



World-Ecology and Ireland: The Neoliberal Ecological Regime

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Abstract

Since the collapse of the Celtic Tiger, the socio-economic particularity of neoliberal capitalism in its Irish manifestation has increasingly been critiqued, but little attention has been paid to neoliberalism as ecology within Ireland. This article conducts an exploratory survey of the characteristics of the Irish neoliberal ecological regime during and after the Celtic Tiger, identifying the opening of new commodity frontiers (such as fracking, water, agro-biotechnology, and biopharma) constituted in the neoliberal drive to appropriate and financialize nature. I argue for the usefulness of applying not only the tools of world-systems analysis, but also Jason W. Moore's world-ecological paradigm, to analysis of Ireland as a semi-periphery. What is crucial to a macro-ecological understanding of Ireland's experience of the neoliberal regime of the world-ecology is the inextricability of its financial role as a tax haven and secrecy jurisdiction zone from its environmental function as a semi-peripheral pollution and water haven. More expansive, dialectical understandings of "ecology" as comprising the whole of socio-ecological relations within the capitalist world-ecology—from farming to pharma to financialization—are vital to forming configurations of knowledge able not only to take account of Ireland's role in the environmental history of capitalism, but also to respond to the urgent ecological crises of the neoliberal present.

Keywords: World-Ecology; Ireland, Neoliberalism; Food-Systems; Energy; Pollution



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Anna Klobucka's observation that world-systems paradigms offer a more complex understanding of European semi-peripheries than the binary models of colonial and postcolonial development is particularly suggestive for the Irish situation (Klobucka 1997: 125-6). Ireland's uneven development and peripheralization cannot be understood solely in the context of British colonialism, with no ability to account for its subsequent subordination to the hegemony of U.S. capital and to core Eurozone states. The historical development of Ireland has been profoundly shaped and continues to be shaped by its role as a politically weak and unevenly developed semi-periphery within the European economy and the capitalist world-system as whole. The converse point could also be made, that as an "intermediating semi-periphery" (O'Hearn 2001: 200) Ireland has played a significant role in the emergence of different cycles of systemic accumulation as a laboratory for new forms of expropriation, from sixteenth-century plantation to twenty-first century neoliberal austerity. However, this role must be understood not only in terms of Ireland's socio-economic relation to the world-economy, but of Ireland's function in the world-ecology. This article argues for the adoption of the theoretical tools of world-ecological analysis in order to conduct a radical reappraisal in the current conjuncture of Ireland's environmental history in relation to the structures of power and capital inside Ireland, and the structures of external power within which Ireland is bound.

Within the Irish academy, the recent emergence of transdisciplinary approaches to ecology has coincided with the intensification of technocratic approaches to funding of environmental research. European schemes and policy agendas such as Horizon 2020 are mostly oriented towards producing bankable technological "solutions" to the challenges of climate crisis, energy sovereignty, and food security confronting contemporary Europe. This forecloses the possibilities of investigating alternative, more emancipatory organizations of nature-society. Obediently incorporating EU policy targets, Irish national funding bodies have emphasized the degree to which technocratic solutions should be monetized, part of the ongoing drive to bolster the knowledge economy and to convert universities into patent factories, where intellectual property can be enclosed and converted into alienable commodities.

Thus, the "Food Harvest 2020" policy document produced by the Irish Department of Agriculture, Fisheries and Food (DAFF) is rooted in an idealist conception of nature and tellingly motivated by the desire to "greenwash" the agri-industry at the same time as it implements the targets of ecological modernization laid out in the Horizon 2020 scheme. The document opens by declaring "Ireland's historic association with the color green is linked to our unspoilt agricultural landscape and our temperate climate. The modern use of 'green' to identify concern for the natural environment has, for some time, been recognized as representing a natural marketing opportunity for Irish agri-food to build on" (DAFF 2010: 3). This cynical

manipulation of the word “green” strips it of ethical and political connotations and represses the history of ecological imperialism and violence implicit in the transformation of Ireland into a mythical “emerald isle”: whether the mass deforestations of early Plantation, or the violence of what Marx famously called “the clearing of the estate of Ireland” that enabled the nineteenth-century conversion to grazier monoculture (Slater 2013: 29). Given the ongoing marketization of knowledge production in the Irish university and the unprecedented commoditization of new ecological commons under neoliberal capitalism, methodological approaches that historicize the evolution of regimes of capitalist nature in Ireland seem all the more vital.

In the past two decades, the primacy of “nature” as a category for analysis in relation to capital has grown more urgent and given rise to an “environmental turn” in left and Marxist theory that increasingly approaches the economic crises of the capitalist world-system as inseparable from the ecological crises of climate change and peak appropriation. Environmental historian Jason W. Moore yokes Marxian ecology to world-systems frameworks in order to forge a “unified theory of capital accumulation and the production of nature” (Moore 2011a: 126). He reinterprets the concept of ecology, adapting the term *oikeois* to designate “the creative, historical, and dialectical relation between, and also always within, human and extra-human natures,” a perspective that attempts to transcend Cartesian dichotomies of humanity vs. nature in favor of an understanding of humanity-in-nature as the matrix in which human activity unfolds and the field upon which historical agency operates (Moore 2013: 3). Through this view, capitalism is not something that acts *upon* nature but rather *through* it (Moore 2015: 6).

World-ecology enables diachronic and synchronic investigation of environmental problems at different temporal and geographical scales, adapting Giovanni Arrighi’s history of the systemic cycles of expanding and contracting capital accumulation to construct an environmental history of capitalism. Arrighi argues that four successive complexes of hegemonic state-capitalist alliances (Iberian-Genoese, Dutch, British, and American) emerged over the *longue durée* of capitalism, produced and sustained by organizational “revolutions” that provided each hegemon a competitive edge in economic and politico-military power (Arrighi 1994: 1). For Moore, the systemic cycles of accumulation corresponding to the rise and fall of different core-hegemonic complexes are founded in organizational revolutions not only of social relations such as class, but of biophysical natures. He posits the capitalist world-system as simultaneously a “capitalist world-ecology,” a “world-historical matrix of human and extra-human nature premised on endless commodification” (Moore 2011a: 108). This world-ecology is constituted not only through the periodic reorganization of geometries of power and economy, but through the remaking of socio-ecological relations:

World hegemonies did not merely organize resource and food regimes; the hegemonies of historical capitalism *were* socio-ecological projects. Dutch hegemony emerged through a world-ecological revolution that stretched from Canada to the spice islands of Southeast Asia; British hegemony, through the coal/steampower and plantation revolutions; American hegemony, through oil frontiers and the industrialization of agriculture it enabled (Moore 2011a: 125).

As such, the capitalist world-system does not merely possess an ecological dimension, but is inherently *constituted* by ecological regimes and revolutions that periodically reorganize and renew the conditions of accumulation to allow intensified appropriation of ecological surpluses. These regimes are dependent on the “dialectic of plunder and productivity”: the appropriation of “free gifts” of nature and their transmutation through labor into surplus value (Moore 2015: 138). When commodity frontiers in each successive ecological regime are exhausted and no longer able to produce surpluses, then the conditions of accumulation falter, until new ecological revolutions emerge. These revolutions produce new technics of appropriation and locate new frontiers, while intensifying existing extraction. However, each revolution cannot resolve the exhaustion of the previous regime; it can only displace its contradictions to a new geographical sector and reconfigure them on a larger scale. Indeed, Moore suggests that the neoliberal regime that emerged in the late 1970s is now mired in an epochal crisis, faced by the disappearance of new frontiers of enclosure and diminishing returns from the financialization of nature.

Since the collapse of the Celtic Tiger, the socio-economic particularity of neoliberal capitalism in its Irish manifestation has increasingly been examined, but little attention has been paid to neoliberalism as ecology within Ireland. As Lucy Collins remarks, much transdisciplinary research in Irish studies in areas such as built environments, migrant studies, heritage studies, and social justice is already inherently “ecological,” but tends to be compartmentalized or not consciously recognized as such (Collins 2014: 18). Any world-ecological history of Ireland must entail not merely examining “environments” and “landscapes,” but rather uncovering the periodic reorganizations of socio-ecological relations into new ecological regimes. Financial service centers and pharmaceutical factories, plantations and cattle ranches, tax havens and pollution havens, global empires and common markets are all forms of environment-making that constellate human relations and extra-human processes into new ecological regimes. More expansive, dialectical understandings of “ecology” as comprising the whole of socio-ecological relations within the capitalist world-ecology—from farming to pharma to financialization—are

vital to forming configurations of knowledge able not only to take account of past environmental transformations but also to respond to the global ecological crises of the neoliberal present.

In this article, I will focus primarily on the contemporary period, conducting an exploratory survey of the characteristics of the Irish ecological regime during and after the Celtic Tiger, identifying the opening of new commodity frontiers (such as fracking, water, agrobiotechnology, and biopharma) constituted in the neoliberal drive to appropriate and financialize nature. I argue for the usefulness of applying not only the tools of world-systems analysis, but also Moore's world-ecological paradigm, to analysis of Ireland as a semi-periphery. Before reading the particularities of Ireland's contemporary neoliberal ecological regime, I begin with a summary of Ireland's incorporation into the capitalist world-ecology in the early modern period, by way of demonstrating antecedents to and contrasts with the contemporary period.

Food and Fuel: The Formation of the "Green Donkey"

Moore identifies three key world-ecological regimes in the environmental history of capitalism: colonization and plantation in the early modern period, the partition of Africa and the integration of Indian and Chinese peasantries into the world-economy under high imperialism, and the neoliberal regime emerging from the 1970s (Moore 2000: 142-5). The rise of capitalism in the fifteenth century was enabled by an ecological revolution in humanity's relation with extra-human nature. Frontier-led appropriations of the "Four Cheaps"—food, energy, labor power, and raw material—unleashed a strategy of commodification shaped around the technics of the plantation, the monoculture, and the mine (Moore 2015: 17). The early modern revolution of labor productivity within commodity production and exchange turned on the emergence of a twinned dynamic that combined strategies of exploitation (within commodification) and strategies of appropriation (outside of commodification). This strategy was enabled by new symbolic regimes and technics that reconceived nature as abstract and external, time as linear, and space as flat and geometrical. Extra-human nature was reconceived as an allegedly free gift, a surplus that could be appropriated and put to work without cost to the capitalist. "Abstract social labor"—the invention of new forms of expropriation of surplus human labor—was reliant on the simultaneous invention of "abstract social nature," the reimagination of nature as a source of "cheap" or free surpluses that could be rationalized and efficiently appropriated in service to commodity production (Moore 2014b: 5). Nature's unpaid work was thus exploited in both human and biophysical form, whether the nutrient density of hitherto uncommoditized soils and of forests put to fire; the energy sources provided by new flora exported throughout imperial networks and transformed into global commodities, such as sugar or the potato; or the many forms of unpaid labor, including the reproductive labor of women and the work of slaves,

indentured servants, and tenant farmers. The symbolic regimes and technics involved in “abstract social nature” enabled the radical simplification of the “diversity of human and extra-human activity necessary to capitalist development but not directly valorized (‘paid’) through the money economy” (Moore 2014a: 21).

While the Americas are rightly seen as the ground zero of capitalist accumulation in the early modern period, opening a “Great Frontier” (Webb 1964: xv) that enabled the European appropriation of vast ecological surpluses from hitherto uncommoditized regions, Ireland also functioned, on a smaller scale, as a frontier and testing ground for new technics and imaginaries that were crucial to the formation of the Atlantic economy and to the expansion of the capitalist world-ecology. The Atlantic island functioned as a geographical stepping-stone for transatlantic settlement and a laboratory, conveniently proximate to expanding Britain, in which to trial techniques of privatization and expropriation: “It was the very people who were most deeply concerned with the plantation and colonization of Southern Ireland—Humphrey Gilbert, Walter Raleigh, Richard Grenville—who took the leading part in planting the first colonies in Virginia. It is as if Ireland were the blueprint for America” (Wallerstein 1974: 88). The radical simplification of nature can be clearly seen in the context of Irish plantation, where mass deforestation fundamentally transformed the ecology of Ireland, accompanied by radical forms of dispossession of indigenous populations and targeted destruction of non-human species and flora, including wolves and broad-leaf trees, in order to facilitate the importation and production of exogenous crops and commodities for export, and to eliminate the social and cultural bases of the reproduction of pre-capitalist modes of life. As Archibald Lewis remarks of the role of English expansion in relation to frontier development in Western Europe, “The most important frontier [...] was an internal one of forest, swamp, marsh, moor and fen” (cited in Wallerstein 1974: 138). The significance of land and agriculture is almost overdetermined in Irish historiography, yet it is crucial to understand the transformation of Irish environments not merely as a product of colonialism, but rather in relation to the larger early modern revolution in capitalist accumulation. The reorganization of Ireland’s biologically diverse bogs and forests into rationalized sites of capitalist monoculture was crucial to the erosion of Irish self-sufficiency and the integration of the island into the capitalist world-ecology.

Edmund Spenser’s notorious political treatise, *A View of the Present State of Ireland* (ca. 1598), composed from Spenser’s three-thousand-acre settlement in Munster in the 1590s, powerfully crystallizes the symbolic regimes associated with the reconception of Irish ecology as abstract social nature. Recounting the late wars of Munster as a historical precedent for the suppression of Irish insurrection and as a model for Tudor reconquest and plantation of Ireland, Spenser’s narrator approvingly describes the aftermath of English-imposed starvation of the

rebels: “In short space there were none almost left, and a most populous and plentiful country suddenly left void of man and beast; yet sure in all that warre, there perished not many by the sword, but all by the extremitie of famine” (Spenser 1997: 102). The ecological plenitude of Irish nature, conveniently emptied of its indigenes, is released for capture as ecological surplus. Spenser’s advocacy of tactical famine as a means of dispossession and as a force of creative destruction that will reshape the formerly unproductive Irish “wilderness” into generative plantation marks the historical transition from a feudal to capitalist mode of production, embodied in conceptions of abstract social nature as “tabula rasa” ripe for social reengineering. Sarah Hogan draws a parallel between the “shock doctrine” of neoliberal accumulation through dispossession, as described by Naomi Klein, and the “rationalistic, tactical, economic” expedients imagined by Spenser (Hogan 2012: 463) in the mathematical, abstract part of the work that proposes a scheme for English plantation. This scheme imagines the grid-like remapping of Ireland to impose a geographically dispersed network of plots, garrisons, and towns that will rationalize the countryside and produce new divisions of labor between Protestant English landowners and the newly landless Irish populace. Spenser proposes a radical simplification of Irish nature, suggesting the reorganization not only of social, but of ecological relations, in the course of agrarian revolution: “Evills must first be cut away by a strong hand, before any good can be planted, like as the corrupt branches and unwholesome boughs are first to be pruned, and the foule mosse cleansed and scraped away, before the tree can bring forth any good fruite” (Spenser 1997: 93).

In this scheme, deforestation is a form of abstract social nature necessary to integrate Ireland into the capitalist *oikeois* and to eliminate human political resistance and non-human resistance to the ecological revolution, killing both the Irish “wolf-heads” who took refuge in the forests, and the wolves which threatened imported livestock; tellingly, both varieties of “wolf,” Celtic insurgent and *canis lupus*, had bounties placed on their heads by Cromwell. Clearing the forests literally made space for new forms of agriculture, opening up land and eroding the basis of previous social unities such as kinship and communal transhumance that posed resistance to the ecological revolution. However, the forests were also a commodity frontier in their own right, a source of unpaid energy surpluses. The ascendant logic of capitalist accumulation in Western Europe was driven by a need to found new regimes of cheap food and cheap energy:

The drive for fuel and food—especially wood, wheat, and sugar—reinforced the uneven development of world capitalism; in the case of western and eastern Europe, it transformed the latter’s small differences into large and durable inequality, and it created new peripheries in the

Atlantic islands and the Americas. This development of an unequal world division of labor, in turn, created new capitalist efficiencies of specialization between agriculture and pasturage and between agrarian activities and industrial activities (Moore 2000: 134).

Wallerstein describes the “wood famine” confronting early modern capitalism as giving rise to an insatiable demand for wood products, which he labels “the other great basic need” next to food, and, along with sugar, the major growth crop of the early modern world-economy (Wallerstein 1974: 44-5). After the inexorable deforestation of Western Europe, England’s colonization of Ireland opened a crucial new frontier for the appropriation of timber. Oak was particularly scarce, and Ireland’s broad-leaf forests were “used up to supply England with timber” so that whereas one eighth of the island was under forest cover in 1600, it had “virtually disappeared by 1700” (Wallerstein 1974: 281). After timber supplies dwindled in the cores and semi-peripheries of the early modern world-system, a new revolution in cash-crop forestry would occur in the Baltic region, which by “the sixteenth century . . . had begun to export wood in large quantities to Holland, England, and the Iberian peninsula” (Wallerstein 1974: 45). The exhaustion of Ireland’s timber frontier demonstrates the sectoral relocation of commodity frontiers to new geographies and highlights the role of the Irish semi-periphery as an exemplar for the subsequent establishment of new timber frontiers in India’s teak forests, as well as the transformation of forested island ecologies in the Caribbean into cane-sugar monocultures through systematic deforestation. Furthermore, the Irish situation dramatizes the extent to which the invention of new modes of abstract social labor through which to expropriate surplus human labor—as captured in the evolution of new forms of capitalist agriculture to provide cheap food—are inextricable from the invention of abstract social nature and the creation of previously uncommoditized natures as a source of free surpluses—as captured in the reduction of the biodiversity of Irish forests to an “input” of cheap energy and timber.

The ecological regime that took shape during the long sixteenth century was not merely mercantilist, but productivist in its creation of an agro-ecological revolution that combined market, class, and ecological transformations in a geography expanding from the Baltic and Scandinavian peripheries of Europe to the Caribbean and South America (Moore 2008: 59). If sixteenth-century Dutch hegemony was partly founded in the appropriation of grain from Poland, the rise of English hegemony was subsequently dependent on the Caribbean plantations, American Midwest grain-belts, and the agro-economy of Ireland. Raymond Crotty describes the “non-individualist, non-capitalist, land-based economy” of pre-conquest Ireland as characterized by “communally grazed land determined output, [wherein] the individual, by his work or the

work of his slaves or capital, could not affect output” (Crotty 2001: 101). The organization of the pre-capitalist Irish *oikeois* around cattle—which due to Ireland’s temperate climate could survive winters without fodder—enabled the Irish to avoid importing grain, and thus to maintain a degree of self-sufficiency without capital. Plantation, by enclosing, deforesting, and fencing off land, introducing new conceptions of cattle as private property to be sold in open markets, forcing populations to adopt regulated pasture and abandon hilly regions, building towns and garrisons in order to rationalize and control territories, and coercing those engaged in pasturage to begin practicing tillage and husbandry, undermined this independence from capital and converted the Irish into tenants deprived of rights to land. Nevertheless, as Eoin Flaherty reminds us, pre-famine geographies of communality such as the rundale persisted well into the nineteenth century (Flaherty 2013: 75).

The expropriation and privatization of Irish land, and the subsequent emergence of intensive, enclosed and export-oriented agriculture which it enabled, could not have been achieved without the inauguration of a new agri-food system organized around the potato, which sustained the new forms of appropriation of unpaid peasant labor (Crotty 2001: 172). The Irish were the first Europeans to accept *Solanum tuberosum*, imported from the South American Andes, as a primary food crop (D’Arcy 2010: 120). If Irish farmers could subsist on the potato, the costs of the reproduction of labor could be drastically lowered. Crotty emphasizes the global imbrication of Irish agro-ecology within the larger world-system, drawing an explicit connection between the subordination of the Irish peasantry and the construction of a global “coolie” class stretching from the West Indies to Ireland to India (Crotty 2001: 178). The subsequent conversion of Irish agriculture to grazier economy must be understood as indelibly linked to the development of salting technology and the ability to provision slaves in the Caribbean plantations with foodstuffs produced by disenfranchised Irish peasants, even as the Molasses Act of 1732 forced a new market for British West Indies sugar in Ireland.

In the mid-eighteenth century, when English agriculture encountered a yield crisis that forced England to shift from a grain exporter to a leading grain importer, Ireland’s subordination as a semi-periphery organized around agricultural exports intensified. Conor McCabe powerfully describes the post-famine conversion that transformed Ireland into a roofless factory producing livestock, reshaping socio-ecological relations around the monoculture of King Cattle:

No matter how green the grass grew, no matter how flat the fields were, there was nothing natural about the Irish live cattle trade. It was a modern industrial assembly line, one which stretched for hundreds of miles, from the small holders of Sligo to the slaughter houses of

Deptford, and one for which the cattle ranchers supplied the raw material. The graziers did not produce beef. They did not produce shelf-ready products. They exported livestock to British fatteners and slaughter houses, and it was there that the products which ended up on the kitchen table were made. This system of production had deep historical roots—so much so that almost all attempts to disentangle the Irish economy from such a lopsided relationship as one which saw calves on grass as the *ne plus ultra* of agricultural and industrial ambition, were completely frustrated up until the 1950s, at which stage the importation of foreign industry was put forward as the seemingly perfect partner to the livestock business. Although not a straight line by any means, the first hints of this assembly line can be seen as far back as the early 1770s (McCabe 2013: 59).

The means through which the implementation of extreme forms of economic rationalization and liberalism refused assistance to the famine-stricken in nineteenth-century Ireland and enabled vast clearances that made way for new forms of grazier economy and cattle ranching have been amply documented by Irish historians, and read productively in comparison to the forced integration of Indian peasantries into the world-market through the social engineering of famine in nineteenth-century India (Davis 2002: 9). The institution of the grazier economy would marginalize other sectors of industrial production and crystallize a pattern of asymmetric development that would persist into the twentieth and twenty-first centuries, opening the door to the ascendancy of financialization in the neoliberal regime.

Tax Haven, Pollution Frontier:

Neoliberal Ecology with Irish Characteristics

Whereas the early modern appropriation of new commodity frontiers from Ireland to the Americas provided a plenitude of surpluses that fueled the engine of capitalist accumulation for centuries, the neoliberal era confronts the exhaustion of the frontiers that made “cheap nature” possible. Farshad Araghi has argued that late capitalism is mired in a “crisis of cheap ecology,” caused by a decline of the short-term and contradictory gains of the Green Revolution and the loss of prior biophysical inputs in labor, energy, food and resources (Araghi 2010: 39). Loosely beginning in the 1970s, the neoliberal regime has relied on the rapid subsumption of whatever frontiers remained after nineteenth-century industrialization, including oil in the North Sea, West Africa and the Gulf of Mexico, the exhaustion of fertile soil and cheap water by agro-export

regimes appropriating food surpluses and peasant holdings from China to Mexico, and the privatization of cheap metals and oils enabled by the integration of the former USSR into the world market (Moore 2012: 245). However, following these enclosures, capitalist accumulation now confronts the stagnation of agricultural yields; a tendency towards mass urbanization that stresses the agro-demographic order; climate volatility, and geo-technical challenges to resource extraction, particularly of energy, water, and metals. The bubbles in global food and primary commodity prices since 2001 telegraph the decline of the “Four Cheaps” of labor, energy, food and raw resources, and the intensification of ecological contradictions by financial speculation.

Rather than being defined by a new productivity revolution, the neoliberal era has instead advanced the penetration of finance capital into the global reproduction of human and extra-human natures. Neil Smith describes the neoliberal invention of “nature banking,” which turns on the manufacture of “allowable natural destruction” by fragmenting nature into “tradable bits of capital,” as a fundamental shift in the capitalist production of nature that reconceives “nature as a financial accumulation strategy” (Smith 2006: 16). When traded on environmental derivatives markets, ecological commodities such as carbon credits allow financiers to speculate on and profit from price volatility as environmental crises accelerate. If previous forms of appropriation of nature emphasized the transmutation of ecological surpluses into use-values for capitalist production—wood into energy, cattle into food—these financial derivatives function primarily as market instruments, acting to transfer stewardship of previously uncontrolled commons to private business interests, and bringing nature under the control of the market in the attempt “to commensurate all of reality into generic income streams” (Moore, 2012a: 19). As such, neoliberal financialization extends beyond the manufacture of derivatives to the reordering of the totality of nature-society relations: “From the agro-food sector to working class households that depend on credit cards to pay groceries and medical bills, global nature has become dependent on a circuit of capital premised on accumulation by financial means rather than industrial and agricultural production” (Moore 2011: 43-4). Instead of the unprecedented horizontal expansion across space that marked earlier cycles of accumulation, the neoliberal regime privileges the vertical extension of profit-maximization strategies into new spheres of life, the transition from stakeholder to shareholder capitalism, and short-term profit-making strategies and privatization over the long-term strategies of fixed capital investment and development of new productive capacities. The neoliberal logic of accumulation is distinctive for its “impatience,” expressed in the extreme rapidity of its ecological asset-stripping.

This temporal hegemony of finance capital over accumulation can clearly be seen in the context of the Irish semi-periphery. Semi-peripheries act as “transistor zones” where “two different segments of a commodity chain become articulated and receive their first pricing” thus

making it possible “for the core and periphery to transmit value to each other, especially as both the rural dispossessed of the hinterlands and the factors of the core’s jobbing interests congregate there, one to commodify their labor and the other to finance and insure the material apparatuses that will consume this labor-power” (Shapiro 2007: 37). Since the late twentieth century, the Irish semi-periphery has acted as a transistor zone *par excellence* for the negotiation of new modes of financialization and speculative entrepreneurialship. Ireland’s integration into the neoliberal ecological regime has been characterized by peripheral dependency on foreign capital investment, the tendency towards financialization and housing speculation rather than industrial production, the intensification of earlier monocultures formed under colonialism (such as the beef and dairy economies), the formation of new monocultures organized around new commodity frontiers in biocommodities, and the drive to enclose remaining commons (as in water, oil and gas).

In Latin America, Africa, Southeast Asia and other key regions of the Global South, the “neoliberal turn” has been distinguished by a subordination to “eco-financial imperialism,” manifested in the coercive imposition of waves of privatization and structural adjustment programs by supra-national institutions such as the IMF and World Bank, in exchange for loans to finance state debts, and by an emphasis on “speculative-centric, carbon-intensive accumulation” (Bond 2014). In contrast, Ireland’s boom was preconditioned by what Peadar Kirby, Luke Gibbons and Michael Cronin describe as its “subservient integration” into market fundamentalism: a submissive, rather than coerced, orientation to American and West European capital (Kirby, Gibbons and Cronin 2002: 2). Ireland’s contemporary position might be considered alongside the “Southern national champions” that Ruy Mauro Marini describes in the South American context as “sub-imperialist”: favored allies of capitalist cores and pro-corporate regimes that promote financial globalization and act as regional platforms for accumulation, collaborating with the expansion of transnational capital in their territories, while willingly undermining their own productive capacity and economic sovereignty in exchange for the alleged position of partnership with the cores (Mauro Marini 1972: 14). The key difference is that unlike sub-imperialist nations such as Brazil or South Africa, Ireland does not enjoy the regional geopolitical privilege of acting as a “deputy sheriff” and policing the behavior of neighboring peripheries; rather it primarily functions as a “poster nation” exemplar of semi-peripheral compliance with neoliberal financialization and austerity.

In Ireland, the national fantasy of having achieved “First World status” as a roaring Tiger, and thus of having overcome the asymmetries of colonial development, was contradicted by the dependency of Tigerhood on offering financial services to multinational corporates courted by the state, transforming the country into a tax haven and secrecy jurisdiction zone, while

concentrating urban employment in low-paid service jobs. The Irish government took pride in anticipating the growth of the financial services market and reshaping the country into a “treasure island,” where the economic growth would be driven not by job creation or investment in production, but rather by maximizing profit through tax avoidance (Shaxson 2012: viii). The Finance Acts of 1986 and 1987 introduced new financial incentives to encourage private sector investment and established low corporation tax rates of ten percent for certified companies setting up in the newly established Irish Financial Services Centre, a designated area within which companies could undertake any business in the financial services area while receiving 100 percent allowances on equipment and development spending, and 200 percent tax breaks for rental payments for ten years (McCabe 2011: 126).

As a tax haven, Ireland was attractive to U.S. and European multinationals because it offered cheaper property and salaries than its equivalent in Luxembourg, better geographical proximity to Europe than the Cayman Islands, and unlike the British tax havens in the Isle of Man and Jersey, it was already a member of the European Community. The advent of so-called “informational” capitalism in combination with the development of special tax breaks and financial services via the creation of the IFSC positioned Ireland as an export platform for foreign capital in the electronics and IT-sector industries in hardware, software and communications, with nearly every high-profile transnational with an IT portfolio establishing a European base in Ireland, including Apple, Intel, Dell, Sun Microsystems, Oracle, IBM, Hewlett Packard, Compaq, Xerox, Nortel, Ericsson, Panasonic, Philips, Siemens, Hitachi and Motorola (Smyth 2000: 125). Throughout the 1990s, a large proportion of European and central exchequer funding was invested in digitization of Ireland’s trunk transmission network (rather than in environmental infrastructures crucial to ecological resilience such as waste and water systems, or social institutions key to the functioning of Irish society, such as the health service and social housing) in order to form a base for the transition to a reticular economy (Cronin 2002: 56).

The Tiger economy was directly implicated in “the pressure placed upon non-renewable ecological resources by a highly flexible and mobile post-Fordist capitalism” (Smyth 2000: 163). Information and communications technology (ICT) contributes to environmental problems and exhaustion of resources at every stage from production to use to disposal: from the energetically-expensive manufacturing process, to energy-intensive operation of devices, especially as consumer usage continues to proliferate, to disposal of devices and network equipment (Williams 2011: 354). The significant amounts of energy consumed by personal computers, electronic devices and ICT infrastructure including telecoms networks, peripherals, server farms and data centers place a heavy burden on electric grids reliant on the combustion of fossil fuels and exacerbate climate change by contributing to greenhouse emissions of carbon dioxide.

Manufacturing computers and electronic and non-electronic components consumes not only electricity, but large amounts of chemicals, water, and a variety of exotic and highly refined materials including hazardous metals such as lead and cadmium. Despite the direct implication of the ICT industry in climate change and pollution, the environmental costs of the IT sector in the Tiger economy, and its dependence on the enclosure of new frontiers of water, waste, pollution, energy and raw materials, have been relatively invisible in the Irish context, obscured by the discursive tendency to portray the knowledge and creative economies as virtual and immaterial, or even as “green” and less energy-intensive than other forms of production. This invisibility is further aggravated by the absence of “establishment-reviewed epidemiological studies and the inability to trace the flight and subsequent destination of any particular pollutant” in Ireland: the existing science primarily functions not to track environmental consequences but rather to deny that pollution or resource-use exceeds “safe” levels or incurs “risk” (Allen 2005: 20). In contrast to this view, what is crucial to a macro-ecological understanding of Ireland’s role in the world-ecology is the inextricability of its financial role as a tax haven and secrecy jurisdiction zone from its environmental function as a semi-peripheral pollution and water haven. We can adapt Jason W. Moore’s slogan that “Wall Street...becomes a way of organizing all of nature, characterized by the financialization of any income-generating activity” (Moore 2011b: 39) to say that the “IFSC is a way of organizing nature,” with pernicious consequences for water, energy, and food systems in Ireland.

Indeed, the second major “muscle” of the Tiger economy, particularly after the dot-com crash, was the attraction of transnational pharmaceutical corporations. Ireland has followed a similar path to other semi-peripheries in becoming a haven for the processing wings of chemical and pharmaceutical corporations fleeing occupational and environmental regulation in their home countries, especially after the passing of the U.S. Clean Air and Clean Water Acts in 1970 and 1972, which threatened to raise the costs of production. From the 1970s onwards, most of the giants of the global chemical industry set up shop in Ireland, including SmithKline, Pfizer, Merck, Schering Plough and Roche, which accounted for nearly seventy percent of pharmaceutical industry output worldwide (Allen 2004: 4). While this concentration of transnational pharmaceutical industries has often been seen as a phenomenon local to Ireland, it is better understood as part of a world-ecological transition to the outsourcing of toxic industries, waste and pollution from capitalist cores to mediating semi-peripheries.

As Robert Allen notes, Ireland’s role as a “pollution haven” is directly comparable to that of the Mexican semi-periphery after the imposition of environmental deregulation by free trade agreements:

In 1970s the U.S. chemical industry investment in Ireland was \$22.25 million. Within three years it had climbed to \$175 million and by 1981 it had increased to \$1,121 million (approximately 6 per cent of the chemical industry's worldwide investment total)—by 2002 the IDA was quoting total investment at \$12 billion. Over the same period in Mexico a similar increase occurred: in 1973 it was \$503 million, in 1981 it was \$1,144 million. [...] In Ireland after 1981 investment fell off for several years before picking up again at the end of the decade. By 2002 the electronics and software industries had replaced the chemical and pharmaceutical industries as the jewels in Ireland's corporate crown. (Allen 2004: 4)

Neoliberal financial markets have consistently orchestrated decisions as to which forms of pollution are allowed and which eradicated, as in the infamous statement by Lawrence Summers that Africa was “underpolluted” because “the environmentally induced loss of life in more developed countries was more expensive to the world economy compared with the cheapness of life (lost wages) in Africa” (cited in Smith 2006: 18). During the 1990s, at the same time as other European economies began to invest heavily in alternative energies, recycling schemes, waste minimization, and organic farming, and as other underdeveloped and under-industrialized nations questioned or actively resisted the importation of toxic industries, the Irish state deliberately set out to attract industries of hazard, colluding with the powerful chemical lobby to soften EU environmental regulations. Not only does the Irish state demonstrate a lack of political will to enforce stringent environmental standards, improve environmental standards, or protect the quality of existing environments, but its principal objective has been to ensure that changes in regulation, particularly those imposed by the EU, would not be detrimental to the economic performance of the Tiger or deter multinationals specifically seeking to locate investment in a country where environmental regulation is lax. The main focus of the Environmental Protection Agency in Ireland has been “managing” environmental policy to ensure economic performance, rather than “protecting” ecosystems, a shift which George Taylor describes as “the complicated process of organizing consent around new definitions of the *extent to which pollution can be justified*” (Taylor 2001: 5).

While the role of tax breaks and financial services in attracting foreign capital to Ireland has been much remarked, far less attention has been paid to the cheap appropriation of Ireland's ecological frontiers, including groundwater resources, which are at approximately “15,000m³/person/year” about “five times that of many other European countries” (Allen, 2004:

4). Ireland's uncommodified groundwater resources—a source of “cheap water” that could be appropriated without cost to transnational corporations—have been key in attracting industries dependent on the exploitation of clean groundwater. Despite surges of public protests against industrial development in Ireland's rural peripheries throughout the 1980s and 1990s, the state acted to suppress environmentalist discourses and awareness of pollution and resource consumption corresponding to the importation of toxic industries, thus creating a durable amnesia surrounding hydro-ecological crises in Ireland, whether pesticide pollution in agribusiness, or dioxin contamination by pharmaceutical plants. As Allen remarks in the context of the Merck plant's toxification of the Ballydine watershed in the 1980s, “The great toxic disasters of the modern era happened elsewhere, out of sight out of mind and certainly out of Ireland. Yet Merck's poisoning of the Ballydine environment occurred in front of our eyes in Ireland, but it is as if nothing strange happened in this place Mary Hanrahan calls the ‘valley of tears’” (Allen 2005: 19). Much research remains to be done in order to reverse this process of invisibilization and gain a critical understanding of the costs of the reshaping of socio-ecological relations during the Tiger period.

Another key dimension of Irish neoliberal ecology that demands further investigation in the context of the nexus of climate change, petroleum consumption, and pollution is the grazier economy. Denis O'Hearn wittily describes the restructuring of the Irish economy at the end of the 1980s as the transition from the “green donkey” to the “Celtic Tiger” (O'Hearn 2001: 167). While the Tiger economy incorporated new monocultures in pharmaceutical commodities and ICT industries and witnessed a massive boom in banking and construction, the novelty of these developments should not be overembellished. Noting that the Tiger was dominated by financial and property speculation rather than new indigenous exports, and characterized by a continued failure to develop national industries in fisheries and gas, Conor McCabe emphasizes the long historical roots of the agro-export regime that continued to prevail during the Tiger:

The type of business activities which dominated the Irish economy in the twentieth century—cattle exports to Britain and financial investment in London; the development of green-field sites and the construction of factories and office buildings to facilitate foreign industrial and commercial investment; the birth of the suburbs and subsequent housing booms predicated on an expanding urban workforce—saw the development of an indigenous moneyed class based around cattle, construction and banking. [...] Up until the 1980s, cattle was to Ireland what the car industry was to Detroit and, although the Irish Free State

gained partial independence in 1922, its economy, via the cattle industry, remained intertwined with that of the UK. The structural problems related to that situation—an independent country with a regional economy—had an influence on the so-called Whitaker/LeMass revolution in the 1950s and the superficial industrialization of the Irish economy in the decade which followed in its wake. This is also the period when we see a new type of Irish businessman—the speculative builder and financier—come to the fore (McCabe 2011: 10-11).

Far from displacing the donkey, the contradictions of the Tiger emerged from the earlier ecological regime: the growth of financial speculation must be understood as dialectically related to the grazier export economy. Ireland's "green" rural countryside, as celebrated by the Food Harvest 2020 report, should not be understood as the product of temporal "backwardness," nor as innately pastoral and environmentally neutral, but rather as the structural product of semi-peripheralization, characterized by uneven and combined development of some sectors to the exclusion of others in the favor of particular class interests, in this case, the overdevelopment of the conveyor-belt agro-export—economy which emerged in the eighteenth century. In the 1950s, nearly three-quarters of Irish exports were comprised of agricultural and food products, destined for UK markets, resulting in a persistent over-concentration of activity around the agricultural monoculture and over-reliance on low-valued-added exports of agricultural produce. After Ireland's integration into EU, this overreliance was not corrected, since from the 1970s onwards, peripherality was a structuring principle in Irish applications for EU funding and CAP (Common Agricultural Policy) subsidies of the agricultural sector (Cronin 2002: 56). After the collapse of the housing bubble in 2008, the agro-export system organized around dairy and grazier monocultures has persisted as a fundamental sector of the Irish economy. As the Department of Public Expenditure and Reform (DEPR) announced in 2011, "The agri-food, marine and forestry sector is Ireland's largest indigenous sector and makes a major contribution to economic and social development, particularly in rural Ireland" (DEPR 2011: 22).

The domination of cows rather than cars in the Irish economy does not mean that the Irish neoliberal ecological regime has been "greener" than the automotive regimes of Detroit or Wolfsburg. In his short story "Animal Needs," Irish writer Kevin Barry tartly describes a farm in the west of Ireland as emitting a "general sensation of slurry" (Barry 2007: n.pg.), a phrase evocative of the dependence of the Irish agro-food sector on petrochemical fertilizers. Imported oil and GM-fodder underlie the production of Irish "cheap food," as well as substantial waste frontiers: whether the carbon emissions produced by methane-expelling livestock or the pollution

of Irish watersheds by fecal coliforms and nitrate runoffs caused by pig slurry, agricultural waste and illegal dumping. A significant component of Ireland's failure to reach its greenhouse gas emission reduction targets is the steady escalation of agriculture greenhouse gas emissions since 2012 as a result of the Food Harvest 2020 targets for expansion of livestock numbers, particularly of dairy cattle (Armstrong 2015). Understood in these terms, the Emerald Tiger is more brown than green.

The post-Tiger turn to ever more technocratic forms of mass agri-business has only accelerated the ecological contradictions of the agro-export regime. Industrial capitalist agriculture is highly unstable and “overridden with unsustainable ‘technological fixes’ and masked by a host of externalized costs,” including dependence on “relatively cheap oil” to subsidize “the low-priced industrial grains and oilseeds on which global food security has come to hinge” (Weis 2010: 315). The acute volatility of global food prices has resulted in an extreme polarization of dietary combined and uneven development, with many poor people in the Global South confronted with worsening conditions of manufactured food scarcity, at the same time as meat and dairy-centered diets continue to rise in rapidly industrializing economies in China and India. However, as Tony Weis emphasizes, the causes of the food crisis run deeper than market turbulence:

Industrial livestock production is the driving force behind rising meat consumption on a world scale, and the process of cycling great volumes of industrial grains and oilseeds through soaring populations of concentrated animals serves to magnify the land and resource budgets, pollution, and greenhouse gas emissions associated with agriculture. These dynamics not only reflect disparities but are exacerbating them, foremost through climate change. [...] Rising meat consumption and industrial livestock production should be understood together to comprise a powerful long-term vector of global inequality (Weis 2013: 65).

Contrary to the greenwashed vision of unspoiled rural environments offered by the Department of Agriculture, Ireland is a significant contributor to the biophysical contradictions of industrial capitalist agriculture, particularly the industrial grain-livestock complex that underlies the dairy economy and cattle economy, and thus imbricated in the crises of “cheap food” and “cheap oil” in the larger world-ecology.

Dairy exports, particularly of whole powdered milk and infant formula, are one of the largest sectors of the post-Tiger Irish economy, with a high rate of export to growing Asian markets. In 2012, as part of the Food & Agri-Services mission to China, the Chinese dairy producer Dairy United signed a Memorandum of Understanding with University College Dublin to collaborate on the creation of a trade corridor to facilitate the introduction of Irish exports and dairy agri-business to the Inner Mongolian region (UCD News 2012). This dairy revolution is reminiscent of India's "white revolution" in the 1990s, conducted as an agro-fix to the waning of the Green Revolution and driven by neoliberal reforms dismantling the Nehruvian state (Scholten and Basu 2009: 1). The Chinese version aims to secure supply of dairy products for its burgeoning urban markets and emerges from the larger internal contradictions of China's increasing limits to the appropriation of food, water, energy, and heavy metals. China's land carrying capacity for mainland agriculture is nearing its limit, especially as the peasantry are increasingly deruralized and industrial development seizes more land. With a thirty-seven percent decrease in wheat, rice and corn yields predicted by the mid-twenty-first century, China is searching for revolutions in food productivity that can unleash new ecological surpluses through agri-technology (Economy 2007). Northern China's Inner Mongolia has been subject to mounting clearances and land grabs, as the traditional grazing lands of minority ethnic Mongolians are seized by the Chinese state and nomadic peoples resettled in permanent housing. Ireland's comprador role in China's white revolution, reliant as it is on the colonization of Inner Mongolia, has a certain historical irony when the origins of the Irish grazier economy in colonial land clearance and liberalization are recalled. Ireland's concerted courting of Chinese capital, as captured in Enterprise Ireland's stated aim of "winning Chinese markets" (Story 2010: 1) also telegraphs the Irish semi-periphery's attempt at economic realignment in the light of shifting inter-state competition and the potential waning of European and American core hegemony. Finally, with the EU abolition of milk quotas after 2014, the removal of crucial subsidies and deregulation of Irish dairy production has created pressure to open up new strategies of financialization in the dairy sector, and the Irish Minister for Agriculture, Food and the Marine, Simon Coveney, has been aggressively advocating for a fully functional dairy futures market (Halleron 2015).

Post-Tiger, the politics of pollution structuring Irish environmental policy (Taylor 2001: 39) have been intensified in the development of new biofinancial mechanisms and environmental derivatives, such as the dairy futures proposed above, and the water futures market envisaged as an extension of Irish Water. The absurd semantics of the plan for a Green Irish Financial Services Centre vividly capture the government's embrace of nature as financial accumulation strategy:

We have the natural resources, the talent and the Government commitment necessary to become a hub for green enterprise. [...]The planned Green Irish Financial Services Centre will build on the success of the IFSC and become a leading player in the global carbon market and promote Ireland as a centre of excellence in the management of carbon. (GreenIFSC N.d.)

Besides providing new financial services in ecological commodities trading, the greening of the IFSC seems to consist largely of adding the word green to its title, while using accelerating climate crisis to force through new forms of biofinancialization. This is characteristic of the Irish government's response to the evacuation of multinational capital since the 2008 financial crisis, which has been to impose rounds of intensified neoliberalization: asset-stripping the public sector, flexibilizing labor, and restructuring higher education and healthcare to prioritize entrepreneurial "smart" technologies. If the Irish state had not previously been coerced into accepting structural adjustment programs, in the wake of the 2008 bank bailout, the largest in European history, it was subjected to the full artillery of neoliberal reforms by the European troika of the International Monetary Fund, European Central Bank and the European Commission, including budgetary austerity, privatization, reorganization of finance, opening of internal markets, removal of tariffs and barriers, and the disciplining of labor markets to increase flexibility. A key element of these reforms has been the identification of new ecological frontiers for enclosure: water via the privatization of domestic water provision; oil via the sale of offshore petroleum exploration licenses to transnational oil companies; natural gas through onshore hydraulic fracturing; fish through the development of mass aquaculture and intensification of salmon-farming; and biocommodities through the development of biotechnology industries in pharma, food, and energy.

The case of oil and gas in the Irish context demonstrates the transition from the era of easily obtainable fossil fuels—or "cheap energy"—to a late neoliberal regime of mounting geo-technical challenges to energy appropriation—or "extreme energy"—in which more intensive, toxic, and high-risk technologies of extraction are implemented. With diminishing returns to existing methods of extraction, and no undetected frontiers or untapped oil reserves still awaiting discovery, capital has been forced to turn to ever-more costly—in both economic and carbon-intensive terms—forms of energy extraction, from tar sands, to fracking, to deep-sea and rock formation drilling. Within this context of intensified competition for resources, Ireland has become a contested zone of experimental hydrocarbon extraction and energy imperialism, with a striking lack of national sovereignty over its resources. The ultra high-pressure upstream pipeline

and inland refinery built by Shell E&P Ireland in the Corrib field off northwest Mayo are a prime example of high-risk technologies that are being trialed in the Irish semi-periphery (upstream pipelines are usually only located under the sea or in uninhabited areas due to the risk of explosion posed by the volatile mix of chemical compounds and raw gas). The ecological regime intertwining Ireland's role as a tax haven and as a water and pollution haven can be sharply seen in this energy scenario. The Irish licensing system for oil and gas exploration is marked by an extraordinary pro-corporate bias and subservience to foreign capital, with the result that the proportion of the government's take of oil revenues is one of the lowest in the world, well below thirty percent. This is below even that of Peru, in contrast to seventy-five percent take of a country such as Norway (Johnston 2008: 39). The state share in revenues from the sale of gas from Corrib, according to a private 2003 consultants' study for Shell, is estimated to be only seven percent (Shell to Sea 2012: 12). The introduction of the Profit Resource Rent Tax (PRRT) by Minister for Energy and Natural Resources Eamon Ryan in 2007, far from increasing potential state revenues, allows foreign companies to offset all costs and calculate the ratio of their capital investment against remaining profits, thus avoiding paying tax.

Transnational oil and gas industries are among the most profitable companies in the world, and yet they are being subsidized by the Irish public at the same time as they are exploiting the lack of stringent environmental regulation to implement experimental forms of extraction. The tax regimes for fracking are amongst the most generous in the world, and Ireland is poised to become a key frontier for the shale gas revolution. Since 2008, three companies have been authorized to begin preliminary exploration for shale gas in parts of 12 Irish counties on both sides of the border, concentrated in rural, peripheral territories in Leitrim, Roscommon, Sligo, Clare, Cavan and Fermanagh. The need to locate and extract new oil and gas reserves as swiftly as possible has been consistently posed by the state as essential to Ireland's national interest, despite growing public awareness of the environmental costs of fracking, which in the course of hydraulically fracturing rock with high-pressure liquid to release the gas, contaminates groundwater with methane (Osborn et al. 2011: 8172) and can unleash seismic tremors. However, the decade of concerted resistance to the Corrib project from the Shell to Sea movement and local protestors in Rosport, with international connections to Nigerian anti-Shell campaign and the Bolivian "gas wars" and "water wars," has laid a crucial groundwork for grassroots resistance to the shale gas revolution, and may mitigate or delay the enclosure of new gas frontiers in crucial ways.

In the context of water as a resource, the reform of the Irish water sector after the fiscal crisis is part of the state's larger program to restructure the infrastructure sector around semi-state companies that will secure their own revenue from charges and borrowing, in order to take

environmental services off the balance-sheet of overall government deficit figures (Bresnihan 2015a: 7). This strategy of financial engineering is also being applied to other parts of public sector infrastructure, including healthcare, housing, and transport. Of the four main components of DPER's 2011 investment—economic infrastructure, the productive sector and human capital, social investment and environmental infrastructure—the latter, entailing the privatization of waste and water systems, is the most significant in this context (DPER 2011: iii). Due to the successful defeat of water charges in 1977 and again in 1995 by community protests in Ireland's own "water wars," Ireland remained the only EU member state not to charge for domestic water and wastewater services, which were paid instead through general taxation. Accordingly, a key component of the Program of Financial Support agreed with the troika was to transfer independent assessment for responsibility for water services provision from 34 local authorities to a new water utility by the end of 2011. The 2013 Water Services Bill established Irish Water as a new state water utility responsible for operation, maintenance and upgrade of water services infrastructure, customer billing and charging.

The privatization and commercialization of water services in the Global North and Global South has been a key dynamic of neoliberal accumulation—an unprecedented conquest of the hydrological commons that has accompanied the expansion of a water bubble and the drive to create international water futures markets. Ireland is now being belatedly inducted into this hydrological regime, in accordance with the emphasis on ecological modernization and hydrological management articulated in European agendas such as the Water Frameworks Directive. However, less attention has been paid to the specific process of *biofinancialization*, which constructs a new relationship between the flow of water and the flow of money in global financial markets (Bresnihan 2015b), "banking spatially on the future" through an "ecological fix" that redirects finance capital into the infrastructures necessary for social reproduction (Castree and Christophers 2015). The revenue generated by the introduction of household water charges by the Irish Water utility is not sufficient to finance the projected twenty-billion euro investments necessary to improve Ireland's ageing, failing water infrastructure (Bresnihan 2015a: 2). Instead, the new utility intends to raise independent external private investment by using the new stream of revenue from domestic charges to borrow from international credit markets, most likely by issuing infrastructure bonds similar to Bord Gáis's five-year bonds. The semi-peripheral tendency of the Irish state towards weak market regulation plays a central role in transformation of a previously publically-funded, state-managed large-scale infrastructure into a financial asset for private investors. Water infrastructure can be understood as a new frontier for appropriation by financial capital, in which the material, spatially-specific components of the

water system, from pipes to plants to pumps, are transformed into an asset commensurable with other investment opportunities in terms of yield and risk (Bresnihan 2015b).

The need to measure financial performance in order to demonstrate favorability of exchange also means that hitherto uncommoditized aspects of the hydro-social cycle are being incorporated into networks of finance, as in Irish Water's attempts to install household water meters across the country. Bresnihan highlights the novelty of the transformations entailed by this process of biofinancialization, which integrates the flows of finance capital with the flows of the vital resources necessary for socio-ecological reproduction:

What is being measured here is not the present value or condition of Ireland's water resources and infrastructure but their *future* value and performance (i.e. as providers of ecosystems services). One consequence of this is the central role that data and information communication technologies will increasingly play in mediating and representing the value of the water network and the comparative performances of the utility and of individual households. This intensifies and extends a more general tendency in how 'nature' is being valued within contemporary capitalism: no longer a limited stock of material inputs metabolized within the production process, but an infinite series of performing assets that can be measured, evaluated, circulated and *speculated* on in financial markets. Of course, the overlaying of these new information systems onto water resources and infrastructures are not neutral or transparent. They transform social and ecological interactions and generate new exclusions. (Bresnihan 2015b)

However, the establishment of Irish Water has been met by the most significant popular anti-austerity mobilization since 2008. The imposition of the new household water charges have been seen as the proverbial straw that broke the donkey's back: a regressive burden on Ireland's squeezed majority who have already born the pain of five years of austerity, and who already contribute to the cost of water provision through general taxation, making the water charge a double tax. Huge numbers have joined the campaign against water charges since autumn 2014, and protestors has made use of a wide range of tactics, from civil disobedience in the form of boycotts of registration to Irish Water and a refusal to pay charges, to direct actions blocking the installation of meters in working-class neighborhoods, to large-scale marches and mobilizations in the streets (Finn 2015: 49). At the time of writing, the charges seem likely to be defeated.

Eurostat, the EU statistics agency, ruled in 2015 that Irish Water failed the state corporation test, due in large part to the boycott of household water tax which crippled its revenue streams and blocked its capacity to fund itself into the future. The Irish public's insurgent refusal of the new forms of social discipline required to transform water users into efficient, rationalized consumers presents a serious barrier to biofinancialization of the water system.

Bioprospecting in the area of food systems, however, faces fewer obstacles to expansion in Ireland. A key feature of late neoliberal accumulation that seeks to open up new vertical frontiers for commodification, bioprospecting scours the natural world for sub-atomic commodities and patentable genetic material that can be transformed into laboratory-manufactured genes. In her prescient discussion of DuPont's OncoMouse, Donna Haraway observed that "biology—life itself" has become "a capital accumulation strategy" (Haraway 1996: 65). Eco-systems and microbiomes are being "unbundled" on unprecedented levels in order to enable privatization of their constituent parts, forging new commodities that Kaushik Sunder Rajan terms "biocapital" (Sunder Rajan 2006: 2). Although this terminology is problematic to the extent that it treats biocommodities as a distinctive new form of capital itself, rather than a particular frontier of enclosure within the neoliberal regime of capitalism, Rajan's observation that the life sciences have been commodified, financialized, and enclosed by corporate capital to hitherto unprecedented levels (Sunder Rajan 2006: 3) highlights a dominant tendency in the Irish setting. A central component of the EU policy agenda elaborated by European Technology Platforms in the agri-food-forestry-biofuels sectors is the "knowledge-based bio-economy" (KBBE), which proposes bio-technoscience as a techno-knowledge-fix that can reconcile environmental and economic sustainability. The KBBE is a political-economic strategy that furthers the neoliberalization of nature and knowledge in EU member states through intellectual property regimes, framing ecological crisis as a problem of inefficiency which can be overcome through "benign eco-efficient productivity" and promising to unlock the productive potential of natural resources, but actually dependent on the production of "new combinations of 'living' and 'dead' labour" (Birch, Levidow, and Papaioannou 2010: 2898).

Within Ireland's knowledge economy, despite the incessant urging of the government to "innovate, innovate," the development of biocommodities is largely founded on the intensification of pre-existing monocultures in pharma, agri-business, and energy. These include genetic tests to identify thoroughbred horses with the greatest genetic potential for racecourse success (Equinome 2015); research by Irish university departments in life sciences and genomics into the molecular mechanisms and genetics of chronic diseases so that transnational biopharma industry partners including GlaxoSmithKline, Pfizer and Merck can manufacture novel diagnostic solutions and gene therapies; the trials of transgenic "blight-resistant" potatoes

conducted by Ireland's agricultural agency Teagasc (Teagasc 2013: 2); the Irish state forestry company Coillte's creation of a sterile "green desert" of over a million acres of pesticide-laden monocultural non-native Sitka Spruce coniferous plantations for timber export (McCarthy 2013); and the development of *Miscanthus* and willow biomass plantations to replace the turf-based bioenergy regime in the now-exhausted peat bogs which Bord na Móna has strip-mined since the 1950s as part of the LeMass energy modernization (Dauber et. al 2010). These developments in bioenergy and agriculture are celebrated by green capitalists as ecological modernizations that will resolve the problems of food and energy scarcity and alleviate climate change.

However, biotechnology is a "short-term fix" that has not yet provided a productivity revolution sufficient to resolve the current decline of cheap food, water, and energy inputs and thus to sustain cheap labor (Moore 2012a: 15). Agro-biotechnology has been bolstered by a new intellectual property regime and pushed forward as the techno-fix to crises of (manufactured) food and fuel scarcity, but has failed to produce substantive yield revolutions, even after two decades of dissemination and experimentation. Biomass plantations, though often perceived as carbon-neutral or low-carbon fuels that provide a way of getting off the "oil hook," entail their own problems of decreased biodiversity, intensified deforestation, threatened food security, accelerated water use, and land grabbing, and can potentially produce carbon emissions greater than those of coal when planted on drained peat bogs and ancient grasslands, thus releasing more carbon than they capture, leading critics to question whether agrofuels are any "cleaner" than fossil fuels (Abbasi and Abbasi 2010: 919). Biotechnology has functioned primarily as a mode of wealth redistribution and economic restructuring of the world's food and fuels system, transferring surplus capital and control over land, genetic resources, economic space, and market power from small farmers to international financial institutions, biotechnology firms, governments and transnational agribusiness conglomerates, by enclosing new vertical and molecular frontiers of life, as in the case of GMO seeds (Holt-Giménez 2009: 180).

The socio-ecological violence of these extractive transformations in the eked-out regime of late neoliberalism is pervasive in the reconstitution of human subjectivity as post-genomic and the reshaping of the rules of reproduction, which are accompanied by the intensification of forms of state discipline, austerity, and biopolitical control, especially of the bodies of the poor, dispossessed, minority, and marginalized. According to the biopharmaceuticals wing of IDA, Ireland's inward investment promotion agency, nine out of the world's ten largest biopharma giants are currently based in Ireland, with thirty-three major plants clustered in the country, and since 2014, Ireland has become the world's seventh largest exporter of medicinal and pharmaceutical products (IDA 2014). The biopharma complex mines vertical frontiers of life and reproduction in order to commoditize and reshape human nature on the molecular scale, so that

people's very bodies and affects acquire economic and political value. The Irish pharma complex is at the heart of the global production of "pharmaco-pornographic capitalism" (Preciado 2008: 107), manufacturing up to 6 of the so-called "blockbuster drugs" that annually earn more than 1 billion dollars (IDA 2014). Many of these are psychotropic anti-depressants, which Beatriz Preciado argues reconstitute subjectivities through "micro-prosthetic mechanisms of control" (Preciado 2008: 107). As such, there is a dialectical relation to be uncovered in the Irish pharma complex between the mass manufacture of SSRI and SNRI export commodities for transnational corporations availing of tax, water, and pollution havens; the stark social violence produced by neoliberal austerity, labor precarity, and biopolitical control enforced by state apparatuses; and the national population's increased consumption of prescription drugs to alleviate privatized pain.

Conclusion

The double dynamic of neoliberal governmentality, which deregulates markets while simultaneously intensifying state regulation and biopolitical subordination of human and non-human forms of life, can be seen sharply in the Irish context of state repression of environmental protestors, whether in the jailing of the "Rosport Five" in 2005 and the forms of force consistently employed against Corrib protestors, or the political policing of anti-Irish Water campaigners which came to its head with the pre-dawn arrests by the Gardaí of left activists and working-class residents involved in the Jobstown sit-down strike in November 2014. In this article, I have offered a preliminary survey of the prevalence of cattle and construction, pharma and financialization within the Irish neoliberal ecology, but it is just as crucial to interrogate the ways in which the opening of new frontiers have been contested by anti-systemic protest and transformation from below. From the 1980s onwards, Ireland's decades of successful community protests against environmental issues ranging from the campaign against nuclear proliferation and extraordinary success of the movement to block the entry of nuclear power plants; to campaigns against waste management and toxic waste incineration (Fagan 2003); to resistance to GMO foods and Monsanto despite the relentless pressure of the Monsanto lobby and emergence of locally-based movements in organic farming, slow food and permaculture; to Shell to Sea's activism against the Corrib pipeline; to anti-fracking campaigns and the new campaign to block drilling and the creation of an oil refinery in Dalkey Prospect all offer evidence of the persistence of modalities of revolt and resistance that reject the neoliberal regime's oppressive configuration of nature-society. Tasks for future world-ecological analysis of Ireland might be then not only to excavate these histories, but to re-imagine the ways in which nature-society can be reconfigured to be more emancipatory, biodiverse, and renewing of the dialectical interrelations between

humans and the rest of nature, thus rethinking the place of food, energy, and resource frontiers in conceptions of development and modernity.

About the Author

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