

Supplementary material. Table 1: List of 11 Action points, including a short description for each point and a list of existing examples or implementable policy recommendations.

Action points	Description of the challenge and action point	Existing examples and/or implementable recommendations for policy makers and practitioners
1. Redefine human-nature relations, based on relational approaches and multispecies justice	Foster 'biocentric' or 'ecocentric' human-nature relations that are based on a relational worldview, a worldview that recognizes deep interconnection and co-dependence between human and other-than-human worlds, recognizing all species as sentient beings, which fosters multispecies justice. This implies a need to revisit the ontological and epistemic frameworks and assumptions, and how the different ontologies (e.g. separation vs. unity between human and other-than-human) shape our realities, actions and behaviours (Ramcilovic-Suominen in Press).	Educational and cultural routes: 1. Promoting closeness and interconnectedness with nature among children from a very young age on, through stories, practice, educational and cultural institutions, including in formal education (e.g. Forest Schools). 2. Supporting and funding projects and programmes for onto-epistemic plurality; for example, interactions between western scientific and Indigenous, as well as local, tacit and embodied knowledges of citizens and people working with land and ecosystems and forms of life. 3. Leveraging and interacting with spiritual and/or religious groups (e.g. IFEEES Protecting our planet for future generations using Islamic teachings¹, LaudatoSI movement²).
		Self-Reflexive and psychological routes: 4. Challenging speciesism and supporting psychological development approaches which decenter individualistic and anthropocentric perspectives towards greater ecological identity, and multispecies justice. 5. Promoting mindfulness, self-knowledge and self-transformation as a way of wider socioecological change and transformation, among policy makers, businesses, and other experts. Example: Inner Development Goals Initiative³ 6. Mental health Nature Based Interventions: Expanding the framing of nature-based interventions to include 'human-nature'-based interventions that help to foster alternative relationships between humans and nature and consequent pro-environmental behaviours (e.g. Green Social Prescribing⁴, nature engagement campaigns by NGOs (Richardson et al. 2016) and governments (Gilchrist 2023)
		Legal routes ('Earth Jurisprudence'): 7. Develop legal frameworks that recognize the Rights of Nature, giving the "environment" (i.e. various life forms, ecosystems and other-than-human beings) similar legal rights to those of humans. This approach can develop from conferring rights that need to be reconciled between

¹ <https://www.ifees.org.uk/>

² <https://laudatosimovement.org/who-we-are/>

³ <https://www.innerdevelopmentgoals.org/>

⁴ <https://www.england.nhs.uk/personalisedcare/social-prescribing/green-social-prescribing/>

		conflicting sovereign entities to protecting essential sets of relationships (Albrecht 2020). Some of the countries that have recognized legal rights to various life forms and ecosystems, including rivers, mountains, forests and a set of other-than-human beings, include: New Zealand, Panama, Ecuador. See, for example: Harmony with Nature⁵, Global Alliance for the Rights of Nature⁶. 8. Codify Ecocide as an international crime. See more on Ecocide Law⁷ and ELI (2023) where a draft text for a possible EU Directive is presented.
2. Reject commodification of life and nature	Reject the dominant approach to ecosystem protection is anthropocentric and commodity driven, causing perverse socioecological and psychological outcomes, including the disconnect with nature, leading to weakening of care, affect and responsibility. Promote instead alternative approaches based on care, reciprocity, responsibility and relationality (see also the Action 1 above).	9. Do away with neoliberal conservation and market-based approaches. Adopt instead life promoting standards, benchmarks and indicators (see action points: 3/15, 16), as well as policies that strengthen commons and community agency (see action points: 3/17 & 4/19, 20). 10. Accordingly, redefine policy priorities in a way that features health and vitality of ecosystems and people as an integral part of it with roles and responsibilities to play; and that is based on inter and intra-generational fairness of future human and other-than-humans. For instance, Büscher and Fletcher (2019) propose ‘Convivial Conservation’ as an alternative to ineffective and harmful neoliberal capitalist nature conservation, and Conservation Basic Income as one of the tools (Fletcher and Büscher 2020). 11. Promoting and nurturing commons: The policies and initiatives could at the minimum respect and directly support and fund commons and livelihoods. The European Commons Assembly has been working with the Commons Intergroup in the European Parliament to promote commons principles such as embracing stewardship, co-creation and social and ecological sustainability and establish institutions to facilitate the growth of commons, as opposed to barriers, enclosures and commodification (Hammerstein and Bloemen 2016). Different ownership structures can be encouraged by promoting forms of ownership that incentivise stewardship of commons rather than their (ab)use and overuse. Examples include steward ownership of cooperatives and trusts (see Vezzoni and Ramcilovic-Suominen 2023) 12. Promoting and recognising the value of care and social reproduction in economic and ecological activities and discourses, replacing eco-efficiency with sufficiency (Mehta & Harcourt 2021; Wichterich 2015). 13. Community agency: Governmental policies and incentive packages, programmes and initiatives, especially those relying on market-based instruments, risk exacerbating new

⁵ <http://www.harmonywithnatureun.org/rightsOfNature/>

⁶ <https://www.garn.org>

⁷ <https://ecocidelaw.com>

		enclosures (Heron and Heffron 2022). These green finance initiatives should, at minimum, “include community agency in decision-making, control and ownership” (e.g. Scottish Land Commission 2023).
3. Reject economic growth imperative and the associated myths and narratives	The bioeconomy policy project could explore, generate and promote new narratives, new myths and stories that go beyond the obsession with economic growth, profit accumulation, and consumer culture. Embracing the importance of non-material wellbeing and thriving within socioecological limits, while advancing equal distribution of wealth and power, but also solidarity, generosity, community, caring relations with other humans and other-than-human species and communities.	14. Recognize biophysical impossibility of an exponentially expanding economy. In a continuously growing economy, expanding the bio-based products and bioenergy may simply contribute to increase existing production and consumption, rather than leading to a substitution of fossil-based products (Leturcq 2020). 15. Redefine policy priorities to cancel economic growth from policy objectives, while placing the vitality and health of ecosystems and people that are part of it, with roles and responsibilities to play in it, as the primary policy objectives. For example, in a recent report for the Beyond Growth 2023 Conference, the European Parliamentary Research Service (EPRS 2023) criticizes the common policy goal of achieving Sustainable Growth as an oxymoron, suggesting instead rejecting economic profit as the main or only moral compass and objective for decision making.
		16. New indicators: indicators focusing and prioritizing economic growth are dominant in measuring progress in EU Bioeconomy (see for instance JRC Bioeconomics dashboard⁸). This mindset would need to change in line with the rest of actions discussed here, and accordingly different measures and indices should be adopted. At a macro-scale, substituting or integrating GDP with alternative measures, or moving Beyond GDP, has gained ground even in European institutions⁹. For the EU bioeconomy in particular, Giuntoli et al. (2023) notes that the current EU Bioeconomy Monitoring System¹⁰ includes a normative criterion called “Economic development is fostered”. This could be eliminated or amended to include a new holistic ‘well-being’ criterion.
		17. New tools in policymaking: Rejecting the flawed and narrow tools and models, originating in neoclassical economics, as tools in policymaking (see e.g. Raworth 2017; Spash and Guisan 2021; Keen 2021). Rather embrace tools and approaches derived from complexity theories and systems thinking, that are sensitive to context and capable of integrating different perspectives, disciplines and knowledges and for envisioning qualitatively different futures and realities (e.g. quantitative storytelling approaches (e.g. Giampietro and Bukkens 2022; Renner and Giampietro 2020, and Biggs et al. (2021) for an exhaustive list).

⁸ <https://datam.jrc.ec.europa.eu/datam/mashup/BIOECONOMICS/index.html>

⁹ <https://www.consilium.europa.eu/media/49818/beyond-gdp-measuring-what-matters-issues-paper-19-may-2021-web.pdf>

¹⁰ https://knowledge4policy.ec.europa.eu/visualisation/eu-bioeconomy-monitoring-system-dashboards_en

		18. Policy makers could look at community organizing initiatives working on postgrowth , for inspiration, but also support and fund such initiatives. Examples include: (i) Postgrowth Institute ¹¹ ; (ii) Transition Towns ¹² , (iii) Doughnut Economics Action Lab (DEAL) ¹³ , (iv) Postcarbon Institute ¹⁴ .
4. Reject (neo)coloniality, exploitation, domination and other forms of violence, for fairer opportunities between and within different world regions, states and communities.	Renegotiate power, economic and trade rules and relations between former colonial, current settler colonial, and post-colonial states. Similarly, redefine power relations between different sections of society (race, class, gender, ethnicity, religion), within the same world regions and countries. This is a precondition for fairer opportunities and justice between and within the majority and minority worlds (i.e. Global South and Global North). It is a precondition for removing the systemic causes and conditions for marginalization and vulnerability.	Available examples from policy are too few and/or barely scratch the surface of this issue, such as the newest Declaration of the global climate fund adopted at COP28¹⁵. Bioeconomy and other EU policies could be reimagined and reinstated as spaces where inequalities are tackled rather than reproduced, by shifting the focus of policymaking from serving the EU interests to serving global justice and decoloniality. This can be done, for example, by: (i) restraining to predefine policy problems and solutions in the name of other countries and people, (ii) ensuring the right to self-determination and where applicable self-governance of indigenous territories and people, (iii) recognizing their knowledges and legal systems rather than only statutory ones, (iv) incorporating payments for climate and ecological debts. More concretely, policy makers can: 19. Learn from examples of post-capitalist and postgrowth forms of economy emerging at the grassroot level. (see Kothari et al. 2019, La Via Campesina¹⁶), incentivize and scale up such initiatives (see Vezzoni and Ramcilovic-Suominen 2023) 20. Ensure the policies do not feed extractivism and modern slavery¹⁷ and/or death of land defenders elsewhere (Menton and Le Billon 2021, Temper et al. 2020). 21. Use tools such as Environmental Justice Atlas¹⁸ (Temper et al. 2018) as a precautionary measure and for drawing lessons how to avoid land/mining and other extractivism related conflicts, within and outside the EU borders.

¹¹ <https://postgrowth.org/>

¹² <https://transitionnetwork.org/>

¹³ <https://doughnuteconomics.org/>

¹⁴ <https://www.postcarbon.org/>

¹⁵ https://www.cop28.com/en/climate_finance_framework

¹⁶ <https://viacampesina.org/en/>

¹⁷ See e.g. EPRS(2021) [https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/689347/EPRS_BRI\(2021\)689347_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/689347/EPRS_BRI(2021)689347_EN.pdf) and Fern (2023) <https://www.fern.org/publications-insight/duped-2670/>

¹⁸ <https://ejatlas.org>

		22. Learn from, and engage with epistemic and ontological disobedience movements and initiatives, such as those calling for decolonising Europe (e.g. Decolonial Europe Day ¹⁹) and for repatriation of indigenous land, e.g. Land Back movement ²⁰ .
5. Center ethics of care, feminist principles in policy and practice	Fostering an ethics of care within and amongst societies, and in relations between human and other-than-humans. This is a common thread across many other points and actions (e.g. Action2/12). There are growing calls across Europe to address socioecological crises and address intergenerational and multispecies justice. Many youth organisations demanding postgrowth, postcapitalist and postcolonial futures are essentially demanding a care-based economy that ensures economies' embeddedness within nature-society nexus and an integration of social reproduction and reproduction with, and/or by more-than-humans.	Promote and enhance: 23. Ethics of care for each other and other living beings, by addressing “structures of oppression arising due to gender, sexuality, nationality, racialised identities, ethnicity, physical ability and the intersections of these structures and identities” (Generation Climate Europe 2023), but also due to speciesism (see action 1/4, 7 & 8). 24. Care-based approaches to policymaking in a way that does not frame care as a burden or cost, but as an essential policy goal and tool for addressing violence, extractivism, racialised and gendered labour, discrimination, and exclusion, and therefore a central pillar of fairness and justice in the EU policies. The National Recovery and Resilience Plans initiated after the pandemic have a potential to address some structural inequalities and enable ‘social, regional, digital and climate justice’ in European governance (Thissen 2022) but need further development and work. 25. Revisit and reflect on the emerging Feminist Foreign Policies (FFPs): The EU has engaged in discussions about an EU Feminist Foreign Policy through the European External Action Service (EEAS). Several countries such as Sweden and France have explicit FFPs. The aim is to tackle discrimination, especially against women. However, scholars reveal that these attempts are not adequate to achieve a ‘more peaceful and prosperous global order’ (Salazar 2022) and to disrupt the power asymmetries and hierarchies of domination (Guerrina et al. 2023).
6. Curb European ‘imperial mode of living’²¹	Rather than focusing on policy measures to compensate for biodiversity loss and/or emissions elsewhere emerging from ‘western’ or ‘imperial mode of living’, curbing overconsumption at home (e.g. through sufficiency and promotion of	Promote self-limitation and sufficiency approaches and policies, such as, but not limited to: 26. policy measures and standards (both on demand and supply sides) that promote durability and ensure repairability, for example the recently launched Austrian repair bonus voucher scheme²². 27. campaigns for sufficiency and ‘enough’ as opposed to ‘efficiency’ and ‘more’ in terms of consumption and privatisation through and in popular culture and art.

¹⁹ <https://decolonial.eu>

²⁰ <https://landback.org/>

²¹ Brand U, Wissen M (2021) The imperial mode of living: everyday life and the ecological crisis of capitalism. Verso Books, New York

²² <https://www.bbc.co.uk/news/world-europe-67777814>

	non-material wellbeing and the satisfaction of needs for all (Actions 1-5)	28. limiting advertisements for fast fashion and other socioecologically harmful and unnecessary commodities, and activities, including bio-based or “renewable” ones. 29. going beyond scarcity narrative, discursively and in practice, while ensuring free and/or affordable access to the so-called basic needs, from housing, to healthcare, education, nutritious and healthy food and water), regardless economic growth. Ensure distribution of wealth and reprioritizing wellbeing for all over profit making (see also Action 7).
7. Democratize the social and economic provisioning, and secure the right to social movements and protest	Reclaiming control over use, production and distribution of socioecological and reproductive capacities, as well the biophysical and material capacities of a society. Redefine who owns the means of production and ensuring production and consumption meet social needs for all human and other-than-human. The traditionally marginalised and ill positioned groups, including the Indigenous peoples, local communities, minorities, working class and unions must be part of this process, demanding it and enacting it in practice (Hickel 2023, Schmelzer & Hofferberth 2023, Vezzoni and Ramcilovic-Suominen 2023).	Restructuring and reorienting the socioecological provisioning for health, vitality, and wellbeing of human and other-than-human, rather than provisioning for profit making: 30. engaging the concept of care, ethics, wellbeing, welldoing, and equity for all, human and other-than-human, as a set of guiding principles to reset the current system of socioecological provisioning (see also Action 5), 31. a firmer direct democratic control over strategic sectors, including energy, real estate, agriculture, forestry, etc. (Vezzoni and Ramcilovic-Suominen 2023), including revisiting and questioning land ownership structures across Europe (e.g. Heron and Heffron 2022) 32. ensuring that the decisions about what is produced, how, for whom and how much are taken through deliberation and participatory decision-making processes, rather than top-down market-informed decision-making (see also Action 9). 33. securing people’s access to human needs as public goods, which expand to include access to nutritious food, clean water, housing, in addition to healthcare and education (Hickel 2023). 34. guaranteeing the right to protest, social movements, activism and community organizing, all of which have a crucial role in challenging and transforming the dominant hegemonic socioecological and sociopolitical values and structures, establish an institutional framework fit for strong democratic governance, where the rights to directly participate in economic decision-making and the rights to protest and demonstrate are respected rather than repressed, criminalised, and punished.
8. Redefine the Bioeconomy language and vocabulary	Vocabulary invokes certain worldviews in the way the policy problems and solutions are framed (Stibbe, 2021). Critically reflecting on the ideological conditioning of the language currently used is central for transforming bioeconomy policy and activities. The language used in bioeconomy policy by large and far	Redefine vocabulary by rejecting and/or reclaiming terms, such as the following examples: 35. Re-claim or reject ‘Sustainability’ and ‘Sustainable Development’ (SD): Reject the current definition of sustainability and SD in which social and environmental goals are on par with, and in practice subdued to the pursuit of economic growth and profit. The same can be said about the term <i>bioeconomy</i>, as it rests on these two framings. 36. Reclaim Nature-Based Solutions to be about reciprocity, relationality and co-dependence between human and other-than-human across policy instruments & programmes (see Action 1).

	reinforces hegemonic utilitarian, anthropocentric, and colonial-capitalist framings, values, and logics. Such promote human exceptionalism, separation between humans and ‘nature’, and objectify life on Earth, removing it from our considerations of morality and empathy (Muradian et al., 2021).	37. Reject the current framing of <i>Ecosystem Services</i> and <i>Natural Capital</i>, which reinforce utilitarian, anthropocentric and hierarchical human-nature worldview, which in turn lead to commodification, exploitation and destruction of some forms of nature, human and other than human, that are rendered dispensable (see also Action 2). 38. Reclaim ‘circularity’: accept the limits of ‘circularity’ and circular economy in the context of the capitalist growth paradigm (Giampietro 2019; Lehmann et al. 2022); embrace circular and regenerative by design supply chains and products (see also Actions 3, 6, 7)
9. Strengthen participatory and deliberative policymaking.	Policy decisions in bioeconomy-related sectors have momentous consequences for citizens globally. Participatory and deliberative approaches could ensure better integration of multiple perspectives, concerns and interests in bioeconomy-related policies within and beyond Europe.	39. The European Commission has published a Recommendation for promoting participation of citizens and civil society organisations in policymaking (EC 2023), suggesting Member States facilitate the creation of participatory mechanisms, including: citizens’ panels, juries or assemblies, consensus conferences, participatory budgeting, etc. Also, the EEA (EEA 2023b) has stressed the importance of participation in sustainability transitions. Examples exist at national level in Ireland²³, or regional level in East Belgium²⁴. Civil society plays central role (e.g. Extinction Rebellion in the UK²⁵). Yet, the marginalised groups (e.g. various minorities, Indigenous Peoples, immigrant and seasonal workers, women, youth) remain unrepresented in policymaking, signalling a need for: 40. Cocreating safe spaces and platforms for marginalised groups’ meaningful engagement. The European Commission’s Joint Research Centre manages a Competence Centre on Participatory and Deliberative Democracy²⁶ which aims to promote the creation of such spaces & platforms.
10. Support onto-epistemic plurality, decolonial, Indigenous and transdisciplinary research and sciences	Recognizing other than western or Eurocentric sciences and knowledges and holding space for Indigenous science in defining policy and problems accordingly is crucial for minimizing epistemic dominance, violence, and injustices, in favour of onto-epistemic plurality.	41. Embrace and support decolonial research, principles of consent, intellectual and cultural autonomy & justice (Orlove et al. 20023) 42. Supporting Indigenous-led research (Kimmerer and Artelle 2024) 43. Promote onto-epistemic plurality at domestic and global level. The IPBES task force on Indigenous and Local Knowledge²⁷ and its established participatory mechanisms, such as

²³ <https://citizensassembly.ie/about/>

²⁴ <https://www.buergerdialog.be/en/>

²⁵ <https://extinctionrebellion.uk/decide-together/citizens-assembly/>

²⁶ https://knowledge4policy.ec.europa.eu/participatory-democracy_en

²⁷ <https://www.ipbes.net/indigenous-local-knowledge>

		dialogue workshops, stands as one of the few examples of promoting onto-epistemic plurality. But there are nascent attempts to set up global citizen assemblies ²⁸ .
11. Invite ethical scrutiny and reflexivity within research and policy	Individual and societal values and virtue have a crucial role in driving transformations but are rarely openly debated and discussed. Bioeconomy policy and governance could more actively involve social sciences and humanities and their methodologies to allow for contemplation and reflection on the driving values and ethical implications of bioeconomy policies.	44. The European Commission has established a European Group on Ethics (EGE) in Science and New Technologies²⁹ to provide advice on ethical issues associated with development of science and new technologies. As biotechnology continues to be a key focus of the bioeconomy policy project and as the impact is felt globally, direct engagement with such initiatives could contribute to a deeper and more informed societal deliberation on these new technologies. 45. In addition, when operating beyond the EU borders, and/or within the borders of Indigenous populations within the EU, development of new local community codesigned and led guidelines and principles need to be supported and applied. 46. Involving ethicists to discuss and define a safe and just space for self-identity and values (Oliver et al. 2022) and/or ‘consumption corridors’ or ‘societal boundaries’ (Brand et al. (2021). 47. Ethics roundtables could be assembled and consulted on a regular basis along the policy cycle for bioeconomy-related policies, e.g. affecting land governance, use and ownership.

²⁸ <https://globalassembly.org>

²⁹ https://research-and-innovation.ec.europa.eu/strategy/support-policy-making/scientific-support-eu-policies/european-group-ethics_en#ege-opinions-and-statements

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