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Sustainability and Metabolic Revolution in the Works of Henri Lefebvre

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Abstract

Humanity's present social–ecological metabolic configuration is not sustainable, and the need for a radical transformation of society to address its metabolic rifts with the rest of nature is increasingly apparent. The work of French Marxist Henri Lefebvre, one of the few thinkers to recognise the significance of Karl Marx's theory of metabolic rift prior to its rediscovery at the end of the twentieth century, offers valuable insight into contemporary issues of sustainability. His concepts of the urban revolution, *autogestión*, the critique of everyday life, and total (or metabolic) revolution all relate directly to the key concerns of sustainability. Lefebvre's work embodies a vision of radical social–ecological transformation aimed at sustainable human development, in which the human metabolic interchange with the rest of nature is to be placed under substantively rational and cooperative control by all its members, enriching everyday life. Other critical aspects of Lefebvre's work, such as his famous concept of the production of space, his temporal *rhythmanalysis*, and his notion of the right to the city, all point to the existence of an open-ended research program directed at the core issues of sustainability in the twenty-first century.

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Introduction

Sustainability, like its predecessor "sustainable development", is a highly contested concept in its meanings, its objectives, and the means of change. That said, it refers to a vital aspect of our social-ecological metabolism, and a general consensus exists that, whatever the meaning of sustainability is, our current social-ecological metabolic configuration is not consistent with it.[1] Indeed, for many born since the late 1970s (i.e., during the rise to political dominance of neoliberal capitalism),[2] capital seems less like Joseph Schumpeter 's[3] (p. 84) "perennial gale of creative destruction" and more like an unrelenting force of ever-more rampant destruction and enervating stagnation. This political situation, in turn, feeds into the various ways in which sustainability is understood.

For those with a vested interest in perpetuating some minor variant of the status quo, sustainability's conceptual content —when it is not simply used as a marketing device or sophisticated rhetorical cover for "business as usual"[4]—consists of minimal adjustments to the metabolic interactions within social-ecological systems. Its form assumes a similarly minimalist and generally technocratic set of market adjustments and limited (if not proscribed) policy incentives. This mechanistic approach is often supported by proponents of ecological modernisation and neoliberalism, as it assumes that the requisites for the reproduction of nature can be wholly (or succinctly) dominated by the established, if alienated, society. Not surprisingly, this is the version of sustainability favoured in political and media discourse, as well as among those sustainability scientists who take the doctrine of exponential economic growth for granted [5,6].

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At the other pole are those who argue that the entire metabolic interaction between society and nature must be transformed to allow for a less antagonistic co-evolution. At various points between these poles are those who believe that social–ecological systems can be somehow split apart, and either their social or their ecological aspects addressed independently—perhaps in concert, or with one side of the split taking priority over the other (as in the ongoing but ultimately unhelpful arguments over "anthropocentric" versus "ecocentric" conservation [7,8]). Such one-sided, even if supposedly totalising, understandings of sustainability are a large part of the reason that the concept is so ambiguous, contested, and often abused by vested interests. Nevertheless, this does not negate its importance [9,10], despite the efforts of some hyper-critics to place the responsibility for sustainability's "recuperation" or co-optation by capital on the

1 ↩ UNEP. *Global Environment Outlook 6: Healthy Planet, Healthy People*; United Nations Environment Programme: Nairobi, Kenya, 2019; p. 745. [Google Scholar]

2 ↩ Harvey, D. *A Brief History of Neoliberalism*; Oxford University Press: Oxford, UK, 2006; p. 254. ISBN 978-0-19-928327-9. [Google Scholar]

3 ↩ Schumpeter, J.A. *Capitalism, Socialism and Democracy*; Routledge: New York, NY, USA, 1976; p. 442. ISBN 0-203-20205-8. [Google Scholar]

4 ↩ Foster, J.B. The planetary rift and the new human exemptionalism: A political-economic critique of ecological modernization theory. *Organ. Environ.* **2012**, *25*, 211–237. [Google Scholar] [CrossRef]

5 ↩ Clark, B.; Auerbach, D.; Longo, S.B. The bottom line: Capital's production of social inequalities and environmental degradation. *J. Environ. Stud. Sci.* **2018**, *8*, 562–569. [Google Scholar] [CrossRef]

6 ↩ Longo, S.B.; Clark, B.; Shriver, T.E.; Clausen, R. Sustainability and Environmental Sociology: Putting the Economy in its Place and Moving Toward an Integrative Socio-Ecology. *Sustainability* **2016**, *8*, 437. [Google Scholar] [CrossRef]

7 ↩ Holmes, G.; Sandbrook, C.; Fisher, J.A. Understanding conservationists' perspectives on the new-conservation debate. *Conserv. Biol.* **2017**, *31*, 353–363. [Google Scholar] [CrossRef]

8 ↩ Napoletano, B.M.; Clark, B. An ecological-marxist response to the half-earth project. *Conserv. Soc.* **2019**, *18*, 37–49. [Google Scholar] [CrossRef]

9 ↩ Castro, C.J. Sustainable development: Mainstream and critical perspectives. *Organ. Environ.* **2004**, *17*, 195–225. [Google Scholar] [CrossRef]

10 ↩ Burkett, P. *Marx and Nature: A Red and Green Perspective*; St. Martin's Press: New York, NY, USA, 1999; p. 312. ISBN 978-1-349-41490-1. [Google Scholar]

concept's originators[11] (p. 1114). If we reject the view that social and ecological priorities can be split apart—not least because any attempt to impose a program of strictly "ecological" sustainability in a society structured antagonistically will inevitably prompt resistance and rebellion, and therefore be "socially" unsustainable, and vice-versa—and instead take sustainability to mean the consistent provision of conditions for the realisation of each individual's social-ecological potential and development, be the subject human or non-human, the essential question becomes, is such sustainability attainable under the currently prevailing social–metabolic conditions of reproduction?

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Most evidence to date suggests that the answer to this question is no [12,13]. Despite advances in scientific thought and methodology that have brought to attention mounting issues such as climate change, biodiversity loss, toxic contamination, and resource depletion, little substantive progress has been made in addressing their causes (see, for instance, the disparity between the severity of the ecological crises and the politically viable measures proposed to address them [1]). In fact, most of these problems have been getting worse, despite repeated warnings from sustainability scientists.[14] Indeed, the manner in which the warnings of epidemiologists were systematically ignored by those in power even as COVID-19 transitioned from a regional outbreak into a global pandemic provides a dire corrective to the optimistic expectation that those who hold power are willing or able to set aside their immediate interests for the sake of human welfare [15,16]. This, unfortunately, is only the latest of an ever-growing volume of empirical indications that substantiate the radical position that the current mode of social–metabolic control, governed by a bottom-line growth imperative (in profits, investment, tax revenues, or, more generally, value), is incapable of the sort of rational control that sustainability entails [5,17,18].

Recent scholarship has demonstrated that, terminology aside, concern regarding the capital system's inherent unsustainability has long been a major focus of critical thought, and that radical thinkers, including Karl Marx and Fredrick Engels (see, for example, [10,19,20,21]), insightfully highlighted the social–metabolic implications of the industrial transformation of capitalist production in the nineteenth century. Marx, in particular, developed a sophisticated metabolic analysis with a transformative vision of sustainability that posits that the social metabolism must be

11 ↩ Lefebvre, H. *Critique of Everyday Life*; One-Volume; Verso: London, UK, 2014; p. 912. ISBN 978-1-78168-317-0. [**Google Scholar**]

12 ↩ Foster, J.B.; Clark, B.; York, R. *The Ecological Rift: Capitalism's War on the Earth*; Monthly Review: New York, NY, USA, 2011; p. 544. ISBN 978-1-58367-218-1. [**Google Scholar**]

13 ↩ Foster, J.B. Capitalism has Failed—What next? – The Jus Semper Global Alliance, November 2020.

14 ↩ IPBES. *Summary for Policymakers of the Global Assessment Report on Biodiversity and Ecosystem Services*; Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services: Bonn, Germany, 2019; p. 56. [**Google Scholar**]

15 ↩ John, J.; Jitheesh, P.M.; Chomsky, N. The Pandemic Has Only Exposed the Suicidal Tendencies of Capitalism: Noam Chomsky. Available online: **https://thewire.in/world/noam-chomsky-interview-covid-19-pandemic-capitalism-neoliberalism-us-hegemony** (accessed on 21 May 2020).

16 ↩ Wallace, R.; Liebman, A.; Chaves, L.F.; Wallace, R. COVID-19 and Circuits of Capital: New York to China and Back – The Jus Semper Global Alliance, August 2020.

17 ↩ Mészáros, I. *Beyond Capital: Towards a Theory of Transition*; Merlin Press: London, UK, 1995; p. 994. ISBN 0-85036-432-9. [**Google Scholar**]

18 ↩ Leiss, W. *The Domination of Nature*; McGill-Queen's University Press: Montreal, QC, Canada, 1994; p. 272. ISBN 978-0-7735-1198-9. [**Google Scholar**]

19 ↩ Foster, J.B. *Marx's Ecology: Materialism and Nature*; Monthly Review: New York, NY, USA, 2000; p. 200. ISBN 978-1-58367-012-5. [**Google Scholar**]

20 ↩ Foster, J.B. *The Return of Nature: Socialism and Ecology*; Monthly Review: New York, NY, USA, 2020; p. 698. ISBN 978-1-58367-836-7. [**Google Scholar**]

21 ↩ Saito, K. Karl Marx's Ecosocialism: Capital, Nature, and the Unfinished Critique of Political Economy; Monthly Review: New York, NY, USA, 2017; p. 308. ISBN 978-1-58367-640-0. [**Google Scholar**]

consciously regulated within the universal metabolism of nature to prevent and repair metabolic rifts in ecosystems and avoid exhausting the wealth of nature—conditions more recently approximated in Earth-system science at the global level by planetary boundaries defining humanity's "safe operating space" [22,23]. Furthermore, sustainability is not a fixed goal or endpoint, but the means to permit the realisation of human and non-human potential [19,24]. In keeping with such investigation of the contributions of radical thinkers to notions of sustainability avant la lettre, and considering the inherently spatial-temporal nature of social-ecological metabolic processes [14,25,26], we argue that the work of French Marxist Henri Lefebvre, whose life spanned most of the twentieth century, provides important insights for developing a radical perspective on sustainability suited to our present situation as we enter the third decade of the twenty-first century.

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Lefebvre was a prolific and influential intellectual, and continued engaging key issues of his time and place until his death shortly after his ninetieth birthday in 1991. Engagement with and appropriation and incorporation of his thought in anglophone scholarship, however, has tended to be partial and fragmentary, in part due to the small proportion of this work that was initially translated into English, as well as the disciplinary lenses through which it was refracted (e.g., geography and the production of space).[27] This has contributed to a general neglect of his creative, dialectical handling of the oppositional unity of nature and society, which is especially present in some of his work translated over the last decade (esp.[28]), and its insights into the contemporary "epochal crisis" of capital.[29] A renewed engagement with Lefebvre's scholarship is promising, as recent scholarship[30] has detailed how he was one of the few Marxist thinkers to recognise Marx's theory of metabolic rift and its implications prior to the concept's rediscovery by John Bellamy Foster.[31] Thus, it is possible to assess how Lefebvre employed the concept in the context of the total revolution (economic, political, and cultural) needed to realise the urban revolution, the radical transformation of everyday life, and the movement for *autogestión*, all of which directly speak to contemporary debates in sustainability. Contrary to some popular interpretations of Marxism, such a revolutionary vision does not entail postponing social transformation pending a revolution that will automatically bring about the necessary social–ecological metabolic changes. Instead, it offers an understanding of revolution as a process whose transformation must be currently pursued even while building

22 ↩ Rockström, J.; Steffen, W.; Noone, K.; Persson, Å.; Chapin, F.; Stuart, I.; Lambin, E.; Lenton, T.M.; Scheffer, M.; Folke, C.; et al. Planetary boundaries: Exploring the safe operating space for humanity. *Ecol. Soc.* **2009**, *14*, 32. [Google Scholar] [CrossRef]

23 ↩ 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.; et al. Planetary boundaries: Guiding human development on a changing planet. *Science* **2015**, *347*, 1259855. [Google Scholar] [CrossRef]

24 ↩ Marcuse, P. From critical urban theory to the right to the city. *City* **2009**, *13*, 185–197. [Google Scholar] [CrossRef]

25 ↩ Neef, E. Der Stoffwechsel zwischen Gesellschaft und Naturals geographisches Problem. *Geogr. Rundsch.* **1969**, *21*, 453–459. [Google Scholar]

26 ↩ Meadows, D.H.; Meadows, D.L.; Randers, J.; Behrens, W.W., III. *The Limits to Growth*; Potomac Associates: New York, NY, USA, 1972; p. 211. [Google Scholar]

27 ↩ Elden, S. Politics, philosophy, geography: Henri Lefebvre in recent anglo-american scholarship. *Antipode* **2001**, *33*, 809–825. [Google Scholar] [CrossRef]

28 ↩ Lefebvre, H. *Marxist Thought and the City*; University of Minnesota Press: Minneapolis, MN, USA, 2016; p. 160. ISBN 978-0-8166-9875-2. [Google Scholar]

29 ↩ Foster, J.B. The epochal crisis. *Mon. Rev.* **2013**, *65*, 1–12. [Google Scholar] [CrossRef]

30 ↩ Foster, J.B.; Napoletano, B.M.; Clark, B.; Urquijo, P.S. Henri Lefebvre's marxian ecological critique: Recovering a foundational contribution to environmental sociology. *Environ. Sociol.* **2019**, *6*, 31–41. [Google Scholar] [CrossRef]

31 ↩ Foster, J.B. Marx's theory of metabolic rift: Classical foundations for environmental sociology. *Am. J. Sociol.* **1999**, *105*, 366–405. [Google Scholar] [CrossRef]

Lefebvre expressed as a dialectic of the possible–impossible... that we must demand the impossible to get all that is possible. Thus, a key aspect of what Lefebvre offers is a deeper insight into the social-ecological barriers to and conditions of metabolic restoration upon which the process of sustainability must be premised.

momentum for deeper change, which can then bring about the conditions under which a less antagonistic social–metabolic order can be implemented. Lefebvre often expressed this notion as a dialectic of the possible–impossible—i.e., to invoke one of his favourite aphorisms, we must demand the impossible to get all that is possible[32] (p. 35). Thus, a key aspect of what Lefebvre offers is a deeper insight into the social-ecological barriers to and conditions of metabolic restoration upon which the process of sustainability must be premised.

Lefebvre and the Metabolic Rift

Marx's theory of metabolic rift as a process of systemic rupture in the interchange of material–energy–labor has been laid out systematically and related to his materialist conception of nature and human history [19,31]. As a general theory of the capital system's social–ecological contradictions, it follows from three key observations by Marx: (1) that the social metabolism, embedded in a broader "universal metabolism of nature", defines the labor process as the mediator between society and the rest of nature; (2) that the capital system's relations of (re)production, aptly expressed in the antagonistic separation of town and country, introduces an inherent antagonistic separation or alienated mediation into this process, which creates ecological rifts in ecosystems; and (3) that society must necessarily govern the social metabolism with nature rationally in a society of associated producers conducive to the (mutually interdependent aims of) full development of individual potential and a less antagonistic human relationship with the rest of nature [33,34]. It is this concept that led Marx to posit the aforementioned radical notion of sustainability, which entails viewing the Earth and its social–ecological systems not as private property, but as a common patrimony handled by society as its usufructuaries who, like *boni patres familias*, are charged with handing "it down to succeeding generations in an improved condition"[35] (p. 546).

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The significance of Marx's ecological critique of capital [21], encompassing its radical implications for what is now called "sustainability", was not lost on Lefebvre, who readily incorporated it into his project of total revolution [30]. After recounting Marx's description of how capitalist production "disturbs the organic exchanges between man and nature" and incorporating it into his historical account of the city, Lefebvre [28] (pp. 121–122) observed that "Capitalism destroys nature and ruins its own conditions, preparing and announcing its revolutionary disappearance. Only later will the exchanges (organic as well as economic) between the social and the natural, the acquired and the spontaneous, be

[32] ↩ Lefebvre, H. *Writings on Cities*; Kofman, E., Lebas, E., Eds.; Blackwell Publishers: Malden, MA, USA, 1996; p. 250. ISBN 978-0-631-19188-9. [Google Scholar]

[33] ↩ Foster, J.B.; Clark, B. Marx's universal metabolism of nature and the Frankfurt school: Dialectical contradictions and critical syntheses. In *Changing Our Environment, Changing Ourselves: Nature, Labour, Knowledge and Alienation*; Ormrod, J.S., Ed.; Palgrave Macmillan UK: London, UK, 2016; pp. 101–135. ISBN 978-1-137-56991-2. [Google Scholar]

[34] ↩ Mészáros, I. *Marx's Theory of Alienation*, 5th ed.; Merlin Press: London, UK, 2005; p. 356. ISBN 0-85036-554-6. [Google Scholar]

[35] ↩ Marx, K. *Capital: A Critique of Political Economy: Volume Three*; Engels, F., Ed.; Penguin Classics; Penguin Books: New York, NY, USA, 1981; p. 1088. ISBN 978-0-14-044570-1. [Google Scholar]

able to reestablish themselves 'in a form adequate to the full development of the human race' (Capital, vol. 1, 638)".[36] Thus, the social–ecological project of sustainability in both Marx and Lefebvre's vision is intrinsically tied to the necessity of metabolic restoration, which entails mending the metabolic rifts that capital has generated and organising the social metabolism so it operates within the earthly metabolism. As Engels[37] demonstrated, this includes overcoming "the opposition between town and country", which is now to be understood as "no more a utopia (abstract) than the suppression of the antagonism between capital and wages", but rather actively prevented by capital [28] (p. 98). In short, Lefebvre [28] (p. 131), following Marx, recognised that the "regulation of organic exchanges [including those of raw materials and energy supplied by nature] must become a 'governing law' of the new society". Should humanity fail in this task and allow capital to continue to turn the scientific "mastery over nature" to "the destruction of nature", Lefebvre [28] (p. 149) suggested that "We may very well ask whether the destruction of nature is not an 'integral' part of society's self-destruction, a turning against itself, while maintaining the capitalist mode of production, its forces, and its power".

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This radical vision of sustainability based on the theory of metabolic rift stands in contrast to narrower conceptions of "environmental" sustainability that have tended to diverge from concerns with social and environmental justice, even as the ongoing global consolidation of the capital system undermines both [6,38,39]. Unfortunately, the materialist dialectic of the metabolic rift has not always been adequately understood, especially in more constructivist realms of critical inquiry, closing off keen insights for understanding ecological crisis and potential futures.[40] In part, this is due to an opposition to material–dialectical approaches, which often reflects a tendency to conflate Marx's critique with the object of that critique. Thus, concepts such as the capitalist notion of value or celebration of the absolute domination of nature are falsely imputed to Marx (and Engels), who were in fact highly critical of these ideas [41,42]. Similarly, failures to understand how dialectics entail a combination of identity and distinction in unity has led scholars to inaccurately characterise Marx's approach as either dualistic or monistic [43,44], when it is in truth neither [45,46].

36 ↩ Marx, K. *Capital: A Critique of Political Economy: Volume One*; Engels, F., Ed.; Penguin Classics; Penguin Books: New York, NY, USA, 1976; p. 1152. ISBN 978-0-14-044568-8. [Google Scholar]

37 ↩ Engels, F. *Herr Eugen Dühring's Revolution in Science [Anti-Dühring]*; Dutt, C.P., Ed.; Marxist Library: Works of Marxism-Leninism; International Publishers: New York, NY, USA, 1935; Volume 18, p. 364. [Google Scholar]

38 ↩ Agyeman, J.; Bullard, R.D.; Evans, B. Exploring the nexus: Bringing together sustainability, environmental justice and equity. *Space Polity* **2002**, *6*, 77–90. [Google Scholar] [CrossRef]

39 ↩ Burkett, P. Marx's Vision of Sustainable Human Development. *Mon. Rev.* **2005**, *57*, 34–62. [Google Scholar] [CrossRef]

40 ↩ Napoletano, B.M.; Foster, J.B.; Clark, B.; Urquijo, P.S.; McCall, M.K.; Paneque-Gálvez, J. Making space in critical environmental geography for the metabolic rift. *Ann. Am. Assoc. Geogr.* **2019**, *109*, 1811–1828. [Google Scholar] [CrossRef]

41 ↩ Foster, J.B.; Burkett, P. *Marx and the Earth: An Anti-Critique*; Historical materialism book series; Brill: Boston, MA, USA, 2016; p. 326. ISBN 978-90-04-28879-9. [Google Scholar]

42 ↩ Moore, J.W. Marx's Ecology and the environmental history of world capitalism. *Capital. Nat. Soc.* **2001**, *12*, 134–139. [Google Scholar] [CrossRef]

43 ↩ Castree, N. Capitalism and the Marxist critique of political ecology. In *The Routledge Handbook of Political Ecology*; Perreault, T., Bridge, G., McCarthy, J., Eds.; Routledge international handbooks; Routledge: Oxon, UK, 2015; pp. 279–292. ISBN 978-1-138-79433-7. [Google Scholar]

44 ↩ Moore, J.W. Toward a singular metabolism: Epistemic rifts and environment-making in the capitalist world-ecology. *New Geogr.* **2014**, *6*, 10–19. [Google Scholar]

45 ↩ Napoletano, B.M.; Urquijo, P.S.; Paneque-Gálvez, J.; Clark, B.; York, R.; Franch-Pardo, I.; Méndez-Lemus, Y.; Vieyra, A. Has (even Marxist) political ecology really transcended the metabolic rift? *Geoforum* **2018**, *92*, 92–95. [Google Scholar] [CrossRef]

46 ↩ Malm, A. *The Progress of this Storm: Nature and Society in a Warming World*; Verso: New York, NY, USA, 2018; p. 256. ISBN 978-1-78663-415-3. [Google Scholar]

In regard to Marx's contemporary relevance, Lefebvre was strongly opposed to both a dogmatic assertion of Marxian doctrine and an equally dogmatic rejection of Marx's material–dialectical approach. He insisted that any attempt to understand capitalist modernity must take Marx as one of its starting points but, critically, while paying attention to how capitalist civilisation has evolved since Marx's lifetime [47,48]. Lefebvre also developed a complex, dialectical understanding of the nature-society problematic and its metabolic mediation through social labour throughout his work [49,50], in which he also drew on Friedrich Nietzsche to argue against collapsing all distinctions between the natural and the social—which would thereby deny the imperceptible and indefinable (following Nietzsche) distinction between body and thought[51] (pp. 301–304)[52] (pp. 262–272)—while simultaneously refusing any form of absolute separation or "rigid boundary" between the terms [51] (pp. 312–315). This offers a perspective from which to begin a more insightful investigation into what a radical, sustainable transformation of humanity's social-ecological metabolism would entail.

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Sustainability in Lefebvre's Revolutionary Project

Given his engagement with Marx's theory of metabolic rift, Lefebvre was also sensitive to the rising tide of ecological concerns in the latter half of the twentieth century. In an article on the politics of space that first appeared (in French) in 1970 (and thus shortly after Paris's major rebellion in May 1968 and its worldwide counterparts), Lefebvre[53] (pp. 32–33) observed that "The natural environment is involved in a process of self-destruction in the sense that man, who is an integral and dependent part of the natural environment, is the agent of destruction", rendering the "environment a political issue" and one directly tied into the production of space-time, as both a context of the social metabolism and a social–metabolic process. Moreover, given that "It is impossible to return to the past", the "ravaging and destruction of the natural environment" should be seen as representing a leftist criticism that entails the "collective ownership and management" of remaining natural areas and resources, as well as of "new scarcities, such as water, air, daylight and space" created by capital. This radical approach to the ecological crisis stands in contrast to ecological views that see Marxism and ecological concerns as inherently contradictory, as well as pseudo-constructivist claims that capital produces its own nature, or nature in its own image.[54]

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47 ↩ Lefebvre, H. *The Sociology of Marx*; Pantheon: New York, NY, USA, 1968; p. 214. ISBN 978-0-231-05581-9. [Google Scholar]

48 ↩ Lefebvre, H. *Metaphilosophy*; Elden, S., Ed.; Verso: London, UK, 2016; p. 384. ISBN 978-1-78478-274-0. [Google Scholar]

49 ↩ Lefebvre, H. *Dialectical Materialism*; University of Minnesota Press: Minneapolis, MN, USA, 2009; p. 192. ISBN 978-0-8166-5618-9. [Google Scholar]

50 ↩ Lefebvre, H. Introduction to Modernity: Twelve Preludes September 1959–May 1961; Verso: London, UK, 1995; p. 414. ISBN 978-1-85984-056-6. [Google Scholar]

51 ↩ Lefebvre, H. *Henri Lefebvre: Key Writings*; Elden, S., Kofman, E., Lebas, E., Eds.; Athlone Contemporary European Thinkers; Continuum: London, UK, 2003; p. 304. ISBN 978-0-8264-9246-3. [Google Scholar]

52 ↩ Lefebvre, H. *Hegel, Marx, Nietzsche: Or the Realm of Shadows*; Verso: London, UK, 2020; p. 240. ISBN 978-1-78873-375-5. [Google Scholar]

53 ↩ Lefebvre, H. Reflections on the politics of space. *Antipode* **1976**, *8*, 30–37. [Google Scholar] [CrossRef]

54 ↩ Foster, J.B. Marxism in the Anthropocene: Dialectical Rifts on the Left. *Int. Crit. Thought* **2016**, *6*, 393–421. [Google Scholar] [CrossRef]

Lefebvre saw in the ecological crisis the threat that the capitalist production of space and time posed to the human habitation of Earth. He pointed to the need to allow humanity to consciously produce space and time as an oeuvre, or work (in the sense of art), rather than a product dominated by the narrow dictates of capital accumulation.[55] In this, humanity must recover the appropriation of nature (especially its own nature) from the domination (and thus destruction) of nature [51,52,56]. For Lefebvre, the production of space and time cut to the heart of environmental concerns [56,57]. He repeatedly (see, for example, [32] p. 186) cautioned against using language of pollution, environment, and so on in a way that conceals the distinct feature of the contemporary ecological crisis, i.e., that "the symbiosis—in the sense of exchange of energies and material—between nature and society has recently undergone modification doubtless to the point of rupture" [56] (p. 326). Responding to this metabolic rift in the production of space, in turn, requires reconsidering and asserting the production of space as a whole, as an oeuvre, which entails addressing all of nature, "without, however, isolating it in its pure state by restricting nature to reserves and parks" [55] (p. 133).

Noting the inherent contradiction between ideologies of infinite growth and the stationary state, Lefebvre pointed out that the key factor overlooked in the debate is the extent to which growth has been split apart from development, and the former becomes an end rather than a strategy.

This novel, dialectical approach to overcoming dichotomies also informed Lefebvre's reception of the Club of Rome report [26], a key moment in the emergence of sustainability as a global concern.[58] Noting the inherent contradiction between ideologies of infinite growth and the stationary state, Lefebvre [55] (pp. 132–134) pointed out that the key factor overlooked in the debate is the extent to which growth has been split apart from development, and the former becomes an end rather than a strategy. Taking this back to the production of space, he argued that "Several measures proposed by the Meadows report can be used, without necessarily accepting 'global equilibrium,'" to contemplate technological alternatives, but only as approximations moving towards "the essential question: space". Elsewhere, Lefebvre[59] (pp. 118–119) criticised both those "so-called 'leftist' groups" who "would willingly smash growth, risking a return to the archaic and to the dislocation of the social totality by concentrating on the peripheries alone", and also the "European socialists and communists" who "simply propose to take over the baton from the bourgeoisie" and "regard the critique of growth as simply a kind of generalised Malthusianism" (which is not to deny the frequent attempts by some to infuse questions of growth with neo-Malthusian arguments regarding population).[60] Rather, he saw the issue as one of reasserting development (in a different sense to that in which the term has been reduced to economism) over growth, or a redirection of growth to the satisfaction of social rather than individualistic and capital-induced needs, thus implying its progressive limitation. Hence, the question of sustainability is situated squarely within the production of space and time,

The question of sustainability is situated squarely within the production of space and time, and the need for metabolic restoration—which does not split it off from or substitute it for "class struggle", but rather enlarges this concept to encompass class struggle over the reproduction of the relations of production.

55 ↩ Lefebvre, H. *Toward an Architecture of Enjoyment*; Stanek, Ł., Ed.; University of Minnesota Press: Minneapolis, MN, USA, 2014; p. 248. ISBN 978-0-8166-7720-7. [Google Scholar]

56 ↩ Lefebvre, H. *The Production of Space*; Basil Blackwell: Oxford, UK, 1991; p. 464. ISBN 978-0-631-18177-4. [Google Scholar]

57 ↩ Lefebvre, H. *Rhythmanalysis: Space, Time and Everyday Life*; Athlone contemporary European thinkers; Continuum: London, UK, 2004; p. 130. ISBN 978-0-8264-7299-1. [Google Scholar]

58 ↩ Redclift, M. *Sustainable Development: Exploring the Contradictions*; Routledge: London, UK, 1987; ISBN 978-0-415-05085-2. [Google Scholar]

59 ↩ Lefebvre, H. The Survival of Capitalism: Reproduction of the Relations of Production; St. Martin's Press: New York, UK, USA, 1976; p. 131. [Google Scholar]

60 ↩ Angus, I.; Butler, S. *Too Many People? Population, Immigration, and the Environmental Crisis*; Haymarket Books: Chicago, IL, USA, 2011; p. 280. ISBN 978-1-60846-140-0. [Google Scholar]

and the need for metabolic restoration—which, contrary to accusations by Manuel Castells[61] and Neil Smith,[62] inter alia, does not split it off from or substitute it for "class struggle", but rather enlarges this concept to encompass class struggle over the reproduction of the relations of production [59]. Indeed, this entails a radical appropriation of the concept of sustainability and its reconfiguration as an object and process of class struggle.

Such latent insight into sustainability can be found in several of the issues on which Lefebvre wrote. An attempt to provide a comprehensive and systematic treatment of insights into sustainability in the various themes and debates in which Lefebvre engaged would be difficult in light of their breadth, depth, and diversity, as attested by a recent volume offering a brief overview of his corpus [51], and thus is beyond the scope of this article. Rather, we focus here on some of the more predominant topics with which Lefebvre engaged that have immediate implications for sustainability. In addition to, but also contained within, his ideas on the production of space and time, these are his thesis of the urban revolution, his advocacy of *autogestión* (literally, self-management, but implying control by workers and citizens),[63] and his critique of and demand for a fundamental transformation of everyday life with the associated notion of total revolution, which brings together many of sustainability's different concerns, as well as relating it to the accomplishments and failures of so-called really-existing socialism.

In addition to his ideas on the production of space and time, these are his thesis of the urban revolution, his advocacy of autogestión and his critique of and demand for a fundamental transformation of everyday life with the associated notion of total revolution, which brings together many of sustainability's different concerns.

The Urban Revolution

In The Urban Revolution (written in the context of the 1968 uprisings), Lefebvre[64] (p. 5) described "the transformations that affect contemporary society, ranging from the period when questions of growth and industrialisation predominate (models, plans, programs) to the period when the urban problematic becomes predominant, when the search for solutions and modalities unique to urban society are foremost". The term "urban society", in turn, refers not to the inhabitants of a particular city, but "to the society that results from industrialisation, which is a process of domination that absorbs agricultural production. This urban society cannot take shape conceptually until the end of a process during which the old urban forms, the end result of a series of discontinuous transformations, burst apart" [64] (p. 2). The much-remarked shift in 2007 signifying the preponderance within society of urban settlements is a notable point in this progression, and has helped to bring attention to the important interconnections between urbanisation, slums, and sustainability [65,66,67]. But in itself, this change was more a quantitative than a qualitative phenomenon along

The term "urban society" refers not to "the society that results from industrialisation, which is a process of domination that absorbs agricultural production.

61 ↩ Castells, M. *The Urban Question: A Marxist Approach*; Edward Arnold: London, UK, 1977; p. 502. ISBN 978-0-262-53035-4. [Google Scholar]

62 ↩ Smith, N. *Uneven Development: Nature, Capital, and the Production of Space*, 3rd ed.; University of Georgia Press: Atlanta, GA, USA, 2008; p. 344. ISBN 978-0-8203-3590-2. [Google Scholar]

63 ↩ Elden, S. *Understanding Henri Lefebvre: Theory and the Possible*; Continuum Studies in Philosophy; Continuum: New York, NY, USA, 2004; p. 272. ISBN 978-0-8264-7003-4. [Google Scholar]

64 ↩ Lefebvre, H. *The Urban Revolution*; University of Minnesota Press: Minneapolis, MN, USA, 2003; p. 224. ISBN 978-0-8166-4160-4. [Google Scholar]

65 ↩ UN-HABITAT. State of the World's Cities 2006/2007: The Millennium Development Goals and Urban Sustainability; United Nations Human Settlements Programme: Nairobi, Kenya, 2006; p. 204. [Google Scholar]

66 ↩ UN-HABITAT. *State of the World's Cities 2008/2009: Harmonious cities*; United Nations Human Settlements Programme: Nairobi, Kenya, 2008; p. 224. [Google Scholar]

67 ↩ Davis, M. *Planet of Slums*; Verso: London, UK, 2007; p. 228. ISBN 978-1-84467-160-1. [Google Scholar]

the progression described by Lefebvre [64] (p. 15) from the industrial city (itself the outcome of previous historical tendencies), through a dialectical process of implosion–explosion, into the critical zone, where the "urban problematic becomes a global phenomenon". The status of the town–country antagonism emphasised in Marx's presentation of the metabolic rift is transformed through this implosion–explosion, as the urban fabric ensnares the rural in its net, but without overcoming or mastering the town–country opposition [32] (p. 120). Indeed, the agrarian crisis underlies and aggravates the crisis of the traditional city [32] (p. 126, p. 150), as both are dissolved through the triadic process of homogenisation–fragmentation–hierarchisation in the capitalist production of space [51,56] (pp. 206–216). The capitalist state, in an instance of the state absorbing the contradictions in space of capital and its predecessors and transforming them into new contradictions of space [56,[68]], plays a key role in this process. It imposes a homogenisation of space as private property that retains the rural–urban distinction, and incorporates others in the fragmentation and hierarchisation of space. Through this, the urban–rural tension is actually intensified and interferes with other real relations [32], even as urbanisation extends over society. Actually overcoming this town–country antagonism, which is now absorbed into the more general antagonistic social division of labour and division of society against itself, requires displacing the economic factor, whose priority is overwhelming under capitalist relations of production [28,[69]].

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Suburbanisation, of course, has further blurred the urban–rural distinction,[70] but at the cost of exacerbating the associated tensions and metabolic contradictions rather than resolving them, with the extension of capitalist urbanisation into the countryside producing a "reciprocal degradation" involving the "urbanisation of the countryside" and the "ruralisation of the city" [28] (p. 140). At the global level, the "planetarisation of the urban", abetted by suburbanisation, poses "the major risk that space will be homogenised and that diversities will be annihilated" alongside the fragmentation and hierarchisation of spatial segregation and exclusion[71] (p. 205). Indeed, the proliferation of standalone houses, and the private automobility and its destructive infrastructure with which this process is entwined [55,56,[72]], has been widely recognised as a fundamental obstacle to sustainability,[73] and an instance of how technological development subordinated to capital tends to accelerate the destruction of nature while increasing society's dependence on commodity exchange. Importantly, Lefebvre [32] examined suburbanisation in terms of a class strategy, which incorporates different, sometimes contradictory, objectives and tactics (including the political objective of calming

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[68] ↩ Lefebvre, H. *State, Space, World: Selected Essays*; University of Minnesota Press: Minneapolis, MN, USA, 2009; p. 344. ISBN 978-0-8166-5317-1. [Google Scholar]

[69] ↩ Lefebvre, H. *The explosion: Marxism and the French Upheaval*; Monthly Review: New York, NY, USA, 1969; p. 160. ISBN 978-0-85345-102-0. [Google Scholar]

[70] ↩ Benton, T. The rural-urban division in U.K. politics. *Capital. Nat. Soc.* **2007**, *18*, 20–43. [Google Scholar] [CrossRef]

[71] ↩ Lefebvre, H. Dissolving city, planetary metamorphosis. *Environ. Plan. D* **2014**, *32*, 203–205. [Google Scholar] [CrossRef]

[72] ↩ Sweezy, P.M. Cars and cities. *Mon. Rev.* **2000**, *51*, 19–35. [Google Scholar] [CrossRef]

[73] ↩ Martin, G.T. Global automobility and social ecological sustainability. In *The Urban Political Economy and Ecology of Automobility: Driving Cities, Driving Inequality, Driving Politics*; Walks, A., Ed.; Routledge Studies in Urbanism and the City; Routledge: London, UK, 2014; pp. 23–37. ISBN 978-0-415-70615-5. [Google Scholar]

working-class dissent, the economic objective of maintaining a sufficient demand for housing and automobiles to keep up with supply, cultural preferences for home ownership and open space, etc.), and relates it to the rural–urban antagonism, thereby evading simplistic reductions to cultural preferences or even particular economic objectives. Thus, the global proliferation of suburbanisation is as intrinsically related to alienation from nature as it is to the pursuit of constant growth, and is a focal point of various social–metabolic contradictions and—equally important—contestations in the capitalist production of space.[74]

Fundamental to this process (an instance of "geographic rift" sensu[75]) is the commodification—or in Marxist terms, their conversion to and domination by exchange-value (the value form of commodities expressed quantitatively as money) over use-value (the natural-material or qualitative aspects of commodities)—of land, space, and the living bodies that inhabit and produce them, and their subsequent expropriation by increasingly globalised market forces [32,56,[76]]. Thus, it is with reason that Lefebvre [28] (p. 102) carefully (but not uncritically) reviewed Engels's [37] aforementioned response to Herr Dühring's assertion that the town–country separation is a permanent characteristic of society, noting that both Marx and Engels were in complete agreement on the need to overcome this separation "by overturning the socioeconomic relations that constitute the armature of bourgeois society", and thus by "eliminating the division of labour". Once again, this demonstrates that sustainability, at least in a radical sense of providing conditions for full present and future development, is inherently an issue of class struggle.

Lefebvre keenly sensed how capital addresses the rural-urban opposition in a manner typical of its handling of its contradictions. That is, rather than resolving contradictions, capital absorbs, generalises, and displaces them, such that the fragmentation and spatial and temporal separation of production and consumption (when the two are not immediately identical; see[77]) become characteristic of capitalist society as whole. The same is true in regard to various other spatial-temporal fragmentations of everyday life and the social-ecological metabolism (such as recreation, labour, and reproduction), including the fragmentation and hierarchisation of the city itself [51,56].

With the increasing global integration of labour-value or commodity chains in an imperialistic world economy, this triad of homogenisation–fragmentation–hierarchisation has produced an increasingly acute "global rift" that has compounded the interlinked ecological, economic, as the COVID-19 pandemic has brutally demonstrated.

With the increasing global integration of labour-value or commodity chains in an imperialistic world economy, this triad of homogenisation–fragmentation–hierarchisation has produced an increasingly acute "global rift"[78] that has compounded the interlinked ecological, economic, and, as the COVID-19 pandemic has brutally demonstrated, epidemiological vulnerabilities of the capital system.[79] At the same time, Lefebvre's notion of a progressive environmental politics of space does not call for the restoration of a (real or imagined) rural-urban harmony from the past, but an understanding of the perils and possibilities opened up by the present process of the urbanisation of society.

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[74] ↩ Napoletano, B.M.; Paneque-Gálvez, J.; Méndez-Lemus, Y.; Vieyra, A. Geographic rift in the urban periphery, and its concrete manifestations in Morelia, Mexico. *J. Lat. Am. Geogr.* **2019**, *18*, 38–64. [Google Scholar] [CrossRef]

[75] ↩ Napoletano, B.M.; Paneque-Gálvez, J.; Vieyra, A. Spatial fix and metabolic rift as conceptual tools in land-change science. *Capital. Nat. Soc.* **2015**, *26*, 198–214. [Google Scholar] [CrossRef]

[76] ↩ Foster, J.B.; Clark, B. *The Robbery of Nature: Capitalism and the Ecological Rift*; Monthly Review Press: New York, NY, USA, 2020; p. 386. ISBN 978-1-58367-841-1. [Google Scholar]

[77] ↩ Marx, K. *Grundrisse: Foundations of the Critique of Political Economy*; Penguin Classics; Penguin Books: New York, NY, USA, 1973; p. 912. ISBN 978-0-14-044575-6. [Google Scholar]

[78] ↩ Foster, J.B. Late imperialism: Fifty years after Harry Magdoff's The Age of Imperialism. *Mon. Rev.* **2019**, *71*, 1–19. [Google Scholar] [CrossRef]

[79] ↩ Foster, J.B.; Suwandi, I. COVID-19 and catastrophe capitalism: Commodity chains and ecological-epidemiological-economic crises – The Jus Semper Global Alliance, September 2020.

Key to grasping these possibilities is understanding how conflicts between the peripheralisation of people and the centralisation of power become an important site of struggle, as "Such conflicts—occasionally—allow something other to break the barriers of the forbidden" [56] (p. 379), opening new opportunities in the possible–transgression–impossible dialectic.

Lefebvre confronted the aforementioned urban revolution and its problematic with the now-famous cry, in a book by the same title (to commemorate the centenary of Capital), of "the right to the city", which was taken up during and following the Paris uprising in 1968 (English translation in [26]). This concept, which became a cornerstone of critical urban theory,[80] entails a challenge to the shunting of peoples into peripheries by the urban process and a demand for substantive control over the production of space and urbanisation by urban inhabitants (which, in Lefebvre's reconceptualisation of the urban, would include inhabitants conventionally designated "rural", as well as an expanded notion of citizenship and "belonging" more generally [51] pp. 238–254), in opposition to the "growth machines" formed by the alignment of political and economic interests.[81] This change entails an alteration of the centralisation of decision-making and consumption that has contradictorily accompanied the dispersal of the urban fabric. It involves comprehending the historical shifts that have taken place; the creation of new, revolutionary urban forms [32] (pp. 120, 170); and a recognition of how the town–country antagonism has been subsumed within the larger class contradictions of capital as the social division of labour between town and country [28,32].

Reconceptualising the city as a form–content unity that provides the place of encounter, culture, and human development that gives meaning to industrial production, rather than just the form of concentrated settlements, necessitates understanding the historical manner in which reason arose in the city in the face of peasant lives dominated by nature, despite this rationality now seemingly dissociated from the city.

Reconceptualising the city as a form–content unity that provides the place of encounter, culture, and human development that gives meaning to industrial production, rather than just the form of concentrated settlements, necessitates understanding the historical manner in which reason arose in the city in the face of peasant lives dominated by nature, despite this rationality now seemingly dissociated from the city [32] (pp. 127–131). Here, Lefebvre's analysis highlights how the appropriation of nature involves (1) the technical and scientific mastery of nature; (2) the need for art (understood as "praxis and poesies on a social scale", or a creative engagement with nature not premised on its destruction, rather than mere ornamentation); and (3) philosophy, or the unification of the philosophical human with its flesh-and-blood counterpart, to help restore the oeuvre. In other words, these factors are an important part of the social metabolism within new urban forms, which influence the production of space and especially the urban as a work of art and a metabolic process rather than a product. They create a foundation to assert the non-destructive *appropriation* of nature, space, and time against capital's destructive expropriation in the pursuit of ever-more value in the abstract form of money [32] (pp. 173–176). In this sense, space acts as both the context in which the social-ecological metabolism operates and a contested moment of this metabolism.

Correspondingly, this understanding entails a reconceptualisation of both the urban and the rural from the conventional focus on form, as well as a rethinking of the city from a fixed and sterile habitat into a space that is inhabited, a play on words that emphasises a prioritisation of time over space, in the sense that time (history) comes to be written in space

[80] ↩ O'Byrne, D. A contribution to building unified movements for the environment: Aligning interests, forming alliances. *Hum. Geogr.* **2020**. [Google Scholar] [CrossRef]

[81] ↩ Logan, J.R.; Molotch, H. *Urban Fortunes: The Political Economy of Place*; 20th Anniversary; University of California Press: Berkeley, CA, USA, 2007; p. 413. ISBN 978-0-520-25428-2. [Google Scholar]

[32] (p. 172), as well as the dialectical unity of form and content. The relationship of this somewhat abstract concept with sustainability is perhaps given a bit more clarity in Lefebvre's suggestion that, unlike at present—where "second nature" (i.e., nature transformed by humans) is premised on the destruction of "first nature" (i.e., nature without humans to some degree or another)—with the conscious, rational [32] (p. 131), and cooperative production of space, a more revolutionary second nature could be superimposed "without wreaking complete destruction" [56] (p. 348). In other words, a new social metabolic order is possible, and is indeed necessary to sustain the conditions that support life.

Sustainability is perhaps given a bit more clarity in Lefebvre's suggestion that, unlike at present—where "second nature" (nature transformed by humans) is premised on the destruction of "first nature" (nature without humans to some degree or another)—with the conscious, rational and cooperative production of space, a more revolutionary second nature could be superimposed "without wreaking complete destruction".

Another important aspect of the right to the city in regard to sustainability is its contrast with a notion of a "right to nature", which, in Lefebvre's experience [32] (pp. 157–158), leads to the commercialisation and colonisation of nature and the countryside through "organised leisure", suburbanisation, and the various ways in which "urban dwellers carry the urban with them". Under the social metabolic order of capital, the rights to nature and the countryside ultimately end up "destroying themselves", i.e., their objects. In this sense, Lefebvre argued that the "need and the 'right' to nature contradict the right to the city without being able to evade it", though he also clarified that this "does not mean that it is not necessary to preserve vast 'natural' spaces". In other words, the right to the city can be understood as an active engagement in the production of space-time by urban inhabitants in a manner that allows the "urban" to serve as a "place of encounter" and "priority of use value". Thereby, this change creates an urban fabric, or urban society, that can encompass nature and rural society without destroying them. This position is not entirely dissimilar to various proposals for systems of nature preserves and protected areas, except that it recognises the designation of a "natural" area as a performative action and stipulates the right of the inhabitants to organise space as a whole as the necessary starting point rather than an incidental consideration. Importantly, this conception presents a direct challenge to the ownership of land as private property, and thus the very foundations of capital [32] (p. 210). The implications of the right to the city become further apparent when this is related to Lefebvre's advocacy of *autogestión*.

Autogestión

Although frequently translated as "self-management" (including in several of Lefebvre's works), Stuart Elden [63] (p. 226) suggests that the "term *autogestión* is best left untranslated", as it implies more than the literal translation conveys, including the notion of control by the producers and inhabitants and an ongoing process subject to critical self-reflection. Mihailo Marković[82] (pp. 493–494) argues that the concept is inherent to socialist democracy going back to the utopian socialist proposals prior to Marx, though the idea also carries connotations of opposition to Soviet-style state socialism. Importantly, Lefebvre referred frequently to the concept in his works. He included the right to *autogestión* in his new contract of citizenship, defining it as "knowledge of and control (at the limit) by a group—a company, a locality, an area or a region—over the conditions

Lefebvre included the right to autogestión in his new contract of citizenship, defining it as "knowledge of and control (at the limit) by a group—a company, a locality, an area or a region—over the conditions governing its existence and its survival through change", indicating it needs to be recognised as a social-ecological and thus interdependent metabolic process.

[82] ↩ Bottomore, T. *A Dictionary of Marxist Thought*, 2nd ed.; Bottomore, T., Ed.; Wiley-Blackwell: Oxford, UK, 1992; p. 664. ISBN 978-0-631-18082-1. [**Google Scholar**]

governing its existence and its survival through change", indicating it needs to be recognised as a social-ecological and thus interdependent metabolic process [51] (p. 252). He carefully distinguished *autogestión* from co-management (or, in more contemporary terms, stakeholder participation), which he described as a "hollow (and dangerous) slogan" that limits confrontation to a framework that suits the existing authoritarian form of management [59] (pp. 120–121), as well as from autonomy (particularly of universities), which tends to weaken the link to "society as a whole" and can result in subordination "blindly to the exigencies of the market" [69] (p. 87), thereby leaving the existing social–metabolic configuration intact.

Lefebvre [69] (p. 84) proposed *autogestión* as an answer to the "problem of the socialisation of the means of production posed by Marx" that avoids the "authoritarian and centralised planning" of state socialism. This is not to say that he put it forward as a panacea, however, as he acknowledged that it entails several risks—including that of becoming an empty slogan or degenerating into co-management—and raises numerous problems, not the least of which being the need to implement it worldwide without sacrificing direct control, and the tension between the technical and the social division of labour and its spatial expression. Moreover, he emphasised that *autogestión* must extend beyond the economic realm to the social and political, and thus become a strategy, or else it will fail [59] (p. 120). In this, *autogestión* and sustainability face the same fate: either they are elevated to the level of a strategy addressed to the transformation of society as a whole, or they lapse into empty slogans. Also like sustainability, *autogestión* is not something that can be put on hold pending a social revolution, but must be pursued immediately lest society move in the opposite direction, and in fact helps to build and define the movement necessary to carry out the more profound social transformation. István Mészáros [17] (pp. 763, 845) emphatically made the same argument regarding *autogestión*, maintaining that it is a necessary component of the planning and "substantive democratic decision making from below" that must together "define the elementary requirements of the socialist hegemonic alternative to capital's social metabolic order". In this, *autogestión* is an integral part of the necessity for social control that comprises a new social metabolic order.

The autogestión is a necessary component of the planning and "substantive democratic decision making from below" that must together "define the elementary requirements of the socialist hegemonic alternative to capital's social metabolic order".

Of direct relevance to sustainability is the manner in which Lefebvre [59] (p. 121) saw *autogestión* as capable of effecting a "breach in the existing system of decision-making centres that manage production and organise consumption without leaving producers and consumers with the slightest concrete freedom or the slightest participation in making real choices". Under monopoly-finance capital, the amount of material and energy that is wasted even in the provision of basic necessities, through the packaging, forced obsolescence, the stimulation (or simulation) of desire, and the means of destruction (e.g., the military-industrial complex), is difficult to quantify, but even rough approximations suggest an astronomical waste of resources (see, for example, [83,84,85]). Thus, *autogestión* offers an important corrective to attempts to develop

Lefebvre's conception of autogestión points to the need to overcome the alienation of space and time by situating control in the hands of the associated producers, while giving a more concrete sense of what this entails without suggesting a pre-established formula that can be imposed in each context.

83 ↩ Foster, J.B. The Theory of Monopoly Capitalism: An Elaboration of Marxian Political Economy; Monthly Review: New York, NY, USA, 2014; p. 320. ISBN 978-1-58367-441-3. [Google Scholar]

84 ↩ Smil, V. Improving efficiency and reducing waste in our food system. *Environ. Sci.* **2004**, *1*, 17–26. [Google Scholar] [CrossRef]

85 ↩ Baran, P.A.; Sweezy, P.M. *Monopoly Capital: An Essay on the American Economic and Social Order*; Monthly Review: New York, NY, USA, 1966; p. 416. ISBN 978-0-85345-073-3. [Google Scholar]

sustainability indices based on assumptions of consumer sovereignty, the efficiency impelled by market competition, and per-capita estimates of material and energy use (a habit heavily criticised by Cohen).[86] It also offers more depth than the United Nations' optimistic aspirations for "sustainable consumption and production" and decoupling [87,88] in the absence of a fundamental reconfiguration of society's metabolic interchange with the rest of nature. That is, Lefebvre's conception of *autogestión* points to the need to overcome the alienation of space and time by situating control in the hands of the associated producers, while giving a more concrete sense of what this entails without suggesting a pre-established formula that can be imposed in each particular context. It also calls attention to the scale of transformation that genuine sustainability would entail, which extends up to the level of the state and the interstate system, but is rooted in a complete transformation of everyday life. In this sense, sustainability is not something that can be pursued by an individual, lifestyle, or city in isolation from the rest of the process of totality.

Transformation of Everyday Life and the Total Revolution

Lefebvre's [11] three-volume Critique of Everyday Life represents a sustained and comprehensive engagement with Marx's concept of alienation that spanned more than three decades, with the first volume published in 1947 and the third in 1981. (He also published a closely related book in 1968).[89] With the central place that everyday life has assumed under capitalist modernity, it plays a key role in the mediation of the social metabolism with the rest of nature, and therefore must be considered as within a totality. This has important implications, particularly for ecological–modernistic notions of decoupling that rely on a combination of technological optimism and an autonomous realm of culture amenable to transformation without addressing the fundamental features of the capital system, or that even claim to harness it in whole or part to sustainability (e.g., [90,91]).

With respect to the revolutionary role of information technology, Lefebvre [11] (p. 1171) cautioned that it "can neither resolve nor cancel contradictions: it can only express them or disguise them". Even if we set aside the extent to which the so-called non-material goods sector relies on a metabolic process rooted in its material counterpart (including computers and other electronic devices, transportation, infrastructure, energy, etc.), the flood of trivial and outright false information through which one must sift on the Internet, in addition to the bombardment of advertising, confirms Lefebvre's [11] (pp. 1176–1177) prescient observation that the concentration of growth in the non-material goods sector "tends thereby to choke and even paralyse it". Even more fundamentally, such a technological and cultural "solution" to the problem of sustainability depends on the very same process that

The further subjecting of "everyday life" to such technocratic and capitalist manipulation would be consistent with what Lefebvre described as the "Bureaucratic Society of Controlled Consumption" characteristic of the present, formally rational social order.

86 ↩ Cohen, J.E. *How Many People Can the Earth Support*; W. W. Norton & Company: New York, NY, USA, 1996; p. 544. ISBN 978-0-393-31495-3. [Google Scholar]

87 ↩ UNDESA. *Global Sustainable Development Report 2015: Advance Unedited Version*; United Nations Department of Economic and Social Affairs: New York, NY, USA, 2015; p. 202. [Google Scholar]

88 ↩ UNDESA. Global Sustainable Development Report 2019: The Future is Now—Science for Achieving Sustainable Development; United Nations Department of Economic and Social Affairs: New York, NY, USA, 2019; p. 252. [Google Scholar]

89 ↩ Lefebvre, H. *Everyday Life in the Modern World*; Harper Torchbook: New York, NY, USA, 1971; p. 206. ISBN 06-131608-3. [Google Scholar]

90 ↩ Asafu-Adjaye, J.; Blomqvist, L.; Brand, S.; Brook, B.; DeFries, R.; Ellis, E.; Foreman, C.; Keith, D.; Lewis, M.; Lynas, M.; et al. *An Ecomodernist Manifesto*; Breakthrough Institute: Oakland, CA, USA, 2015; p. 32. [Google Scholar]

91 ↩ Wilson, E.O. *Half-Earth: Our Planet's Fight for Life*; Norton: New York, NY, USA, 2016; p. 272. ISBN 978-1-63149-252-5. [Google Scholar]

generated the unsustainable metabolic ruptures in the first place: the deeper penetration of capital and its programming of consumption (especially through the alienating application of technology [48]) into every aspect of everyday life.[92]

The further subjecting of "everyday life" to such technocratic and capitalist manipulation would be consistent with what Lefebvre [89] (pp. 60–66) described as the "Bureaucratic Society of Controlled Consumption" characteristic of the present, formally rational (in the Weberian sense) social order. Nevertheless, he also noted that the imposition of this same formally rational, instrumentalist programming on society prompts rebellions, contradictions, and the displacement of basic problems, tending towards collapse as it encounters irreconcilable residues in nature (both human and non-human). What makes the advocacy of such a path to sustainability even more counterproductive is the manner in which capital has profited from the ways that human alienation frustrates the possibilities of development and the realisation of potential, which render everyday life intolerable. These conditions create a need for escape that, together with the loss of the féte and enjoyment to the domination of exchange-value [55], in turn offers capital numerous outlets to market commodities for recreational consumption and tourism, thereby exacerbating social-ecological ruptures in several metabolic processes. Moreover, this alienation actually arrests humanity's adaptation to and mastery of its own internal nature, and constantly attempts to impose a linear rhythm of accumulation over the cyclical and non-cumulative rhythms of everyday life [52,57,89]—thereby pushing the "cultural" moment (whose splitting off into a separate moment, like the emergence of the everyday, is itself a relatively recent social phenomenon associated with capitalist modernity [50]) of society further from sustainability.

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These contradictions inform Lefebvre's conception of "total revolution", and its accounting for the empirical metabolic performance of "really-existing" (state) socialism. In its basic contours, the notion of total revolution is fairly straightforward: inasmuch as capitalist modernity has constituted the economic, political, and cultural as fairly distinct "planes", the revolutionary project must occur on all three [89] (pp. 197–199). Such a revolution necessarily entails a total transformation of everyday life, but is not by this an individual act; rather, it is a social one, as it likewise entails a complete reconfiguration of humanity's social-ecological metabolic configuration, or a metabolic revolution. The implications of this straightforward proposition, however, are far more complex and profound, and much of Lefebvre's prolific writing can be characterised as attempts to work through different aspects of these in various ways, with a critical re-appraisal of Marx's writing serving as his starting point [47,[93]].

Despite the fact that some of the most diverse and comprehensive criticisms of the Soviet Union under Stalin and afterwards were associated with Marxism, the unsustainable record of the former is still often associated with the latter in popular imagination.

Despite the fact that some of the most diverse and comprehensive criticisms of the Soviet Union under Joseph Stalin and afterwards were associated with Marxism (e.g., [17,[94],[95]]), the unsustainable record of the former is still often associated

[92] ↩ Lefebvre, H. Toward a leftist cultural politics: Remarks occasioned by the centenary of Marx's death. In *Marxism and the Interpretation of Culture*; Macmillan: London, UK, 1988; pp. 75–88. [**Google Scholar**]

[93] ↩ Kolakowski, L.; Lefebvre, H. Evolution or revolution. In *Reflexive Water: The Basic Concerns of Mankind*; Elders, F., Ed.; Souvenir Press: London, UK, 1974; pp. 199–267. ISBN 978-0-285-64742-8. [**Google Scholar**]

[94] ↩ Amin, S. Crisis, nationalism, and socialism. In *Dynamics of Global Crisis*; Monthly Review: New York, NY, USA, 1982; pp. 167–231. ISBN 978-0-85345-606-3. [**Google Scholar**]

[95] ↩ Arnove, A.; Binns, P.; Cliff, T.; Harman, C.; Shawki, A. (Eds.) *Russia: From Workers' State to State Capitalism*; International Socialism; Haymarket Books: Chicago, IL, USA, 2003; pp. 106–148. ISBN 1-931859-06-X. [**Google Scholar**]

with the latter in popular imagination.[96] (Importantly, a very different record exists in Cuba, irrespective of one's perspective on its Marxist status.)[97] Given such reduction of environmental destruction to Marxism, a brief mention of Lefebvre's perspective on this issue is warranted. To begin, he pointed out that "History has been influenced as much, if not more, by the falsification of Marxism as by Marx's thinking" [51] (p. 248). Though a member of the French Communist Party from 1928 until either departing or being expelled (accounts vary) in 1958, Lefebvre tended to be highly critical of Stalinist dogma, with his 1939 Dialectical Materialism described by Michael Kelly[98] (p. 62) as "the antithesis of diamat", the official version of dialectical materialism promulgated by Stalin. With respect to the total revolution, Lefebvre [89] (p. 198) argued that progress on the cultural plane in the Soviet Union and elsewhere "has been blocked by economistic, politicising, and philosophising interpretations of Marx's doctrine" that impeded its realisation and the transformation of everyday life, as well as resulting in an official Marxism so fixated on the control of nature that it became oblivious to Marx's notion of appropriation [50]. More fundamentally, Lefebvre argued that, in consolidating power and assuming the responsibility of administering growth, Stalin moved the Soviet Union in the opposite direction to Marx's project of the withering away of the state, and was converging with the increased intervention of capitalist states in maintaining conditions for growth and penetrating everyday life in the consolidation of what he called the "state mode of production" [68] (pp. 2686–2710). Thus, the revolutionary project to date has not been total in either its geographical scope or its comprehensive transformation of society from bottom to top, and the resulting social–ecological metabolic configurations have remained subject to the dictates of the capital system [17].

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Lefebvre recognised the importance of subjecting reality to such critical scrutiny, but he also recognised that critique that satisfies itself with finding faults in the present social–metabolic order is not sufficient, as it must more importantly "find the opening, the way of escape".

Lefebvre [89] (p. 150), like Marx, recognised the importance of subjecting reality to such critical scrutiny, but he also (again, like Marx) recognised that critique that satisfies itself with finding faults in the present social–metabolic order is not sufficient, as it must more importantly "find the opening, the way of escape". This, for him, entailed addressing the philosophical dissolution of power, and recognising the way it is concentrated among a small sector of powerful "decision-makers" with control over the media and the political process, as the mode of production dominates and subordinates the whole social-ecological metabolic process in its inherently partial and fragmented attempts to constitute itself as a coherent system [59] (p. 10). Moreover, he did not view revolutionary transformation as an end state or the simple solution to society's problems, but a process necessary for developing the social conditions under which solutions and resolutions could be worked out and pursued [32] (p. 25). Correspondingly, Lefebvre [59] (p. 91) maintained that the project of transition and transformation cannot be expected to follow from such a revolution, but must precede and inform it, whereas merely insisting that nothing can be done prior to such a revolution is actually a form of conservatism. As part of this project, and as a way to move beyond the back-and-forth debate between

96 ↩ Foster, J.B. *The Ecological Revolution: Making Peace with the Planet*; Monthly Review: New York, NY, USA, 2009; p. 328. ISBN 978-1-58367-179-5. [Google Scholar]

97 ↩ Betancourt, M. The effect of Cuban agroecology in mitigating the metabolic rift: A quantitative approach to Latin American food production. *Glob. Environ. Chang.* **2020**, *63*, 102075. [Google Scholar] [CrossRef]

98 ↩ Kelly, M. Henri Lefebvre, 1901–1991. *Radic. Philos.* **1992**, *60*, 62–63. [Google Scholar]

Lefebvre argued, the social–ecological contradictions of capital's mode of metabolic control and the urgent need to develop an alternative are not merely academic issues, but already issues of life or death for countless people.... Taking into account the lessons of the way the COVID-19 pandemic propagated through the capital system, it seems even more apparent now that the alternative of sustaining capital's mode of social–ecological metabolic control renders Francis Fukuyama's postulation that the capitalist state could constitute "the final form of human government" more ominous than its author intended.

reformism and revolution, Lefebvre [69] (p. 126) proposed, based on the experience of May 1968, a strategy of "revolutionary reforms", each of which does not in itself constitute a revolution, but nonetheless "strikes at the structures of society—the social relations of production and property". This, together with Lefebvre's aforementioned aphorism regarding the need to demand the impossible to gain the possible, is pertinent to the challenges facing sustainability, where a similar question of strategy has been raised, if often in a somewhat more muted form of cooperation or confrontation.[99] Moreover, as Lefebvre [32] (p. 186) argued, the social–ecological contradictions of capital's mode of metabolic control and the urgent need to develop an alternative are not merely academic issues, but already issues of life or death for countless people. This fact prompted him to clarify that, without surrendering to a catastrophic nihilism, the cry of "Beware! Revolution or death" is best understood as meaning, "If you do not want us to die, make the revolution, swiftly, totally". Thus, he described total revolution as "today par excellence the impossible-possible (that is, possibility, necessity and impossibility)! There is nothing closer and more urgent, nothing more fleeting and more remote". While revolutionary transformation is not a simple task, it remains a necessary one. Taking into account the lessons of the way the COVID-19 pandemic propagated through the capital system, it seems even more apparent now that the alternative of sustaining capital's mode of social–ecological metabolic control renders Francis Fukuyama's[100] (p. 4) postulation that the capitalist state could constitute "the final form of human government" more ominous than its author intended.

The appropriation of 'nature' has two aspects: mastery of the external world, and appropriation by man of his own nature. As much as technological development under capital's mode of social-ecological metabolic control may have contributed to the first aspect, it has actually impeded the second. As a result, the appropriation of nature under capital has become its domination and destruction.

Conclusions

From a meta-philosophical perspective (which involves the utilisation of philosophical concepts without attempting to constitute a final, closed system), Lefebvre [48] (p. 260) argued that "The appropriation of 'nature' has two aspects: mastery of the external (material) world, and appropriation by man of his own nature (biological, physiological, social, psychological)". As much as technological development under capital's mode of social-ecological metabolic control may have contributed to the first aspect, it has actually impeded the second [52]. As a result, the appropriation of nature under capital has become its domination and destruction. Expectations that a combination of technological development, limited policy interventions, and a shift in cultural values under capital can eventually balance the two aspects and restore appropriation essentially posit the constitution of a closed totality out of three isolated fragments of reality, and thus exacerbate the underlying alienation from nature responsible for the metabolic rift and intensify its social-ecological contradictions. By contrast, Lefebvre [59] put forward the total revolution as a process of totalisation

[99] ↩ Brulle, R.J.; Jenkins, J.C. Spinning our way to sustainability? *Organ. Environ.* **2006**, *19*, 82–87. [Google Scholar] [CrossRef]

[100] ↩ Fukuyama, F. The end of history? *Natl. Interest* **1989**, *16*, 3–18. [Google Scholar]

that is constantly self-critical and therefore open, capable of self-transformation through the incorporation of residues thrown up by partial totalisations. In this article, we focused on specific aspects of Lefebvre's thought with more obvious implications for sustainability, but this more abstract meta-philosophical aspect is an important underlying theme. Thus, it also points to a fruitful avenue for further examination and debate, particularly with respect to the ideological orientations of different visions of sustainability, which are more commonly known and we do not have the space to discuss here.

Of equal importance to sustainability is the manner in which Lefebvre's thought can contribute to the social mobilisation necessary to fulfil most (non-technocratic[101]) visions of sustainability. In discussing the notions of *autogestión*, space as the stake and site of social struggle, and the same dynamics in regard to everyday life, we have pointed to some of the ways in which this can be pursued, but in a fairly abstract way. This is not due to a disregard for the complexities of engagement with actual social mobilisation, but recognition that these concepts, like sustainability, are ones whose more concrete dimensions cannot be set down in advance and imposed unilaterally. As Peter Marcuse [24] (p. 194) has explained of Lefebvre's formulation of the right to the city, "It is not for lack of imagination or inadequate attention or failing thought that no more concrete picture is presented, but because, precisely, the direction for actions in the future should not be preempted, but left to the democratic experience of those in fact implementing the vision". This has important implications for expectations that sustainability can be achieved through the provision of scientific information at the level of policy and managerial interventions alone. Indeed, the notion of *autogestión* especially emphasises that society must pursue its objectives as a whole through the substantive participation of each of its members. To somewhat oversimplify Lefebvre's notion of total revolution, the necessary social transformation must take place on the economic, political, and cultural planes together, and entail a transformation of everyday life to achieve the lasting reconfiguration of the social metabolism necessary to bring about sustainable interchange with the universal metabolism of nature. Translating this into a worldwide movement remains a formidable challenge, but then, if overcoming the social barriers to sustainability were easy, we likely would not be in our present situation. Moreover, as Lefebvre [60] (p. 127) cautioned, failing to undertake such a reconstruction of society as a whole from below will likely permit a reconstitution of the state from above, and thus further solidify the existing impediments to the transformations that sustainability entails.

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As we stated previously, what we have undertaken here is an overview of some of the aspects of Lefebvre's writing and its engagement with the metabolic rift that we believe are of potential interest to sustainability scholarship. We have not attempted to offer a comprehensive analysis of Lefebvre's work, the metabolic rift, or their implications for and notions of sustainability. Thus, many avenues of Lefebvre's thought remain open for further exploration. In addition to the meta-philosophical aspects of the social-ecological metabolic interplay between society and nature, Lefebvre's [57] later work on *rhythmanalysis* incorporates most other aspects of his thought, and brings the production of space into relation with the production of time in a manner that could help to reconceptualise these as a social-ecological metabolic process of and in space-time. This, in turn, could stimulate important debates and conceptual developments in sustainability

[101] ↩ Franch-Pardo, I.; Napoletano, B.M.; Bocco, G.; Barrasa, S.; Cancer-Pomar, L. The role of geographical landscape studies for sustainable territorial planning. *Sustainability* **2017**, *9*, 2123. [**Google Scholar**] [**CrossRef**]

science. Similarly, Lefebvre's extensive critique of the modern state (portions of which are translated in [51,68] and aspects of which appear throughout his corpus) could provide invaluable insights into efforts to encourage advances towards sustainability through policy interventions. For, until and unless Marx's vision of the withering of the state is realised, it remains an important site and stake of struggle, and recognition that engagement with the state alone is incapable of realising a sustainable transformation of humanity's social-ecological metabolism is not the same as rejecting all efforts to implement better policies out of hand. Rather, as Lefebvre's proposed revolutionary reformism suggests, attempts to influence policy can play an important role in the transformation of society, provided that they are recognised as means rather than ends.

Importantly, engagement with Lefebvre reminds us that sustainability cannot be pursued as an abstract, utopian project, with its precise contours and specifics worked out in isolation from praxis and then imposed on the rest of society. While the task of determining and pursuing the necessary conditions to facilitate the social development of a sustainable social metabolic order is urgent, it must be undertaken with a self-critical understanding of the relationship between science and society as a whole. This entails not only identifying the inherent barriers to sustainability under the present social–metabolic system of control, but also continuing to pursue a greater understanding of the nature within which humanity is mutually constituted, warning society of the likely consequences and metabolic rifts of continuing along current metabolic trajectories, and supporting and engaging in the struggle to overcome the systemic barriers to sustainability, with the recognition that this entails a confrontation with and eventual overturning of the fundamental institutions of the capital system [17]. Given the current social division and fragmentation of labour, it is unlikely that each person will contribute equally to each of these different tasks, but the greater the extent to which they are pursued in cooperation by associated producers, the more likely genuine progress towards sustainability can be made as part of a social-ecological project of bringing about a better society.

It would undoubtedly be unrealistic to expect all sustainability scholars to accept Lefebvre's revolutionary Marxist project as a route to sustainability. Indeed, for many, the notion of total metabolic revolution is likely jarring, and the possibility of conscious, rational control over humanity's social-ecological metabolism seems remote. The closing off of alternatives that go beyond the strict boundaries of profit-based accumulation (to which, allegedly, "there is no alternative") has been a central component of capital's struggle for ideological hegemony [17], and it has attempted to impose these same boundaries on sustainability science [6]. Few who have participated in efforts to effect substantive changes to society and its social-ecological metabolic interchange with nature would deny that the transformation of society is a long and difficult process and involves a great deal of risk. Nevertheless, the risk in not engaging in such a "long ecological revolution" [75] (pp. 269–287) is even greater. Thus, Lefebvre [26] (p. 122) shared Marx and Engels's [101] (p. 142),[102] (p. 153) general assessment that the world was headed toward "ruin or revolution". Indeed, examined from the other side of Lefebvre's project—a careful, critical scrutiny of capitalist modernity—the present difficulties are placed in a concrete, historical context, situating the seeming timelessness of capital's social-ecological metabolism and its predecessors within finite spatial-temporal conditions. At the same time, capital's role as the current unbridled mode of metabolic control raises numerous problems for the notion

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[102] ↩ Marx, K.; Engels, F. *Ireland and the Irish Question*; Progress: Moscow, Russia, 1971. [**Google Scholar**]

Given the inherent structuring tendencies of the capital system's form of metabolic control, is it really likely that humanity can undertake a meaningful pursuit of sustainability with the grip of capital's "invisible hand" constantly tightening around its throat?

of metabolic restoration and its spatial-temporal scope. Inasmuch as Lefebvre's vision of the production of space explicitly does not entail a global array of self-contained, homogeneous communes, materials and energy will still flow around the globe, continuing to raise questions regarding localised metabolic dynamics and technical–spatial–social divisions of labour. These and numerous other issues require further debate and discussion, some of which will likely remain unresolved until the solutions can be subjected to praxis. One conclusion that Lefebvre's perspective unequivocally reinforces is that humanity cannot afford to treat nature as a mere externality that can be internalised by market incentives or other measures that fail to confront capital as an inherently partial yet totalising project, if only because, as Engels[103] (p. 461) said and as Lefebvre emphasised through his work, we do not stand outside or over nature as its conquerors, but "exist in its midst". This understanding underscores both the necessity and urgency underlying the pursuit of an alternative, transformative vision of sustainability. Given the inherent structuring tendencies of the capital system's form of metabolic control, is it really likely that humanity can undertake a meaningful pursuit of sustainability with the grip of capital's "invisible hand" constantly tightening around its throat?

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[103] ↩ Marx, K.; Engels, F. *Collected Works*; International Publishers: New York, NY, USA, 1975; Volume 25. [**Google Scholar**]

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