

The Necessity of System Change: An Ecological and Marxian Synthesis

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Over the last few decades, we have witnessed both an intensification and a convergence of a number of crises: from the 2008 global financial crisis to the emergence of new infectious diseases (the SARS outbreak of 2003 and the ongoing pandemic of COVID-19, to mention two), to the acceleration of climate change and biodiversity loss, to the persistence of various forms of malnutrition. Such crises have offered the opportunity to reflect on the most important drivers. For example, we know that the encroachment of human activities related to the expansion of farming, logging, and mining into previously remote wild habitats is an important driver for biodiversity loss and the emergence of new infectious diseases, while also accelerating climate change (for example, through deforestation). We know that the continuous extraction and use of fossil fuels in transport and production is the main cause of greenhouse gas emissions. Finally, we also know that the deregulation of the financial markets has encouraged speculative behaviours, which can wreak havoc on economic and social systems.

In all of these cases, we have heard experts, regulators, and members of civil society calling for radical changes to financial, food, and energy systems. But while such outlooks are important, they remain incomplete, since they tend to focus on the proximate causes while missing the deeper systemic elements. In what follows, we provide a more comprehensive narrative that looks at the systemic cause of the different crises: the accumulation and circulation of capital on an ever-increasing scale.



Demonstrators hold placards during a protest by young people calling for action on climate change, in London, Britain, on April 12, 2019. [Photo/[Xinhua](#)].

The Process of Capital Accumulation

A significant part of the biosphere has been converted into a global production system, with humans appropriating about 25 percent of the world's net primary productivity.¹ Almost the entirety of food, feed, and raw material extraction, production, and distribution today happen within the capitalist circuits.² Capitalism is a socioeconomic system centred on class-based capital accumulation, to which the satisfaction of human needs is subsumed.³ In order to understand the ultimate drivers behind the ecological crisis, it is therefore necessary to look at capital itself.⁴ Capital is not a thing, but a process and a social relationship. As a process, it refers to the perpetual circuit of accumulation that starts with an amount of money capital (M), which is invested in the acquisition of commodified labour and means of production (C), leading to the production (P) of new means of production and commodities (C'), to be sold for a larger amount of money (M') in order to start the cycle again on a larger scale, starting from M'.

Note how purely financial investments seem at first sight to stand outside of this definition, since they can be denoted simply as the process $M - M'$, expressing the fact that, in this circuit, money gives rise to money directly, independent of production. In this respect, Karl Marx wrote that "it becomes as completely the property of money to create value, to yield interest, as it is the property of a pear tree to bear pears."⁵ Yet, the surplus money (ΔM) must be generated through a real production activity. This brings us back to the original formula of the capital accumulation process, since value originates in production.⁶

As a social relationship, the process of capital accumulation entails the confrontation between two classes of people: capitalists, the holders of money capital and the means of production; and workers, who must sell their labour power to the capitalists in order to survive.

First Moment: Investment and the Acquisition of Commodities

It is important to describe the various "moments" of the capital-accumulation cycle to grasp its relationship to the various crises.⁷ Drawing on the definition of capital as a process of accumulation ($M - C \dots P \dots C' - M'$), we start from the first "moment" of the process: the investment of money capital in production ($M - C$). This implies that a certain amount of money (M) is deployed to acquire commodified labour and the means of production. This moment belongs to the sphere of exchange. Today, there is a large amount of wealth, estimated at over U.S. \$418 trillion in 2020, highly concentrated in the hands of a limited number of super-rich individuals.⁸ For example, according to the World Inequality Database, the top 10 percent of the world population holds an estimated 76 percent of global wealth, while the bottom 50 percent owns an estimated 1.8 percent.⁹ Given the high level of concentration of wealth, investment decisions are

¹ ↪ Fridolin Krausmann et al., "Global Human Appropriation of Net Primary Production Doubled in the 20th Century," *Proceedings of the National Academy of Sciences* 110, no. 25 (June 18, 2013): 10324–29; M. Nyström et al., "Anatomy and Resilience of the Global Production Ecosystem," *Nature* 575, no. 7781 (November 2019): 98–108.

² ↪ Branko Milanovic, *Capitalism, Alone: The Future of the System That Rules the World* (Cambridge, Massachusetts: Harvard University Press, 2019).

³ ↪ István Mészáros, *Beyond Capital* (New York: Monthly Review Press, 2000).

⁴ ↪ John Bellamy Foster and Intan Suwandi, "COVID-19 and Catastrophe Capitalism," *Jus Semper*, September 2020 ; Jacopo Nicola Bergamo, "Pandemic Capitalism: Metabolic Rift, World-Ecology Crossing Dialectical Biology," *Historical Materialism* 31, no. 1 (2023): 93–121.

⁵ ↪ Karl Marx, *Capital*, vol. 3 (London: Penguin, 1981), 516.

⁶ ↪ An analogous discourse can be made for merchant capital ($M - C - M'$), where a commodity is bought cheaply to be sold for a higher price. In this case as well, the commodity in question and the value incorporated in it is generated in production.

⁷ ↪ David Harvey, *Marx, Capital and the Madness of Economic Reason* (London: Profile Books, 2017).

⁸ ↪ Credit Suisse Research Institute, *Global Wealth Report 2021*, 2021.

⁹ ↪ World Inequality Database, "Top 10% National Income Share (2023)," world.

concentrated generally in the hands of those relatively very few who control the wealth: capitalists. The investment decisions of the super-rich affect not only economic development but also lead to vast ecological transformations, for example, substantial changes to tropical and temperate forests, and to massive contributions to carbon emissions.¹⁰

The Second Moment: Production and Class Exploitation

The second moment of capital accumulation (...P...) refers to the use of commodified labour and means of production to produce (P) new commodities (including new means of production) (C'). This moment thus belongs to the sphere of production proper. While investment decisions are in the hands of those who control capital, the actual work of creating

In Argentina Gran Chaco, an important agricultural frontier, these contractors rely on the exploitation of agricultural workers, who are required to be extremely mobile, uprooted from their families and communities, and forced to live in appalling conditions.

new means of production and producing commodities—for instance, processing, transporting, and trading them—is done by a different class of people: wage-workers. The expansion of the production of agricultural commodities into tropical forests and the felling of trees, if not carried out directly by small holders, is

carried out by workers employed by capitalist firms. For instance, in Argentina Gran Chaco, an important agricultural frontier, these contractors rely on the exploitation of agricultural workers, who are required to be extremely mobile, uprooted from their families and communities, and forced to live in appalling conditions.¹¹ The culling of animals in slaughterhouses and the processing and transportation of meat is done by working people. The extraction of minerals and the production of garments and microprocessors are also done by working people.

Wage earners do not share in the surplus and are generally paid only what is needed for the reproduction of their labour power. This gap between wages and the surplus value they generate has increased with the emergence of global value chains due to the global labour arbitrage (the existence of lower unit labour costs in the periphery of the capitalist economy relative to productivity). This has led to the displacement of many production activities to countries in the Global South, where superexploitation is quite common.¹² Being less wealthy, workers in general tend to be more vulnerable to the effects of financial, environmental, and health crises.

Hence, the relationship between capitalists and workers is antagonistic. This important concept plays a crucial role in identifying the key to system transformation. The money capitalist, who invests in production, buys two commodities: means of production (materials, machinery, and so on) and labour power. The latter, however, cannot be separated from the physical person of the worker. Moreover, the capitalist is also the legal owner of the produced commodities. For this reason, the worker suffers a double separation/alienation: from the means of production and from the product of labour. It is notable that the violent separation of the workers from the means of production, which is the precondition of wage labour, first occurred in Europe with the progressive enclosure of the commons, and is still ongoing in other parts of the world.

¹⁰ ↪ Victor Galaz et al., "Finance and the Earth System—Exploring the Links between Financial Actors and Non-Linear Changes in the Climate System," *Global Environmental Change* 53 (November 2018): 296–302; M. Graziano Ceddia, "The Super-Rich and Cropland Expansion via Direct Investments in Agriculture," *Nature Sustainability* 3, no. 4 (April 2020): 312–18; M. Graziano Ceddia, "Investments' Role in Ecosystem Degradation," *Science* 368, no. 6489 (April 24, 2020): 377; Lucas Chancel, "Global Carbon Inequality over 1990–2019," *Nature Sustainability* 5 (November 2022): 931–38.

¹¹ ↪ Diego Silva Garzón, "Argentinean Agribusiness and the Porous Agricultural Company," *Tapuya: Latin American Science, Technology and Society* 3, no. 1 (January 2020): 170–89; J. M. Vilulla, *Las cosechas son ajenas: Historia de los trabajadores rurales detrás del agronegocio* (Ituzaingo, Argentina: Editorial Cienflores, 2014).

¹² ↪ John Smith, *Imperialism in the Twenty-First Century* (New York: Monthly Review Press, 2016).

The Third Moment: Realisation

The third moment of capital accumulation ($C' - M'$) refers to the sale of the commodity (C') for an amount of money (M') larger than the initial investment (M). This moment also belongs to the sphere of exchange. Here, it is necessary for the capitalist to realize the surplus value made possible by production. Unless consumers and investors provide sufficient effective demand, the capital invested in means of production and in the production of commodities is lost. For this reason, it is necessary (setting aside the demand for capital goods) that (a) consumers' desires are directed (via advertising) towards the acquisition of the produced commodities, and (b) consumers have enough purchasing power to satisfy these desires. With respect to the first point, the great conservative economist Joseph Schumpeter has noted how "consumers' initiative in changing their tastes is negligible...and...all change is incident to, and brought about by, producers' action."¹³

Take the case of meat consumption. The existence of a large and increasing demand for meat, inflated by the promotion of certain lifestyles (for example, meat consumption as a form of conspicuous consumption) is necessary to sustain the mass production, low prices, and high accessibility of the product. At the same time, high meat consumption plays a crucial role in valorising the production of agricultural commodities (for example, soy and other crops) and all the operations and infrastructures associated with it, which are necessary to reward the wealthy investors. All this is happening even when the role of the livestock and meat processing industries in the pollution of water sources and the emergence and spread of infectious diseases is abundantly known.¹⁴ Once the commodity has been sold, the profit realised can be re-invested to begin a new, larger cycle of investment and production.

Capitalism's Contradictions and the Need for Transformative Change

While proceeding through its various "moments," capital accumulation seeks to transform nature and human nature and culture according to its own needs.¹⁵ It is in this sense that capitalism is a historically developed articulation of

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production, social reproduction, culture, and institutions regulating the entire social-metabolic process. Yet this process is not smooth or free from contradictions and crises. Having reached every corner of the earth, the contradictions of the capital system are now manifesting themselves at the planetary level. The emergence of new infectious diseases and subsequent pandemics—alongside numerous other socio-environmental problems, such as climate change, biodiversity loss, and the possibility of a nuclear holocaust

—are a manifestation of capitalism's ecological contradictions on a planetary scale. The multitude of calls for system transformation point to the fact that the resolution of these contradictions can only occur by superseding the system from which they originate. Yet, the transformation or supersession of the capital system is not a simple matter, since, in the very process of its becoming, capitalism produces and reproduces its own material, institutional, and cultural presuppositions. In the words of Marx and Frederick Engels, capital "creates a world after its own image."¹⁶ Referring to the system of capital, Marx wrote (quite revealingly in this respect): "This organic system itself, as a totality has its

¹³ Joseph A. Schumpeter, *Business Cycles: A Theoretical, Historical, and Statistical Analysis of the Capitalist Process* (New York: McGraw-Hill Book Company, 1939), 66.

¹⁴ ↪ Rob Wallace, *Big Farms Make Big Flu: Dispatches on Influenza, Agribusiness, and the Nature of Science* (New York: Monthly Review Press, 2016); L. Cesoniene, M. Dapkiene, and D. Sileikiene, "The Impact of Livestock Farming Activity on the Quality of Surface Water," *Environmental Science and Pollution Research* 26 (2019): 32678–86.

¹⁵ ↪ Andreas Malm, *The Progress of This Storm: Nature and Society in a Warming World* (London: Verso, 2018).

¹⁶ ↪ Karl Marx and Friedrich Engels, *The Communist Manifesto* (Ware, Hertfordshire, England: Wordsworth Editions Limited, 2008).

presuppositions, and its development to its totality consists precisely in subordinating all elements of society to itself, or in creating out of it the organs which it still lacks. This is historically how it becomes a totality.”¹⁷

Complex Systems, Emergence, Persistence, and Change

The system of capital emerges historically as a complex organised structure. In order to find out how it could possibly be transformed, it is therefore necessary to make a journey into the theory of complex systems. This requires some preliminary considerations on how complex systems emerge, persist, and change. To this end, we draw on process ecology and maintain that the emergence and persistence of complex organised systems occur via autocatalytic configurations of processes, or the interaction of mutually supporting processes.¹⁸ Autocatalytic configurations have a number of emergent properties: centripetality, directionality, and autonomy. Centripetality indicates the tendency of complex systems to grow while drawing an increasing amount of resources toward the system. Directionality indicates the fact that the system tends to become more complex and organised, fine-tuning the various elements to the needs of the whole system. Autonomy refers to the fact that these properties emerge autonomously at the system level. These properties confer to complex systems a “memory,” or path dependence, which implies development.¹⁹ Complex systems, as autocatalytic configurations of processes, have the ability to persist by dampening down random perturbations. However, although the behaviour of a complex system is not random, its historical development is open to change, and it is in this sense indeterminate.

This “openness” in the causal fabric is the essential difference between an organism and a mechanism. Such openness results from the fact that the autocatalytic configuration is never perfect and the system always retains some contradictions in the form of centrifugal tendencies.²⁰ A first form of centrifugality originates from the complementary relationship between organisation/constraint and contingency/indeterminacy. This means that “overly efficient systems can be too brittle to withstand a major perturbation.”²¹ The lack of organisation/constraint, reflected, for example, in increasing entropy, which tends to disrupt systems, can also open up new opportunities of development. Second, within an autocatalytic configuration, competition occurs among existing and potential nodes of the autocatalysis.

Third, such a competition is associated with cooperation. The potential nodes of an autocatalytic configuration are “selected” based on their ability to catalyse (that is, to cooperate with) other processes/nodes within the loop. Hence, competition at one level of organisation (individual processes/nodes) is conducive to cooperation at the next level (the entire autocatalytic loop), thus indicating a dialectical relationship between competition and cooperation.²²

Finally, every system is constantly facing random or external perturbations. The existence of contradictions/centrifugalities in a given system implies the possibility of the system to respond to perturbations through adaptation (a temporary and partial response) or transformation (a more fundamental response).

¹⁷ ↪ Karl Marx, *Grundrisse* (London: Penguin, 1973), 278.

¹⁸ ↪ Robert E. Ulanowicz, *A Third Window: Natural Life Beyond Newton and Darwin* (Radnor, Pennsylvania: Templeton Press, 2009); Robert E. Ulanowicz, “The Tripartite Nature of Causalities in Ecosystem Dynamics,” *Current Opinion in Systems Biology* 13 (February 2019): 129–35; Zhongmin Xu et al., “The Common Developmental Road: Tensions among Centripetal and Centrifugal Dynamics,” *National Science Review* 5, no. 3 (May 2018): 417–26.

¹⁹ ↪ Magnus Nyström and Carl Folke, “Spatial Resilience of Coral Reefs,” *Ecosystems* 4, no. 5 (August 2001): 406–17; Ulanowicz, “The Tripartite Nature of Causalities in Ecosystem Dynamics.”

²⁰ ↪ Xu et al., “The Common Developmental Road.”

²¹ ↪ Xu et al., “The Common Developmental Road,” 421.

²² ↪ Yaneer Bar-Yam, *Making Things Work: Solving Complex Problems in a Complex World* (Cambridge, Massachusetts: Knowledge Press, 2004).

Historical Materialism and the Development of Social Formations

While process ecology directly deals with the emergence of organised complexity—with both its persistence and its change—it does not specifically refer to social formations, although it has also been applied to the study of economic phenomena.²³ In order to address more specifically the issue of emergence, persistence, and change in social formations, we will draw on historical materialism. The connections between historical materialism and process ecology are many and have been explored elsewhere.²⁴

Historical materialism is a method, originally developed by Marx and Engels, that posits that history proceeds from material processes rather than from ideas.²⁵ It is based on dialectics, an approach that sees reality as a set of interrelated processes, rather than as a set of entities (things).²⁶ By explicitly focusing on processes, dialectics naturally embraces the idea of dynamism, history, and change. By accounting for interrelations, dialectics also recognises that processes do not operate in isolation but are part of larger “wholes” that condition them. The larger whole or system emerges historically out of the interaction among various processes.

Capitalism as a Complex Socioecological System

Given the nature of the capital system, which is a complex socioecological system, we believe that historical materialism is particularly conducive to analysing and understanding its emergence, persistence, and eventual transformation in line with the tenets of process ecology. Every socioecological system is historically an organic “totality” emerging out of various interlocking “moments” that support each other in an autocatalytic fashion. Mutual support among the various moments is necessary for the emergence and persistence of any social formation, the purpose of which is the regulation of the metabolic exchange between humans and nature. This requires securing the conditions for both biological reproduction and social reproduction. In an important passage, Marx noted how “Nature is man’s inorganic body.” He continued: “Man lives on nature—[this] means that nature is his body, with which he must remain in continuous intercourse if he is not to die. That man’s physical and spiritual life is linked to nature means simply that nature is linked to itself, for man is a part of nature.”²⁷

For this reason, the necessary metabolic exchanges between man and nature have also been referred to as “first order mediations.”²⁸ At the center of these exchanges is productive activity, labour, which is the ontological foundation of “humanness.” István Mészáros notes that human beings “as a specific part of nature (i.e., a being with physical needs historically prior to all others) must produce in order to sustain himself, in order to satisfy these needs. However, he can only satisfy these primitive needs by necessarily creating, in the course of their satisfaction through his productive activity, a complex hierarchy of non-physical needs which thus become necessary conditions for the gratification of his original physical needs as well.”²⁹

²³ ↪ Brian D. Fath et al., “Measuring Regenerative Economics: 10 Principles and Measures Undergirding Systemic Economic Health,” *Global Transitions* 1 (January 2019): 15–27; Robert E. Ulanowicz, “Socio-Ecological Networks: A Lens That Focuses Beyond Physics,” *Frontiers in Ecology and Evolution* 9 (2021).

²⁴ ↪ G. Ceddia, W. Mioni, and R. Montani, “The Dialectics of Capital: Learning from Gran Chaco,” *Sustainability Science* 17 (November 2022): 2347–62.

²⁵ ↪ Karl Marx and Friedrich Engels, *The German Ideology* (Amherst, New York: Prometheus Books, 1998).

²⁶ ↪ Bertell Ollman, *Dance of the Dialectic* (Urbana, Illinois: University of Illinois Press, 2003).

²⁷ ↪ Karl Marx and Frederick Engels, *Economic and Philosophic Manuscripts of 1844 and The Communist Manifesto*, trans. Martin Milligan (Amherst, New York: Prometheus Books, 1988), 76.

²⁸ ↪ István Mészáros, [Social Structure and Forms of Consciousness, Volume 1: The Social Determination of Method](#) (New York: Monthly Review Press, 2010), 281.

²⁹ ↪ István Mészáros, *Marx’s Theory of Alienation* (London: Merlin Press, 2005), 80.

It follows that nonphysical and spiritual needs and activities have their ontological foundations in human being's productive activity, labour. This brings us closer to identifying the various moments forming the totality of a social formation in all its material, cultural, and institutional expressions. In a famous passage in the first volume of *Capital*, Marx, while reflecting on the role of technology, noted that "Technology reveals the active relation of man to nature, the direct process of the production of his life, and thereby it also lays bare the process of the production of the social relations of his life and of the mental conceptions that flow from those relations."³⁰

This reveals how, according to the materialist conception of history, forces of production mediate the metabolic relationship between human labour and nature. In doing so, historical materialism reveals not only production processes themselves, but also social reproduction, social relations, and culture.³¹ A social formation is a complex socioecological system, a concatenation of various moments. The organisation of the system allows it to persist by guaranteeing its social reproduction and regulating the exchange with the surrounding biosphere. This is an emergent property of the system that concerns the allocation of the available human and natural resources. We note the partition of the "whole" system into a material/economic sphere, denoting the mode of production (including the moments of technology, production, reproduction, and social relations of production), and a cultural/institutional sphere (including the moments of mental conceptions and cultural institutions). The relationship between these two spheres is dialectical. The cultural/institutional sphere emerges out of material/economic practices, while at the same time constraining them. This does not imply material or technological determinism, since the relationship between the material/economic and cultural/institutional spheres is a dialectical one. In fact, theory, through its effect on institutions and on material practices, can also become a real force in history.³²

The Capitalist Configuration and the Existing Second-Order Mediations

While any social formation as a complex socioecological system rests on the necessary first-order mediations between humans and nature, reflecting the interaction among the various constituent moments associated with the material/economic and cultural/institutional spheres, the particular form taken by these moments is historically specific. The

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process of capital accumulation previously described ($M - C \dots P \dots C' - M'$) imparts a particular form to the first-order mediations, engendering historically contingent second-order

mediations.³³ It is therefore important to look in more detail at today's prevailing configuration.

As a process, the accumulation of capital strongly conditions the functioning of the social formation in all its components. For example, technology and production are oriented toward the generation of profits. The focus on profit introduces a cleavage between production objectives and human needs, as demonstrated by the malnutrition illnesses (for example, obesity and undernourishment), health crises (affected by access to health care), housing/homelessness, the rural/urban divide, and so forth. This focus on profit seeps into mental conceptions and institutions.

As with other complex systems, the capitalist social formation is not free from centrifugal tendencies. Yet, capitalism imparts to these a specific form. First, we must note that capital, as a process ($M - C \dots P \dots C' - M'$), is inherently

³⁰ ↪ Karl Marx, *Capital*, vol. 1 (London: Penguin, 1976), 493.

³¹ ↪ Harvey, Marx, *Capital and the Madness of Economic Reason*.

³² ↪ Karl Marx and Frederick Engels, *Collected Works*, vol. 3 (London: International Publishers, 1975), 182; Antonio Gramsci, *Quaderni del carcere* (Torino: Einaudi, 2014); Kate Crehan, *Gramsci's Common Sense: Inequality and Its Narratives* (Durham: Duke University Press, 2016).

³³ ↪ Mészáros, *Beyond Capital*, 109; Mészáros, *Social Structure and Forms of Consciousness*, vol. 1, 282.

expansive. The satisfaction of qualitatively different human needs through the production (P) of goods and services (C') is only the means to the quantitative expansion of value (the production of surplus value) ($M' = M + \Delta M$). Being a mere quantity, exchange value knows no bounds. For this reason, "the tendency to create the world market is directly given in the concept of capital itself. Every limit appears as a barrier to be overcome."³⁴ Globalization on the one hand and increasing concentration and centralisation of capital (in the form of multinational corporations) on the other imply that global capitalism is prone to disruption through systemic crises, that is, financial crises, pandemics, and ecological destruction.

Kenneth Boulding, one of the fathers of ecological economics, famously said that anyone "who believes that exponential growth can go on forever on a finite planet is either a madman or an economist."³⁵ Centrifugal tendencies arise from the competition among different capitalist corporations, states, and economic blocs. Lastly, and most importantly, capitalism itself is characterised by an unresolvable centrifugal tendency. We already know that as a social relationship, capital accumulation entails the subordination of the workers to the holders of money capital and the means of production. This relationship is inherently antagonistic and permeates all the elements of the material/economic and cultural/institutional spheres.

Labour and the Real Agency of Transformation

The previous section provides us with an important clue to the task of systemic transformation. Namely, the transformation of the capitalist social formation can only occur by acting on all of these elements simultaneously. Given capitalism is a complex system, intervening in relation to single elements will not generate system transformation. Any

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element of the system both interacts with and is selected by the entire system. The target of transformation should be the whole set of second-order mediations.³⁶ This can be done only by dissolving the capital regime at its core. At the center of the capital relationship $M - C \dots P \dots C' - M'$ stands the capitalist production process $\dots P \dots$, where alienated labour and means of production are combined under the diktats of capital's own

expansionary need to produce another commodity (C'). The only way to transform the capital system is by dissolving the antagonist relationship between capital and labour and returning the social control of the production process to the direct producers.³⁷ This is crucial because labour is the key agency for radical change. At the ontological level, labour as "productive activity is the mediator of the subject-object relationship between man and nature."³⁸

In the capitalist system, productive activity (that is, wage labour) fulfils the needs of capital accumulation. It is only through the emancipation of labour, by providing access to the means of production to freely associated producers, that we can ensure that production is oriented toward satisfying common needs, and not to the mere accumulation of capital. Emancipating labour means breaking the $M - C \dots P \dots C' - M'$ process at its core. Once freely associated workers

³⁴ ↪ Marx, Grundrisse, 408.

³⁵ ↪ Kenneth Boulding, "The Economics of the Coming Spaceship Earth," in Environmental Quality in a Growing Economy: Essays from the Sixth RFF, ed. Henry Jarrett (New York and London: RFF Press, 2011).

³⁶ ↪ István Mészáros, [Social Structure and Forms of Consciousness, Volume 2: The Dialectic of Structure and History](#) (New York: Monthly Review Press, 2010), 391–92; István Mészáros, [The Necessity of Social Control](#) (New York: Monthly Review Press, 2014).

³⁷ ↪ Mészáros, Beyond Capital; Mészáros, The Necessity of Social Control.

³⁸ ↪ Mészáros, Marx's Theory of Alienation, 80.

are again in control of the means of production and of the production process, the spheres of exchange (namely, $M - C$ and $C' - M'$) will also be transformed. Once labour power and means of production are reunited, they cease to take the form of commodity exchange so that freely associated producers can decide what to produce according to mutually recognised needs through more communal forms of production and exchange. It is in this sense that the supersession of capital can lead to the emergence of a new form of exchange, namely, the mutual exchange of activities aimed at satisfying human needs.

From a Narrow to a Broad Conception of Class Struggle

Marx in *Capital* demonstrated the fundamental contradiction between the individual unit of production and the totality mediated by the sphere of circulation. Labour in the individual production unit increasingly becomes socialised due to capital's rationalisation of the labour process through machinery, making cooperation an essential factor of production and creating the "collective labourer."³⁹ Still, the market is substantially anarchic, and people relate to each other simply as the owners of commodities (including labour as a commodity) and money.

In capitalism, the socialisation of labour in the productive sphere is alienated because the labour process is subordinated to the process of valorisation. Nevertheless, the structural antagonism and direct cooperation in production together are conditions of possibility for the formation of a collective consciousness. In fact, from a historical-materialist perspective, class consciousness arises from the capital accumulation process as its own immanent contradiction, making the proletariat the "gravedigger" of capitalism.⁴⁰ Thus, not only is the antagonistic relationship between capitalists and workers situated in production, as mentioned, but the prerequisites for the formation of a collective consciousness of workers as a class lie objectively within the production process because the material interests of these classes are opposed.

However, we have already emphasised the nonmechanical nature of this process. According to Antonio Gramsci, the deterministic view has been used in the past as a kind of ideology of the subalterns, necessary to move forward despite the heaviness of defeats in the political struggle.⁴¹

The mechanistic interpretation gives a one-sided emphasis on conflict in the workplace, generating various twists and dead ends in the history of the emancipation of the labour movement. What is instead crucial is to define what this objective antagonism consists of from the point of view of the materialist conception of history as a whole. In this way, it is possible to elaborate a broad and plural conception of class struggle and of the processes of collective consciousness formation.

In a too-often forgotten letter, Engels clarified what transpires from the entire body of his and Marx's writings: "According to the materialist view of history, the determining factor in history is, in the final analysis, the production and reproduction of actual life. More than that was never maintained either by Marx or myself. Now if someone distorts this by declaring the economic moment to be the only determining factor, he changes that proposition into a meaningless, abstract, ridiculous piece of jargon."⁴²

³⁹ ↪ Marx, *Capital*, vol. 1, 544.

⁴⁰ ↪ Marx and Engels, *The Communist Manifesto*.

⁴¹ ↪ Gramsci, *Quaderni del carcere*, 1064.

⁴² ↪ Marx and Engels, *Collected Works*, vol. 49, 34.

In this passage is contained a broad and plural conception of class struggle.⁴³ In the late capitalism of the Anthropocene crisis, subordination to capital is generalised, and the interest of the vast majority in liquidating the capitalist relations of production that undermine “the production and reproduction of actual life” objectively emerges. There are at least three different reasons to extend the concept of class struggle, based on—and not in opposition to—Marx and Engels: the expansion of productive labour in capitalism, the different forms of subsumption of labour, and the plurality of metabolic rifts.

First, the object of Marx’s critique was capital as a social relation. However, his analysis is historically situated, and thus the object of observation was nineteenth-century English capitalism, the most advanced realisation of capitalism at the time, from which he extrapolated through abstraction the $M - C \dots P \dots C' - M'$ logic of accumulation. However, the Marxian method has the ability to capture changing historical trends, and thus continues to illuminate the present. What for capital is productive labour is labour that produces surplus value. It is not confined to the production of commodities as objects of consumption and investment, but extends to numerous spheres of life. Marx gave some examples in *Capital*, including one of how a teacher can be productive for capital when they create surplus-value for a school-business.⁴⁴

Second, the relationships that workers establish with capital are not all of the same kind. In the capitalist mode of production Marx distinguished between the formal and the real subsumption of labour to capital.⁴⁵ Subsumption is the process by which the social relations of production penetrate the labour process itself. In the early stage of capitalism, the subsumption of labour under capitalist production is only formal, because in the workshop’s organisation, the division of labour is not yet developed sufficiently and productivity rests upon the skills of the workers in using labour’s tools. This means that capital subsumes under itself a social and labour organisation that is prior to it.⁴⁶ The further

The metabolic rift is the result of a social metabolism alienated from social and natural conditions, and expresses itself in a plural manner, from the ecological rift to the corporeal rift. The ecosystem in which human civilisation developed has been ruptured on a planetary scale to the point of posing the question of a possible civilisational collapse through ecological crisis or nuclear war.

mechanisation of production leads to the real subsumption of labour, in which an inversion occurs between the subject and the instrument of work, whereby the skill of the worker loses its centrality in productivity and the worker becomes an appendage to the machine. Work intensifies, and labour productivity increases together with labour alienation. The distinction between formal and real subsumption allows us to understand the differences without artificially dividing the class. If factory labour or

mechanised agriculture is truly subsumed, then that of the so-called creative or intellectual workers is formally so.

Third, the triadic scheme of the Marxian analysis of metabolism is composed of the dialectic between social metabolism, the universal metabolism of nature, and the metabolic rift.⁴⁷ The metabolic rift is the result of a social metabolism alienated from social and natural conditions, and expresses itself in a plural manner, from the ecological rift to the corporeal rift. The ecosystem in which human civilisation developed has been ruptured on a planetary scale to the point

⁴³ ↪ Domenico Losurdo, *Class Struggle: A Political and Philosophical History* (New York: Palgrave Macmillan, 2016).

⁴⁴ ↪ Marx, *Capital*, vol. 1, 644.

⁴⁵ ↪ Marx, *Capital*, vol. 1, 1019–38.

⁴⁶ ↪ Harry Harootunian, *Marx After Marx: History and Time in the Expansion of Capitalism* (New York: Columbia University Press, 2015); Massimiliano Tomba, “On the Capitalist and Emancipatory Use of Asynchronies in Formal Subsumption,” *Review* (Fernand Braudel Center) 38, no. 4 (2015): 287–306.

⁴⁷ ↪ John Bellamy Foster and Brett Clark, “*Marxism and the Dialectics of Ecology*,” *Monthly Review* 68, no. 5 (October 2016): 3.

of posing the question of a possible civilisational collapse through ecological crisis or nuclear war. Overwork, unhealthy working environments, extreme environmental conditions, extreme poverty, mental illness due to social alienation, epidemics, and hyper-connectedness have also caused rifts in the human corporeal metabolism.⁴⁸

We can conclude from this that the concept of class is stratified by the division of labour and the forms of subsumption of capital, but unified by its objective position in the “production and reproduction of actual life” and crossed by the capitalist metabolic rift. This is why the concept of the environmental proletariat as the universal class seems promising for framing the subject that can bring about the urgently needed transformation of the present.

The Environmental Proletariat as the Subject of Transformation

The concept of the environmental proletariat has been sketched out by John Bellamy Foster.⁴⁹ In a recent interview, Foster clarified that

The notion of the environmental proletariat, which is simply a way of referring to the proletariat in terms of the full complexity of its material existence, is concerned with work relations but also the full range of material life conditions.... The true revolutionary struggle, as István Mészáros argued, required the transformation of the entire system of social metabolic reproduction, currently dominated in an alienated way by capital. To speak of an environmental proletariat is thus to speak of a broader proletariat, the coming together of environmental and economic concerns, of proletarians, peasants, and the Indigenous.⁵⁰

Foster also argues that the formation of the planetary environmental proletariat is underway. He emphasises that economic and environmental workers’ struggles have always been intertwined in the Marxist tradition, and this is becoming increasingly evident as the capitalist crisis of the Anthropocene deepens. The planetary environmental proletariat finds its protagonists in the social movements of the Global North and South, including the Landless Workers’ Movement in Brazil, the international peasants’ organisation La Via Campesina, the climate-strike movement, the Black Lives Matter movement, the struggle over social reproduction, and many others.⁵¹

We believe that the environmental proletariat will play a crucial role in overthrowing the capitalist mode of production with the ultimate goal of establishing the society of freely associated producers. The decisive instrument to achieve this is democratic planning, following the principle of from each according to one’s abilities, to each according to one’s needs.⁵²

⁴⁸ ↪ John Bellamy Foster and Brett Clark, *The Robbery of Nature* (New York: Monthly Review Press, 2020).

⁴⁹ ↪ John Bellamy Foster, “[Capitalism, Exterminism, and the Long Ecological Revolution](#),” MR Online, December 24, 2017.

⁵⁰ ↪ John Bellamy Foster interviewed by Jia Keqing, “[Ecological Marxism](#),” Jus Semper, February 2024.

⁵¹ ↪ Jacopo Nicola Bergamo, *Marxismo ed ecologia: origini e sviluppo di un dibattito globale* (Verona: Ombre Corte, 2022); John Bellamy Foster, *Capitalism in the Anthropocene* (New York: Monthly Review Press, 2022), 491.

⁵² ↪ John Bellamy Foster, “[Planned Degrowth: Ecosocialism and Sustainable Human Development—An Introduction](#),” Jus Semper, September 2023; Karl Marx, *Critique of the Gotha Programme* (New York: International Pub

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