Review

The Appeal of the Circular Economy Revisited: On Track for Transformative Change or a Question of Moral Licensing?

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The Appeal of the Circular Economy Revisited: On Track for Transformative Change or a Question of Moral Licensing?

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Abstract: The concept of an economy that is circular and without the need for material or energy input has an irresistible appeal to those who have recognized that planetary boundaries exist and that resources are not unlimited. Thus, in the public discourse its narrative outperforms other lines of arguments when it comes to keeping radical critics of destructive extractivism and the growth imperative in check and averting the uptake of diverging opinions by larger segments of the population and government bodies. Moreover, the myth of a circular economy has the additional benefit that it can win over parts of the environmental movement that dread radical and transformative change, particularly in the urban milieus of a middle-class that enjoys the privileges of the current social order. In this paper I argue that the circular economy narrative tends to hinder the necessary systemic transformation while entailing a wide range of specific measures that deserve to be recognized for their merit.

Keywords: circular economy; planetary boundaries; green lifestyle; moral licensing

Introduction

Now that the narrative of recycling has lost its luster, circular economy has become the buzzword for sustainability advocates (Geissdoerfer et al., 2017; Stahel, 2016). In a time when man-made climate change and environmental catastrophes can no longer be denied, the apologists of extractivist capitalism (Alcoff, 2022) require a new smoke screen to obfuscate the workings of an imperial mode of living (Brand et al., 2017) that benefits the few at the expense of the many while proceeding with the irreversible destruction of the biosphere that is indispensable for human life (IPBES, 2019; IPCC, 2022; Steffen, Broadgate, et al., 2015).

On admitting that economic activity operates within the natural environment, it follows that it must obey the laws of nature and is bound by their dictates. With regards to the proposal of a circular economy, Boulding (1966) introduced the concept of the Earth System as a closed loop where material entropy that occurs outside of natural processes can only be countered by constant energy input. Yet, under the premises of the Laws of Thermodynamics, the energy contained in a closed system is unchangeable and irreversible spontaneous processes will increase entropy in the sense of homogeneous distribution of energy or matter to a maximum (Sandler & Woodcock, 2010; Starikov, 2021). Drawing on these considerations, the economist Nicholas Georgescu-Roegen scrutinized the relevance of the Second Law of Thermodynamics (the Entropy Law) for the economic process and emphasized that it operates on a unidimensional timeline where energy is dissipated and natural resources are depleted, which renders a growth economy, or even steady-state economy, impossible in the long-term (Georgescu-Roegen, 1971).

The ideas of Boulding and Georgescu-Roegen inspired the concept of Degrowth that demands a radical transformation of the societies of the global North to reduce their ecological metabolism and their resource avidity (Bonaiuti, 2018; Kallis et al., 2012, 2018; Kerschner, 2010). However, critics note that Georgescu-Roegen has misinterpreted the Second Law of Thermodynamics and drew an improper analogy between the entropy of energy and the entropy of material substance, even though his work should still be considered a valid contribution to the economic discussion about the theoretical impossibility of full recycling due to his distinction between stocks – non-renewable in

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any circumstances – and funds which are renewable if exploited at a sufficiently low rate (Khalil, 2004).

Envisioning a circular economy and the concept of the *perpetuum mobile*

When Leonardo da Vinci postulated the impossibility of a *perpetuum mobile* within the physical conditions of planet Earth (Bera, 2021), he could not have imagined that a similar concept would resurrect five centuries later. But the ancient dream of humanity to create an apparatus that would work incessantly without the additional input of human labor, or an external source of energy or material, awoke to new life: the congenial concept of a circular economy promises to transform waste into wealth and to warrant the pursuit of exponential economic growth forever, in the Neverland of sustainability. The idea of a circular economy has risen to fame in a dimension that competes with the proposal of sustainable development itself, while drawing, albeit not explicitly, on prior concepts of industrial ecology and industrial symbiosis (Cecchin et al., 2021).

Before the industrial revolution kicked in, global economic activity was almost entirely circular but the advent of mass production of goods and the more efficient extraction of natural resources turned the former circular economy into a linear process that started to create large amounts of waste and depleted natural resources (Bali Swain & Sweet, 2021). In the years that followed the publication of the report on the *Limits to Growth*, commissioned by the Club of Rome and compiled by a team of international scientists at the MIT – Massachusetts Institute of Technology (Meadows et al., 1972), the make-use-dispose process of the linear economy was difficult to sustain, both in practice and in theory, and it became necessary to create a new discursive space regarding waste management and resource use. Hence, framing waste as a resource (Zaman, 2022) created the opportunity for collective action and research based on an experience of shared ideas and values, allowing the notion of a circular economy to act as an umbrella concept that connects previously unrelated constructs and creates a new paradigm, continuing to branch out and to become more and more complex over time (Blomsma & Brennan, 2017). As Hirsch and Levin (1999) point out, an umbrella construct is particularly useful in fields that lack a solid theoretical background and its validity tends to be less challenged if its constituency is nonacademic which might explain the longevity of the circular economy concept, despite its shortcomings and inconsistencies.

In a revision of the circular economy concept Kirchherr *et al.* (2017) mustered a plethora of 114 definitions which in itself illustrates its heterogeneity and the subsequent need to fall back on assumedly incongruous frameworks like the umbrella concept to forge the idea of a coherent explanatory model. After an iterative coding process that embraced 17 dimensions, the authors came up with a definition of the circular economy as "an economic system that is based on business models which replace the 'end-of-life' concept with reducing, alternatively reusing, recycling and recovering materials in production/distribution and consumption processes, thus operating at the micro level (products, companies, consumers), meso level (eco-industrial parks) and macro level (city, region, nation and beyond), with the aim to accomplish sustainable development, which implies creating environmental quality, economic prosperity and social equity, to the benefit of current and future generations" (Kirchherr, Reike, and Hekkert 2017: 224-225). The authors underscore the need to renounce subverted definitions of the circular economy that are mostly framed as a path to economic prosperity and are pushing the social and environmental goals into the background if the concept intends to reach beyond the venture of sustainable development – which itself can be considered a debatable construct (Bendell, 2022) – and to surpass only incremental improvements, bringing about effective and transformative change. Yet, no estimate is given regarding the actual percentage of ideal definitions – as opposed to subverted definitions – that operate successfully in the real world of the circular economy.

Another issue that the concept of a circular economy faces is the question of indicators that should be used to measure its outcomes and the effective reduction of environmental and social damage (Stephan, 2022). Hence, if the main strategies for implementing a circular economy include preservation of the product itself and its function, retrieval of its components, and recovery of embodied materials and energy, a framework of indicators to embrace all these dimensions must

operate under the concept of *Life Cycle Thinking*, to analyze potential impacts and the overall burden or benefit for the environment in comparison to linear processes, and not focus mainly on material use and waste production as does the present European Union policy (Moraga et al., 2019). Furthermore, reports on interventions at the micro, meso and macro levels generally do not consider the 'use phase' of products and omit the systemic interactions between interventions on different levels and their results on the societal level that can include large rebound effects (Harris et al., 2021).

Facing-up to the real economy

Planetary boundaries have been surpassed, at least in the domains of genetic diversity and biochemical flows, and zones of increasing risks of impacts currently exist in areas such as biosphere integrity and climate change (Steffen, Richardson, et al., 2015), while socio-economic and (unfavorable) Earth Systems trends have been accelerating since the industrial revolution, mainly due to the activity of OECD countries and, more recently, due to the emerging economies of the so-called BRICS countries, including Brazil, Russia, India, China and South Africa (Steffen, Broadgate, et al., 2015). In 2015, the year the above papers were published, the General Assembly of the United Nations approved the 2030 Agenda for Sustainable Development, an array of good intentions that includes 17 Sustainable Development Goals (SDGs) and 169 targets that do not forego the goal of economic growth (SDG 8), rendering – implicitly – the proclaimed protection of the Earth System impossible (Hickel, 2019). These goals and targets have been criticized for being far from the reality of environmental and socioeconomic system dynamics and impossible to attain within planetary boundaries (Bendell, 2022; Bengtsson et al., 2018; Donaires et al., 2019; Skene, 2021; Zeng et al., 2020). Explicitly referring to the Agenda for Sustainable Development, the European Commission adopted in 2020 a "New Circular Economy Action Plan for a cleaner and more competitive Europe" to accelerate the transformations required by the European Green Deal, yet without questioning the aim of economic growth or consumption at large (*A New Circular Economy Action Plan: For a Cleaner and More Competitive Europe*, 2020).

As the road to hell is paved with good intentions, a reality check on the circularity of the global economy shows that currently only 8.6% is circular, down from 9.1% just two years ago, while global material consumption exceeded for the first time 100 Gt of raw material in 2019, up from 28.6 Gt in 1972 when the Club of Rome's report on the *Limits to Growth* was first published (Circle Economy, 2022). Hence, overall material consumption roughly quadrupled while the world population doubled during the same period (Worldometers.info), a trend that has been observed for more than hundred years (Marín-Beltrán et al., 2022), making it difficult to envision sustainability when the rate of material consumption has decoupled from the rate of population growth, and economic growth is still strongly tied to the environmental footprint (Parrique et al., 2019; Tilsted et al., 2021; Ward et al., 2016).

By itself, the circular economy does not necessarily lead to a reduction in the use of primary raw materials, although a shift to different raw materials might be observed (Schaubroeck, 2020). Also, the World Bank Group recognizes that by 2050 the transition to purportedly renewable energy production will require over 3 billion tons of minerals and metals, notably graphite, lithium and cobalt, corresponding to an increase of up to 500%, to stay within the climate goals of the Paris Agreement, and even doubling the rate of recycling of suitable minerals like copper and aluminum will not meet demand (Hund et al., 2020). Furthermore, ageing material stocks accumulated in buildings, infrastructure, and machinery, which have increased 23-fold since the beginning of the 20th century and continue to grow, require continuous energy and material flows for maintenance, dismantling and (re)construction with a recycling rate of just 12%, and an anticipated need for disposal of 35% over the period from 2010 to 2030 due to the end of their service lifetimes (Krausmann et al., 2017). Hence, only a substantially lower level of material stocks will allow to achieve a global reduction in greenhouse gas emissions which is essential to keep global warming at bay (Krausmann et al., 2020). Circularity must be combined with the concept of longevity to increase eco-efficient resource use (Figge et al., 2018), and rebound effects due to efficiency gains need to be addressed comprehensively (Zink & Geyer, 2017). Moreover, the attempt to avoid landfill within the European

Union to comply with the moral imperative of a circular economy often displaces the treatment of waste towards the global South through international recycling networks which burdens people and environments with cleaning up a problem that they did not cause in the first place (Gregson et al., 2015).

As Corvellec et al. (2022) note, the concept of a circular economy and its associated business models frequently amount to mere statements of good faith. Critics point rightfully at current conceptions and implementations of circularity that require a broader and transdisciplinary approach to overcome the limitations of unaccounted secondary energy and material input (Cullen, 2017) and to engage in a participated policy process that is crucial to address complex problems within the uncertainties of post-normal science when decision stakes are high (Funtowicz & Ravetz, 1994).

The feel-good of pro-environmental behavior and its hideous downside

The umbrella concept of the circular economy interacts closely with – and embraces – the concept of lifestyle in high-income countries of the global North. As laid out by Mikael Jensen (2007), the concept of lifestyle can be defined within four levels, from global to individual, and entails the notions of consumption and identity which, besides addressing national, cultural, and subcultural identities, operate on an individual level whereby self-identity is expressed through the process and type of material consumption. Products perceived as environmentally friendly and fairly traded embody a message of ethical concern and humanitarian consciousness and consumers associate them with a positive moral value. Hence, environmentally concerned people tend to achieve self-realization within a framework of "green" consumption patterns, but don't forego necessarily consumption and resource use itself, focusing instead on (zero-)waste and recycling to maintain consistent personal narratives (Connolly & Prothero, 2003). In the understanding of Lorek and Fuchs (2019), this type of sustainable consumption has to be termed 'weak' as it represents foremost purchasable efficiency gains that are only available to the affluent clientele and occur without effective environmental gains, while 'strong' sustainable consumption draws back on a concept of sufficiency that grants a dignified life for all and replaces the growth paradigm.

Overall, higher household income is closely associated with a greater ecological footprint (Adua, 2022; Alfredsson et al., 2018; Feng et al., 2021; Hardadi et al., 2021) and individual environmental concerns and pro-environmental behavior in the private sphere do not necessarily reduce household carbon footprint (Csutora, 2012; Huddart Kennedy et al., 2015). For instance, air travel represents a major share of individual greenhouse gas emissions, particularly in high-income urban populations (Czepkiewicz et al., 2019; Ivanova et al., 2020), but is rarely relinquished, even by people with internalized knowledge about climate change (Jacobson et al., 2020), a finding that is supported by the analysis of representative datasets of the UK population which also showed no association between pro-environmental values and concerns and the reduction of non-work related flying behavior (Alcock et al., 2017). Thus, the claim that so-called lifestyle movements can act as drivers of social change based on individual action within a framework of a loose collective superstructure based on social networks, influencers and shared media (Haenfler et al., 2012) must be questioned in the context of pro-environmental behavior and green lifestyles.

The striking inconsistencies of a "green" lifestyle and lingering on travel patterns with high climate impact may be difficult to explain at first glance and are therefore readily omitted. However, alongside denial mechanisms that are similar to those that erect psychological barriers to shift from material comfort to a low-energy behavior (Stoll-Kleemann et al., 2001), the moral disengagement triggered by aggressive advertising of long-distance travel contributes to the blanketing out of its climate effects (Stubenvoll & Neureiter, 2021). Additionally, the effect of moral licensing may further enable the denial of existing contradictions between material and energy consumption, associated greenhouse gas emissions, and the narrative of sustainability. In moral psychology, ethical behavior is closely linked to the self-perceived value of moral acts that interfere with self-interest. But while past transgressions increase the resolve to engage in ethical behavior, the boost to the moral self after acting ethically can provoke subsequent licensing of egoistic and unethical attitudes, particularly

when there is a conflict between self-interest and an abstract value or goal, or self-construal is based on social roles and relationships (Blanken et al., 2015; Mullen & Monin, 2016; Xiong et al., 2022).

Under the assumption that purchasing environmental-friendly products might prompt subsequent unethical behavior, Mazar and Zhong (2010) studied the effect of moral licensing in an experimental study in Canadian students that showed a positive association between the prospect of green consumption and high moral and social values. However, while the mere exposure to environmental-friendly products had a favorable effect on altruistic behavior, actual purchase of these products led to a decrease in altruistic behavior and even to clearly unethical conduct. In a similar study on the potential of behavior change initiatives and policies to increase overall pro-environmental behavior (positive spillover), Clot et al. (2022) studied the effect of "green licensing" in a group of 85 undergraduates at a UK university and concluded that licensing actually provoked a negative spillover and worse pro-environmental behavior in other domains.

Complementing this argument within a larger moral self-regulation framework, Shalvi et al. (2015) emphasize that self-serving justifications act in protection of the moral self, either in advance of intentional unethical behavior, resorting to mechanisms of ambiguity, self-serving altruism, and moral licensing, or afterwards, using physical or symbolic cleansing, partial confessing, and distancing with pointing to others' moral failures. Regarding the conflict between green lifestyles and continued air travel, analogue notorious self-serving justifications come to mind and include references to the small percentage of carbon emissions due to air traffic in comparison to total greenhouse gas emissions, the necessity to visit close relatives, eventually old and sick, the merits of good deeds due to green household attitudes, the practice of carbon offset, the acknowledgement of human imperfection bound to social norms, or the allusion to even more frequent flyers or severe environmental impacts caused by other groups.

Clues for transformative change

The construct of zero-waste and a circular economy does not only operate on an individual level to ultimately justify unsustainable consumption patterns but can also be understood as an attempt to render the challenging of industrial capitalism impossible, removing it from the political sphere towards a depoliticized question of consumer behavior (Valenzuela & Böhm, 2017). But even as consumer feeds into the fetishism of recycling, in a symbolic effort of redemption to suppress the acknowledgment of wasteful behavior and obtain moral permission for future consumption, the cleaves and cracks of an exploitive global socioeconomic system became visible. Hothouse Earth pathways loom on the horizon (Steffen et al., 2018) and disruptive behaviors of the Earth System are not science fiction anymore but a real prospect (Bernardini et al., 2022). The decry for environmental justice and decolonization can no longer be ignored and resound with proposals of a degrowth future in the global North. Thus, "ideas such as those of subsistence-living, balance between all living beings and reciprocity, self-sufficiency and self-reliance open the possibility for debates in which both sets of movements can contribute" to co-create convivial technologies and alternative economic systems that refuse neoliberal growth narratives (Rodríguez-Labajos et al. 2019:182). Moreover, the current social and ecological crises require imagining "other ways of being, and transformative change to our economic life", and "the social body, with a shared commitment to life in common, is a common goal that unites diverse struggles, including environmental justice and degrowth movements. Success of these diverse struggles in fostering collective subjectivity and postcapitalist alternatives will depend on the ability of these diverse movements to come together, stand in solidarity, learn from each other and tell alternate stories about how we are to live the Anthropocene" (Singh 2019: 141).

Natalie Ralph's proposal of conceptual merging of circular economy, degrowth and conviviality design approaches might represent a first step in the direction of circular futures when it calls for a framework that embraces local sourcing of raw materials, the possibility of local manufacturing, the inclusion of users' creativity in the design process, creating products that fulfill an effective need and not an artificially induced desire, are widely accessible, contribute to future sharing and learning, and can be modified or improved without restriction during an extended lifecycle and repaired by an average person (Ralph, 2021). Hence, a circular economy discourse that aims to reach beyond

variations of the R's of waste management and resource use will necessarily have to embrace systemic socio-ecological transformation and a "plurality of alternatives" to envision participated circular futures (Calisto Friant et al., 2020), and, alongside the acknowledgment of planetary boundaries, the formulation of societal boundaries that are mandatory to enable a fair and conscious decision process that creates the conditions for a good life for all within a framework of collective self-limitation which overcomes the imperial mode of living at the expense of others (Brand et al., 2021).

The transformation of social structures that allows to envision a future which entails elements of the circular economy without succumbing to its vicissitudes will possibly require the shift from market relations to human relations, within a framework of "intentional sharing and togetherness" (Jarvis 2019: 270). Renouncing explicitly the idea of a consumption-orientated sharing economy, Jarvis puts forwards a concept of "real places and co-present realities" that might occur in collective endeavors like co-housing or food cooperatives which, in turn, shape relational human values. This framework will embed individual agency, 'we-intentions', democratic procedures, the defense of ecosystems and ideals of social justice within practices inspired by the degrowth mindset, understood as a "radical niche innovation" to counter the dynamics of the existing extractivist growth capitalism and to create pluriversal pathways towards alternative practices and systemic change (Vandeventer, Cattaneo, and Zografos 2019: 272).

Concluding remarks

The amazing diversity of circular economy definitions allows one to pick and choose those that are most suited to one's preferences and particular circumstances, without changing the dynamics of the industrial growth economy or demanding radical individual and systemic transformation. Thus, the utopia of circularity sanctions the maintenance of privileged habits of conspicuous consumption within a framework of green lifestyles and pro-environmental behaviors and ends up reinforcing the *status quo* of unsustainable exploitation of the Earth's resources while only a small – and diminishing – fraction of materials is someway reused or recycled, and global consumption increases continuously. Psychological mechanisms like moral licensing hinder transformative behavioral change even in groups that exhibit high moral standards and acknowledge the predicament of the destruction of the biosphere, particularly when its members enjoy the economic privileges that enable an environmentally destructive lifestyle in the first place. Without a paradigm shift in overall societal goals from exponential economic growth towards sustainable and regenerative practices, the current conflict between self-interest, interwoven with dominating societal norms, and consistent pro-environmental behavior is irresoluble, except in fringe groups that operate outside of the mainstream society and either are driven by strong moral values or bound to vernacular lifestyles that are directly threatened by the industrial extractivism of the growth economy.

References

1. Adua, L. (2022). Super polluters and carbon emissions: Spotlighting how higher-income and wealthier households disproportionately despoil our atmospheric commons. *Energy Policy*, *162*, 112768. https://doi.org/10.1016/j.enpol.2021.112768
2. Alcock, I., White, M. P., Taylor, T., Coldwell, D. F., Gribble, M. O., Evans, K. L., Corner, A., Vardoulakis, S., & Fleming, L. E. (2017). 'Green' on the ground but not in the air: Pro-environmental attitudes are related to household behaviours but not discretionary air travel. *Global Environmental Change*, *42*, 136–147. https://doi.org/10.1016/j.gloenvcha.2016.11.005
3. Alcoff, L. M. (2022). Extractivist epistemologies. *Tapuya: Latin American Science, Technology and Society*, *5*(1). https://doi.org/10.1080/25729861.2022.2127231
4. Alfredsson, E., Bengtsson, M., Brown, H. S., Isenhour, C., Lorek, S., Stevis, D., & Vergragt, P. (2018). Why achieving the Paris Agreement requires reduced overall consumption and production. *Sustainability: Science, Practice and Policy*, *14*(1), 1–5. https://doi.org/10.1080/15487733.2018.1458815
5. Bali Swain, R., & Sweet, S. (2021). Sustainable Consumption and Production: Introduction to Circular Economy and Beyond. In R. Bali Swain & S. Sweet (Eds.), *Sustainable Consumption and Production, Volume II: Vol. II* (pp. 1–16). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-030-55285-5_1

6. Bendell, J. (2022). Replacing Sustainable Development: Potential Frameworks for International Cooperation in an Era of Increasing Crises and Disasters. *Sustainability*, *14*(13), 8185. https://doi.org/10.3390/su14138185
7. Bengtsson, M., Alfredsson, E., Cohen, M., Lorek, S., & Schroeder, P. (2018). Transforming systems of consumption and production for achieving the sustainable development goals: moving beyond efficiency. *Sustainability Science*, *13*(6), 1533–1547. https://doi.org/10.1007/s11625-018-0582-1
8. Bera, R. K. (2021). On Scientific Theories and Their Impact on Society. *SSRN Electronic Journal*, *1979*, 1–35. https://doi.org/10.2139/ssrn.3912391
9. Bernardini, A. E., Bertolami, O., & Francisco, F. (2022). Chaotic Behaviour of the Earth System in the Anthropocene. *ArXiv*, 1–18. https://doi.org/10.48550/arXiv.2204.08955
10. Blanken, I., van de Ven, N., & Zeelenberg, M. (2015). A Meta-Analytic Review of Moral Licensing. *Personality and Social Psychology Bulletin*, *41*(4), 540–558. https://doi.org/10.1177/0146167215572134
11. Blomsma, F., & Brennan, G. (2017). The Emergence of Circular Economy: A New Framing Around Prolonging Resource Productivity. *Journal of Industrial Ecology*, *21*(3), 603–614. https://doi.org/10.1111/jiec.12603
12. Bonaiuti, M. (2018). Are we entering the age of involuntary degrowth? Promethean technologies and declining returns of innovation. *Journal of Cleaner Production*, *197*, 1800–1809. https://doi.org/10.1016/j.jclepro.2017.02.196
13. Boulding, K. (1966). The Economics of the Coming Spaceship Earth. In H. Jarrett (Ed.), *Environmental Quality in a Growing Economy* (pp. 3–14). Baltimore: Johns Hopkins University Press.
14. Brand, U., Boos, T., & Brad, A. (2017). Degrowth and post-extractivism: two debates with suggestions for the inclusive development framework. *Current Opinion in Environmental Sustainability*, *24*, 36–41. https://doi.org/10.1016/j.cosust.2017.01.007
15. Brand, U., Muraca, B., Pineault, É., Sahakian, M., Schaffartzik, A., Novy, A., Streissler, C., Haberl, H., Asara, V., Dietz, K., Lang, M., Kothari, A., Smith, T., Spash, C., Brad, A., Pichler, M., Plank, C., Velegrakis, G., Jahn, T., … Görg, C. (2021). From planetary to societal boundaries: an argument for collectively defined self-limitation. *Sustainability: Science, Practice and Policy*, *17*(1), 264–291. https://doi.org/10.1080/15487733.2021.1940754
16. Calisto Friant, M., Vermeulen, W. J. V., & Salomone, R. (2020). A typology of circular economy discourses: Navigating the diverse visions of a contested paradigm. *Resources, Conservation and Recycling*, *161*, 104917. https://doi.org/10.1016/j.resconrec.2020.104917
17. Cecchin, A., Salomone, R., Deutz, P., Raggi, A., & Cutaia, L. (2021). What Is in a Name? The Rising Star of the Circular Economy as a Resource-Related Concept for Sustainable Development. *Circular Economy and Sustainability*, *1*(1), 83–97. https://doi.org/10.1007/s43615-021-00021-4
18. Circle Economy. (2022). *The Circularity Gap Report 2022*. Amsterdam: Circle Economy.
19. Clot, S., Della Giusta, M., & Jewell, S. (2022). Once Good, Always Good? Testing Nudge's Spillovers on Pro Environmental Behavior. *Environment and Behavior*, *54*(3), 655–669. https://doi.org/10.1177/00139165211060524
20. Connolly, J., & Prothero, A. (2003). Sustainable consumption: consumption, consumers and the commodity discourse. *Consumption Markets & Culture*, *6*(4), 275–291. https://doi.org/10.1080/1025386032000168311
21. Corvellec, H., Stowell, A. F., & Johansson, N. (2022). Critiques of the circular economy. *Journal of Industrial Ecology*, *26*(2), 421–432. https://doi.org/10.1111/jiec.13187
22. Csutora, M. (2012). One More Awareness Gap? The Behaviour–Impact Gap Problem. *Journal of Consumer Policy*, *35*(1), 145–163. https://doi.org/10.1007/s10603-012-9187-8
23. Cullen, J. M. (2017). Circular Economy: Theoretical Benchmark or Perpetual Motion Machine? *Journal of Industrial Ecology*, *21*(3), 483–486. https://doi.org/10.1111/jiec.12599
24. Czepkiewicz, M., Árnadóttir, Á., & Heinonen, J. (2019). Flights Dominate Travel Emissions of Young Urbanites. *Sustainability*, *11*(22), 6340. https://doi.org/10.3390/su11226340
25. Donaires, O. S., Cezarino, L. O., Caldana, A. C. F., & Liboni, L. (2019). Sustainable development goals – an analysis of outcomes. *Kybernetes*, *48*(1), 183–207. https://doi.org/10.1108/K-10-2017-0401
26. *A new Circular Economy Action Plan: For a cleaner and more competitive Europe*, (2020) (testimony of European Commission).
27. Feng, K., Hubacek, K., & Song, K. (2021). Household carbon inequality in the U.S. *Journal of Cleaner Production*, *278*, 123994. https://doi.org/10.1016/j.jclepro.2020.123994

28. Figge, F., Thorpe, A. S., Givry, P., Canning, L., & Franklin-Johnson, E. (2018). Longevity and Circularity as Indicators of Eco-Efficient Resource Use in the Circular Economy. *Ecological Economics*, *150*, 297–306. https://doi.org/10.1016/j.ecolecon.2018.04.030
29. Funtowicz, S. O., & Ravetz, J. R. (1994). Uncertainty, complexity and post-normal science. *Environmental Toxicology and Chemistry*, *13*(12), 1881–1885. https://doi.org/10.1002/etc.5620131203
30. Geissdoerfer, M., Savaget, P., Bocken, N. M. P., & Hultink, E. J. (2017). The Circular Economy – A new sustainability paradigm? *Journal of Cleaner Production*, *143*, 757–768. https://doi.org/10.1016/j.jclepro.2016.12.048
31. Georgescu-Roegen, N. (1971). *The Entropy Law and the Economic Process*. Cambridge: Harvard University Press.
32. Gregson, N., Crang, M., Fuller, S., & Holmes, H. (2015). Interrogating the circular economy: the moral economy of resource recovery in the EU. *Economy and Society*, *44*(2), 218–243. https://doi.org/10.1080/03085147.2015.1013353
33. Haenfler, R., Johnson, B., & Jones, E. (2012). Lifestyle Movements: Exploring the Intersection of Lifestyle and Social Movements. *Social Movement Studies*, *11*(1), 1–20. https://doi.org/10.1080/14742837.2012.640535
34. Hardadi, G., Buchholz, A., & Pauliuk, S. (2021). Implications of the distribution of German household environmental footprints across income groups for integrating environmental and social policy design. *Journal of Industrial Ecology*, *25*(1), 95–113. https://doi.org/10.1111/jiec.13045
35. Harris, S., Martin, M., & Diener, D. (2021). Circularity for circularity's sake? Scoping review of assessment methods for environmental performance in the circular economy. *Sustainable Production and Consumption*, *26*, 172–186. https://doi.org/10.1016/j.spc.2020.09.018
36. Hickel, J. (2019). The contradiction of the sustainable development goals: Growth versus ecology on a finite planet. *Sustainable Development*, *27*, 873–884. https://doi.org/10.1002/sd.1947
37. Hirsch, P. M., & Levin, D. Z. (1999). Umbrella Advocates Versus Validity Police: A Life-Cycle Model. *Organization Science*, *10*(2), 199–212. https://doi.org/10.1287/orsc.10.2.199
38. Huddart Kennedy, E., Krahn, H., & Krogman, N. T. (2015). Are we counting what counts? A closer look at environmental concern, pro-environmental behaviour, and carbon footprint. *Local Environment*, *20*(2), 220–236. https://doi.org/10.1080/13549839.2013.837039
39. Hund, K., La Porta, D., Fabregas, T., Laing, T., & Drexhage, J. (2020). Minerals for Climate Action: The Mineral Intensity of the Clean Energy Transition. In *Climate Smart Mining Initiative - The World Bank Group*.
40. IPBES. (2019). *Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services* (E. Brondizio, S. Diaz, J. Settele, & H. T. Ngo (eds.)). Bonn: IPBES Secretariat.
41. IPCC. (2022). Summary for policymakers. In *Climate Change 2022: Impacts, Adaptation and Vulnerability. Working Group II Contribution to the IPCC Sixth Assessment Report*. Cambridge University Press.
42. Ivanova, D., Barrett, J., Wiedenhofer, D., Macura, B., Callaghan, M., & Creutzig, F. (2020). Quantifying the potential for climate change mitigation of consumption options. *Environmental Research Letters*, *15*(9), 093001. https://doi.org/10.1088/1748-9326/ab8589
43. Jacobson, L., Åkerman, J., Giusti, M., & Bhowmik, A. (2020). Tipping to Staying on the Ground: Internalized Knowledge of Climate Change Crucial for Transformed Air Travel Behavior. *Sustainability*, *12*(5), 1994. https://doi.org/10.3390/su12051994
44. Jarvis, H. (2019). Sharing, togetherness and intentional degrowth. *Progress in Human Geography*, *43*(2), 256–275. https://doi.org/10.1177/0309132517746519
45. Jensen, M. (2007). Defining lifestyle. *Environmental Sciences*, *4*(2), 63–73. https://doi.org/10.1080/15693430701472747
46. Kallis, G., Kerschner, C., & Martinez-Alier, J. (2012). The economics of degrowth. *Ecological Economics*, *84*, 172–180. https://doi.org/10.1016/j.ecolecon.2012.08.017
47. Kallis, G., Kostakis, V., Lange, S., Muraca, B., Paulson, S., & Schmelzer, M. (2018). Research On Degrowth. *Annual Review of Environment and Resources*, *43*(1), 291–316. https://doi.org/10.1146/annurev-environ-102017-025941
48. Kerschner, C. (2010). Economic de-growth vs. steady-state economy. *Journal of Cleaner Production*, *18*(6), 544–551. https://doi.org/10.1016/j.jclepro.2009.10.019
49. Khalil, E. L. (2004). The Three Laws of Thermodynamics and the Theory of Production. *Journal of Economic Issues*, *38*(1), 201–226. https://doi.org/10.1080/00213624.2004.11506672

50. Kirchherr, J., Reike, D., & Hekkert, M. (2017). Conceptualizing the circular economy: An analysis of 114 definitions. *Resources, Conservation and Recycling*, *127*, 221–232. https://doi.org/10.1016/j.resconrec.2017.09.005
51. Krausmann, F., Wiedenhofer, D., & Haberl, H. (2020). Growing stocks of buildings, infrastructures and machinery as key challenge for compliance with climate targets. *Global Environmental Change*, *61*, 102034. https://doi.org/10.1016/j.gloenvcha.2020.102034
52. Krausmann, F., Wiedenhofer, D., Lauk, C., Haas, W., Tanikawa, H., Fishman, T., Miatto, A., Schandl, H., & Haberl, H. (2017). Global socioeconomic material stocks rise 23-fold over the 20th century and require half of annual resource use. *Proceedings of the National Academy of Sciences*, *114*(8), 1880–1885. https://doi.org/10.1073/pnas.1613773114
53. Lorek, S., & Fuchs, D. (2019). Why only strong sustainable consumption governance will make a difference. In O. Mont (Ed.), *A Research Agenda for Sustainable Consumption Governance* (pp. 19–34). Cheltenham: Edward Elgar Publishing. https://doi.org/10.4337/9781788117814.00010
54. Marín-Beltrán, I., Demaria, F., Ofelio, C., Serra, L. M., Turiel, A., Ripple, W. J., Mukul, S. A., & Costa, M. C. (2022). Scientists' warning against the society of waste. *Science of The Total Environment*, *811*, 151359. https://doi.org/10.1016/j.scitotenv.2021.151359
55. Mazar, N., & Zhong, C.-B. (2010). Do Green Products Make Us Better People? *Psychological Science*, *21*(4), 494–498. https://doi.org/10.1177/0956797610363538
56. Meadows, D. H., Meadows, D. L., Randers, J., & Behrens III, W. W. (1972). *The Limits to Growth*. New York: Universe Books.
57. Moraga, G., Huysveld, S., Mathieux, F., Blengini, G. A., Alaerts, L., Van Acker, K., de Meester, S., & Dewulf, J. (2019). Circular economy indicators: What do they measure? *Resources, Conservation and Recycling*, *146*, 452–461. https://doi.org/10.1016/j.resconrec.2019.03.045
58. Mullen, E., & Monin, B. (2016). Consistency Versus Licensing Effects of Past Moral Behavior. *Annual Review of Psychology*, *67*(1), 363–385. https://doi.org/10.1146/annurev-psych-010213-115120
59. Parrique, T., Barth, J., Briens, F., Kerschner, C., Kraus-Polk, A., Kuokkanen, A., & Spangenberg, J. H. (2019). Decoupling debunked: Evidence and arguments against green growth as a sole strategy for sustainability. *European Environmental Bureau*, 80.
60. Ralph, N. (2021). A conceptual merging of circular economy, degrowth and conviviality design approaches applied to renewable energy technology. *Journal of Cleaner Production*, *319*, 128549. https://doi.org/10.1016/j.jclepro.2021.128549
61. Rodríguez-Labajos, B., Yánez, I., Bond, P., Greyl, L., Munguti, S., Ojo, G. U., & Overbeek, W. (2019). Not So Natural an Alliance? Degrowth and Environmental Justice Movements in the Global South. *Ecological Economics*, *157*, 175–184. https://doi.org/10.1016/j.ecolecon.2018.11.007
62. Sandler, S. I., & Woodcock, L. V. (2010). Historical Observations on Laws of Thermodynamics. *Journal of Chemical & Engineering Data*, *55*(10), 4485–4490. https://doi.org/10.1021/je1006828
63. Schaubroeck, T. (2020). Circular economy practices may not always lead to lower criticality or more sustainability; analysis and guidance is needed per case. *Resources, Conservation and Recycling*, *162*, 104977. https://doi.org/10.1016/j.resconrec.2020.104977
64. Shalvi, S., Gino, F., Barkan, R., & Ayal, S. (2015). Self-Serving Justifications. *Current Directions in Psychological Science*, *24*(2), 125–130. https://doi.org/10.1177/0963721414553264
65. Singh, N. M. (2019). Environmental justice, degrowth and post-capitalist futures. *Ecological Economics*, *163*, 138–142. https://doi.org/10.1016/j.ecolecon.2019.05.014
66. Skene, K. R. (2021). No goal is an island: the implications of systems theory for the Sustainable Development Goals. *Environment, Development and Sustainability*, *23*(7), 9993–10012. https://doi.org/10.1007/s10668-020-01043-y
67. Stahel, W. R. (2016). The circular economy. *Nature*, *531*, 435–438. https://doi.org/10.1038/531435a
68. Starikov, E. B. (2021). How many laws has thermodynamics? What is the sense of the entropy notion? Implications for molecular physical chemistry. *Monatshefte Für Chemie - Chemical Monthly*, *152*(8), 871–879. https://doi.org/10.1007/s00706-021-02803-w
69. Steffen, W., Broadgate, W., Deutsch, L., Gaffney, O., & Ludwig, C. (2015). The trajectory of the Anthropocene: The Great Acceleration. *The Anthropocene Review*, *2*, 81–98. https://doi.org/10.1177/2053019614564785

70. Steffen, W., Richardson, K., Rockström, J., Cornell, S. E., Fetzer, I., Bennett, E. M., Biggs, R., Carpenter, S. R., de Vries, W., de Wit, C. A., Folke, C., Gerten, D., Heinke, J., Mace, G. M., Persson, L. M., Ramanathan, V., Reyers, B., & Sörlin, S. (2015). Planetary boundaries: Guiding human development on a changing planet. *Science*, *347*, 6223. https://doi.org/10.1126/science.1259855
71. Steffen, W., Rockström, J., Richardson, K., Lenton, T. M., Folke, C., Liverman, D., Summerhayes, C. P., Barnosky, A. D., Cornell, S. E., Crucifix, M., Donges, J. F., Fetzer, I., Lade, S. J., Scheffer, M., Winkelmann, R., & Schellnhuber, H. J. (2018). Trajectories of the Earth System in the Anthropocene. *Proceedings of the National Academy of Sciences*, *115*(33), 8252–8259. https://doi.org/10.1073/pnas.1810141115
72. Stephan, G. (2022). Circular Economy: Illusion or First Step towards a Sustainable Economy: A Physico-Economic Perspective. *Sustainability*, *14*, 4778. https://doi.org/10.3390/su14084778
73. Stoll-Kleemann, S., O'Riordan, T., & Jaeger, C. C. (2001). The psychology of denial concerning climate mitigation measures: evidence from Swiss focus groups. *Global Environmental Change*, *11*(2), 107–117. https://doi.org/10.1016/S0959-3780(00)00061-3
74. Stubenvoll, M., & Neureiter, A. (2021). Fight or Flight: How Advertising for Air Travel Triggers Moral Disengagement. *Environmental Communication*, *15*(6), 765–782. https://doi.org/10.1080/17524032.2021.1899956
75. Tilsted, J. P., Bjørn, A., Majeau-Bettez, G., & Lund, J. F. (2021). Accounting matters: Revisiting claims of decoupling and genuine green growth in Nordic countries. *Ecological Economics*, *187*, 107101. https://doi.org/10.1016/j.ecolecon.2021.107101
76. Valenzuela, F., & Böhm, S. (2017). Against wasted politics: a critique of the circular economy. *Ephemera: Theory & Politics in Organization*, *17*(1), 23–60.
77. Vandeventer, J. S., Cattaneo, C., & Zografos, C. (2019). A Degrowth Transition: Pathways for the Degrowth Niche to Replace the Capitalist-Growth Regime. *Ecological Economics*, *156*, 272–286. https://doi.org/10.1016/j.ecolecon.2018.10.002
78. Ward, J. D., Sutton, P. C., Werner, A. D., Costanza, R., Mohr, S. H., & Simmons, C. T. (2016). Is Decoupling GDP Growth from Environmental Impact Possible? *PLOS ONE*, *11*(10), e0164733. https://doi.org/10.1371/journal.pone.0164733
79. Worldometers.info. (n.d.). *World Population by Year*. Retrieved May 29, 2022, from https://www.worldometers.info/world-population/world-population-by-year/
80. Xiong, S., Wang, K., Zhang, L., & Xiao, H. (2022). "I" get license but "we" keep consistent: The role of self-construal in subsequent pro-environmental decision. *Current Psychology*, 0123456789. https://doi.org/10.1007/s12144-022-02773-0
81. Zaman, A. (2022). Zero-Waste: A New Sustainability Paradigm for Addressing the Global Waste Problem. In *The Vision Zero Handbook* (pp. 1–24). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-030-23176-7_46-1
82. Zeng, Y., Maxwell, S., Runting, R. K., Venter, O., Watson, J. E. M., & Carrasco, L. R. (2020). Environmental destruction not avoided with the Sustainable Development Goals. *Nature Sustainability*, *3*, 795–798. https://doi.org/10.1038/s41893-020-0555-0
83. Zink, T., & Geyer, R. (2017). Circular Economy Rebound. *Journal of Industrial Ecology*, *21*(3), 593–602. https://doi.org/10.1111/jiec.12545