* this volume). It can be seen as an outgrowth of intensifying capitalism that reworks itself through the people, institutions, and technologies that govern (*Birch, 2019; Hiedenpää et al., 2022*). Much of the literature suggests that the EU bioeconomy policy has been appropriated by powerful corporate and industry interests, and governmental actors in support of economic growth and the industrial use of natural resources (*Andersson and Westholm, 2018; Holmgren et al., 2022; Korhonen et al., 2018; Kröger and Raitio, 2017; Lühmann, 2021; Scordato et al., 2017*). As many papers in this special issue show, this trend is similar in the Global South countries that have adopted the bioeconomy project (*Bastos-Lima, 2022; Gebara et al., 2022; González et al., 2022; Kumeh et al., 2021; Ollinaho and Kröger, 2022*). The question emerges how and why a policy such as the EU bioeconomy, which has recently been revised to respond to its previous shortcomings (*Kurki and Ahola-Launonen, 2021*), continues to side-line alternative voices and discourses that aim to shift from

'business-as-usual' (BAU) approaches in the EU bioeconomy. Focusing on this question, we look in particular at how certain ideas and visions emerge as dominant while other get ever more marginalised in the discursive field of bioeconomy. We also zoom into the claims of the bioeconomy as a transformative policy and ask what is transformative in current bioeconomy visions, and how. By focusing on the potentials and limitations for transformations in the various bioeconomy visions, we contribute to a better understanding of ontological assumptions in the bioeconomy and their wider socio-political global implications. Finally, considering the major knowledge gaps regarding bioeconomy developments in the Global South, the remaining gap of social science perspectives (*Sanz-Hernández et al., 2019*) and a lack of engagement with issues such as, for example, intersectionality, ecofeminism, justice and decoloniality (*Sanz-Hernández and Jiménez-Caballero, 2022; Ramcilovic-Suominen 2022*), we propose an emerging policy and research agenda.

We posit several reasons the bioeconomy necessitates critical engagement with these questions and issues. **First**, in examining the actors promoting the bioeconomy as a win-win scenario, we can observe similarities with actors who previously promoted both the concepts of green growth (*D'Amato et al., 2017*) and the concept of sustainable development (SD). While the concepts emerge from different actors – the UN system played a leading role in promoting SD, while the OECD, industry, and governments initiated the bioeconomy – actor coalition building, and convergence are present in the two agendas' translation, institutionalisation, and implementation. Global international organisations, including research and civil society groups, most funded by and/or based in the Global North, took the responsibility and the self-proclaimed legitimacy to promote and steer the SD agenda policy globally. These actors have been accused of hegemonising and co-opting SD in favour of growth (*Demaria and Kothari, 2017*). After the promotion of governmental bioeconomy policies, a similar set of actors, including the UN organisations (*UN, 2015, 2018; UNOSSC, 2019*), and the existing and newly established governmental and think tanks, is again taking the lead in transitioning the world, this time to the bioeconomy (*CBA, 2022; CIFOR, 2022; IACGB, 2020; Palahi et al., 2020; ZEF, 2017; UN, 2015, 2018*). Actor coalitions of researchers and policymakers based in and/or funded by interest groups in the Global North leading the translation of the EU bioeconomy policy to the Global South is likely to reproduce neocolonial interventionism (*Apostolopoulou et al., 2021*). Such coalitions are not only good predictors of policy direction but are motivated by self-interest to ensure the continuity of funding and influence. Rather than bringing transformation, they effectively legitimise any 'latest and greatest' policy buzzwords and initiative that promise funding, resulting in perpetuating rather than destabilising status quo.

Second, similarities are also visible in framings and narratives used in bioeconomy, green economy and sustainable development. Previous policy initiatives like those associated with SD have side-lined social, cultural, and ecological aspects from an originally more comprehensive and holistic framing, leading to the dominance of economic sustainability (*Demaria and Kothari, 2017*). Meanwhile, in the EU's bioeconomy, we see a contrasting dynamic where sociocultural and socioecological aspects are added to an originally dominant pro-economy policy agenda (*Kurki and Ahola-Launonen, 2021; Eversberg and Holz, 2020*). Regardless of the differences in the dynamics, the end result is a similar set of narratives, promises, and solutions, including the 'more of everything' narrative and the dominance of eco-modernist sociotechnical solutions like net-zero and negative emissions. Such framings, intentionally or not, serve to distract attention from the root causes of socioecological crises, such as overconsumption and capitalist logics that supports it (*Hickel, 2020*), coupled with widespread (neo) colonial inequalities (*Sultana, 2022*) and various extractivisms (*Chagnon et al., 2022; Kröger, 2022*). This in turn delays action demanded by the increasingly louder and more anxious calls for transformative change (*Thompson, 2021*).

The **third** reason for critical engagement with the concept relates to the intended and unintended, direct, and indirect consequences the EU bioeconomy implementation, as well as translation of the policy ideas to non-European post-colonial countries of the Global South. Translating ideas of bioeconomy to those geographies and spaces, via green investments and sustainable markets (see for example <https://www.sustainable-markets.org/>), or technical support and knowledge transfer for bioeconomy (CBA 2022, CIFOR 2022, Palahí et al., 2020; ZEF, 2017) may have potentials. But, there are also multiple reasons to be cautious, considering the path dependency, as bioeconomy is promoted by the same set of international actors, it applies same policy tools and approaches, such as market-oriented approaches and apolitical scientific and technological fixes, with variety of undesired effects. Applying these ideas within the existing institutional and political structures, ignoring, the existing onto-epistemological injustices, power asymmetries and inequalities, is likely to reproduce the same harmful effects. Extensive empirical research on 'green', 'nature-based', and 'climate-smart' policies and solutions have demonstrated substantial levels of green enclosure and dispossession, green colonialism, green extractivism and various associated forms of violence and injustice (Brock et al., 2021; Dunlap and Arce, 2021; Nygren et al., 2022; Scott and Smith, 2017; Sovacool et al., 2021; Zografos and Robbins, 2020). Several papers in this special issue point to similar dynamics in case of translating bioeconomy ideas in countries such as Brazil, India, Indonesia, and Ghana (Bastos-Lima, 2022; Gebara et al., 2022; Kumeh et al., 2021; Ollinaho and Kröger, 2022).

It is increasingly clear for an increasing group of people that unless the root causes of conflict and injustice are addressed, it is naïve to expect that a transition to, for example, renewable energy or bioeconomy alone will be more socially and ecologically benign and just (Backhaus et al., 2021; Bastos-Lima, 2022; Dunlap and Arce, 2021). The root causes of socioecological degradation and injustice are directly related to economic and political power asymmetries (Martin et al., 2020; Scoones, 2016), onto-epistemological injustices (Temper, 2019; Rodríguez, 2020; Gebara et al., 2022), and extractive human-nature relations and mentalities (Gebara, 2021; Kröger, 2022). The existing dynamics of domination and dependence between the EU and other former imperial powers on the former colonies and/or otherwise less economically and politically privileged countries enable continuation of dispossession and inequalities between them - which can also occur in the name of bioeconomy - reproducing racialised and neocolonial green capitalism (Backhaus et al., 2021; Gonzalez, 2021; Fuchs et al., 2020; Scott and Smith, 2017; Zografos and Robbins, 2020).

2. Revisiting the discursive bioeconomy field: Pro-economic growth and pro-planetary limits visions in the EU bioeconomy discourses

In mapping the dominant approaches and logics in the EU bioeconomy policy discourses, scholars have identified several bioeconomy visions. Bugge et al. (2016) distinguish between biotechnology, bio-resource, and bio-ecology visions. Vivien et al. (2019) distinguish between 'science-based', 'biomass-based', and 'biosphere limits-based' bioeconomy visions. These scholars accurately identify three foci relevant to the EU bioeconomy: (i) science and (bio)technology; (ii) biomass and biological raw material; and (iii) biological or ecological limits. Yet the three are not mutually exclusive in practice. Science and technology visions on the one hand and biomass and biological raw materials on the other strengthen each other and are present in all bioeconomy policy communications. Both visions have been key since the start of the EU bioeconomy policy debates and continue to dominate this policy domain. In contrast, the focus on biological and planetary limits was side-lined until about 2018, when, faced by criticism of its pro-industry and pro-economic growth agenda, the EU bioeconomy strategy was revised to acknowledge planetary and ecological limits. We next outline these dynamics and competing agendas, proposing two distinct

bioeconomy visions: the pro-economic growth and pro-planetary limits visions.

The role of research, innovation, science and technology, and biomass and other biological raw materials has been central to the EU biomass-based economy from its inception and the first bioeconomy strategy (Ramcilovic-Suominen and Pülzl, 2018) to the present and revised strategy (Kurki and Ahola-Launonen, 2021; Lühmann, 2020). Hence, instead of treating the 'biomass-based' and 'science-based' bioeconomy as two separate visions (Bugge et al., 2016; Vivien et al., 2019), we consider them as one prominent and dominant bioeconomy vision that aims to promote 'biotechnology'. By *biotechnology*, we refer to an economy in which science and biotechnology are central in making the shift in production and consumption from fossil to biomass and biological raw materials. Biotechnology is a dominant vision and a central feature of the EU bioeconomy policy debate, strongly integrated and well elaborated in both bioeconomy strategies, and it serves to maintain the current social order and societal structures relying on and promoting economic growth (D'Amato et al., 2017; Eversberg and Holz, 2020; González et al., 2022 this volume; Kurki and Ahola-Launonen, 2021; Kröger, 2016; Ramcilovic-Suominen, 2022). As the biotechnology vision serves to maintain the centrality of economic growth in the bioeconomy with the aid of innovation, research, and technology, we refer to this broadened vision as a **pro-economic growth bioeconomy vision**.

As the name suggests, the 'bio-ecology' (Bugge et al., 2016) and 'biosphere-limit-based' bioeconomy visions (Vivien et al., 2019) are associated with ecological and planetary limits. Building on Georgescu's original work on 'bioeconomics' (Georgescu-Roegen, 1975), Vivien et al. (2019) suggest that the 'biosphere limits' bioeconomy adopts a degrowth approach and perspective. However, we stress that the pro-planetary or biosphere limits bioeconomy, focusing solely on biological and ecological boundaries, does not do justice to a much broader concept of degrowth, in which alongside planetary limits, planetary justice is a central element (Akbulut et al., 2019; D'Alisa et al., 2015; Hanaček et al., 2020; Kallis et al., 2020; Hickel, 2020). As this body of literature indicates, and as elaborated in Section 4, the issues of justice, socioecological transformation, and increasingly care and reciprocal relationality (Singh, 2019) are integral elements of degrowth (Kallis et al., 2020; Hickel, 2020). Hence, rather than linking it to degrowth as previously done (Vivien et al., 2019), we term this vision the **pro-planetary limits bioeconomy vision**. This vision is less prominent in the bioeconomy policy area than pro-economic growth, receiving some attention in the revised EU bioeconomy strategy (EC, 2018), which acknowledges ecological and planetary boundaries and finite biological resources, emphasising circularity and a more holistic notion of sustainability. While this is a welcome shift in the formal bioeconomy policy, the socioecological concerns remain framed as challenges to be addressed so that the main objectives – green growth, green jobs, and EU global competitiveness – can be realised (Eversberg and Holz, 2020; Ramcilovic-Suominen, 2022).

We next further elaborate the two visions. The **pro-economic growth bioeconomy vision** is based on the premise that modern technologies and innovations (like biotechnology, nanotechnology, and 3D printing) can support the shift from non-renewable materials and energy sources to renewable ones (biomass, wind, solar, etc.) and the former's substitution for the latter. Some key means are circularity and the cascade use of materials and products, which increase material and energy efficiency (Albert, 2020). The goal is to decouple economic growth from environmental impacts (Albert, 2020; Giampietro, 2019). This framing resembles the 'ecological modernisation' discourse (Bäckstrand and Lövbrand, 2006), which argues that economic growth and environmental protection are mutually compatible, despite empirical findings to the contrary (Hickel, 2019; Hickel and Kallis, 2019; O'Neill, 2020). Science, (bio)technology, and predominantly market-based responses are the key tools and solutions to the socioecological crisis in this vision. Critical social and political ecology research highlights its underlying politics, from disproportionate funding in natural

science and technological development compared to the social sciences (Overland and Sovacool, 2020) to the disproportionate allocation of socioecological harms and benefits associated with bio and green projects (Bastos-Lima, 2022; Backhaus et al., 2021; Ollinaho and Kröger, 2022; Sovacool et al., 2021; Zografos and Robbins, 2020). As discussed later, this vision postpones rather than promotes radical change and transformation, because it reproduces the existing global economic and power relations that deepen extractivism and fuel inequalities (Backhaus et al., 2021; Eversberg and Holz, 2020).

The **pro-planetary limits bioeconomy** resonates with what Vivien et al. (2019) term the 'bioeconomy that considers the limits of the biosphere', but is silent on the politics, power, and onto-epistemological and other injustices. This vision emerges as a critique of the pro-economic growth bioeconomy vision, debunking the propositions and promises of a compatibility between constant growth and planetary boundaries (Hickel, 2019). The work of ecological economists and degrowth scholars has been instrumental in unsettling pro-economic growth and the big 'win-win' narrative. For example, O'Neill (2020) demonstrates that '*no country in the world currently meets the basic needs of its citizens at a globally sustainable level of resource use*'. It is increasingly established in the literature that growth-centred development is ecologically unsustainable (Hickel, 2019; Hickel and Kallis, 2019), and the win-win and pro-economic growth narratives are therefore gradually being challenged, even by the more dominant EU based institutions (EEA (European Environmental Agency), 2021). Invoking strong ecological sustainability notions, this vision is likely to perform better than the pro-economic growth vision regarding environmental concerns. However, it falls short in dealing with concerns related to social injustice, the asymmetry in power relations and domination, and their associated politics, identities, onto-epistemologies, and intersectional dimensions (class, race, ethnicity, gender, sexuality, etc.). These are crucial because they predefine how resource scarcity and biophysical limits play out for different sections of society, and how they experience them (Gonzalez, 2021; Mehta and Harcourt, 2021; Sultana, 2021). By disengaging the root causes of inequality, this vision depoliticises and normalises stark differences in the ecological footprint, levels of pollution and consumption, and disproportional effects on different regions, countries, and societal groups (Oxfam International, 2015, 2020).

3. Extractivisms, green enclosure, and speculative governance of nature value creation in the bioeconomy

The bioeconomy, in its current form, focusing on extracting biomass, is fundamentally an extractivist practice. Extractivism has different degrees and characteristics (Kröger, 2022), depending on the relevant bioeconomy activity, context, and sector. Yet the overall logic of extracting something for the purpose of a human existence and 'economy', even with the 'bio' prefix, is a largely violent and destructive process, turning living beings with their habitats into an extractable mass or a unified 'bio' category. The bioeconomy is thus a purely Western and modern construct, contradicting the wisdom of Indigenous populations lacking a concept of private property (Nichols, 2020) or words like 'nature' or 'forest' as separate entities, but who understand the world as the habitat for a web of life and its beings (González and Kröger, 2020). It is argued that extractivist expansions through commodity frontiers that produce raw materials like sugar, wood, feed, and fuel are essential for capitalism's continued existence in the web of life (Moore, 2015). This is because value formation in the capitalist world ecology is premised on the denial of most living beings' work, such as microbes creating and composing what is called 'soil' (Haraway, 2015), fungi transporting carbon and nutrients between trees (Simard, 2021), and even most humans, including women and others whose domestic work is unrecognised. Moore (2015) argues that all this unrecognised work is appropriated, and only a limited amount of work is paid, made visible and recognised. This logic is at the core of the bioeconomy's accumulation and power relations.

Extractivism functions in multiple ways. Within the bioeconomy, extractivist stances distract attention from all living things, seeking to ensure the fastest and largest possible extraction of limited raw materials. This extractive appropriation is usually highly socially unequal, leaving barren or toxic landscapes like deforested areas behind and replaced by monocultures that allow only soybeans and corn to exist in lands that once had a rich assemblage of life forms (Kröger, 2022). These initiatives impose various forms of violence constituting ethno-, eco-, and genocidal practices. Unsurprisingly, environmental and human rights defenders, especially indigenous activists, are being murdered as bioeconomy-based monocultures spread around the world (Dunlap, 2021; Shapiro and McNeish, 2021).

However, the bioeconomy concept has recently also been used in other, non-monoculture related contexts – for example, to refer to the collection and marketisation of traditional knowledge of medicinal extracts from forests (Gebara et al., 2022 this volume). Such bioeconomies, which may cause less direct trespassing of ecological and climate limits than monoculture bioeconomies, are nevertheless based on the same principle and attitude of extracting for mostly private or lopsided gain (Durante et al., 2021). A dangerous monetisation of nature is thus also inserted into indigenous and non-monetised communities compelled to see their living spheres in capitalist terms rather than non-extractivist, reciprocal, and care-based relations, as in the 'Amazon Creative Labs' (Gebara et al., 2022) for instance. The growth imperative of most sectors remains greatly related to the biophysically destructive bioeconomy in attaining its raw materials for more value-adding production or energy uses. A metabolic shift from these materiality-emphasising consumption, production, and thought patterns is required, rather than 'bridging' the North-South 'metabolic rift' (Moore, 2017) if this merely entails shifting overconsumption habits between people.

A decolonising and dematerialising of the economy are required; in contrast, bioeconomy projects aim to augment the amount of 'biomass' in the economy, turning living beings into an unidentifiable and undistinguishable mass of objects, not subjects (Ollinaho and Kröger, 2021). Agency and the role of all human and more-than-human actors and entities need to be recognised in any notion of the 'economy', including various postgrowth and degrowth economic paradigms and associated policies. Otherwise, the bioeconomy continues to be a core destruction process of current and future possibilities of life for most living beings. It does this in radically narrowing the possibilities and scope of what can exist in a bioeconomy-targeted area, as in monoculture expansions (Kröger, 2022). This also happens at an onto-epistemological level, when sacred, spiritual, holistic or otherwise-labelled understandings of life not based on an extractivist logic are enacted to reduce life forms into monetised and commoditised tradable objects, as in fortress conservation-based green capitalisms. These onto-epistemic roots and lineages of different bioeconomy forms need to be further identified and studied for their impacts on minds and life forms around the world, (see Kröger, 2022 for methodological suggestions for this).

Further, it is important to highlight how the histories of colonial conservation and extractivism have directly influenced the form and function of contemporary environmental governance and more recently, the bioeconomy in different parts of the world (Dressler, 2017). Yet little attention has been paid to the co-emergence of conservation and extractive enclosures, and how the territorial demarcation, resource claiming, and dispossession of one reinforces and legitimates the other (Büscher and Davidov, 2013). Despite many indigenous or locally controlled and managed conservation areas (Fletcher et al., 2021), top-down conservation and extractive synergies persist and are truly global. Büscher and Davidov's (2013) edited volume uses numerous empirical case studies to demonstrate how the development of new conservation enclosures, ecotourism schemes, and similar 'green' and 'climate friendly' initiatives is often designed to offset the impact, supply resources, or simply greenwash industrial developments in the name of 'corporate social responsibility', thereby merely sustaining the pace and

scale of industrial development. Other literature describes how various green enclosures – from major afforestation schemes for carbon offsetting or expanding marine protected areas for blue carbon etc. – are often tied to, and help legitimate, global corporate policies and practices (Fairhead et al., 2012; Dressler, 2017). Kumeu et al., 2021 (this volume) show how both state and traditional authorities use the bioeconomy narrative in Ghana to diminish forest communities' access to forest reserves and legitimise plantation forestry.

Such conservation and extractive synergies are now part of a global neoliberal environmental governance regime (Büscher et al., 2014) within which global bioeconomy governance is embedded (Birch 2019). Forged by the World Bank, UN programmes, the EU, international NGOs, and transnational corporations, much of the world's resources and ecologies is increasingly framed in market and business terms with market-based solutions.

Natural capital accounting that ascertains the imputed market value of 'ecosystem services' is intended to generate finance through various market mechanisms (carbon-trading and offsetting schemes, payment for ecosystem services, etc.) as the basis for landscape-scale conservation involving new global actors, finances, 'smart' and 'climate smart' technologies, and local labour to manage and maintain such infrastructure (Dressler, 2017). Such governance is both speculative and performative. Rather than accepting the "exhaustion of capitalism's 'Cheap Nature' strategy" (Moore, 2015), actors, ideas, and technologies tend to reform capital to draw out its abstract value well beyond sites of extraction, accumulation, and degradation. The rise of natural capital valuation governance, especially in sites of accumulation and extraction, therefore less concerns material substance and local realities than the ability of social actors to manoeuvre networks to leverage the promise of big ideas and practices, by asserting the reputed effectiveness of schemes related to natural capital accumulation and valuation. Such schemes and tendencies are evident in bioeconomy-related initiatives like genetic engineering technologies and creating new markets for new products (Birch, 2019; Kröger, 2016), which has emerged as a necessary strategy in many national bioeconomy policies (Gebara, 2021 this volume; Holmgren et al., 2022; Korhonen et al., 2018).

Speculative governance serves as frontier capitalism's newest spatial and ecological fix in its potential to overcome, through discursive productions of value, the creative destruction of labour and land during extractivist ruptures of the bioeconomy (Lühmann, 2021). Using speculative governance, like their predecessors, bioeconomy initiatives seek to revalue land, labour, and social and biological diversity, or 'capital', which extractivism has eroded by monetising their further use value through finance, technologies, and narratives underpinning natural capital accumulation. Examples of bioeconomy initiatives include plantation forestry for various biofuels and other agro commodities for bio-based products (Bastos-Lima 2022; Kröger and Raitio 2017; Backhaus et al., 2021; Lühmann, 2021), and theft of traditional knowledge in creating 'Amazon Creative Labs' and 'Bank of Codes', the main aim of which is to strengthen the economic potential of Amazonian socio-biodiversity 'assets'. Various forms of violence associated with the natural capital valuation schemes and extractive initiatives sustain the apolitical and overly technical orientation of interventions and solutions to environmental decline, neglecting the underlying political economy that damages human rights and drives environmental defenders globally (Shaw, 2021).

4. The missing decolonial, degrowth, and justice perspectives in the EU bioeconomy: towards an emerging policy and research agenda

Drawing on the decolonial and environmental justice literature (e.g. Escobar, 2020; Kothari et al., 2019; Rodríguez, 2020; Rutazibwa, 2018; Schöneberg, 2019; Temper, 2019), feminist political ecology (Mehta, 2010; Mehta and Harcourt, 2021; Nirmal and Rocheleau, 2019; Sultana, 2022), and degrowth (D'Alisa et al., 2015; Kallis et al., 2020; Hickel

et al., 2021; Parrique, 2019) in this section we outline some of the key gaps that apply to both bioeconomy policy and research. Before we proceed with those gaps, we shortly outline the key concepts employed, including transformations, degrowth and environmental justice.

The literature and debate on *transformations* have thrived in the last decade, resulting from increased public support for the idea that the current ecological, public health, and social crises are unlikely to be addressed within the existing political and economic structures and dominant epistemological frames and imaginaries, all of which are seen as part of the problem (Büscher et al., 2021; Leach et al., 2021; Menton et al., 2020; Nightingale et al., 2019). Decoloniality, environmental justice, and degrowth constitute central elements of the socioecological transformations (Feola et al., 2021; Gram-Hanssen et al., 2021; Vogel and O'Brien, 2022; Ramcilovic-Suominen, 2022). We understand transformations as a concept that goes beyond the socio-technical transition to sustainability (Geels, 2019) and calls for a shift in the onto-epistemic foundations (Escobar, 2018), in addition to the shift in practices, structures and technologies. We also highlight the importance of the process, or the means, not only the outcome or the destination of change (Bentz et al., 2022) when conceptualising and analysing transformations. The concept of transformations implies a change that seek to address the root causes, (Martin et al., 2020; Temper, 2019; Bentz and O'Brien 2022) and that seek to enable radical alternatives outside the hegemonic structures, definitions and binaries (Ramcilovic-Suominen, 2022).

Concerning degrowth and environmental justice, we emphasise that despite mutual differences and owing to a constructive dialogue the two have also much in common, (Akbulut et al., 2019; Escobar, 2015; Demaria and Kothari, 2017; Hanaček et al., 2020; Martínez-Alier, 2012; Singh, 2019). While both concepts originate from the Global North, various synergies exist with movements and philosophies from the Global South (Hanaček et al., 2020); including Buen vivir, Rights of Nature (Acosta, 2020) and the broader idea of a pluriverse (Demaria and Kothari, 2017; Kothari et al., 2019). These ideas and social movements identify with a common agenda for postcapitalist societies and the need to go beyond the current profit-oriented economic system thriving on extraction, dispossession, extraction and coloniality of human and more-than-human world (Abram, 1997).

As concepts and as social movements, degrowth and environmental justice have benefited from feminist and decolonial schools of thought which have illuminated the importance of intersectionality, power relations, race, gender, class, ethnicity, religion, care, vulnerability, and relationality (for degrowth see: Mehta and Harcourt, 2021, Nirmal and Rocheleau, 2019, for environmental justice see: Álvarez and Coolsaet, 2020; Temper, 2019). For example, while downscaling of economies and reduction of production and consumption remain central to degrowth, a successful convergence with wider global struggles and disciplines beyond ecological economics, such as feminism, post-colonialism, and environmental justice studies, means degrowth now encompasses concerns and issues like global justice (Akbulut et al., 2019), care and reciprocity (Dengler and Seebacher, 2019), and reciprocal human-nature relationality (Hickel, 2020). While more remains to be done to '(...) shrink its sense of universality and enter as an equal player in the post-development convergence' (Nirmal and Rocheleau, 2019:471), degrowth can inform both bioeconomy and transformation debates.

Applying decolonial and feminist lenses requires engagement with the key question of whose interests a policy serves, and whether it continues or discontinues the mindsets, mandates, logics, discourses, structures, categories, and binaries (e.g. developed/undeveloped, superior/inferior) rooted and instituted within the imperial and colonial project. Such questions and perspectives are central for transformations as they open the space for reinventing alternatives to the hegemony of growth, green growth and bioeconomy.

Applying the above ideas and schools of thought we emphasise the missing perspectives in the EU bioeconomy and subsequently propose several themes to inform bioeconomy policy and research. Those also

represent gaps in the current bioeconomy policy and research, and are presented as such: (i) the lack of and the need for self-reflexivity and an inward focus in identifying policy problems and solutions; (ii) the lack of and the need for embedding the EU's role in global bioeconomy governance in its historical context and critically engaging with the question of EU's roles and responsibilities as a global actor; (iii) the lack of and the need for understanding the levels of silencing and (mis)representation of marginalised groups and their knowledge systems and worldviews in the policies such as bioeconomy; and (iv) the lack of focus on a diverse web of life and life-supporting practices, together with the relevant and marginalised epistemologies and ontologies that support them, and consequently a need to reprioritise and revitalise such practices and epistemologies in the EU bioeconomy.

To elaborate on the first gap – *the lack of and the need for self-reflexivity and shifting the focus inward when identifying policy problems and solutions*. There is a substantial gap – geographic, cultural, political and economic gap – in the EU's bioeconomy policy, but also in international environmental policy and governance more broadly, in terms of where, for whom, by whom and why are these policies designed, versus where/for whom/by whom and how they are implemented. The EU policies as well as various international sustainability initiatives and commitments tend to externalise policy problems and solutions elsewhere, to global frontiers and peripheries, altering local people's lifestyles and livelihoods. Lifestyles and livelihoods of those who live most modestly, while the EU economies and lifestyles of those who historically and currently are most responsible for the problems such initiatives aim to address (Hickel, 2020; Sultana, 2022) are hardly questioned let alone directly affected by such policies. For example, the newly proposed EU regulation for deforestation-free value chains for cocoa, coffee and several other commodities do not include direct policy measures to reduce overconsumption of these “commodities” by its population; rather, they impose rules and demands on how the EU wants the products to be produced and delivered. Similarly, the EU bioeconomy policy externalises the demand for biofuel to other geographies (Backhaus et al., 2021), without proposing policy measures to address the lifestyles of the privileged, predominantly wealthy, and predominantly white communities and countries. To avoid the inherent injustices in these approaches, such policies need to question the consumerist lifestyle and culture in the EU, focus on the right policy problems and develop solutions that address them.

In the context of bioeconomy, this among others implies tackling overconsumption, questioning growth-oriented economy, extractivism and violence it creates. It is here where degrowth- and justice-oriented policies gain attention, advocating for postgrowth-, justice-, and wellbeing-centred economy (EEA, 2021; Raworth, 2012). Sufficiency, defined in opposition to excess and accumulation (Kallis, 2013), and living a good life within planetary boundaries are central to postgrowth paradigms. Raworth (2012) describes this as ‘living within the doughnut’ – a safe and just space for humanity, where everyone has a solid social foundation without causing massive extinctions and making life impossible for current and future living beings. Sufficiency necessitates a redefining of the good life and relates to a global metabolic shift (D'Alisa et al., 2015; Hickel, 2020; Kallis et al., 2020). Degrowth-driven policy measures also include carbon and wealth taxes, scaling down environmentally polluting sectors and industries, a universal basic or living income, a four-day working week, reclaiming the right to rest, and the right to non-material joy and social connections – all of which indirectly and directly imply less consumption and a change of capitalist consumption-oriented economy and lifestyles (Kallis et al., 2020).

Introducing such policy measures to the bioeconomy and beyond can already have important positive implications for ecological sustainability and social justice. However, such policy measures require further impetus to address the deeper causes of violence, injustice, power asymmetries, and onto-epistemological divides and injustices (Garcia-Arias and Schöneberg, 2021; Mehta and Harcourt, 2021; Nirmal and Rocheleau, 2019). Addressing such root causes necessitates a direct and

active undoing of the underlying systemic injustices and power asymmetries, requiring a more fundamental and radical shift beyond modes of provision, consumption, and addressing the onto-epistemological injustices and extractivism, including patriarchy, racism and colonialism, the legacies of which continue to linger in the extractive global economic, social, and political relations (Sultana, 2022).

Continuing along these lines of thinking, we highlight the next gap in bioeconomy policy and research – *the lack of and the need for embedding the EU's role in global bioeconomy and environmental governance, in the historic context* – the period before former colonies' political independence. Such an historical embeddedness requires a re-evaluation of the EU's current role in global development and its positionality in relation to the Global South countries. It requires critical engagement with the question of EU's roles and responsibilities as a global actor, which in turn provides a more holistic understanding of the present inequalities, wealth, and poverty, specifically linking the economic poverty in the Global South with the economics wealth in the Global North (Rutazibwa, 2018). Research needs to critically re-examine and deconstruct the EU's role as an international and good-willed actor in the light of its colonial history, where many current European economic powers enriched themselves by dispossessing former colonies and continue to do so (Hickel, 2018; Rutazibwa, 2018). This in turn points to the need to take actions on the EU's historic responsibilities and for unconditional reparations for past and present extractivist practices and social violence in the former colonies and beyond (Hickel, 2018, 2020). Such practices and violence include but are not limited to the bioeconomy project's extractivist logics (Fuchs et al., 2020; Lühmann 2021).

The next gap also relates to the previous one, as it concerns the lack of attention to, and a need for *understanding who is silenced and misrepresented in formation and implementation of the EU bioeconomy, but also what kind of ideologies and technologies are used to silence the 'subaltern'* (Spivak, 1988). This question is widely applicable in analysing the EU and other western actors' interventions in non-western contexts and countries in the Global South, by scrutinising their modes of interaction and the lack of consideration for the existing locally embedded ideas and knowledges. The question is surely relevant to the domestic actors and societal groups as various bioeconomy policies are critiqued for the limited input, engagement, voice and representation of own citizens (Mustalahti, 2018; Holmgren et al., 2022). Globally, by focusing on technoscientific and expert-driven solutions and innovations, various international environmental policies have reproduced the dominance of ‘expert knowledge’ resulting in ‘capacity building’ programmes that largely benefit their organisers (Nightingale et al., 2019; Ramcilovic-Suominen and Mustalahti, 2022). Equally important, such policies have reproduced the epistemological hierarchy, dominance and universality of western knowledge over other forms of knowledge, marginalising the latter (Escobar, 2020; Spivak 1988). Applying these ideas allows us to see the EU's roles and interventions, together with its ‘will to improve’ people's lives elsewhere through a different lens, one which reframes the ‘green’, ‘bio’, ‘sustainable’, and ‘climate friendly’ policies as tools that strengthen the dominance of Eurocentric onto-epistemologies (Escobar, 2018; Schöneberg, 2019). These issues are applicable to the EU's bioeconomy and other similar EU policies, as they often end up reproducing slow or symbolic violence (Ojha et al., 2009), but also a form of epistemic injustice, rendering local people's cognitive and onto-epistemological worldviews invisible (Gebara, 2021; Rodríguez, 2020).

Finally, we highlight the *lack of attention on multiple existences and life-supporting practices* (Kröger, 2022), *together with the marginalised epistemologies and ontologies that support such practices, in both policy and research on bioeconomy*. While broadly defined, this point is critical for reimagining ways out of the dominant growth-centric, violent and extractivist logics, practices and wider structures. We call for more research into the pluriverse of knowledges and life-respecting epistemologies and ontologies, including indigenous

knowledge systems and relational ontologies in policy formulation and implementation processes (Arsenault et al., 2019; Whyte, 2017; Winter, 2021). This can be enabled by deliberately designing open and flexible policies that allow an uptake of the ways of knowing and doing, embedded in the place where a policy is felt, rather than imposing predefined policy problems and solutions for others to adopt and follow. This relates to the silencing and misrepresentation aspect as well, as the policymakers and researchers alike need to reflect on the extent to which their work enable or hinder the voices of most vulnerable and affected groups (e.g. informal and formal small-scale producers and rural communities in the biomass provisioning countries). As the EU and other international actors by default work with the state, its policies ultimately delegitimise the struggle of those unrepresented and/or oppressed by the state (Dunlap, 2021; Ramcilovic-Suominen et al., 2021). Making space for different worldviews and knowledges can enable alternative decentralised forms of collaboration and engagement to emerge, one which aim to strengthen global solidarity and economic and social justice, rather than economic, political, and cultural domination and steady economic growth (Escobar, 2018; Kothari et al., 2019; Ziai, 2012).

5. Conclusions: The EU bioeconomy visions and prospects for transformations

We have reviewed the existing bioeconomy visions, arguing that they fall into two large groups: pro-economic growth; and the planetary limits visions of bioeconomy. We have also outlined the missing perspectives, ideas, and logics in the current EU's bioeconomy discourses, reviewing critical social environmental studies to situate the bio- and green economy policy initiatives and projects in the neocolonial, neoliberal, and speculative governance and extractivist contexts. We have argued that the existing bioeconomy debates and visions focus predominantly on economic growth, and that biophysical, or planetary boundaries perspectives are insufficient to address the systemic injustices and power imbalances rooted in the historic and contemporary dispossession and domination. The bioeconomy and other related EU policies continue to promote green growth, coupled with technoscientific and eco-modernist fixes. In the green growth logic, the right to fix the socioecological crises is granted to the actors and structures that originally created the crises. Unsurprisingly, the green growth political agenda has not only failed, but has also created new violence and vulnerabilities (Mosatafanezhad and Dressler, 2021; Nightingale et al., 2019). Growing disappointment with decades of underperformance means alternatives to green growth have attracted attention, which include the 'postgrowth' paradigms, such as degrowth and doughnut economics (EEA, 2021; Raworth, 2012), as well as postcolonial (Rutazibwa, 2018; Schöneberg, 2019) and decolonial justice approaches (Álvarez and Coolsaet, 2020; Ramcilovic-Suominen, 2022).

As we argue above, transformations require questioning and unsettling of the existing onto-epistemological foundations and power relations embedded in the global political, governing, and economic structures. Truly transformative approaches focus on the questions of power asymmetries and power relations as well as the social production of knowledge (D'Amato et al., 2022; Leach et al., 2021; Scoones, 2016; Temper, 2019). Thus defined, neither of the two existing bioeconomy visions could be framed or understood as transformative. The *pro-economic growth bioeconomy vision* is best described as an eco-modernist vision offering optimistic and unrealistic promises for tackling socioecological and existential crises without any significant change, using largely the existing ideas, policy problems, and solutions, and entrusting the existing actors or structures with the task of 'saving the world'. Policy solutions are found in the rusty toolbox of neoliberal governance, which is fixated with the goal of profiting from environmental protection and with various numerical targets like zero deforestation and emissions. It portrays such a set of solutions as the only viable, realistic, and scientifically valid option, thereby dismissing any alternative options as utopian and/or non-scientific. This serves to delay

transformations by diverting public attention from the root causes of crises like social inequalities, the global extractive capitalist social order, and the socially and ecologically destructive patterns of overproduction and overconsumption that it requires. It is therefore unsurprising, as the emerging literature indicates, that rather than supporting transformations, the pro-growth bioeconomy vision protects and defends the status quo and business as usual (Holmgren et al., 2022; Leipold, 2021).

The *pro-limits bioeconomy vision* differs from the pro-growth vision in that it identifies different issues as the main problem and aims to achieve different goals. It portrays economic growth as the main problem and aims to achieve 'life within planetary and ecological boundaries'. This implies different policy solutions, including circularity and sufficiency, which can bring better ecological performance. Yet the two visions share considerable similarities, including how they identify, justify, address, and pursue policy problems, solutions, and aims. Much like the pro-growth vision, this vision assumes neutrality across social scales (class, gender, race, wealth, etc.), failing to engage with the broader spectrum of root causes beyond growth (e.g. inequalities, race, patriarchy, colonialism). Moreover, much like the pro-growth vision, it assumes the universality of European science and knowledge, relying on scientific ecological limits and indicators, ignoring other knowledge systems and the questions feminist and decolonial scholars highlight, such as whose knowledge counts, who is entitled to define planetary boundaries, for whose interests, and who is eventually responsible for crossing these planetary boundaries. In other words, it leaves the extractive logics and (neo)colonial relations and injustices intact. This vision can therefore lead to a transformative outcome of a narrow set of environmental indicators, but it is unlikely to transform the logics and mindsets that underline social and environmental distractions, let alone social injustices.

Applying *decolonial and feminist perspectives to ideas emerging from degrowth* shift the debates and priorities, shedding light on conditions enabling transformations within and more importantly beyond bioeconomy. This includes the onto-epistemological shifts and reprioritisation of research and policy towards addressing the various forms and dimensions of inequalities, violence, injustices, and (neo)colonialism, which are the root causes of socioecological crises. In contrast with the two bioeconomy visions presented above, where the aim is to resolve scientifically defined problems and achieve an optimal economic or ecological state, priority is given to ensuring an open process centered around marginalised groups and worldviews, as such a process promises to enhance justice for a broader set of experiences, relationalities, and onto-epistemologies (Gram-Hanssen et al., 2021). Although such a vision emphasises process and pluriversal politics over pre-set aims and futures, that does not imply that the latter are irrelevant. Rather, it is only through truly emancipatory processes and pluriversal politics that we can envision and move closer to more just and more broadly desired futures.

Declaration of Competing Interest

The authors have no competing interest to declare.

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