



Sustainability Narratives as Transformative Solution Pathways: Zooming in on the Circular Economy

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Abstract

The circular economy can be understood as one of the sustainability narratives (along with, e.g., the bioeconomy, the green economy and the sharing economy), currently relevant in academia, business and policymaking. Sustainability narratives are characterized by a distinctive set of transferable and scalable solutions, addressing resource/services use and distribution in social-ecological-technical systems. Core solutions in the circular economy are technologically-driven improvements *towards reductions of inputs/outputs in production and consumption systems*. However, the conceptual diversity of the circular economy is such that it can, like other sustainability narratives, serve multiple sustainability discourses (e.g., ecological modernization, sustainable development and degrowth). In order to cater to societal needs within the planet's biophysical boundaries, the contribution of the circular economy needs to be strengthened in regard to the protection of biodiversity and ecosystems and to the just distribution of resources, opportunities and prosperity. Socio-cultural change should be understood as complementary to technology- and private sector-driven solutions. While circular economy principles are meant to be translated into tailored micro- and macro- level strategies based on context-specific characteristics and needs, the causal connections between units or geographical regions are a crucial issue for sustainability. The overall co-evolution and harmonization of multiple narratives towards coherent sustainability pathways should strive towards decreasing dependence on fossil resources, reversing biodiversity loss and ecosystems degradation and enabling a quality life for all people. The conclusions of this article provide key points that can further guide analyses and implementation of the circular economy in the context of sustainability transformations.

Keywords Social-ecological systems · Socio-technical systems · Transitions · Green economy · Bioeconomy · Post-growth

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Sustainability Transformations

The current global health and ecological crises anticipate profound changes in the functioning of our society and economy. It is increasingly visible and acknowledged that biodiversity and ecosystems, climate regulation, biogeochemical and water cycles, inter alia, are necessary prerequisites for human prosperity, health and justice. Desirable futures for humanity should fulfil intra/intergenerational needs while operating within planetary boundaries [28, 61, 65]. The UN Sustainable Development Goals represent a global agenda setting until 2030, along with ancillary regional and national political processes, such the European Green Deal. However, pursuing sustainability generally requires co-creation and co-governance processes involving local and international actors, including, among others, scholars, policymakers, practitioners, industries and communities.

Accordingly, sustainability science has—at least aspirationally—been established by now as normative, transdisciplinary, systemic and ontologically rich, encompassing all dimensions of human and (to a certain extent) nonhuman life and well-being. It is concerned with framing complex problems and finding radical and transformative solutions for the mutual and long-term prosperity of the biosphere, human societies and their economies, thus operating in a ‘real-world’ experimental research setting ([4, 14, 83, 36, 57]). The concepts of transitions and transformations are, respectively, used to study desirable trajectories of change in socio-technical and social-ecological systems, over time [63].

Socio-technical transitions and the multilevel perspective suggest that the emergence and success of technological innovations depends on the niche environments they are developed in, as well as higher-level regime dynamics. Such transitions often focus on the sustainability of production-consumption in specific socio-technical areas, such as energy, waste or food systems [30]. Social-ecological transformations instead entail a quest for resilience in the context of deeply interlinked human-ecosystem interactions. This applies, in particular, to the use and management of ecosystem services from natural and semi-natural ecosystems. Such transformations may be triggered by an internal or external perturbation or crisis and result in radical shifts that challenge existing undesired feedback loops and path dependencies [60]. Recent research has adopted a unified framework to assess social-ecological-technical systems holistically [23].

Related literature on sustainability pathways suggests that ‘trajectories of change are viewed as emerging from political and discursive struggles that play out in complex, dynamic, and contested situations in ways that are highly contextual’ ([63], p. 10). Consequently, there is no one-fits-all solution, but an open-ended and dynamic multiplicity of competing pathways [73, 75] (Fig. 1). This resonates with the notions of wicked and super wicked problems, such as climate change and biodiversity loss, resource depletion and social inequalities, which have an infinite number of potentially applicable solutions, all value-laden [47, 67].

Allowing for a diversity of potential pathways and solutions guarantees the inclusion of values and needs of multiple actors. Moreover, the possibility of choosing between multiple options improves the ability to respond to uncertainties and unexpected events, thus increasing adaptation and resilience capacities of environment-human systems [47]. To be effective, interventions underpinning solutions should address multiple problems and their ultimate causes, be collective and collaborative, as well as engaging and intrinsically motivated [22], or in other words, intervention should be based on deep leverage points [1].

This article thus examines one of the narratives—the circular economy—which, in the past decade, have become highly relevant in academia, business and policymaking for providing a set of distinctive sustainability-oriented solutions. The overall aim of the article is to assess the role of

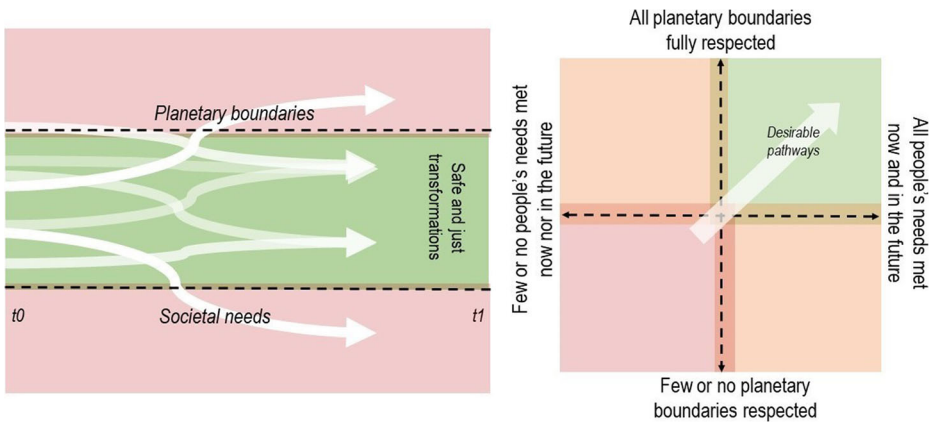


Fig. 1 Sustainability pathways towards societal transformations (adapted from and inspired by Leach et al. [47]). On the left: multiple narratives (arrows) converge/diverge contributing to shape sustainability pathways. On the right: desirable pathways should fulfil intra-/inter-generational needs while operating within planetary boundaries

the circular economy in the context of sustainability transformations. Section 2 introduces and refines the notion of sustainability narratives. In Section 3, the notion of sustainability narrative is used to outline a review of the circular economy. In Section 4, three key considerations are spelled out about the circular economy potential to contribute to sustainability transformations, and a set of key questions are provided to further guide its analysis and implementation.

Sustainability Narratives as Pathways of Change

Some articles have recently used the term ‘narratives’ in reference to concepts such as the circular economy, the bioeconomy, the green economy, degrowth or postgrowth [27, 35, 37, 50, 52, 72, 78]. In some of these articles, the term is used in a generic way to mean a storyline recurrent in policymaking, academia, the media and/or other contexts. The term ‘narrative’ has a long tradition in social science and especially in organization studies [6, 16]. Narration is at the basis of any form of human communication. In this article, the term ‘sustainability narrative’ is used to identify macro-concepts that frame and address one or multiple sustainability problems and offer a distinctive set of transferable and scalable solutions (based also on previous definitions [37, 50]). In particular, narratives address strategic issues at the core of sustainability challenges, suggesting, for instance, which and/or how resources and services should be used and distributed across societal actors (e.g., considerations regarding rural-urban and North-South dynamics) (Table 1). I further suggest that sustainability narratives are characterized by (a) a high degree of conceptual plasticity across stakeholders; (b) a quintessential core of archetypical solutions; and (c) a tailored implementation leveraging and addressing contextual characteristics and needs (Fig. 2). It can be argued that the implementation of individual and combined narratives contributes to shaping pathways of change in socio-technical and social-ecological systems [50].

Narratives may address specific systems (urban, industrial, agricultural, natural or semi-natural), but generally encompass or are applicable to multiple systems. Some narratives are currently mainstreamed at the regional or global level in policymaking or in organization strategies (e.g., the bioeconomy and the circular economy), while some may emerge more

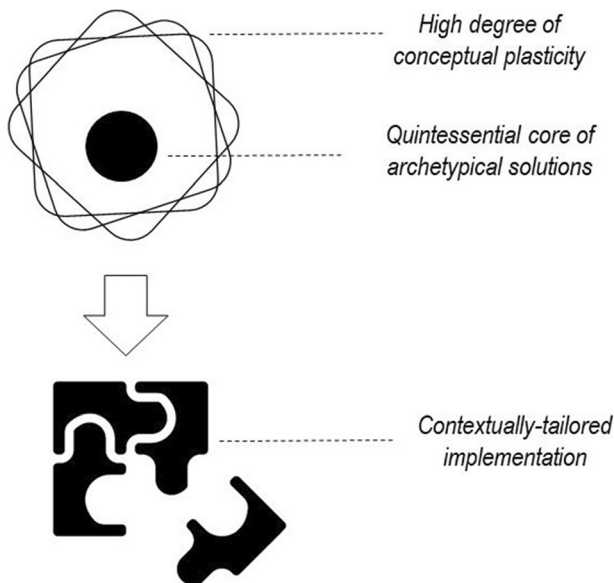
Table 1 Examples of sustainability narratives and their characterizing solutions. The definitions are for illustrative purposes only, and should not be intended as crystallized versions

Narrative	Quintessential core solutions
Circular economy	Reducing resource inputs, waste and emissions by keeping material and energy flows within production and consumption systems (e.g., long-lasting design; material/energy efficiency; reuse and remanufacturing preferred over recycling) (e.g., [43]).
Bioeconomy	Using biological resources to replace fossil-origin products and services, based on knowledge and innovation (e.g., the development of innovative and high-value bio-based goods and services) (e.g., [9]).
Green economy ¹	Protecting and enhancing ecological functions to support human well-being (e.g., ecosystem services accounting, ecosystem conservation and restoration, nature-based solutions and green infrastructures) [7].
Sharing economy	Improving sharing potential of existing products and services (e.g., shared ownership and multi-functionality) (e.g., [29]).
Sufficiency	Reconsidering superfluous consumption, reconnecting consumption to well-being and satisfaction of needs and improving self-sufficiency at the system level (e.g., refusing to produce or buy, producing and buying local) (e.g., [69]).

¹ Note that the green economy is not a synonym for green growth ([17, 41]).

from citizens' initiatives (e.g., sufficiency). Solutions proposed by individual narratives have potentially global or regional relevance and applicability, but can be fine-tuned to specific contexts. Consequently, 'narratives are not merely stories, but they function as justification for particular interventions' ([50], p. 394).

Narratives are adopted by societal actors such as policymakers, think tanks, NGOs, business organizations and research institutes to legitimize and frame their work. In turn, societal actors further develop dominant and emerging narratives, with a diversity of critical interpretations [17–19]. It is here necessary to clarify why the term narrative rather than that

**Fig. 2** Representation of key characteristics of a sustainability narrative: high degree of conceptual plasticity, quintessential core of archetypical solutions, contextually-tailored implementation

of discourse is used. In discourse analysis, discourses are defined as ‘socio-cultural meaning structures’ identified through ‘general characteristics of text, speech or the symbolic aspect of actions’ ([48], p. 447). The assumption is that ‘reality is constructed through processes of social meaning-making, relying on the use of language as well as social practices’ (ibid.). Certain discourses and meta-discourses have been found to dominate environmental policies, as well as the scholarly literature, including the discourses of ecological modernization, environmental neoliberalism and sustainable development. The bioeconomy, for instance, has been described as a new emerging discourse or meta-discourse or as a new arena reproducing old discourses [2, 44, 64]. Leipold et al. ([48] p. 446) have argued that ‘ecological modernization discourses [...] are continuously reinterpreted, for instance in the shape of “green,” “circular” or “bio-economy” discourses.’ Following these line of thoughts, this article suggests that compared to discourses, narratives such as the green economy, the bioeconomy and the circular economy present more specific sets of solutions (Table 1). Such narratives are often associated with a certain discourse (e.g., ecological modernization and sustainable development), but (due to their inherent conceptual diversity) can also transcend and be adapted to serve multiple discourses (as suggested in, e.g., [10, 15, 32, 78]).

There is an emerging understanding that solutions from multiple sustainability narratives (Table 1) need to be interpreted as complementary and synergic. For instance, the circular bioeconomy has recently been defined as (more than) the combination of the individual ideas of the circular economy and the bioeconomy, advocating for the development of bio-based products within a logic of resource circularity [20, 39, 74, 77, 79]. An explorative qualitative study based on the perspectives of sustainability researchers suggested that there is a potential to couple circular (e.g., efficiency, recycling, reusing and upcycling) and green economy solutions (e.g., engaging business, customers and investors in the conservation of biodiversity and ecosystems) [19]. Palahí et al. [51] recently proposed a series of action points based on a biodiversity-based circular bioeconomy, in order to rethink industrial, urban, food and health systems and promote participation and a more equitable distribution of prosperity. Furthermore, the term ‘nature-positive economy’ has very recently emerged in the context of sustainable business and finance [49, 82]. The expression appears to be an umbrella term for different kinds of solutions across multiple human-environment systems and sectors, including land and ocean, food systems, mobility, infrastructures and the built environment, energy and extractives. Nature-positive solutions include, for instance, circular and resource-efficient models, planet-compatible consumption, sustainable materials and energy, biomimicry, nature-based solutions and green infrastructures, as well as remediation, protection, compensation and regeneration of natural systems. Different narratives or solution types may, however, present conflictual elements in their practical implementation, because as pointed out by Giampietro and Funtowicz ([35], p. 68), they ‘compete for the same resources – land, energy, water, minerals’.

The Circular Economy as a Sustainability Narrative

The circular economy has emerged during the past decade as a politically relevant [24, 25, 58] and practitioner-driven [76] concept, with transformative potential rooted in a longer historical tradition, drawing from industrial ecology and cleaner production [10, 13, 81]. The circular economy can be described as an example of a sustainability narrative, following the definition provided in Section 2.

A high degree of conceptual plasticity among stakeholders is central to the current renaissance of the circular economy. The social science literature on the circular economy has recently flourished with an abundance of articles examining the circular economy as a controversial, dynamic and heterogeneous concept [5, 31, 33, 45, 46, 54, 56]. The circular economy has been contextualized against national and international agendas and processes [11, 21, 53, 71] or against the concepts of strong sustainability and degrowth (e.g., [12, 33, 72]). The conceptual and practical limitations of the circular economy with regard to sustainability have been highlighted (e.g., [45, 55]). Often, the circular economy definitions adopted by scholars and practitioners have not been explicitly linked to sustainable development, and the economic dimension has been emphasized over environmental considerations [43]. One key expectation is that circular solutions would enable the decoupling of economic growth from environmental degradation, but absolute decoupling remains undemonstrated [35, 52, 62, 80]. While circular solutions are supposed to mitigate the pressure on biodiversity and ecosystems through the reduction of resource extraction and waste emission, leakage and rebound remain central challenges to progress towards environmental goals [15, 68]. In addition, the potential role of biodiversity and ecosystems to serve functions and solve problems in artificial systems, coupled with circular economy solutions, remains underemphasized [8]. The social dimension, including equity and justice (inter and intragenerational, including considerations of North-South dynamics), has also been identified as a problematic gap area [11, 15, 43, 55, 56]. [U]nequal North–South power relations characterise the functioning of the existing (circular) economy ([70], p. 12), particularly with regard to value chain opportunities and to waste cycles. It appears evident that interpretations of the circular economy range widely, from more technical and conservative to more inclusive and radical interpretations. The latter call for a ‘socio-cultural change [...] transforming consumption and production structures based on materialism, convenience, and ownership to ones based on collaborative consumption, sharing economies and use-value’ ([10], p. 6), de facto incorporating elements from the sharing economy. Despite the diversity of understandings in the scientific and practitioner literature, more holistic and transformational solutions still appear to be missing from European Union policies [11].

The quintessential core of archetypical solutions in the circular economy—comparatively to other narratives—is related to limiting resource inputs and waste and emission outputs in production and consumption systems, with the intent to retain material and energy and value for as long as possible. While in practice circular economy principles have often been interpreted as efficiency, recycling and waste management (as found in e.g. [3, 10, 34, 38, 43]), several scholars and practitioners advocate the need to embrace a much more systemic interpretation (as per the diversity described in the paragraph above). The spectrum of circular economy principles is captured by the various ‘Rs’ frameworks, ranging from the 3Rs (reduction, reuse and recycling) to the 10Rs (refuse, reduce, resell/reuse, repair, refurbish, remanufacture, repurpose, recycle, recover and re-mine) [66]. Much of the change envisioned in developed economies is based on technological innovation and improvement (backed by policy support), which is also largely expected to mediate consumer (or user) engagement ([40]). However, a discussion about the active role of consumers or users is increasingly emerging as a key for the implementation of the circular economy. Consumer choices are especially relevant for the initial steps of the 10R framework [66], and lack of consumer interest has been identified as the most notable barrier to the circular economy in the European Union, based on experts’ opinions [42].

A tailored implementation leveraging and addressing contextual peculiarities and needs is fundamental to the concrete and successful implementation of circular economy national or

organizational strategies. While the principles of the circular economy are globally relevant (set aside from the conceptual diversity described above), national, as well as meso- and micro-level strategies need to be accommodated in the existing territorial reality, including ecological, demographic, geo-political, cultural, socio-economic and industrial structures. An important point here is the roles and expectations laid on different types of actors enabling change, based on the context, from large corporate to smaller or even informal actors [70]. Taking forest systems as an example, in forest-rich Nordic countries, such as Finland and Sweden, the related industry has a long tradition of closed-loop patterns in production facilities that ‘typically operate closely with local communities, providing jobs and district heating as well as waste disposal’ in a ‘symbiotic industrial setting (which clearly follows the CE [i.e., circular economy] philosophy)’ ([59], p. 1298). Circular (bio) economy strategy in such a finely concerted context will be different from those of southern Europe countries, such as Italy, that point towards improving the use of agro-forest residues and enhancing cultural and human capital, as well as the rich diversity of forest resources [26]. While contextual diversity is physiological, it may result in an uneven development and implementation of solutions within and between institutions and industries [13].

Conclusions

This article examined the role of the circular economy in the context of societal transformations towards sustainability, suggesting that the circular economy can be understood as one of the narrative framing and addressing sustainability challenges. The circular economy largely does so from a perspective of economic renewal and environmental improvements, but with an increasing diversity of more radical interpretations (at least in the scholarly literature). The circular economy narrative is recognizable based on a distinctive set of archetypical solutions, which overall are aimed at retaining resources and value in production and consumption systems, largely through the mediation of technology. However, the ability of the circular economy to address the fundamental causes of sustainability (wicked) problems, and thus to provide ‘deeply leveraged’ solutions, is dependent on the way the narrative is understood and accordingly implemented. In fact, given the heterogeneity of interpretations, the circular economy, like other sustainability narratives, can serve multiple discourses (e.g., ecological modernization, sustainable development and de-growth). Three key considerations are flagged in this article regarding the sustainability potential of the circular economy, with the hope that these can be of use beyond scholarly work, to practitioners and alike.

First, in order to cater to societal needs within the biophysical boundaries of the planet, the links and contribution of the circular economy to ecological and social goals need to be strengthened, especially in regard to biodiversity and ecosystems, and to resource distribution and justice. Socio-cultural change should be understood as complementary to technology- and private sector-driven solutions.

Second, the global relevance of circular economy solutions is supposed to be operationalized through tailored strategies, by addressing and leveraging the contextual characteristics and needs of the unit to be changed (e.g., country, municipality, industry, organization and product). The connections and repercussions of individual units or geographical regions on others are a fundamental issue to guarantee a more sustainable and just circular economy.

Third, multiple sustainability narratives and their sets of solutions (Section 2 and Table 1) must be considered and implemented through complementary and synergic approaches. The

co-evolution and harmonization of different narratives should strive towards decreasing societal dependence on fossil resources, reversing biodiversity loss and ecosystems degradation, and enabling a just redistribution of prosperity and a quality life for all people.

The following open questions are proposed that can further guide the conceptual analysis and practical implementation of the circular economy:

- What kind of transformations can be achieved through the circular economy (safe, just)?
- Is there complementarity between the solutions proposed by the circular economy and those envisioned by other narratives?
- What kind of governance processes and deeper leverage points are supposed to support the implementation of the circular economy?
- What is the role of multiple societal actors (e.g., central governments, municipalities, corporate interests, SMEs and individual citizens) in the implementation of the circular economy?
- How are circular economy solutions tailored to specific contexts at the micro, meso and macro level, and what kinds of disharmonies or tensions emerge from these processes?
- How effective and efficient are envisioned or implemented circular economy solutions in forwarding desired transformations, and how can progress be measured at the micro, meso and macro level?

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Declaration

Conflict of Interest The author declares no conflict of interest.

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References

1. Abson DJ, Fischer J, Leventon J, Newig J, Schomerus T, Vilsmaier U, von Wehrden H, Abernethy P, Ives CD, Jager NW, Lang DJ (2017) Leverage points for sustainability transformation. *Ambio* 46:30–39. <https://doi.org/10.1007/s13280-016-0800-y>
2. Arts B, Appelstrand M, Kleinschmit D, et al (2010) Discourses, actors and instruments in international forest governance. A global assessment report. Prepared by the Global Forest Expert Panel on the International Forest Regime / Rayner J, Buck A, Katila P, Vienna, Austria: International Union of Forest Research Organizations (IUFRO) (IUFRO World Series 28) - ISBN 9783902762016 - p. 57-74.
3. Barreiro-Gen M, Lozano R (2020) How circular is the circular economy? Analysing the implementation of circular economy in organisations. *Bus Strateg Environ* 29:1–11. <https://doi.org/10.1002/bse.2590>
4. Bettencourt LMA, Kaur J (2011) Evolution and structure of sustainability science. *PNAS* 108:19540–19545. <https://doi.org/10.1073/pnas.1102712108>

5. Blomsma F, Brennan G (2017) The emergence of circular economy: a new framing around prolonging resource productivity. *J Ind Ecol.* 21:603–614. <https://doi.org/10.1111/jieec.12603>
6. Boje D (2011) *Narrative methods for organizational & communication research.* Sage
7. Borel-Saladin JM, Turok IN (2013) The green economy: Incremental change or transformation? *Environ Policy Gov* 23:209–220. <https://doi.org/10.1002/eet.1614>
8. Buchmann-Duck J, Beazley KF (2020) An urgent call for circular economy advocates to acknowledge its limitations in conserving biodiversity. *Sci Total Environ.* 727:138602. <https://doi.org/10.1016/j.scitotenv.2020.138602>
9. Bugge MM, Hansen T, Klitkou A (2016) What is the bioeconomy? A review of the literature. *Sustainability* 8:691. <https://doi.org/10.3390/su8070691>
10. Calisto Friant M, Vermeulen WJV, Salomone R (2020) A typology of circular economy discourses: navigating the diverse visions of a contested paradigm. *Resour Conserv Recycl.* 161:104917. <https://doi.org/10.1016/j.resconrec.2020.104917>
11. Calisto Friant M, Vermeulen WJV, Salomone R (2021) Analysing European Union circular economy policies: words versus actions. *Sustain Prod Consum.* 27:337–353. <https://doi.org/10.1016/j.spc.2020.11.001>
12. Charonis G-K (2013) Degrowth, steady state economics and the circular economy: three distinct yet increasingly converging alternative discourses to economic growth for achieving environmental sustainability and social equity. *J Chem Inf Model* 53:1689–1699. <https://doi.org/10.1017/CBO9781107415324.004>
13. Chizaryfard A, Trucco P, Nuur C (2020) The transformation to a circular economy: framing an evolutionary view. *J Evol Econ.* <https://doi.org/10.1007/s00191-020-00709-0>
14. Clark WC (2007) Sustainability science: A room of its own. *PNAS* 104:1737–1738. <https://doi.org/10.1073/pnas.0611291104>
15. Clube RKM, Tennant M (2020) The circular economy and human needs satisfaction: promising the radical, delivering the familiar. *Ecol Econ.* 177:106772. <https://doi.org/10.1016/j.ecolecon.2020.106772>
16. Czarniawska B (2011) *Narratives in social science research.* Sage
17. D’Amato D, Droste N, Chan S, Hofer A (2017a) Green economy: pragmatism or revolution? Perceptions of young researchers on social ecological transformation. *J Environ Values* 26:413–435. <https://doi.org/10.3197/096327117X14976900137331>
18. D’Amato D, Droste N, Allen B et al (2017b) Green, circular, bio economy: a comparative analysis of sustainability avenues. *J Clean Prod* 168:716–734. <https://doi.org/10.1016/j.jclepro.2017.09.053>
19. D’Amato D, Droste N, Winkler KJ, Toppinen A (2019) Thinking green, circular or bio: eliciting researchers’ perspectives on a sustainable economy with Q method. *J Clean Prod.* 230:460–476. <https://doi.org/10.1016/j.jclepro.2019.05.099>
20. D’Amato D, Vejjonaho S, Toppinen A (2020) Towards sustainability? Forest-based circular bioeconomy business models in Finnish SMEs. *For Policy Econ.* 110:101848. <https://doi.org/10.1016/J.FORPOL.2018.12.004>
21. Dantas TET, de-Souza ED, Destro IR, et al. (2021) How the combination of circular economy and Industry 4.0 can contribute towards achieving the sustainable development goals. *Sustain. Prod. Consum.* 26:213–227. <https://doi.org/10.1016/j.spc.2020.10.005>
22. De Witt A (2018) Transformative solutions for sustainable well-being: designing effective strategies for addressing our planetary challenges. In: Dhiman S, Marques J (eds) *Handbook of Engaged Sustainability.* Springer, Cham. https://doi.org/10.1007/978-3-319-53121-2_12-1
23. Depietri Y, McPhearson T (2017) Integrating the grey, green, and blue in cities: nature-based solutions for climate change adaptation and risk reduction. In: Kabisch N, Korn H, Stadler J, Bonn A (eds) *Nature-Based Solutions to Climate Change Adaptation in Urban Areas. Theory and Practice of Urban Sustainability Transitions.* Springer, Cham. https://doi.org/10.1007/978-3-319-56091-5_6
24. European Commission (2015) *Closing the loop—an EU action plan for the circular economy.* Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. COM/2015/0614.
25. European Commission (2020) *Circular economy action plan. For a cleaner and more competitive Europe.* <https://doi.org/10.2775/855540>
26. Falcone PM, Tani A, Tartiu VE, Imbriani C (2019) Towards a sustainable forest-based bioeconomy in Italy: findings from a SWOT analysis. *For Policy Econ.* 110:101910. <https://doi.org/10.1016/j.forpol.2019.04.014>
27. Fischer K, Stenius T, Holmgren S (2020) Swedish forests in the bioeconomy: stories from the national forest program. *Soc Nat Resour.* 33:896–913. <https://doi.org/10.1080/08941920.2020.1725202>
28. Folke C, Biggs R, Norström AV, Reyers B, Rockström J (2016) Social-ecological resilience and biosphere-based sustainability science. *Ecol Soc* 21:43. <https://doi.org/10.5751/ES-08748-210341>
29. Frenken K, Schor J (2017) Putting the sharing economy into perspective. *Environ Innov Soc Transitions* 23: 3–10. <https://doi.org/10.1016/j.eist.2017.01.003>
30. Geels FW (2019) Socio-technical transitions to sustainability: a review of criticisms and elaborations of the Multi-Level Perspective. *Curr. Opin. Environ. Sustain.* 39:187–201. <https://doi.org/10.1016/j.cosust.2019.06.009>

31. Geissdoerfer M, Savaget P, Bocken NMP, Hultink EJ (2017) The Circular Economy – A new sustainability paradigm? *J Clean Prod.* 143:757–768. <https://doi.org/10.1016/j.jclepro.2016.12.048>
32. Genovese A, Pansera M (2020) The circular economy at a crossroads: technocratic eco-modernism or convivial technology for social revolution? *Capital Nature, Social:*1–19. <https://doi.org/10.1080/10455752.2020.1763414>
33. Ghisellini P, Cialani C, Ulgiati S (2016) A review on circular economy: the expected transition to a balanced interplay of environmental and economic systems. *J. Clean. Prod.* 114:11–32. <https://doi.org/10.1016/j.jclepro.2015.09.007>
34. Ghisellini P, Ulgiati S (2020) Circular economy transition in Italy: achievements, perspectives and constraints. *J Clean Prod.* 243:118360. <https://doi.org/10.1016/j.jclepro.2019.118360>
35. Giampietro M, Funtowicz SO (2020) From elite folk science to the policy legend of the circular economy. *Environ Sci Policy.* 109:64–72. <https://doi.org/10.1016/j.envsci.2020.04.012>
36. Global Sustainable Development Report (2019) *The Future is Now – Science for Achieving Sustainable Development.* United Nations, New York
37. Guske AL, Jacob K, Hirschnitz-Garbers M et al (2019) Stories that change our world? Narratives of the sustainable economy. *Sustain.* 11:6163. <https://doi.org/10.3390/su11216163>
38. Haas W, Krausmann F, Wiedenhofer D, Heinz M (2015) How circular is the global economy?: an assessment of material flows, waste production, and recycling in the European union and the world in 2005. *J Ind Ecol.* 19:765–777. <https://doi.org/10.1111/jiec.12244>
39. Hetemäki L, Hanewinkel M, Muys B et al (2017) Leading the way to a European circular bioeconomy strategy. From Science to Policy 5 European Forest Institute
40. Hobson K, Lynch N (2016) Diversifying and de-growing the circular economy: radical social transformation in a resource-scarce world. *Futures* 82:15–25. <https://doi.org/10.1016/j.futures.2016.05.012>
41. Kasztelan A (2017) Green growth, green economy and sustainable development: terminological and relational discourse. *Prague Econ Pap* 26:487–499. <https://doi.org/10.18267/j.pep.626>
42. Kirchherr J, Piscicelli L, Bour R et al (2018) Barriers to the circular economy: evidence from the European Union (EU). *Ecol Econ.* 150:264–272. <https://doi.org/10.1016/j.ecolecon.2018.04.028>
43. Kirchherr J, Reike D, Hekkert M (2017) Conceptualizing the circular economy: an analysis of 114 definitions. *Resour Conserv Recycl* 127:221–232. <https://doi.org/10.1016/j.resconrec.2017.09.005>
44. Kleinschmit D, Arts B, Giurca A, Mustalahti I, Sergent A, Püzl H (2017) Environmental concerns in political bioeconomy discourses. *Int For Rev.* 19:41–55. <https://doi.org/10.1505/146554817822407420>
45. Korhonen J, Honkasalo A, Seppälä J (2018a) Circular economy: the concept and its limitations. *Ecol Econ* 143:37–46. <https://doi.org/10.1016/j.ecolecon.2017.06.041>
46. Korhonen J, Nuur C, Feldmann A, Birkie SE (2018b) Circular economy as an essentially contested concept. *J Clean Prod.* 175:544–552. <https://doi.org/10.1016/j.jclepro.2017.12.111>
47. Leach M, Raworth K, Rockström J (2013) Between social and planetary boundaries: navigating pathways in the safe and just space for humanity. *World Social Science Report.* <https://doi.org/10.1787/9789264203419-10-en>
48. Leipold S, Feindt PH, Winkel G, Keller R (2019) Discourse analysis of environmental policy revisited: Traditions, trends, perspectives. *J. Environ. Policy Plan.* 21:445–463. <https://doi.org/10.1080/1523908X.2019.1660462>
49. Loorbach D, Schoenmaker D, Schramade W (2020) *Finance in transition: principles for a positive finance future.* Rotterdam School of Management, Erasmus University, Rotterdam. https://www.rsm.nl/fileadmin/Images_NEW/Positive_Change2020_Finance_in_Transition.pdf
50. Luederitz C, Abson DJ, Audet R, Lang DJ (2017) Many pathways toward sustainability: not conflict but co-learning between transition narratives. *Sustain Sci.*:393–407. <https://doi.org/10.1007/s11625-016-0414-0>
51. Palahí M, Pansar M, Costanza R, Kubiszewski I, Potočník J, Stuchtey M, Nasi R, Lovins H, Giovannini E, Fioramonti L, Dixson-Declève S, McGlade J, Pickett K, Wilkinson K, Holmgren JLB (2020) Investing in Nature to Transform the post COVID-19 economy: a 10-point action plan to create a circular bioeconomy devoted to sustainable wellbeing. *Solut J* 11
52. Mastini R, Kallis G, Hickel J (2021) A green new deal without growth? *Ecol Econ.* 179:106832. <https://doi.org/10.1016/j.ecolecon.2020.106832>
53. McDowall W, Geng Y, Huang B, Barteková E, Bleischwitz R, Türkeli S, Kemp R, Doménech T (2017) Circular economy policies in China and Europe. *J Ind Ecol.* 21:651–661. <https://doi.org/10.1111/jiec.12597>
54. Merli R, Preziosi M, Acampora A (2018) How do scholars approach the circular economy? A systematic literature review. *J Clean Prod.* 178:703–722. <https://doi.org/10.1016/j.jclepro.2017.12.112>
55. Millar N, McLaughlin E, Börger T (2019) The circular economy: swings and roundabouts? *Ecol Econ* 158: 11–19. <https://doi.org/10.1016/J.ECOLECON.2018.12.012>
56. Murray A, Skene K, Haynes K (2015) The circular economy: an interdisciplinary exploration of the concept and application in a global context. *J Bus Ethics* 140:369–380. <https://doi.org/10.1007/s10551-015-2693-2>

57. Nagatsu M, Davis T, DesRoches CT et al (2020) Philosophy of science for sustainability science. *Sustain Sci*. 15:1807–1817. <https://doi.org/10.1007/s11625-020-00832-8>
58. National People's Congress (2008) People's Republic of China Circular Economy Promotion Law. Standing Committee of the Fourth Session of the Eleventh National People's Congress 29 August 2008, Beijing. www.gov.cn/flfg/2008-08/29/content_1084355.htm
59. Näyhä A (2019) Transition in the Finnish forest-based sector: company perspectives on the bioeconomy, circular economy and sustainability. *J Clean Prod*. 209:1294–1306. <https://doi.org/10.1016/j.jclepro.2018.10.260>
60. Olsson P, Galaz V, Boonstra WJ (2014) Sustainability transformations: a resilience perspective. *Ecol Soc*. 19:1. <https://doi.org/10.5751/ES-06799-190401>
61. O'Neill DW, Fanning AL, Lamb WF, Steinberger JK (2018) A good life for all within planetary boundaries. *Nat Sustain*. 1:88–95. <https://doi.org/10.1038/s41893-018-0021-4>
62. Parrique T, Barth J, Briens F, Kerschner C, Kraus-Polk A, Kuokkanen A, Spangenberg JH (2019) Decoupling debunked: evidence and arguments against green growth as a sole strategy for sustainability. European Environmental Bureau
63. Patterson J, Schulz K, Vervoort J, van der Hel S, Widerberg O, Adler C, Hurlbert M, Anderton K, Sethi M, Barau A (2017) Exploring the governance and politics of transformations towards sustainability. *Environ Innov Soc Transit* 24:1–16. <https://doi.org/10.1016/j.eist.2016.09.001>
64. Pülzl H, Kleinschmit D, Arts B (2014) Bioeconomy – an emerging meta-discourse affecting forest discourses? *Scand J For Res* 29:386–393. <https://doi.org/10.1080/02827581.2014.920044>
65. Raworth K (2017) A doughnut for the Anthropocene: humanity's compass in the 21st century. *Lancet Planet. Heal*. 1:e48–e49. [https://doi.org/10.1016/S2542-5196\(17\)30028-1](https://doi.org/10.1016/S2542-5196(17)30028-1)
66. Reike D, Vermeulen WJV, Witjes S (2018) The circular economy: new or refurbished as CE 3.0?—exploring controversies in the conceptualization of the circular economy through a focus on history and resource value retention options. *Resour Conserv Recycl* 135:246–264. <https://doi.org/10.1016/j.resconrec.2017.08.027>
67. Rittel HWJ, Webber MM (1973) Dilemmas in a general theory of planning. *Policy Sci* 4:155–169. <https://doi.org/10.1007/BF01405730>
68. Sauvé S, Bernard S, Sloan P (2016) Environmental sciences, sustainable development and circular economy: alternative concepts for trans-disciplinary research. *Environ Dev*. 17:48–56. <https://doi.org/10.1016/j.envdev.2015.09.002>
69. Schäpke N, Rauschmayer F (2014) Going beyond efficiency: including altruistic motives in behavioral models for sustainability transitions to address sufficiency. *Sustain Sci Pract Policy* 10:29–44. <https://doi.org/10.1080/15487733.2014.11908123>
70. Schröder P, Anantharaman M, Anggraeni K, Foxon TJ (2019a) The circular economy and the Global South: sustainable lifestyles and green industrial development. Routledge ISBN: 978-1138358935
71. Schroeder P, Anggraeni K, Weber U (2019) The relevance of circular economy practices to the sustainable development goals. *J Ind Ecol*. 23:77–95. <https://doi.org/10.1111/jiec.12732>
72. Schröder P, Bengtsson M, Cohen M, Dewick P, Hofstetter J, Sarkis J (2019b) Degrowth within—aligning circular economy and strong sustainability narratives. *Resour Conserv Recycl*. 146:190–191. <https://doi.org/10.1016/j.resconrec.2019.03.038>
73. Scoones I, Leach M, Newell P (2015) The politics of green transformations. Routledge ISBN 9781138792906
74. Stegmann P, Londo M, Junginger M (2020) The circular bioeconomy: its elements and role in European bioeconomy clusters. *Resour Conserv Recycl X* 6:100029. <https://doi.org/10.1016/j.rcrx.2019.100029>
75. Stirling A (2014) Emancipating transformations: from controlling 'the transition' to culturing plural radical progress. STEPS Working Paper 64, Brighton: STEPS Centre. ISBN: 978-1-78118-170-6
76. The Ellen MacArthur Foundation (2012) Towards a circular economy—economic and business rationale for an accelerated transition. *Greener Manag Int* 97. <https://doi.org/2012-04-03>
77. The Ellen MacArthur Foundation, Essity, IKEA, Royal DSM, Tetra Pak (2018) Renewable materials for a low-carbon and circular future. https://www.ellenmacarthurfoundation.org/assets/galleries/ce100/CE100-Renewables_Co.Project_Report.pdf
78. Tomaselli MF, Hajjar R, Ramón-Hidalgo AE, Vásquez-Fernández AM (2017) The problematic old roots of the new green economy narrative: how far can it take us in re-imagining sustainability in forestry? *Int For Rev*. 19:139–151. <https://doi.org/10.1505/146554817822407376>
79. Toppinen A, D'Amato D, Stern T (2020) Forest-based circular bioeconomy: matching sustainability challenges and novel business opportunities? *For. Policy Econ*. 110:102041. <https://doi.org/10.1016/j.forpol.2019.102041>
80. Ward JD, Sutton PC, Werner AD, Costanza R, Mohr SH, Simmons CT (2016) Is decoupling GDP growth from environmental impact possible? *PLoS ONE* 11:e0164733. <https://doi.org/10.1371/journal.pone.0164733>

81. Winans K, Kendall A, Deng H (2017) The history and current applications of the circular economy concept. *Renew. Sustain. Energy Rev.* 68:825–833. <https://doi.org/10.1016/j.rser.2016.09.123>
82. World Economic Forum and AlphaBeta (2020) The Future of Nature and Business—New Nature Economy Report II. Switzerland, Cologne/Geneva. http://www3.weforum.org/docs/WEF_The_Future_Of_Nature_And_Business_2020.pdf
83. Ziegler R, Ott K (2011) The quality of sustainability science: a philosophical perspective. *Sustain Sci Pract Policy* 7:31–44. <https://doi.org/10.1080/15487733.2011.11908063>
84. Global Sustainable Development Report (2019) The future is now – science for achieving sustainable development. United Nations, New York