What is the 'Green' in 'Green Growth'?

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The term “green growth', like the phrase 'sustainable development', always sounds a bit defensive. It's as if its users were saying, 'Sure, most people expect growth *not* to be green – but in fact it can be!' Yet mingled with that defensiveness is grandiosity: 'We now have the power to break altogether the links between capital accumulation and degradation of the conditions of human existence that have marked the last half millennium.'

Proposals for green growth ambitiously seek to engage at least three crises at once. First, they promise to respond to economic crisis by developing new environmental assets, rentable properties and repair projects that, it is asserted, will someday be objects for profitable investment. This investment, it is suggested, will address ecological crises ranging from climate change and water shortages to biodiversity depletion and deforestation in depoliticized ways that help free business from constraints that would otherwise be imposed on it by environmental movements, planners or state regulators. Finally, green growth proposals claim to be able to relieve the state of much of the increasing expense of environmental protection.

Can this pompous, implausible triple promise be fulfilled? There are reasons for skepticism on all three fronts, but this chapter will focus largely on the claim that green growth can address ecological crises. It will argue that in practice, green growth is not about solving ecological crises but rather reinterpreting them, creating new opportunities to take business advantage of them, and diffusing responsibility for them. It is not about forging a benign kind of growth, but about creating a new type of 'green' – new types of 'nature'. These new natures, while distinctive, turn out to feature much the same sort of contradictions and unsustainabilities as do older natures that have historically grown up with and helped to constitute capital. Various aspects of their construction are being and will continue to be resisted by those whose lives and livelihoods involve defending commons.

The chapter unfolds in five parts. The first section introduces the idea that there are distinct historical natures associated with various eras of capital accumulation. A second section elaborates how these constantly-contested natures came to be constituted as 'external' to society that represents, exploits and conserves them. A third suggests that placing the 'green' of 'green growth' in this tradition can help to explain both its special features and its continuity with previous capitalist natures. A fourth part sketches how the new 'green' might be seen as responding to capitalist crises. A final part reiterates the inevitability of the contradictions of and resistances to the new 'green' in the course of drawing together a few conclusions.

Some Prehistory

For over two centuries, poets, memorialists, historians, sociologists, technologists and political theorists have stressed that to create new kinds of human being – wage workers – is also to create new kinds of nonhuman 'nature', and that attempts to convert commons into anti-commons always involve drives to convert commoners into anti-commoners. When commons are enclosed, relationships among humans and nonhumans that involve, say, subsistence cropping, gathering practices, seasonal and solar rhythms, feudal obligations, communal constraints and collaboration practices, or human identification with water sources tend to come under pressure from meshes of other relationships including the wage relation, dependence on food markets for subsistence, private property relations, discipline of workers via industrial machines linked to networks of extraction of

coal and oil, and so forth.[1] Like most relationships, the new connections and processes involved in enclosure and the exploitation of wage labour are beset by instabilities and contradictions. In Karl Marx's view, they worked only by 'simultaneously undermining the original sources of all wealth – the soil and the worker.'[2]

Recently, Jason W. Moore, following in the footsteps of feminist theorists, has expanded and refined Marx's picture. Moore argues that every increase in the productivity of paid labour – which, together with growth in the mass of working consumers, has been especially central to the expansion of capital since the Industrial Revolution – is made possible only by a proportionately greater appropriation of the unpaid work of both nonhumans and humans, extracted from 'frontiers of uncapitalized natures' which lie 'outside the circuit of capital but within reach of capitalist power'.[3] Every small step in productivity improvement, Moore argues, requires a great leap in the appropriability of what he calls the 'Four Cheaps' (labor power, food, energy, raw materials). For example, impressive increases in the productivity of pulp and paper workers culminating in the operations of today's giant, hugely capital-intensive pulp mills and their adjoining capital-intensive tree plantations have become possible only through the progressive theft or enslavement of vast areas of (often originally forested) land and soil fertility, the low-cost extraction of ores and fossil fuels from ever-wider territories to make and run the machines, and the 'free gift' of the supportive work of workers' families, especially women.

Such appropriations – and subsequent capitalizations – are not achieved by a single, historically invariant form of violence. They become possible only through changes in human and nonhuman relationships. These relationships appear partly in the emergence of contested 'natures' that become more detachable, more measurable, readable, standardizable, combinable and mobile, as befits their partial or intermittent transformation, via new entanglements and processes, into bearers of value that can circulate in capitalist exchange. Although the new connections are often referred to with shorthands such as 'quantification', 'abstraction', 'fragmentation', 'monetization' or 'alienation', such labels are clumsy synechdoches that foreshorten much of the conflict-ridden politics involved by telescoping changes in large complexes of relationships into a few, often highly-mystified, 'intellectual' zones of the process. In reality, the quantifiable 'unit' so critical to capital accumulation, as George Henderson emphasizes, 'is neither unit nor thing as such, but a highly volatile set of social relations and processes.'[4] It is those processes in their entirety that must be appreciated if the contradictions inherent in the restricted types of quantification and abstraction specific to capital's natures are to be grasped. A 'critique of quantification' gets no closer to the deeper contradictions involved in capital's appropriations than a 'critique of violence' would. If, as Moore suggests, today's class struggles increasingly revolve around reproduction – the 'hidden abodes' on which production relies – then they are less about the 'monetization of nature' or the 'quantification of nature' than about the constitution of nature.[5]

For example, the early European wood-pulp industry (like some frontier wood-pulp industries today) used surveying techniques as well as developments in navigation, roadbuilding and so forth not as applications of academic theory to an invariant nature, but as an integral part of a complicated process of wresting raw materials from forests that, still earlier, had been co-created through relationships linking trees, soils, microorganisms, various nonindustrial agrarian, trading or hunting and gathering communities and so on. By the same token, most of today's advanced pulp mills feed on 'fibre resources' that are harvested from regimented tree plantations of a type that could only have been fashioned through modern forestry techniques, agrochemicals based on oil extraction, contemporary property law, the use of state power to apply that law to the benefit of capital, internal combustion engines, cloning techniques, harvesting machinery, pulping devices, and the appropriation and accumulation of the intellectual commons of forest scientists – that is, again through a set of complex relationships among human beings, trees, territories and soils, as well as the undermining of other relationships. Neither of these 'natures' – the exploitable forests,

the high-tech plantations – was a passive substrate related to a distinct 'social' entity called 'capital' merely through a primitive relationship of 'violence' or 'extraction'. Nor were they pre-existing objects whose appropriation came about only at the point at which they happened to be measured or exchanged for money. Nor were they imaginary objects created by a reductionist 'politics of knowledge' involving numbers and calculations, nor a sort of 'superstructure' built on a separate base of purely 'economic' relations. Rather, they helped constitute those relations. Both the exploitable forests and the high-tech plantations formed part of capital itself, insofar as the innovations entwined with the existence of each were integral both to the development of wage labour and to increases in its productivity.

On Moore's view, it is by finding revolutionary ways to 'appropriate new streams of unpaid energy/work' and deliver them cheaply into the 'circuit of capital as a whole' that capital overcomes periodic productivity crises.[6] '[N]ot only does capitalism *have* frontiers; it *is* a frontier civilization'.[7] These frontiers – where 'a small amount of capital [can] appropriate a very large basket of nature's gifts: cheap forests, fertile soil, workers unable to offer effective resistance, and so forth'[8] – are not pre-existing givens, but are continuously constructed just as labour power is constructed. Thus in early phases of capital accumulation, colonial-zone 'cheap natures' were identified, codified, rationalized and organized with the help of new shipbuilding technologies and cartographic techniques propelled in part by – for example – the Renaissance reinvention of linear perspective as well as other representationalist technologies that in certain ways make territories quickly legible from afar to imperialistic communities. In this way, capital could collect windfalls from, for example, the rich *massapé* soils of 17th century Brazil's sugar cane lands, or the work of the families of millions of forced laborers at the Potosi silver mines, or of the African families whose children were impressed into American plantation labour. Later windfalls, in the form of cheap food for manufacturing labour, arrived, via a world market, from the fertile prairies and grasslands of settler frontiers such as those of North America, and, still later, from new 'petro-farmed' lands of the Green Revolution made possible by state subsidies for violence in the oil-bearing territories of the Middle East.[9]

In the 19th century, the steam engine and the science of thermodynamics became frontier techniques for turning coal from a rock into a 'fossil fuel' and freely appropriating the 'work' of past ages of plant life, vastly boosting the productivity of factory labour and agriculture alike. Indeed, energy itself presents another good example of the seemingly more 'abstract', 'external' natures whose construction has always formed part of the evolution of capital. The frontiers supplying the cheap energy so crucial to economic growth have never just been 'out there', but have always been actively 'made'. Before 19th-century thermodynamics – which came out of the development of fossil-fuelled steam engines and electric motors and batteries – nobody talked about energy at all in its current sense. People talked about horses, fire, trade winds, lightning, the ripening of wheat and so forth.Each was connected less with a common 'energy' than with ploughing, cooking, sailing, eating and so on, with all the limits to interchangeability and accumulation that the existence of such disparate meshes of relationships imply. In some contexts, the actions and beings involved were even seen as having individual personalities, dignities or rights. By about 1870, however, 'energy' had become part of the currency of 'nature'. The commensurability of heat, kinetic energy, electricity, magnetism, and chemical energy had been cemented not just in the discourse of physicists, but also in the materiality of everyday life, in the conversion engines, factory floors, wires, pipes, travels and relationships linking goods, metals, and peoples and their territories, routines and governments across the world. And it was only through the new relationships constituting the 'nature' of energy – combined with the appropriation of slave or cheap plantation and mining labour across the globe – that such phenomena as the enormous 19th-century profitability increases in Britain's textile industry became possible.

The rise of the new 'nature' of thermodynamic energy represented not just a transformation of the landscapes of workshops, cities, coal-bearing hills and human habits of movement and interaction, but also a metamorphosis of fields and forests at great distances from extraction or industrial sites. As historian Stephen J. Pyne has documented in a series of books, European elites had long opposed open-air, vernacular fire – such as that used in specific regimes by swidden farmers to restore their fields and pastures or by forest dwellers to encourage preferred tree species and the growth of forest mosaics attractive to game animals – as threatening to fixed property as well as 'unproductive' or 'unimproving' in a capitalist sense.[10] The thermodynamic energy/fossil fuel complex gave this prejudice new muscle by shunting more fire out of fields and forests and into the combustion chamber. As wood fuel became less significant for urban dwellers and 'scientific' nature conservation programmes gained ground, uniform strictures on wildfire turned territories hitherto packed with species dependent on place-specific rhythms of anthropogenic burns for their germination or growth into different sorts of 'nature' entirely. At the same time, 'high-productivity' agricultural regimes – such as the Peruvian guano- or Chilean saltpetre-dependent European farms of the 19th century or the Green Revolution fields of the 20th – replaced the nutrient pulses provided by periodic burning with potent, exotic inputs imported from the past and over great distances. One outcome was an unsustainable compulsion toward a global Euclidification and externalization of agricultural space, an attempt to 'rise above, as it were, local soils, local landscape, local labor, local implements, and local weather'.[11] This shift reinforced, from an oblique angle, the earlier Mercatorian attempt to reformat the world as a geometric, uniform space friendly to centralized surveillance, long-distance trade, large-scale extraction and huge transfers of labour, money and other 'units' from one place to another – materialized, as always, in the steel, concrete, fibre, ports, charts and international treaties of global 'infrastructure'. Again, all such changes inhered in relationships linking humans and nonhumans alike – as, for example, when humans working together to practice careful, periodic agricultural or forest burns changed into humans working together to dig firebreaks or struggle against the explosive, massively-destructive fires that came with the new, unprecedented buildups of tinder on the forest floor.

'Externalizing' Nature

One aspect of the new relationships was that they made it easier to lump nonhumans (and some sets of humans) together as an omnibus set of beings 'external' to society. This becomes most obvious in dualistic colonial and industrial practices of instituting a nature that is, roughly speaking, divided between resource or commodity on the one hand and 'wild' on the other – that is, between (1) titled raw material to be carried over the border of 'society' to be processed or 'improved' and (2) 'protected area' supposedly quarantined from human beings (with the exception of scientific and technical specialists and caretakers professionally licensed to interpret communications from across the new nature/society boundary). Such dualisms often wound up articulated in property law and other writings of intellectuals. T. R. Malthus, for example, worked to depoliticize the struggles of his own day over the constitution of nature by refining a picture of scarcity as a fixed, eternal condition of existence, positing a theoretical land eternally menaced by equally theoretical, uncontrollably-breeding poor humans. Such so-called 'discursive' moves could in fact never be easily separated from material acts. The enclosure of commons broke subsistence relationships linking millions of human beings with their land, crops and animals, replacing them with longer-distance connections involving food markets. To a considerable extent, agriculture was depopulated and given over to the mechanized provisioning of distant, urban-centred labour forces with food made 'cheap' partly by successive seizures of underground carbon reserves. Forest reserves and national parks partially excluding indigenous peoples from land and forests became what Benedict Anderson calls a 'quotidian universal' with which every reputable 'nation' had to be equipped.[12] Such 'externalized' natures, moreover, were not new to the 18th or 19th centuries, but had been appearing in some fundamental (and always conflict-afflicted) forms at least since the time of the emergence of what Marx called abstract labour three or four centuries earlier.

One example is space treated as neutral backdrop for far-flung sets of human activities detachable from it. Renaissance perspective's lone centralized observer stationed 'outside' a scene rubs up against not only the roving medieval artist who, mingling with the crowds, paints buildings or tables from several intimate vantage points[13] or the medieval king who 'surveys' his realm only through a pair of horse's ears[14] but also the contemporary Palikur of the Brazilian Amazon who take into account the perspectives of objects seen as well as that of their human viewers.[15] Sixteenth-century surveys of English landed estates, as well as the seventeenth-century land and population survey of Ireland carried out by William Petty (with people appearing as detachable units in a homogeneous, quantifiable space), controversially privileged the emerging point of view of landowners, conquerors, the state and investors trying to stand above and outside meshes of relationships constituting spaces that were being profitably redefined by hedges and fences,[16] land titling, new policing and military routines, and maps on the walls of manor houses or colonial administration buildings.[17] Authors of maps measured land not by how much ground a pair of oxen could plough in a day but by chains and triangulation, in a process that is better described as the supplementation of one set of political relationships with another than simply as 'abstraction'. Many of the colonized themselves, thanks to the work of printing presses, were soon themselves pitching in to co-produce the new space as part of a dynamic that was both supplanting dynastic realms in favour of nation- states and, as Neil Smith notes, playing a key role in the 'evolution and survival of capital'.[18] Throughout, the new space was all about power. It did not rise to relative prominence because a few isolated geniuses decided to throw off encrusted bias and face the physical world as it 'really is', but through intensive alliance-building involving what Bruno Latour calls theatres of persuasion, in which far-flung inscriptions and visualizations of all kinds were assembled in a single framework and technologies built for comparing and manipulating them.[19] Today, making 'external' space continues to be hard work and intensive struggle, a matter of forcefully articulating or clashing together new relationships with old.[20]

The same is true of the new time that historians would later misleadingly characterize as having become "'isolated' as a pure form, exterior to life'.[21] Just as Renaissance perspective contributed to the construction of a space whose shape was not determined by the buildings, human figures or interactions that it contained, so polyphonic music helped to construct, between 900 and 1200, a quantifiable, graphable time that existed outside the contour of any particular religious chant.[22] The emergence of church and city clocks and then – centuries later – railway station clocks synchronized into showing the 'same time' across entire nations helped develop further a temporality partly disentangled from coordination routines specific to particular places.[23] It was through parallel processes that, in the 19th century, energy came to seem external to the embodied work of, say, family cooks or dynamo engineers,[24] and in the 21st, a generalized, exchangeable risk became increasingly disentangled from the specific antics of, say, traders, currencies or tectonic plates.[25]

Each new 'external' nature, moreover, helped externalize others. The struggle of apologists of land surveying was also a struggle toward a conception of property as an 'absolute right' unconditional on the 'owner's performance of any social function,'[26] contributing toward efforts to make real an emerging ruling class ideal according to which a Cartesian 'mind' could do anything it wanted with a passive, externalized, predictable and controllable 'body'. In similar ways, the scientific work that today makes possible the 'alienation, individuation and abstraction involved in constructing the discrete “thingness” of genes and organisms' functions not only to help render these 'bits' mutually equivalent and exchangeable, but also, as Scott Prudham shows, to make it seem that they have been 'invented' by individual experts and investors.[27] The accurate clocks and Mercator projections that facilitated trans-oceanic trading voyages indirectly made possible imperial botanical collections that in turn helped enact a divorce of germ 'raw material' – which could now more easily travel the world in an 'immutable' form – from established human and nonhuman contexts. The thermodynamic energy that arrived with fossil fuels, meanwhile, helped engender not only national or regional time – as Aldous Huxley noted long ago, 'in inventing the locomotive, Watt and Stevenson were part inventors of time'[28] – but also the idea of a progression linking shoulder

harnesses, sailing ships and nuclear power plants in a single master timeline of 'energy use',[29] as well as the synergy apparent today between a 'background' consisting of fixed, large-scale infrastructure and masses of rapidly circulating 'foreground' units of labor, commodities, machines, tools and so forth.[30] As Peter Galison shows, the tricky problems of defining simultaneity (time A = time B) at a distance in the expansive technopolitical contexts of late 19th century capitalism stimulated the development of the still newer temporality described in Einstein's 1905 Special Theory of Relativity. Relativity was in turn instantiated in, for example, today's Global Positioning Systems, which have further 'externalized' space to the point where drivers can no longer necessarily answer the question 'how did you get here?' in terms of narratives involving vernacular landmarks.[31] And when, over the 20th century, economics assumed the role of delineating the 'nature' of human societies and of being a 'container' for area studies and other social sciences, a fresh impetus was given to the old, constantly-contested tendency toward treating land as what Joel Wainwright and Trevor Barnes call 'economic space' – geometrically mapped plots of land under single owners.[32]

Resistance-tempered attempts to 'externalize' a discrete nature (including human nature) form a pair with the conflict-ridden processes, analyzed by Marxists, through which the products of labour come to seem 'external' to the worker. Both are closely linked to the crafting of exchange- and accumulation-friendly equivalences, which in turn are regularly tied to violence.[33] Just as the equivalences implied by the wage relation are, in a sense, devices expressing the 'freeing' of labour as well as the elision of resistance to appropriation and to damage to human organisms and relationships, contributing to a framework making it possible for bosses and workers to 'call it quits' with each month's paycheck,[34] so too the equivalences embodied in the successive new natures of the era of capital are devices that express the exclusion of certain entanglements and responsibilities in favour of others. For example, the equivalences between points or areas in coordinate space (when the proper variables have been entered) are expressions of relationships that help make it possible for partners in great numbers of commercial land transactions to 'call it quits' and move on quickly to the next transactions and their obligations, while other shapers of the land find certain of their relationships with and obligations to it symbolically excluded from its future. The equivalences formatted by turbines and internal combustion engines and expressed in the First Law of Thermodynamics facilitate new global motions and disciplines (for example, as coal and oil are exchanged with each other and transformed into heat, heat transformed into mechanical energy, and mechanical energy transformed into electricity in an externalized 'energy economy') while tending to interfere with other motions and disciplines that many peoples worldwide maintain between distinct 'little energies' and their ways of life. The convenient word-to-word, phrase-to-phrase or belief-to-belief equivalences solidified through colonial practice and professional interpretation and dictionaries meanwhile facilitate a class of rapid interactions that can be quickly 'closed off' at the expense of the embrace of what the logician W. v. O. Quine called the indeterminacy of translation,[35] or what the anthropologist Eduardo Viveiros de Castro terms the 'controlled equivocation' that characterizes longer, differently-entangled, more democratic linguistic and inter-linguistic interactions,[36] encouraging a conception of meaning, belief, and language itself as 'external'.[37] The new equivalences associated with an aggregatable 'uncertainty' made it possible, during the era of accelerated securitization beginning in the last decades of the 20th century, for banks to sever relationships with borrowers that they had had to pursue under a previous 'originate and hold' model of lending, and, increasingly, regard risk as 'external' to such relationships. In short, the so-called 'abstract labor' that represents business's ability to transform, appropriate and store up human subsistence and flourishing activity as an income stream or asset develops to its maximum extent in concert with the evolution of so-called 'abstract natures' that can be symbolized or 'notated' partly by panoplies of new equivalences.

Today's all-encompassing 'environment' – a pre-existing 'container' to be filled by various societies[38] – acquires political force where it becomes common sense to see mapping techniques and clocks as measuring objects and durations in units of a pre-existing 'background' space and time; thermometers and voltimeters as registering units of an eternal, 'external', homogeneous energy; and

dictionaries as recording equivalences that were already present among the 'meanings' that made up one or more languages, conceived as infrastructural 'conceptual schemes' standing above their speakers and their traffic of beliefs and desires. When time becomes a container for history and space a container for place, nature becomes a container for cultures, civilization a layer placed on top of a primeval bestiality, and humanity an organism that leaves 'ecological footprints', tries to hog the earth's 'net photosynthetic product' all for itself, and needs to pay more attention to 'energy return on investment'. Intellectuals start to feel impatient with resistant souls who object to the idea that modern European maps' geometric space constitutes a neutral matrix equally compatible with all human practices. If a container is distinct from the things it contains, how could it possibly disrupt, conflict with, or take anything away from any of them? As long ago as the mid-16th century, apologists for land surveying such as Robert Recorde were protesting, against skeptical 'Tennauntes' of landed estates, that geometry 'hath no man opprest' since it 'measure[s] all truely,/ And yelde[s] the full right to everye man justely.'[39] Today, well-meaning geographers may find themselves adopting a similar attitude toward indigenous peoples who are wary of using European mapping to defend their territories. By the same token, intellectuals accustomed to the world of policy planning and physics classrooms are likely to find irritatingly paradoxical the idea that the energy of thermodynamics, which seems a neutral way of conceptualising and 'containing' or subsuming all of the vernacular 'energies' of subsistence, might actually be in conflict with them. They may not appreciate, for example, that the 'little energy' of kitchen firewood in a village in Southeast Asia – which may be entangled with the forest commons from which it is gathered and the civil custom of not using more wood to boil rice than is strictly necessary – cannot be maintained when that commons is treated as an obstacle to extracting the 'big energy' of thermodynamics from dams, coal mines or biomass pellets to feed an economic growth conceived of as unlimited.

Intellectuals seeking a critical understanding of the prehistory of green growth need to resist the invisibilization of the everyday struggles by which the 'externality' and quantifiability of nature is achieved. Effective alliance-building requires reminders of the practical and everyday ways in which commoners constantly ignore or contest this externality[40] – as well as the ways in which capital itself depends, in a contradictory and conflicted way, on the less-externalized natures of commons. Centuries-long struggles refusing capitalist work have always relied on the defence and development of subsistence commons, as have movements resisting dispossession by infrastructure or resource-development projects. Various contemporary Andean and Amazonian conceptions often decline to countenance a notion of nature as a nonhuman foundation over which society is draped. And while the ideal-type capitalist logic explored by Marx involves perpetual, competition-driven attempts to dynamite material 'roadblocks' along capital's magical route from investment to payoff, an inevitable 'revenge of the finite'[41] highlights capital's own ultimate dependencies on natures that cannot be conceived of as 'external'. The vision of unending production based on the machine always comes up against what Marx called the 'weak bodies and strong wills of its human assistants'.[42] Via ecological crises, attempts to disentangle land, water and work from commons relationships in order to re-entangle them in commodity circuits are always brought up short at a certain point, necessitating moments of re-re-entanglement. Via financial crashes, even interest-bearing money periodically 'discovers its intimate ties to the finite world of use-values'.[43] Many fundamental ties can never be broken at all. Where would capital be unless people on their way to work disregarded the geometric space that is so conducive to transoceanic trade and speedy DHL deliveries and obviated calculation by simply following their fleshly noses past a succession of familiar landmarks and vernacular obligations?[44] How could laborers be induced to surrender a surplus at all unless they operated largely in a homely, often ludic workspace of 'making out', 'baseline communism', pattern recognition, procedural rationality, foot-dragging, and the commons of jokes and daily lampoons of their bosses' quality-assessment schemes?[45] What would capital do on the coast of China or Viet Nam in the 21st century if there did not exist commons regimes in the interior from which workers could be cheaply drawn and which provided continuing partial backup for a reserve labour army? How could the Black-Scholes-Merton formula for option pricing ever have been effective without traders' craft knowledge of markets?[46] How could translation go

forward without the possibility of indeterminacy? How could the economic subject even be constituted in the absence of commons relationships?[47] If capital has an architecture, such divergent and *ad hoc* materials will always form its precariously-constituted bricks and mortar.

The New Natures of Green Growth

How the history of natures is divided up depends on what the end in view is. If the end is to pin down more precisely what is distinctive about the nature named by the word 'green' in 'green growth', it may be useful to speak in a rough-and-ready way of successive natures of capital, each built on top of, or using materials from, previous natures. Imagine an old building constantly being added to, partly demolished, restored, rebuilt and modernized, featuring a never-final collection of new wings, storeys, turrets, odd gargoyles and high-tech fittings. Such a construction project could symbolize the stages, branchings and transformations in the co-construction of non-commons natures, with the substance of the whole dependent in innumerable way3s on (as well as thwarted by) the encompassing, also ever-changing, natures of commons in which it is set, and out of whose materials it is built. Preserved in the foundations and building material of the structure as it exists today is the nature that includes the time and space of the Renaissance and the early colonial era, exemplified by the emergence of wage labour, the printing press, and new accounting procedures; enclosure or appropriation of the work of the commons; increasing transmission of land and labour through capitalist circuits; and the tapping of ever more distant mines and plantations – all of which helped open new vistas for accumulation. Built on this base are new storeys consisting of the 18th- and 19th-century nature of 'resources' – of thermodynamics, scientific forestry, steamships and industrial factories, which vastly boosted wage labour's productivity, the numbers of worker-consumers to absorb its products, and the scale and speed of extraction, inaugurating the expansive universe of ownable, globally-circulatable containers of value of the type traded today as Ford cars, Lenovo computers, barrels of West Texas Intermediate Crude Oil or tonnes of Bleached Eucalyptus Kraft Pulp. Developing in tandem with this 'resource' and 'commodity' nature are counterpart natures consisting of scientific conservation zones and ecosystems. Thus early colonial efforts including botanical collections expand into more fully-fledged movements promoting forest reserves, national parks and so forth, together with constructions of peasants and indigenous peoples as threats to nature. Ecological or ecosystem relations emerge partly as imperial projects or cybernetic accompaniments of technocratic rule.[48] And environmental regulation eventually becomes a commonplace of industrialized societies threatened by their own poisons. Indeed, so fully blended are these natures that a better name for the later versions of 'resource' nature would perhaps be 'resource/conservation zone/ecosystem' nature: a nature, which, whatever its 'green' tinges, is not opposed to but rather an integral part of the expanding appropriation of the 'free gifts of nature'. Manifestations of this nature include the continuing 'bloody and fiery' evolution of protected or reserved areas as counterparts to production forests and industrial agriculture zones, the invention of recreation, and the emergence of explicitly environmental legislation.

Classical conservation zones and reserves tend to be defined more as areas where exploitation is partly or wholly absent than as areas where commons are present. Under colonialism, they were first and foremost the other side of the coin of extraction and plantation agriculture; under industrialism, a reversed mirror image of industrial resources and production. Similarly, the regulated nature enjoyed by the residents of a city in which lead levels in air are restricted to less than 0.15 $\mu g/m^3$ is defined in terms of external state controls on the excesses of an industrial system which is treated as a background and, not, say, in the terms indigenous peoples might use. This is also the way climate is treated today by the United Nations – as a nature to be regulated negatively, by making absent a certain proportion of industrial-era gas emissions. All this is merely to reiterate that the externalizing webs of relations defining protected areas or regulated natures – including labour relations – are different from those defining, say, commons, *pachamama* or indigenous territories.

Now, new natures – the late 20th- and early 21st-century natures of ecosystem services and green growth – are being bricolaged onto these older natures, facilitating the appropriation of the 'free gifts' of commons in novel ways. Like its predecessors, these new natures are defined in terms of absences rather than presences, of control rather than respect, maintaining the old industrial, anti-commons bias. Their innovations are twofold. First, yet more absences are created in order to help remediate the excesses of a pattern of accumulation that continues to be regarded as normal. Global pollution that does *not* happen; oil that is *not* exploited; degradation that *would* have taken place but did not, thanks to the intervention of experts and green capital: all these are fresh aspects of today's industrial natures. Second, even more crucially, all such absences, venerable and novel alike, are made tradable. Natural resource management, conservation reserves, ecosystems and conventionally-regulated spaces of 'environmental quality' are mobilized for circulation. Nature as a disparate set of bounded spaces from which conventional capitalist extraction or production has been partly excluded is retooled as a 'producer' of tokens representing a conservation whose exact place of origin is generally no more relevant to traders than is, say, that of No. 2 Yellow Corn and no more relevant to consumers than that of Apple computers or Rolex watches. In principle indifferent to the ultimate sources of the standardized permits and credits that they deal in, ecosystem service traders and bankers instead pay heed to the certification provided by newly-constructed state or private technocracies (as it were, the 'credit rating agencies' of nature trading). Nature becomes 'liquid', to use Bram Busher's useful phrase,[49] and its value becomes *de dicto* rather than *de re*.[50]

Unlike the conservation component of 19th- and 20th-century industrial nature, which can be read crudely as mixed baskets of relatively uncommensurated ends (for example, individual forests here and there declared off limits to logging, hunting or gathering; Red Lists of endangered species; particular 'airsheds' relatively uncontaminated by lead; or unique landscapes unblighted by windmills), the new natures are zones of 'no net loss'[51] or 'net zero carbon'[52] in which such items are commensurated as means to a new end of an 'averaged', 'flexible' nature.[53] One example of such natures is the tokens of 'functional lift' traded in US water quality markets. These represent increases in 'environmental quality or function' generated by a piece of landscape, measured against what experts say it 'would have contributed without the abatement activities.'[54] Another example is the pollution allowances that circulate in the European Union Emissions Trading Scheme (EU ETS). These are fungible units of the aggregate carbon-cycling capacities of oceans, mountains, forests and anthills worldwide, and have been made exchangeable under certain circumstances with units of reduction of non-CO_2 greenhouse gases such as CH_4.

These units would not be possible if states had not first agreed to (and claimed the ability to measure) scarcity-creating 'caps' on emissions – an arrangement in which nature is construed as something belatedly walled off from capital for future use or for reproduction. Thus the UN Framework Convention on Climate Change at first envisaged the earth's atmosphere as a potential zone of regulated, externalized molecules somewhat in the style of the environmental laws of the 1970s: atmospheric concentrations of greenhouse gases, it was proposed, were ultimately not to exceed such-and-such a level; those nations not doing their fair share would be punished; and so forth. The 1997 Kyoto Protocol's flexible mechanisms were then able to convert this agreement to reduce pollutants to a certain level into entitlements to emit them up to that level, and to make those entitlements tradable. Disparate activities that could be calculated to result in achievement of the relevant molecule levels were made interchangeable, transforming them into units of an abstract, aggregate 'mitigation' process without any single location, pedigree, time frame, technology or set of historical entailments. Title over this new abstract nature (in the sense of the right to charge rent on it) could then be awarded to the states of the industrialized global North.

This distinctive way of appropriating the 'free gifts' of commons can also be seen as a way of appropriating the generations of work embodied in them. Just as human subsistence and flourishing has been partially and problematically transformed into an asset stream for the past 500 years and more, so, too, in the prospective era of green growth, the diversely-entangled activities of other

denizens of earth are to be partially and problematically alienated into what Morgan Robertson calls 'an immense collection of services'. To take just one example, the 'hybrid' human-nonhuman concrete labours that, in innumerable constellations bringing together the efforts of local plant and animal species with those of human caretakers, specialists or police, had generated conventional bits of capitalist nature conservation in specific places are now, in effect, made to circulate in abstract form.[55] Of course, rejiggering and appropriating the activity of nonhuman life has always been a part of the 'resource' organization of nature that accompanies wage labour. When capital constitutes and extracts oil as a fossil fuel, the work of prehistoric organisms is seized and their relationships with contemporary territories and the people who dwell in them broken apart and reassembled in different forms in order to boost the productivity of paid human work and multiply outlets for manufactured goods. With the green economy, however, oil can also be constituted and appropriated by being set aside *in situ* as a quantifiable commodity-that-*would*-have-been-extracted- were-it-not-for-environmental-service-payments-and-the-initiatives-of-consultants-bureaucrats-and- industrial-firms. The old oil is part of a nature of fluid dynamics and pipelines, internal combustion engines, concession contracts, seismology and chain link fencing, as well as of an older Newtonian space and time. This is a nature of pathways that channel finance into extraction; wage goods, state education and police into subsistence communities; and toxins into children's bodies – and a nature that blocks pathways linking soil nutrients with plant roots; marital discord with community mediation; subsistence activities with forest genesis; and shamans with the 'blood of the earth'. The new oil is part of a nature that consists of all this and more – of ecosystem relationships; biotic monitoring; channels through which three units of water pollution from nonpoint sources can be traded for one unit from a point source; emissions factor negotiations; and equations through which biological uncertainty and ignorance can be converted into measurable risk. This is a nature performed partly by carbon registry transactions, environmental economics, and financial transfers to the accounts of environmental consultants, brokers, and 'deception marketers' for their work in packaging and attesting to the value of ecosystem service contracts. Dissociating subsistence activities and nature genesis, it takes human activity and further bifurcates it into production and reproduction while parsing nonhuman activity into ecosystem services and unindividuated background. This is not, of course, the narrative that appears in environmental economics. Just as modern apologists for industrial capital saw value as created mainly through the initiative, sacrifice or organizing ability of owners and managers, not through the work of society, today's market environmentalists tend to view green value as shepherded into being by economists and other experts, not derived from the historical work of commoners and commons. Although apologists for ecosystem service markets often recognize the entitlement of indigenous peoples to wages for acting as caretakers of the new natures, they tend to be silent on the ways that the appropriation of and collection of rent from these natures amounts to the appropriation of the surplus work of generations of humans in interaction with their nonhuman surroundings.

The new natures are natures not only of CO_2, but also of 'CO_2 equivalents'; not only of species, but also of 'species equivalents'. Thus according to the United Nations, climatic stability can be defended in the face of rising carbon dioxide emissions as long as a sufficient amount of other gases certified to have an equal 'Global Warming Potential' are claimed to have been reduced.[56] According to the UK government, forests can now be kept in a steady state of preservation when 10,000 ancient-forest trees are cut, as long as a million monoculture trees are planted in compensation.[57] In the US, a tradeable unit of 'functional lift' refers not to improvements in the overall relationships a particular community enjoys with a patch of floodplain common pasture, nor even just to improvements in the biophysical properties of the soils in that pasture from the perspective of optimal local commercial production of milk, but only to such improvements insofar as they are made capable of being equated with various commodities in regional or national exchange. The nature of pollution changes as well. Fenceline communities whose children fall ill from the poisons discharged by a factory adjoining a schoolyard can today be told that the factory is, in effect, 'not polluting', because it has offset its pollution by buying emissions credits from elsewhere. While the nature that many such communities continue to try to defend is locatable in their own daily

interactions, the nature associated with the new trade in ecosystem services, like risk in an age of derivatives, is located in a space less accessible to them – and often even to national states. In an analogue of what Marx called the drive to maximize relative surplus value, this nature is 'capitalized' or 'mechanized' as much as possible through computer-friendly quantitative formulas and techniques of segmentation into 'stacks' of ecosystem functions, for whose inevitable, multiplying shortcomings human and nonhuman workers in the environmental services industry are then compelled to compensate. In short, just as military protection costs were internalized by the Dutch business/state class of the 17th and 18th centuries, production costs brought within an economizing logic by the 19th-century British business class, and transaction costs internalized by the vertically-integrating US business class during the 20th century,[58] so too is the 'environmental governance' exemplified by 19th-century conservation or 1970s-era regulation now being economically rationalized, with environmental problems reframed as internalizable externalities, market failures or negative value.[59]

The technical, legal and scientific apparatuses through which the 'green' of green growth is being fashioned today are built on, and in some senses advance the complexity of, the cadastral surveys, Mercator projections, and thermodynamics that helped build the natures of earlier eras. Sprawling committees of scientists are needed to work hard to compromise on methods of calculating the relative Global Warming Potentials of various greenhouse gases. Supercomputer-powered Global Circulation Models taking account of Himalayan weathering processes and the nitrogen fixation of bacteria in Norfolk are needed to help states decide how many entitlements to world carbon-cycling capacity are available to appropriate and hand out to private industries. Mass-produced real-time smokestack monitoring instruments developed beginning in the 1970s, together with the latest electronic networks of intercapitalist coordination, are indispensible to help keep track of how much of their rights to the new natures industries are actually making use of. Similarly, satellite imagery interpretation (an enormous advance over the aerial mapping and note-taking that, in the 1920s and 1930s, shaped the emerging colonial nature studied and managed by ecology),[60] while not consciously developed for the purpose,[61] now helps assemble 'environmental asset' portfolios reflecting the 'potential and realized economic values' of ecosystems and ecosystem services.[62] Troops of scientists are needed, too, to create and negotiate the units of an external nature which biodiversity is diversity *of*, and then to simplify them into quantifiable tokens that can circulate as freely as possible in the constrained, flat space and time of policymaking and markets "without containing too much historical baggage".[63] Hardly less challenging are the continual technical efforts needed to build the probabilistic modelling of 'natural' catastrophes – pioneered by engineers and planners starting in the 1960s – into a foundation for the disaster risk markets now promoted by Wall Street and the World Bank.[64]

The New Natures and Capitalist Crisis

It is through the creation of the new, 'liquid' natures of green growth that hitherto uneconomic activities presented as ecological protection are to become worthy of capital investment and susceptible to mass production and the attentions of financial-sector 'quants'; and the state to be relieved of much the costs of reproducing a liveable environment. But what aspects of crisis, if any, might in fact be relieved by this innovation? How? And for how long?

These are vexed questions that will be debated for years to come, but some promising directions of inquiry can be suggested immediately. First, the new natures are clearly sources of innovative colonial rents benefiting both Northern states and Northern industry. Under the Kyoto Protocol, for example, industrialized countries are 'grandfathered' rights to collect rents on the earth's carbon-cycling capacity roughly in proportion to their prior use of it; Southern countries are allowed to continue using the capacity, but are not granted rights to it that they can trade. Under the EU ETS, European states in turn redistribute this new form of property *gratis* to their high-emitting industrial

sectors, again approximately depending on the extent of their past greenhouse gas pollution.[65] The equivalent of hundreds of billions of dollars in rent income has subsequently quietly accrued to Europeans. Private owners of European fossil-fuelled power plants, for instance, have been permitted to charge electricity customers for the nominal value of their rights in the new global nature that their governments have given them for free, in spite of the fact that the nature in question is instantiated in Bangladesh as well as Belgium, Brazil as well as Britain. Assuming that rent is the capture of a share of the total surplus value extracted in the production process, the ultimate providers of the benefits generated by the creation and seizure of the new nature have been workers in general and the human and nonhuman inhabitants of the global South in particular.

Colonialist-style annexation is also exemplified by the process of constructing and trading offsets. Markets in ecosystem credits require vast imaginary tracts of service-providing counterfactual biota to be 'discovered', described and quantified by certified experts in order to provide the 'business as usual' baseline against which to calculate the service improvements brought about now or in the future by offset project investors, and thus to determine the value of the nature credits they own. Buyers and sellers of wetland or biodiversity offsets, for example, must be able to measure the degree to which service provider interventions (will) constitute an improvement over 'what would have happened otherwise'. But because there can be only one baseline, activities of non-investors (forest peoples, farmers, bureaucrats, mycorrhizae, muskrats and so forth) that affect the land must be treated as a deterministic background to the free initiatives of capital and its technocracy, which are allowed to be multiple and a matter of choice. This is essentially a rerun of the Lockean programme by which colonizers gain property rights by 'improving' land that, despite its ever- changing relationships with its indigenous inhabitants, is, like those unworthy inhabitants themselves, regarded as a static 'natural' background. A political stance historically bound up with colonialism, classism and racism is thus logically necessary to the operation of the offset markets central to the project of green growth. This politics has nonhuman as well as human embodiments. The view that nature is external to human beings and predictable in the progressive degradation it suffers at the hands of commoners tends to become a self-fulfilling prophecy insofar as it is deployed to privatize commons and denigrate common rights. Just as natural resource policy 'performs' people as potential 'overusers of nature' through resource seizures that unbalance the power relations that had formerly kept overuse in check, 'no net loss' policy, methodologically forced to conceptualize ordinary people as a deterministic force that would have destroyed a precisely calculable modicum of nature were it not for green market interventions, helps undermine commons norms in concrete ways.

Second, the new natures provide raw materials for the mass production of permits that cut costs to industry of complying with environmental regulation, thus indirectly defending even if not directly augmenting productivity. Conventionally-regulated natures emblematize a mixed regime in which states and even citizens have some power to restrict the freedom of investors to decide what and how much is produced, by whom and for whom, and can undercut profits in a way that is especially irksome during productivity crises. Figures such as the economist Ronald Coase helped devise a successor nature whose value would reappear the form of price: the objective of ecosystem service markets, in the words of Pedro Moura-Costa, founder of the Bolsa Verde of Rio de Janeiro, is 'to transform environmental legislation into tradeable instruments.'[66] In no way does that imply a reduced role for the state, which is crucial in creating and maintaining the new tradable units of nature and in pushing through the transformation of law into price; it is merely that the state's own practices obey more closely a commodity logic. Just as, in industrialized countries, 'public services' such as health care and education had first to be won through labour struggles before they could be privatized and converted, in the neoliberal era, into standardized, deliverable, appropriable 'units' in an ongoing process that Ursula Huws terms 'secondary primitive accumulation',[67] so too the 'nature' associated with post-1970 environmental regulation – based on disciplines such as 'pollution control' and 'natural resource management' – had first to be co-created through popular pressure before it could be metamorphosed into marketable 'ecosystem services'. Today's neoliberal forms of

'capital levered on the state'[68] are thus not confined to railway or post office privatizations, public-private partnerships, lavish corporate subsidization programmes, and the privatization of national and international law,[69] but also include 'green growth'.

The regulatory relief that the new trade provided is related on the one hand to a renewed insistence on the externality of nature and on the other to a movement of capillary deresponsibilization of political actors throughout society, as pollution fines are converted into fees, offences become entitlements, and environmental violators are converted into environmental heroes through their sponsorship of the new natures. Participants in carbon markets, for example, track, manage and price greenhouse gases only as the purified molecules of chemistry, not as 'hybrid' social/natural categories divided between 'survival' and 'luxury' emissions, or commons and industrial emissions, or permissible and impermissible emissions. A further step in externalizing nature is taken by when the fossil-fuelled history of anthropogenic climate change is erased by equating biotic and fossil origin CO_2, implying that per molecule emitted, forest dwellers and industrial users of fossil fuels are equally responsible for global warming. As tens of thousands of of scientists, experts, traders, bankers, lawyers, accountants, consultants and bureaucrats go to work setting fuel emission proxy factors, commenting on carbon project design documents, making submissions to the Clean Development Mechanism Executive Board, hedging investments, buying land, tallying molecules, balancing accounts, formulating schedules and criteria for payments for forest conservation certificates, establishing ownership and discovering prices, they each day produce a bit more political deresponsibilization in each of the offices and purportedly 'apolitical' bureaucracies in which they work, often insouciantly preempting any formal mandate for market extension handed down from the parties of the UN Framework Convention on Climate Change or the state. The more that environmental concerns and skills are refigured into the terms of participation in markets for units of new environmental goods (whether as producer or consumer), the greater the extent to which environmental movements are diverted, hollowed out and replaced with newly-constituted and -certified expertise, and maneuvered into alignment with investor interests.

Third, while units of the new natures may not yet be successful commodities in their own right, they are often attractive as a part of risk-sensitive investment packages that include more conventional assets such as oil, timber, water rights, hunting rights, or the infrastructure used in national, continental or intercontinental extraction and trade corridors. A carbon credit-generating REDD+ project, for instance, might, with the help of NGOs, be bundled into a mineral investment in order to sweeten it for the markets, or even directly facilitate its owner's access to mineral lands; windfarms set up by fossil-fuelled conglomerates partly to produce carbon credits can also serve the purpose of depriving potential renewable-energy competitors of control over land, subsidies and prices. Ecosystem service units can also pull their weight in a diversified portfolio by tapping subsidies from state nature conservation coffers. In the US, the private equity firms known as timber investment management organizations attempt to derive returns on the high conservation value forests they buy by fragmenting them into a wide range of assets derived from both new and old natures, including not only timber but also recreational leases, holiday home lots, carbon-cycling capacity and wetland damage mitigation. Other assets exploited include claims on public subsidies through tax reductions and conservation easements.[70] Indeed, one place where the continuity between historical and current capitalist natures becomes most evident is in the close synergy between extractivism and ecosystem service trading that has often been noted by grassroots environmental movements. An infrastructural 'nature space' transformed and expanded by the addition of ecosystem services fits well with the efforts of an increasingly-powerful financial sector and the states with which it is allied to redefine virtually everything as a guaranteed asset stream.

In addition to their role in a redistributive or extractive politics of rent and finance, are the new natures also a source of system-wide surplus? That is, do markets in ecosystem services add to total value in circulation or merely siphon already-existing value off in the general direction of the owners of the new natures? Is there anything new about the 'growth' in 'green growth', or is it just the same old growth supplemented by more extensive green grabbing? It is true that little if any capital accumulation seems to be taking place in the new ecosystem services economy[71] despite considerable state investment in the infrastructure of commodity creation and the enthusiasm of theorists who nevertheless generally seem hard put to specify what the commodities are that they

claim to be trading in.[72] However (and this is to suggest a fourth avenue for future inquiry), it should not simply be assumed that no new forms of surplus can be extracted from nonhuman/human activity once it has acquired the aspect of a new abstract nature in the way human subsistence and flourishing has in the past acquired the aspect of abstract labour. There is no space to pursue this difficult question in this chapter, but the anti-Cartesian perspective it adopts suggests the potential importance of troubling the hard and fast distinctions that Marxists usually make between rent and profit and between land and labour.

Endless Resistance

The story of the green growth project, this chapter has suggested, is not a story of capital inexorably encroaching on an external, invariant nature until it either is overthrown or heroically 'greens' itself. Despite the geographic metaphor, the 'internalization of externalities' that defines green growth is not an action performed on an eternal, exogenous entity that persists intact through a completable operation, but rather constitutes a change in that object derived from the changes in the relationships that constitute it. This is why it is fatuous to enter into debates about whether new markets for nature conservation – or, for that matter, for health care, risk control, or transport – can deliver the goods more 'efficiently' than the state or other agencies: it will not be the same nature conservation – or health care, risk control, or transport – that is delivered. Because the 'green growth' project of transforming environmental protection into mass-produced units circulating freely in a market is not accomplished by sticking price tags on unchanged objects, still less on unchanged objects that are somehow separate from labour and other human activity, its deeper contradictions cannot be traced to the action of sticking on those price tags – to the 'incorrectness' of the amounts shown on the tags, to the tags' inability to recognize the 'unmeasurability' of what they are attached to, to the tags' use of money as a 'yardstick', nor to the tags' 'reductionism'. Nor can the contradictions be resolved through new metrics, better experts, or a 'more holistic approach to valuation'. The processes through which capitalist natures are organized have always been contradictory, contested, thwarted and forever incompletable, and none more so than those associated with the project of green growth. Yet the forms of resistance that reflect the contradictions through which each nature evolves and in turn engenders new natures are specific to particular circumstances. Understanding the green growth programme means learning to recognize the opposition that is distinctive to it while not losing track of the continuity of that opposition with the longer history of battles against exploitation generally. It involves recognizing, for example, that, as in the English countryside of the 16th century, measurement itself is being contested: that like the unit of commodified labour, the units associated with the new nature (CO_2-equivalents, 'functional lift') are even in some sense the '*source* of the political'.[73]

Resistance to ecosystem services is often most powerful where the prior nature of 'natural resources' on which ecosystem services are based is also contested. Movements such as La Via Campesina, for example, are quick to grasp that the defence of commons against conversion into ecosystem services is continuous with the battle against older capitalist natures:

> '[P]easant agriculture … is not compatible with ... 'ecosystem services' or the notion of 'natural capital' … This economic view of nature does not serve peasant acro-ecological practices but … on the contrary undermine[s] the foundations … [It] is a continuation of a project first begun with the Green Revolution in the early 1940's and continued through the 70's and 80's by the World Bank's poverty reduction projects and the corporate interests involved.'[74]

If treating a forest as a stack of ecosystem services entails relationships that are at odds with those involved with treating it as a commons, that has a lot to do with the history from which ecosystem services has emerged. As ecosystem services, a forest can only be a 'forest-which-otherwise-would-have-been-destroyed' according to scientific and economic projections based on the assumption that it is a piece of 'external' nature in the vein of 19th- and 20th-century industrialism.[75] Small wonder that production of ecosystem-service 'offsets' so often involves eviction and landgrabbing reminiscent of the era of forced establishment of protected areas in the 19th and 20th centuries.[76] Small wonder, too, that many Latin American indigenous groups see as perfectly obvious the continuity between the scientific nature organized during early colonial times 500 years ago and the new nature beginning to feed today's green markets. Such groups are well-placed to point out that it is a serious error to identify the development of purported nonextraction commodities with the defence of commons or indigenous territories: to assume, for instance, that movements to keep oil in the soil in the Ecuadorian Amazon are about 'caps' and 'biospheric limits'; that indigenous practices of s*umak kawsay* or *buen vivir* amount to green developmentalism or 'natural resource management'; that indigenous territories are instances of the abstract spaces invented by 16th-century European mapmakers; that *pachamama* is the externalized 'nature' of capitalism, whose rights, it is implied, can only be defended by humans considered to be outside of it; or that a rejuvenation of 1970s-style environmental regulation will provide the solution to ecological crisis.

The continuity of contradictions, of course, is visible in a great deal more than just the history of human protest. If it has always been a question how human survival and flourishing can be transformed into an asset stream without being undermined, so too is it today a question how ecosystem services can continue to be mobilized once they are no longer integrated with previous contexts of nonhuman and human interactions. Can a woodland retrofitted as a producer of carbon and a stack of other environmental services persist any better than a forest retooled as a producer of industrial fibre, a worker subjected to the extremes of pre-Fordist Taylorian time-and-motion discipline, or seeds frozen in a seed bank without the possibility of being outgrown? The increased alienation and appropriation that is the flip side of internalizing economic externalities (or making them 'visible' in an economic calculus) always throws up further economic externalities, which themselves have to be internalized, and so on *ad infinitum*. Economic internalization does not relieve, but rather accentuates, the contradictions involved in making nature external: internalization *is* externalization.[77]

Where 19th- and 20th-century resource management has taken firmer hold, human resistance may in some ways be more difficult. In Norwegian fisheries, as Petter Holm points out, the struggle against the new trade in individual transferrable quotas (ITQs) has been handicapped by prior entrenchment of the 'cyborg fish' co-created by modern fisheries resource management – fish predictable in their behaviour, divisible into discrete units, private property-ready, and so forth:

> 'When the cyborg fish is already in place, the most violent acts of dispossession against coastal communities have already been undertaken [and] most of the organizational and institutional apparatus that could have served as power-basis for those who wanted to resist ITQs has already been squashed.'[78]

The new kinds of abstraction associated with ecosystem services often blunt resistance by masking the very fact that appropriation is taking place. For example, it was partly because the global greenhouse gas-cycling capacity represented by the Kyoto Protocol's tradable tokens could not be identified with any specific parcel of land, ocean, forest or rock outcrops, nor any particular set of flowering plants, microorganisms or subduction processes, that relatively little outcry was raised when a form of ownership over them was handed out exclusively to wealthy countries. The fact that such annexations are generally accomplished not by military operations but through law – and in a way that prevents future countervailing actions by the state – can make opposition even more challenging. Yet even in the heartlands of the older capitalist natures, resistance is inevitable and obvious to anyone paying close attention. In 2014, for instance, a study done for the European

Commission mooted equations that redefined pollution (e.g., one molecule of SO_2 = 4.45 molecules of NO_x) in ways that, provided environmental laws were amended, would enable EU member states to exceed ceilings for one pollutant in proportion to the reductions they made in the emissions of others below their ceilings;[79] the study had to be suppressed. Meanwhile, at many middle-class locations where experts are assisting in the construction of ecosystem services, a more genteel form of strife simmers among 'capitalists, scientists and regulators concerning value', the 'functional interdependence of ecosystems', and so forth.[80] As Morgan Robertson observes, 'in calling on ecosystem sciences to provide answers' to questions about how to unitize ecosystems, 'economists are sometimes met with information, sometimes with cacophony and sometimes with silence.'[81]

Although these various conflicts tend to be depicted as being about privatization, marketization, commercialization, monetization or reductionism, they are equally well described as being about the 'green' of 'green growth'. As Moore remarks, class conflict today is 'over value itself'; what Nancy Fraser calls the further 'hidden abodes' behind Marx's 'hidden abode' of production have become a, if not the, primary battlefield.[82] It is perhaps clearer now than it has been at any time since the early 19th century that labour struggles *are* environmental struggles, and vice versa. Strategic alliances contesting the 'green' of 'green growth' that bring together what may still seem divergent leftist, indigenous and peasant movements against neoliberalism and mainstream environmentalism will be among the important political forces based on and feeding that understanding.[83]

1 European landmarks of this literature include Clare, John (1997) *John Clare: Everyman's Poetry*, J. M. Dent; Thompson, E. P. (1967) 'Time, Work-Discipline and Industrial Capitalism', *Past and Present* Vol. XXXVIII, 56-97 and (1980) *The Making of the English Working Class,* Penguin; and Polanyi, Karl (2001) *The Great Transformation: The Political and Economic Origins of Our Time,* Beacon Press. Two recent Latin American explorations are Boelens, Rutgerd, Jaime Hoogesteger and Jean Rodriguez de Francisco (2014) 'Commoditizing Water Territories: The Clash between Andean Water Rights Cultures and Payment for Ecosystem Services' *Capitalism Nature Socialism,* Vol. XXV, No. 3, 84-102 and Grandia, Liza (2012) *Enclosed: Conservation, Cattle and Commerce among the Q'eqchi Maya Lowlanders,* University of Washington Press.

2 Marx, Karl (1990) *Capital,* Vol. I, trans. Ben Fowkes, Penguin, 638.

3 Moore, Jason W. (2014) 'The Capitalocene, Part II: Abstract Social Nature and the Limits to Capital', available at http://www.jasonwmoore.com/Essays.html, 36.

4 Henderson, George (2004) '"Free' Food, the Local Production of Worth, and the Circuit of Decommodification: A Value Theory of the Surplus', *Environment and Planning D: Society and Space*, Vol. XXII, No. 4, 507.

5 See also Fraser, Nancy (2014) 'Behind Marx's Hidden Abode: For an Expanded Conception of Capitalism', *New Left Review* Vol. LVI, 55-72.

6 Moore, Jason W. (2014) 'Cheap Food and Bad Climate: From Surplus Value to Negative-Value in the Capitalist World-Ecology', available at http://www.jasonwmoore.com/Essays.html, 20.

7 Moore, Jason W. (2014) 'The Capitalocene, Part II: Abstract Social Nature and the Limits to Capital', available at http://www.jasonwmoore.com/Essays.html, 7.

8 Moore, Jason W. (2011) 'Wall Street is a Way of Organizing Nature: An Interview with Jason Moore', *Upping the Anti: A Journal of Theory and Action* Vol. XII, 46.

9 McMichael, Philip (2009) 'A Food Regime Genealogy', *Journal of Peasant Studies* Vol. XXXVI, No. 1, 139–169. As Nancy Fraser notes, the 'co-construction of "care" as a noncommodity' has long been another accompaniment of the co-construction of labour power as a commodity: Fraser, 'Hidden Abodes', 9.

10 E.g., Pyne, Stephen J. (2000) *Vestal Fire: An Environmental History, Told Through Fire, of Europe and Europe's Encounter with the World*, University of Washington Press.

11 Scott, James C. (2012) *Two Cheers for Anarchism: Six Easy Pieces on Autonomy, Dignity, and Meaningful Work and Play*, Princeton University Press, 48.

12 Anderson, Benedict (1998) *The Spectre of Comparisons: Nationalism, Southeast Asia, and the World,* Verso. 'Forest cleansing' continues today in many nonofficial or semi-official guises as well. See Lohmann, Larry, (1999) 'Forest Cleansing: Racial Oppression in Scientific Nature Conservation', The Corner House.

13 Crosby, Alfred W. (1997) *The Measure of Reality: Quantification in Western Europe, 1250-1600*, Cambridge University Press; Edgerton, Samuel. Y. (1976) *The Renaissance Rediscovery of Linear Perspective*, Basic Books; Latour, Bruno (1986) 'Visualization and Cognition: Thinking with Eyes and Hands' in H. Kuklick (ed) *Knowledge and Society: Studies in the Sociology of Culture Past and Present*, JAI Press, 1-40.

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15 Green, Lesley (2013) 'The Day-World *Hawkri* and Its Topologies: On Palikur Alternatives to the Idea of Space' in Green, Lesley (ed) *Contested Ecologies: Dialogues in the South on Nature and Knowledge*, Human Sciences Research Council Press, 78.

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33 Equivalence among human beings, nicely writes David Graeber, 'only seems to occur when people have been forcibly severed from their contexts, so much so that they can be treated as identical to something else … Any system that reduces the world to numbers can only be held in place by weapons' (Graeber, David [2010] *Debt: The First 5000 Years*, Melville, 386).

34 'Calling it quits' is of course a capitalist idealization. Wage disputes are never just about numbers but also encompass complex and multiple resistances to this type of formatting (Mann, Geoff [2007] *Our Daily Bread: Wages, Workers and the Political Economy of the American West*, University of North Carolina Press). This is even more obvious with fines handed down in tort cases (O'Neill, John [forthcoming] 'The Price of an Apology: Justice, Compensation and Rectification', *Cambridge Journal of Economics*). Substantive statements of equivalence in economics and law tend to be performative utterances.

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38 Wainwright and Barnes, 'Nature, Economy', 977.

39 Quoted in McRae, '"To Know One's Own"', 182.

40 Lohmann, Larry (2015) 'What is Nature? Does Nature Have Rights?', The Corner House.

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43 McNally, 'False Infinity', 12.

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University Press; Gane, Nicholas (2006) 'When We Have Never Been Human, What Is to Be Done?: Interview with Donna Haraway', *Theory, Culture and Society*, Vol. XXIII, No. 7-8, 135–158; Lohmann, Larry, 'Neoliberalism's Climate', forthcoming in Springer, Simon, Kean Birch and Julie MacLeavy (eds) *Handbook of Neoliberalism*, Routledge.

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55 The useful phrase 'hybrid labor' is due to Alyssa Battistoni.

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59 Lane, Richard (2014) 'Resources for the Future, Resources for Growth: The Making of the 1975 Growth Ban' in Stephen, Benjamin and Richard Lane (eds), *The Politics of Carbon Markets*, Routledge, 27-50.

60 Anker, *Imperial Ecology*.

61 As Bruno Latour writes, capitalism 'is not to be used to explain the evolution of science and technology': efforts to 'describe the scientist as a capitalist' take for granted an untenable 'division between mental and material factors' ('Visualization', 31-32). Capital has 'no singular logic, no essence', Timothy Mitchell observes. 'It survives parasitically … taking up residence in human bodies and minds, or in sugar cane or private property, drawing its energies from the chemistry of others, its forces from other fields, its momentum from others' desires' (Mitchell, Timothy [2002] *Rule of Experts: Egypt, Techno-Politics, Modernity*, University of California Press. 303). As Geoffrey Bowker stresses, commodificaiton, representation, organization, infrastructure and nature have to be looked at together.

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63 Bowker, Geoffrey (2005) *Memory Practices in the Sciences*, MIT Press, 205.

64 Kob, Julius (2015) 'Getting the Trembling Mountain to the Market: A History of Catastrophe Modelling and the Emergence of a New Disaster Risk Market', paper presented at the Financialization of Nature Conference, University of Sussex, 19-20 March.

65 Economist advocates of cap and trade systems tend to criticize grandfathering as an inefficient anomaly, usually insisting that emissions allowances should be auctioned instead and the rents shu nted to the auctioneer (usually the state). It is significant that this theoretical insistence has never had much of an impact on practice.

66 Quoted in Nicholls, Mark (2011) 'EcoSecurities Co-Founder Launches Brazilian Environmental Exchange', *Environmental Finance*, 20 December.

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69 See, e.g., McCarthy, James (2007) 'Privatizing Conditions of Production: Trade Agreements as Neoliberal Environmental Governance' in Heynen, Nick, James McCarthy, Scott Prudham and Paul Robbins (eds), *Neoliberal Environments: False Promises and Unnatural Consequences*, Routledge.

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71 Dempsey, Jessica, personal communication.

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81 Ibid.

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83 Thanks for very helpful discussion and comments to Gareth Dale, Jutta Kill, Winnie Overbeek, Jessica Dempsey, Nick Hildyard, Morgan Robertson, Romain Felli, Sarah Bracking, Manu Mathai and Jose Puppim de Oliveira.