"In the short run are we all dead? A perspective on the development climate"

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Introduction

The subject of this paper is climate change, as an ontological question. By this I mean not simply the overproduction and accumulation of greenhouse gas (GHG) emissions in the atmosphere beyond the absorptive capacity of *extant* natural sinks, but how we address its relationship to human history, now we realize 'our technical capacity to alter the world's climate massively' (Duncan 2007). I am inspired by Duncan's assertion that 'the fast and vast climate change we are facing makes all other environmental problems, past and present, so trivial as to be practically irrelevant. What this means is that in the last hundred years we have had no idea what we were really doing on this planet.' Commenting on the transition from theology to an increasingly fractured and haphazard array of scientific and disciplinary "information," he continues: 'Instead of rethinking our possible role on the planet, instead of qualifying or revising our anthropocentric habits, we have shamelessly used the decline of theology relative to science as an excuse to elevate our own importance further. Logically we should have replaced theology with ecology, before enlarging the parameters of our behaviour by the heavy use of fossil fuels.' Furthermore, 'Compared to the planet our species has not been around for long, but compared to what historians or sociologists talk about, we certainly have. For too long. and for absolutely no good reasons, the human past has been seen as excessively discontinuous, temporally broken down into putative "stages" and/or "revolutions".' Duncan's point is ultimately that the modern sciences have been so preoccupied with human history from the dawning of an agricultural civilization, that 'people who lived before agriculture have been condemned to what has been called, with breathtaking arrogance: "pre-history"… [and that] because historians in particular refused to consider humans in deep time that modern science has actually had no ecologically relevant cultural impact, at least not yet' (2007). I propose to consider how to recover, or insert, ecological value into historical analysis, especially of the modern capitalist era.

My argument is that climate change has introduced a certain temporality into the environment that alters our perception of, and relationship to, ecology. It is perhaps important now to bring that new temporality to bear on Keynes' quip, which went like this: 'The long run is a misleading guide to current affairs. In the long run we are all dead. Economists set themselves too easy, too useless a task if in tempestuous seasons they can only tell us that when the storm is past the ocean is flat again.' But faith in the restoration of the market, or focusing on short-run crisis management, won't cut it anymore. In the short-run, maybe less than a decade, the world must act decisively to head off the real possibility of accelerating climate catastrophe, which is already devastating the lives of its most vulnerable inhabitants. How does this affect our understanding of the *longue dureé*? Is the long run dead? Does its salience depend on reconsidering human history in deep time? Should the *longue dureé* be refashioned to gain perspective on climate change? Or do we simply have a death wish?

Braudel's environmentalism

In his celebrated *The Mediterranean*, Fernand Braudel divides his subject into its three temporalities: the *longue dureé*, the *conjoncture* of social history, and the traditional history of events. He describes the first temporality as 'a history whose passage is almost imperceptible, that of man in his relationship to the environment, a history in which all change is slow, a history of constant repetition, ever-recurring cycles' (1966: 20). What is notable about this 'almost timeless history' is precisely that his understanding of the environment, and climate, is essentially spatial. Certainly it interacts with humans, but it is anchored in a notion of 'geographical cycles' of 'periods of construction and deterioration' regarding shifting relationships between mountain dwelling and settlement of the plains, traversed by oscillating circuits of nomadism or transhumance. As he writes:

> In this almost motionless framework, these slow-furling waves do not act in isolation: these variations of the general relations between man and his environment combine with other fluctuations, the sometimes lasting but usually short-lived movements of the economy. All these movements are superimposed on one another. They all govern the life of man, which is never simple. And man cannot build without founding his actions, consciously or not, on their ebb and flow. In other words, geographical observation of long-term movements guides us towards history's slowest processes' (Ibid 102).

The subtitle of *The Mediterranean* is *And the Mediterranean World in the Age of Philip II*, and the study is, as Moore notes, centered on a tension between structural and conjunctural time-space (2003: 434). This tension finds expression in part in environmental relations - however, these are essentially spatial, expressed in 'the Mediterranean world-economy's urban-territorial dialectic' articulating with Braudel's 'conception of town-country relations,' anchored in agro-ecological transformations linked through class conflict to the circulation of capital in the Mediterranean, as urban capital invades agrarian relations (Moore 2003: 435, 437). Moore goes on to theorize the inherent tendency to geographical expansion in capitalism, and its reorganization of a world-ecology (conceptualized by Wallerstein in *The Modern World-System*), as deriving from capital's unsustainable relationship to the soil, conceived by Marx as a rupture of ecological metabolism. In so doing Moore reformulates Braudel's environmentalism, activating its impact through the lens of capital. This is an issue to which I return below.

Braudel was pointedly critical of viewing environment as descriptive context, preferring to weave environmental forces into his narrative. As he wrote: 'Geography in this context is no longer an end in itself but a means to an end. It helps us to rediscover the slow unfolding of structural realities, to see things in the perspective of the very long term' (1966: 23). Here Braudel considers geography, and by extension environment, as a lens through which to situate and examine social change. While this might be properly called, and credited as, environmental history, it nevertheless remains essentially spatial in its conception, and role. Braudel underlines this in offering a unifying conception of climate. Noting that there is variation on the east/west Mediterranean axis, he avers:

> At a time when climatologists are attentive to detail, the Mediterranean is rightly regarded by them as a complex of different climates that are to be distinguished one from another. But that does not disprove their fundamental, close relationships and undeniable unity…. (235)
> Everywhere can be found the same eternal trinity: wheat, olives, and vines, born of the climate and history; in other words an identical agricultural civilization, identical ways of dominating the environment (236).

One might argue from this that Braudel's structural history of the long run focuses more on environmental unity as the space within which the shorter run social history under examination plays out. And if so, what of the structural history we inhabit? Are we now to be deprived of a long run, in which the history of human relationships to the environment will be anything but imperceptible?

Well, Braudel had both the hindsight and the foresight to consider climate change. At one remove he implied it when he observed that 'the climate does not favour the growth of ordinary trees and forest coverings. At any rated it has not protected them. Very early the primeval forests of the Mediterranean were attacked by man and much, too much, reduced…. Compared to northern Europe, the Mediterranean soon became a forested region' (239). But then in a section entitled 'Has the Climate Changed Since the Sixteenth Century?' he claims everything changes, 'even the climate. Nobody now believes in the invariability of the elements of physical geography' (267). He mentions human intervention, in the forms of deforestation, neglected irrigation, and abandoned crops leading to desertification, noting 'a growing body of contemporary literature which accepts that there have been and still are climatic changes in operation. The Arctic ice cap has apparently retreated since 1892-1900 while the desert has made advances in both northern and southern Africa' (268). Nevertheless, he appears to revert to form, suggesting that if there is evidence of identical climatic or environmental conditions between then and now, this 'proves nothing either way about periodical variations of the climate. The real problem is to establish whether or not there has been periodicity, and recent writings incline towards the hypothesis that there has…. So the climate changes and does not change; it varies in relation to norms which may after all vary themselves, but only to a very slight degree' (269).

Climate variation, on both micro and macro scales, is regulated by periodicity. Planetary climate patterns combine a complex of oscillations articulated with geological changes. Tens or hundreds of millions of years ago global temperature, regional precipitation and ice sheet size varied with plate-tectonic reorganizations of the earth's surface. At shorter intervals, such climatic oscillations over tens of thousands of years are now linked to the earth's orbital variations as it circles the sun, and over centuries or decades climate change is a function of volcanic activity and changes in solar power (Ruddiman 2005: 8). Cycles matter. But in the twenty-first century there now appears to be a secular trend that is progressively concentrating the long run into a short run. The conventional theory is that this trend is associated with the Anthropocene period in the earth's history coinciding with industrialization, following the invention of the steam engine in the late-eighteenth century, and heralding a perceptible human impact on the earth's climate. Accordingly, the upper limit for global warming that would reduce the likelihood of catastrophic climate change is pegged at 2 degrees above 'pre-industrial levels' (we are already 0.6 degrees above).

William Ruddiman, in *Plows, Plagues and Petroleum*, however, stretches the Anthropocene to 8,000 years, arguing that in fact humans have been altering the climate significantly over this longer period:

> Climate scientists have long viewed the last 8,000 years as a time of naturally stable climate, a brief interlude between the previous glaciation and the next one. But the story presented here suggests that this warm and stable climate of the last 8,000 years may have been an accident. It may actually reflect a coincidental near-balance between a natural cooling that should have begun and an offsetting warming effect caused by humans. If this new view is correct, the very climate in which human civilizations formed was in part determined by human farming activities. Even thousands of years ago, we were becoming a force in the climate system (2005: 95).

Ruddiman’s hypothesis, based on curious counter-cyclical patterns of unusually high methane and carbon dioxide concentration in the atmosphere, around 5,000 and 8,000 years ago, respectively, is attributed to riziculture,[1] domestication of animals, and deforestation. As he claims:

> Nearly 5,000 years ago, irrigation was first used to flood low-lying terrain and grow wet-adapted strains of rice in China and Southeast Asia. In effect, irrigation was being used to created artificial wetlands in which rice could be grown. In these wetlands, vegetation (both rice and weeds) grew, died, decayed, and emitted methane, but this methane was from human, rather than natural sources.
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> Other human activities also generated methane. Livestock had been domesticated thousands of years earlier in the Near East, and just before 5,000 years ago in Southeast Asia. Livestock generates methane at both ends, both from the manure produced and from gaseous emanations (burbs and belches) from stomachs (2005: 79-80).

And for the 8,000 years ago impact:

> The primary way humans would have released CO2 to the atmosphere during this interval was by cutting forests. A carbon release of 300 billion tons between 8,000 and 250 years ago would require more than twice as much forest clearance before the Industrial Revolution as has occurred during the 200 years of the industrial era. Modern rates are very high because of rapid clearance of tropical rain forests in South America and Asia. By comparison, the estimated annual clearance rate just two centuries ago was almost ten times smaller than today, and the rates faded away back in time toward trivially small amounts for earlier intervals….it seems preposterous to propose more than twice as much total forest clearance prior to 1750 as afterwards.
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> But the conventional-wisdom view failed to take into account one key factor – *time* (2005: 88).

Ruddiman’s point is that even though forest clearance rate may have been only 5 percent of the industrial-era average, the interval being 40 times longer, ‘you end up with twice as much in total emissions’ (2005: 89), much like the fable of the tortoise and the hare.

So this is the very long run of eight millennia. Braudel might say it appears like a stable climate, nevertheless, as Ruddiman suggests, it was likely regulated by human activity offsetting the normal periodicities. Interestingly, Braudel notes ‘the beginning of a long period of inflowing cold and rain’ in the sixteenth century, linking it to the Little Ice Age, and wondering aloud whether it actually affected life in Europe and the Mediterranean. He concludes that the jury is out, citing Le Roy Ladurie's argument that 'the progressively later dates of the grape harvest can be attributed to man's preference for the higher alcohol content of riper fruit' (274, 275). While Braudel cannot explain the Little Ice Age phenomenon, the paleo-climatologist Ruddiman uses more recent data to postulate that the Little Ice Age correlated with the decimation of populations across the world by the Black Death pandemic of the mid-fourteenth century (and outbreaks in the sixteenth century) allowing reforestation of deserted farmland, and higher rates of absorption of CO2 (2005: 130, Flannery 2005:67). This, in conjunction with tens of millions of Chinese deaths at the hands of the Mongols in the thirteenth century, and in the 'arid Near East, where agriculture had originated, the Mongols destroying most of the existing irrigation-based agriculture, and populations fell precipitously' (Ruddiman 2005: 129), lowered atmospheric concentrations of CO2 and cooled the climate. While this thesis is the subject of ongoing vigorous debate, refuted but not disproven (Muir 2008),[2] it does at least underline the idea of a climatic temporality conditioned by, and conditioning, human activity during the period of Braudel's *longue dureé*.

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[1] Braudel emphasized the agronomic conditioning of civilizations in Europe (wheat), Asia (rice) and the Americas (corn) – and rice production’s relative labor intensity, matched with a 5-fold yield advantage (Moore 2003:440).

Braudel concludes his climate discussion ambiguously: 'Whether or not there is a Jet Stream, there is certainly a common source for all climatic change. The 'early' sixteenth century was everywhere favoured by the climate; the latter part everywhere suffered atmospheric disturbance' (2005: 275). Now Braudel was writing two decades before climate scientists first began putting together systematic data, nevertheless there are two points to be made here. First, environment and climate are more than spatial vessels within which cycles occur, they are also temporal phenomena constituted by ecological and biospheric cycles. While discussion of the metabolic rift (Foster 2000, Moore 2000), emphasize the systematic disruption of the nutrient cycle by capital accumulation,[3] it does not address the 'biospheric rift' (Clark and York 2005),[4] and its accumulating consequences.[5] As I shall argue, this is an ontological problem. Second, under conditions of urgency, scientific knowledge is providing us with data that perhaps allows us to fully incorporate ecology, as a time-space attribute, into political economy. I would argue that our political economy prioritize historicization rather than capital theory, as such. These two points can be addressed in reviewing the concept of the 'metabolic rift,' which, through the development lens, transforms a spatial relation (city/countryside) into a sequential relation governed by an epistemic hierarchy, which has left agriculture in the shadow of capitalist modernity.

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[2] For example, the charge that there was not sufficient forest on earth to account for the anomalous rise in CO2 has been conceded by Ruddiman, whose response is that feedback mechanisms were at work. As Muir notes: 'Climate scientists all agree that the magnitude of the temperature changes as the Earth has gone in and out of ice ages cannot be explained by orbital changes alone' (2008).

[3] Colin Duncan (1996) insists the metabolic rift pre-dated capitalism, noted recently also by Jason Moore (2008).

[4] Clark and York subscribe to the view that 'the law of value remains central to understanding capitalism and the ecological crisis' (2005: 407).

[5] Note that Jason Moore argues that environmental change was both condition and consequence of European expansion, renewing and extending 'cycles of unsustainable development on a world-scale' (2003a: 309). The focus here on accumulation cycles and their environmental foundation is important, but partial.

Metabolic rift as foundation

Arguably, contemporary climate change owes much to the 'metabolic rift,' Marx's term for the separation of social production from its natural biological base (Foster 2000). Broadly, the metabolic rift expresses the subordination of agriculture to capitalist production relations, that is, the progressive transformation of agricultural inputs (organic resources to inorganic commodities), reducing nutrient recycling in and through the soil and water, and introducing new agronomic methods dependent upon chemicals and bioengineered seeds and genetic materials produced under industrial conditions. As such, as Moore (2000) notes, the metabolic rift underlies the historic spatial separation between countryside and city, as agriculture industrializes. This, in turn, depends on manufacturing technologies, whose metabolic rift involves expanding inputs of energy and natural resources, and industrial wastes -- recycled today, but largely outside of natural cycles. Fossil fuel dependence is, of course, a fundamental consequence of this rift, and contributing greatly to carbon emissions.

Moore's treatment of the metabolic rift articulates the social division of labor and its world-scale, and imperial implications (otherwise known as the 'ecological footprint'). The mediation of the urban/rural spatial relation by commodity circuits, rather than cycles of waste and regeneration of natural processes, deepens the metabolic rift. Historically, the world was reordered along these lines -- initially via the colonial division of labor, anchored in monocultures producing tropical products for metropolitan industrial and personal consumption. With the development of chemical agriculture and biotechnology, the growing abstraction of agriculture as an 'input-output process that has a beginning and an end' (Duncan 1996: 123) means that rather than a complex embedded in, and regenerating, local biological cycles, agriculture can in principle be relocated to specific locales anywhere on the planet as the 'intrinsic qualities of the land matter less' (Ibid: 122). In effect, agro-industrialization increasingly replicates the spatial mobility of manufacturing systems, including the sub-division of constituent processes into global commodity chains (such as the animal protein complex).

However, the metabolic rift is not only about a material transformation of production, with spatial consequences, it is also about an epistemological break. Henceforth, in the capitalist conjuncture, productive relations, and social institutions, are increasingly embedded in the market, and thereby subordinated to value relations.[6] Under these historical circumstances, the 'market operates as an abstract disciplinary mechanism through which concrete productive activities are compared and value is socially ascribed' (Taylor 2008: 25). The social content of value became of course the methodological pivot in Marx's critique of capitalism, where he demystified the phenomenon of 'price' by revealing it as the fetishized form of underlying social relations. By denaturalizing 'value,' Marx historicized the value relations governing the movement of capital, including the ongoing process of 'accumulation by dispossession' (Harvey 2003).

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[6] Arguably, Polanyi's characterization of the dialectic of social thought regarding the discovery of society in the construction and reconstruction of the market, as instituted process, reproduced this episteme.

Arguably, Marx's critique is constrained by the exigency of demystifying 'value,' as the foundational principle by which capitalist social reproduction is understood and theorized. In launching his critique, Marx confirms the relations, but not the terms, of reproduction – meaning that his theory of capital takes as its point of departure and critique the very relations privileged by economic liberalism. In so doing, the 'metabolic rift' becomes an ontological condition of this interpretation of the relationships of social reproduction. As Marx wrote in *Grundrisse* (1973: 489):

> *It is not the unity of living and active humanity with the natural, inorganic conditions of their metabolic exchange with nature, and hence their appropriation of nature, which requires explanation*, or is the result of a historic process, but rather the separation between these inorganic conditions of human existence and this active existence, a separation which is completely posited only in the relation of wage labour and capital. (emphasis added)

This formulation of an *explanandum* rules out discussion of ecological relations. It is not as if Marx was not aware of the significance of the need for a sustainable social/natural metabolism. Indeed he claimed the 'conscious and rational treatment of the land as permanent communal property [is] the inalienable condition for the existence and reproduction of the chain of human generations' (quoted in Foster 2000: 164). Nevertheless, his analytical point of departure concerns the generation of value, which is a relational attribute of capitalism, where, alongside exchange-value created by labor-power, the use-value of agricultural products embody natural 'wealth' – the foundation for sustainable social reproduction. So the focus on value encloses and reproduces an ontology that, proceeding from the original fact of the metabolic rift, discounts alternative value relations, most notably, those ecological.

This is not to say that 'ecology' is entirely a-social, such that, for example, natural resources are inexhaustible. With respect to agriculture, for example, Marx noted that 'when it progresses spontaneously and is not consciously controlled…[it] leaves deserts behind it – Persia, Mesopotamia, etc, Greece' (quoted in Foster 2000:169). One might extrapolate from this to climatic changes contingent upon unplanned emissions. However, the point is that *given* the metabolic rift, the ontological focus becomes capitalist value relations. That is, the conversion of agriculture to a branch of industry privileges capital in its subordination of landed property in the name of value. Such subordination reconstitutes ‘landed property’ through the lens of capital.[7] But the inversion is in the structure of thought as well, superimposing a capitalist logic on history.

Tomich is helpful here, in distinguishing between Marx’s theory, and the history, of capital. His solution, to go ‘*against the grain of Marx’s classical theoretical presentation,*’ requires that we move from “rational abstractions” ‘toward engagement, appropriation, and theoretical reconstruction of diverse historical relations excluded by the logic of Marx’s presentation…’ (Tomich 2004: 38). In other words, rather than view the history of capital from the logic of value relations alone, governed by its principal social contradiction between capital and wage-labor, it behooves us to recover the ecological and social presuppositions of the social/natural metabolism ruled out by the logic of the ‘metabolic rift.’ Embedded within this foundational story is the key to restoring an ecological dimension to capitalist history – an ecological dimension that has both epistemic and ontological implications.

Epistemically, to restore an understanding of ecological constraints means focusing on the limits to capital’s attempt to overcome ecological barriers, limits which express themselves in degradation of natural resources, including global warming. Capital’s drive to convert natural processes into value relations is realized politically, and this cycle continues today in the debates about Kyoto2, and the extension of carbon trading to manage emissions. A notable attempt to overcome the epistemic rift expressed in the fetish (and critique) of value relations was that of Karl Polanyi. While he did not speak of a metabolic rift, nevertheless Polanyi identified the epistemic rift in his concept of land and labor as ‘fictitious commodities,’ subject to annihilation, as ‘the human and natural substance of society,’ by ‘the idea of a self-adjusting market’ (1957: 3). The politically-instituted self-regulating market, under the aegis of economic liberalism, realized its limits in the counter-movements of agrarian and working classes, and the end of the gold regime. This hiatus, or interregnum,[8] in capitalist history was short-lived, and short-circuited Polanyi’s vision of social and ecological protections with a virulent stabilization of agricultural programs through which petro-farming was adopted universally, beginning in the US, and spreading via the Marshall Plan to Europe and the food aid program and then the green revolution to the rest of the world (McMichael 2007). However, Polanyi’s metaphor of ‘society’ protecting itself against socio-ecological degradation addressed, if not resolved, the epistemic rift embodied in Marx’s value theory.

The theory of value governs Marx’s method of political economy, through which he models how we should historicize capitalist relations. Proceeding from the historic fact of ‘the conversion of agriculture to a branch of industry,’ he enjoins us to invert the historical succession of landed property to capital, inverting it in thought to establish capital’s determinative role. With this methodological inversion we 'see like capital,'[9] and forms of ground rent and property are henceforth understood through the lens of capital accumulation. To be sure, the dynamic hinges on contradictions between the forces and relations of production, so that conceivably pre-capitalist forces of production retain some relative autonomy, but once the lens of capital accumulation is adopted, the subordinating relations assert themselves in thought, if not in material reality.[10] Accordingly, the inversion Marx performs in order to reformulate the historicity of landed property under capitalism represents an inversion in the structure of thought, as it superimposes a capitalist narrative on history, transforming it from the particular to the general, in thought. Arguably this reinforces a dualism to the extent that this method of abstraction elides understandings, practices and processes not governed by (market) value relations.

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[7] Lenin demonstrates this method brilliantly in *The Development of Capitalism in Russia*.

[8] Farshad Araghi (2003) argues cogently that this period interrupts capital’s elaboration of a global value regime, beginning in the late-nineteenth century, and proceeding apace since the 1970s.

Ontology of the market calculus

Whether and to what extent this dualism inadvertently participates in the objectification of social phenomena, it does appear to reproduce structures of thought that are unable to see that ecological contradiction is not simply 'internal' to capitalism, but also 'external' in the sense that there is an ecological other – whether the planetary carbon cycle, or its micro-histories. Here is where the *ontological* implication comes into play in recognizing not only the climatic dimension of capitalism, but also ecological values embodied in the reproduction of farming, forest and fishing cultures on the margins of the market culture. This is not to say that capitalist value relations do not impinge on such cultures – quite the contrary, in most instances they are under pressure from the market culture to surrender ecological values (Martinez-Alier 2002). The encroachment on so-called 'marginal lands' by indebted governments and corporations in the name of the global agrofuels project is often a direct assault on access to a 'commons' valued by its provision of grazing lands, medicines, fuel housing materials, and food in the reproduction of smallholder and nomadic communities.

The carbon market, as an institutionalization of value relations, with local consequences, is a case in point. In his discussion of the funding of carbon offset projects associated with the Kyoto Protocol and the European Emissions Trading System, Lohmann (2006: 171) points to the assault on cultures with relatively light carbon footprints ('survival emissions'), with the allocation of carbon credits to businesses or organizations to pursue carbon projects to offset emissions generated elsewhere ('luxury emissions'). Similar to biopiracy's extension of intellectual property rights over cultivars, the extension of atmospheric property rights discounts and dispossesses agro-ecology. Under the terms of the carbon market, not only do low-carbon lifestyles not count (or even provide models), but also they receive no compensation or credit for their historically low emissions. The right to carbon dumps, then, is simply the artificial superimposition of a property regime in newly enclosed spaces of the planet (see Cotula et al 2008). The right stems from a virulent development episteme which renames 'common lands' as 'idle' or 'marginal' lands, and projects commensurate market-based aspirations on to the associated cultures.

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[9] Cf Scott (1998). Note Jason Moore's comment, in distinguishing capitalism's value form from nature's wealth: 'Marx does not deny that external nature does work useful to humans, only that (*from the perspective of capital*) its productions do not directly enter into capitalism's particular crystallization of wealth' (2003b:450, emphasis added).

[10] Conventional formulations of the 'agrarian question' are a case in point (eg, McMichael 2008).

Such methods of enclosure fractionate culture and ecology into equivalent measures of 'value' to facilitate allocative 'efficiencies,' via trading rights to carbon dumps among polluters. What's the point? First, through the device of this 'fictitious commodity,' corporate interests obtain rights to offset, that is maintain, their emissions by renaming and appropriating resources offshore. Second, appropriation involves dismantling the integrity and viability of more ecologically-embedded cultural practices. And third, it reveals the premises underlying such 'violence of abstraction' – namely, that 'market efficiency' is about power and exploitation, and that the expropriation upon which (capitalist) value is founded includes alienation of other, more fundamental values. One might say that a market calculus displaces an ecological calculus – the difference rests on a fetishization of 'carbon' – as Shiva notes, the Stern Review 'fails to differentiate between the dead carbon in fossil fuels and the living carbon of biodiversity and renewable resources. It focuses on carbon emissions, rather than addressing the health of the carbon cycle' (2008:19).

The market calculus originates in 'primitive accumulation' -- an historical and logical necessity for the commodification and alienation of human labor as the source of value. Harvey's reformulation as 'accumulation by dispossession' underlines the constancy of this process – extending recently to public asset stripping and private revaluing via structural adjustment. By analogy, the revaluing of the carbon cycle accomplishes a similar 'wealth' stripping, insofar as ecological practices, as peasant means of reproduction, are fractionated and instrumentalized to optimize monetary value rather than ecological security (cf Sivini 2007: 40).

How should we account for this? I don't (yet?) have the answer, other than to assert that there are other co-produced values out there – not so much Bunker's natural resource values, which are essentially material, but rather resource-embedded practices that may maintain the carbon cycle. Certainly Bunker opens the door to exploring how to integrate ecological value, with his critique of classical political economy's 'unidimensional calculus of value' (2007: 251). Marx did not develop a theory of the production of use-value – he simply noted that: 'A thing can have use-value, without having value. This is the case whenever its utility to man is not due to labour. Such are air, virgin soil, natural meadows, etc.' (1967: 40). Bunker argues that the attribution of value exclusively to labor is definitional, and therefore arbitrary' (2007: 249). Further, Marx's theory 'that all values are produced within the capitalist mode of production, is a heuristic device that diverges from historical reality and from the physical fact that much of the matter and energy whose expanded and accelerated consumption is necessary for capitalism's "laws of motion" come from non-capitalist extractive economies' (2007: 251).

Marx's representation of natural values as original, or pristine, limits understanding of nature's active biophysical cycles and how they might articulate with (and degrade) social labor. Moore has emphasized Marx's refusal to separate land and labor in his analysis of capital, which 'does not exploit land and labor so much as it exploits the land through labor' (2003b: 450) – but this 'value in motion' approach remains partial insofar as the environment is rendered as capital's 'object,' and remains relatively passive. It resonates in Bunker's focus on the extractive exchange between social production and natural production – the articulation with natural production leaving nature in a relatively passive state – certainly transformative in its own right,[11] but not transformative in its constituent cycles as a consequence of the extractive relationship. This would be the source and dynamics of climate change.

Even as Bunker (1985) attempted to restore a thermodynamic dimension to capitalist and unequal exchange, paralleled in Braudel's, Wallerstein's,[12] and Moore's attempts to build a world-ecology into a theory of capital accumulation, the question of the self-organizing character of the earth's ecology, and, by extension, the interruption of its self-regulating cycles by human impact has been left aside. As I am arguing, the ontological basis for this came from capitalism and its critique, that is, the priority given to the value relation. As Friedmann observes: 'By linking and displacing local ecosystems, the modern world-system obscured human relations to the rest of nature. *It created the first basis for human illusions about markets and money as the apparent basis of life'* (2000: 502, emphasis added). In fact, since the reproduction of industrial agriculture is linear, rather than cyclical, leading to depletion and waste rather than renewal and absorption, Friedmann presciently argues '*suppressed* material cycles eventually *reappeared* at the global level, bringing awareness of the biosphere supporting human economy and human life' (Idem). In other words, the micro-interruptions of local ecosystems are realized increasingly at the macro-climatic scale.

Clark and York adapt the 'metabolic rift' notion to the macro-scale, through the concept of the 'biospheric rift:' 'Capitalism…effectively plunders the historical stock of concentrated energy that has been removed from the biosphere only to transform and transfer this stored energy (coal, oil and natural gas) from the recesses of the earth to the atmosphere in the form of CO2. In this, capitalism is disrupting the carbon cycle by adding CO2 to the atmosphere at an accelerating rate' (2005: 409). They invoke the Jevons Paradox – whereby 'greater efficiency in resource use often leads to increased consumption of resources' (Ibid: 411), to underline the path dependence of capitalism, and the complicity of states and carbon sequestration policies in sustaining this reverse destructive cycle (see also McMichael 2009). But behind this structural force lies the value episteme.

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[11] Thus: 'Theories of value based exclusively on labor neglect the usefulness to continued social reproduction of energy transformations in the natural environment' (Bunker 2007: 247).

[12] Note that Wallerstein, in positing the real question as 'the construction of a more morally acceptable mode of global environmental change' asserts that 'we are not discussing the relationship between the rich and the poor, the core and the periphery, but the living and their future descendants,' and invokes premodern philosophical debates about such generational allocations and their morality' (2007: 383-4). Philosophically important, yes, but whether the social division is of 'synchronic' or 'diachronic' proportions, the moral question is also ontological in the sense in which this essay poses the question…

To the extent that value relations remain the lens through which climatic changes are understood, such as in carbon market constructions, the solution to emissions accumulation denies the source, and that is the renewal of ecological cycles at their earthly base. In denying the source, value theory invisibilizes those who (must) work to renew and sustain ecological cycles, and the values by which they (must) live. As Friedmann notes: '…humans have developed two competing and evolving visions of the earth: global production chains managed by transnational corporations, which disrupt and attempt to replace self-organizing cycles; and a biosphere in which humans work with the self-organizing material living processes of the planet' (Ibid: 508). The former vision creates the 'biospheric rift' (Clark and York 2005), while the latter vision is the one we want, the 'rational' one, according to Marx (quoted in Foster 2000: 164):

> The way that the cultivation of particular crops depends on fluctuations in market prices and the constant changes in cultivation with these price fluctuations – the entire spirit of capitalist production, which is oriented towards the most immediate monetary profits – stands in contradiction to agriculture, which has to concern itself with the whole gamut of permanent conditions of life required by the chain of human generations.

The contradiction between these visions is expressed in the invisibilization of ecological practices and the needs of future generations, as a prerequisite to corporate rights to pollute through the fiction of a carbon market. The fiction is realized through the priority accorded to capitalist value relations in a universe in which 'economy' is disembedded. The *rational* form of value refers to ecological relations in a universe in which 'economy' may be socially embedded, and the metabolic rift is minimized. It is a grounded value. In their study of social movements for biodiversity on the Colombian Pacific coast, Escobar and Pardo note these movements focus on the political right to a territory 'as an ecological, productive, and cultural space' emphasizing 'articulations between settlement patterns, uses of space, and meaning/use practices concerning resources, which are expressed, in the case of indigenous populations, in ancestral cosmologies,' and which are essential to the political resolution of debates on biodiversity, between economic and ecological reasoning (2007: 307, 309, 310). The principle at stake regarding the integrity of ecological metabolism underlies the general preservation of a healthy carbon cycle.

It is a principle that Martinez-Alier claims is alive in the way in which the transnational peasant movement, *Vía Campesina*'s ecological critique localizes universal themes:

> Issues of global environmentalism … are transformed into local arguments for improvements in the conditions of life and for cultural survival of peasants, who are learning to see themselves no longer as an occupation doomed to extinction… This is not a phenomenon of post-modernity, in which some live (or try to make a living) by buying Monsanto shares, others eagerly eat hogs grown with transgenic soybeans, others are macrobiotic, and still others do organic farming. It is rather a new route of modernity, away from Norman Borlaug, a modernity based on scientific discussion with, and respect for, indigenous knowledge, improved ecological-economic accounting, awareness of uncertainties, ignorance and complexity, and, nevertheless, trust in the power of reason (2002, 147).

At present such ecological practice concentrates in the remaining peasant cultures across the world,[13] which represent capital's final barrier – currently targeted by corporate and political elites under the guise of a new green revolution to address the food crisis (McMichael 2008c). Among these cultures there are mushrooming movements to politicize the global food system and promote agro-ecological practices (Desmarais 2007), claiming (through the International Planning Committee on Food Sovereignty) that the world's peasantries 'feed the world and cool the planet.' It is this kind of movement that Marx had in mind when he opined: 'The moral of the tale…is that the capitalist system runs counter to a rational agriculture, or that a rational agriculture is incompatible with the capitalist system (even if the latter promotes technical development in agriculture) and needs either small farmers working for themselves or the control of the associated producers' (quoted in Foster 2000:165).

Conclusion

As implied, carbon credits are the ultimate 'fictitious commodity' in value terms, because there is no standard of value – the emission cap is an arbitrary construct of governments and multilateral institutions. It is a device of power. Returning to the historic separation of humans from the means of production -- it may be the conceptual threshold of capitalism, but it also accomplishes the separation of humans from the means of *reproduction* – that is, from renewable ecological relations. While these are *both* long-drawn-out and variable historical processes, the expropriation of the subsistence producer and the intensification of the metabolic rift are mutually reinforcing. Together they intensify the rift in the carbon cycle, as accelerating fossil fuel emissions have accompanied industrialization of both branches of the social division of labor arising from the metabolic rift.

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[13] See Holt-Giménez (2006) – it is matched, or paralleled, by community-supported and local organic agricultures, local farmers' markets and the Slow Food movement in the global North.

The long run is telescoping into a short run, and it behooves us to address this threat by integrating a political ecology of emission accumulation into our political economy of capital accumulation. And this in turn requires reformulating what we mean by 'value,' and learning to revalue what has been devalued by the value episteme.

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