Determining the economic-environment relation: A *régulationist* approach ✶

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Abstract: *Régulation theory offers a cogent analytical framework to explain the character of the contemporary environmental challenge, the responses of capitalism to environmental issues and the challenge to accumulation posed by sustainable development. Yet sustainable development and the environment more generally have not strongly infiltrated the wide range of topics addressed by régulationists. In seeking to explain the insights provided by this analytical framework to the environment-economic relation compared to mainstream neoclassical economics, this paper also seeks to develop a régulationist approach to the ecological by addressing the criticisms levelled against régulationists for their 'environment-deficit-syndrome' and, in building on two particular contributions directed at breaking this impasse, I contend that the economic-environment relation is not a social relation peculiar to capitalism but is given definition and form by the mode of régulation which secures accumulation. A 4-point method for empirical investigation of the economic-environment relation is proposed and it is concluded that the prospects for sustainable development are constrained to that which do not challenge accumulation and thus only requires adjustment, not transformation, of existing structures and institutions.*

Key words: capitalism, economic-environment relation, neoclassical economics, *régulation* theory, sustainability, sustainable development

1 Introduction

Environmental degradation has escalated with the evolution of capitalism. Climate change has become the hallmark of contemporary environmental concern. The concept of sustainability has been re-configured to validate the green credentials of an economic growth agenda. Neoliberalism has reconceptualised the environment as an economic rather than as an ecological problem with market-based instruments dominating the policy solutions to environmental problems. Contemporary capitalism is also distinguishable by green consumerism, the development of 'clean' technologies and corporate environmentalism. Yet the "systemic ties between capitalism and environmental degradation remain under-explored" (Lippitt 2005: 158).

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Régulation theory, although generally regarded as having a macroeconomic focus but not limited in its application to a particular discipline or topic of study, has directed little attention to environmental issues. This paper argues that *régulation* theory offers a cogent analytical framework to explain the character of the contemporary environmental challenge, the responses of capitalism to environmental issues and the challenge to accumulation posed by sustainable development. Why? *Régulationist* analysis has revealed a periodisation of capitalism reflecting different combinations of production and consumption norms and the evolving but distinctive conjunction of five institutional forms which have ensured the conditions for ongoing accumulation, and the reproduction and maintenance of capitalism's social relations. This provides a framework within which to assess the extent, nature and form of capitalism's relationship to the environment and the reasons for increasing environmental degradation with the evolution of capitalism. Environmental issues are embedded within, not separate or distinct from, capitalism. Therefore explanation of the economic-environment relation must be found by considering this relation within the context of the dynamics of capitalism over time which has been illuminated by *régulationist* analysis.

Such a framework for analysis stands in stark contrast to the analytical context of mainstream neoclassical economics which perceives environmental problems as negative externalities arising from market failure. This less than optimal market outcome, according to mainstream neoclassicists, can be 'corrected' with the imposition of economic incentives to create the 'correct price' which will reduce externalities and lead to some optimum level of environmental control. Thus environmental issues are treated by mainstream neoclassical economics as goods supplied and demanded in a market, as a resource allocation problem not as a constituent part of the evolving process of accumulation.

In seeking to explain the insights provided by *régulation* theory to the environment-economic relation and further progress the development of a *régulationist* approach, I address two seminal contributions which argue respectively for the conceptual framework to include a sixth institutional form, the 'ecological constraint', (Becker and Raza 1999) and that the economic-environment relation may take a general form, a general capitalist form, and a form specific to each phase of capitalism (Zuindeau 2007). Both contributions, despite shortcomings, deepen our understanding of capitalism's relationship with nature being governed by the imperative of accumulation and from which I argue the economic-environment relation is not a social relation peculiar to capitalism, notwithstanding its evolving historical form, but its nature, scope and form is given definition by the mode of *régulation* which secures accumulation by managing and containing capitalism's contradictions and averting a crisis. Building on these conclusions, I propose a 4-point method to move the *régulationist* theoretical framework to an empirical representation of the nature and outcomes of the evolving relationship of capitalism to the environment.

The paper is structured as follows. Section 2 establishes the context for the subsequent discussion. An overview is presented of the twentieth century energy, technology and economic changes that provoked substantial and irreversible environmental damage. The actions and responses of neoliberal capitalism to escalating environmental degradation are then discussed before considering the response of mainstream neoclassical economics to explain this phenomenon. Section 3 sets out the conceptual framework of *régulation* theory before addressing the criticisms levelled against *régulationists* for their 'environment-deficit-syndrome'. The paper then discusses the seminal contributions by Becker and Raza (1999) and, more recently, Zuindeau (2007) to breaking this impasse. Section 3 concludes with my

proposed analytical method for empirical investigation of the environment's relationship to capitalism and the challenge to accumulation posed by sustainable development. Concluding comments form a final section.

2 The problem, the response and mainstream economics

2.1 The ecological legacy of twentieth century capitalism

> In environmental history, the twentieth century qualifies as a peculiar century because of the *screeching acceleration* of so many processes that bring ecological change. Most of these processes are not new ... we have generally done more of these things than ever before, and since 1945, in most cases, far more ... for the most part the ecological peculiarity of the twentieth century is a matter of *scale and intensity* (McNeill 2001: 4, emphasis added)

The growth of the world's economy throughout the twentieth century, and particularly at the unprecedented rate since the Second World War, has been accompanied by the greatest deployment of energy in human history. In the twentieth century, humans used ten times the energy used in the previous thousand years (*ibid:* 15). Significant changes to the energy regime, technology and economic organisation have propelled the scale and intensity of energy use and, as a result, the pace and direction of environmental change.

Transformation of the twentieth century's energy regime - the arrangements to extract, convert, store, transport, use and dissipate waste - occurred through the growing domination of non-renewable fossil fuels. Oil was the fuel of the century being the world's main transport fuel from 1930 and for industry since the late 1950s. Oil, coal and gas now meet more than three quarters of the world's energy needs and are expected to do so for some time to come (International Energy Agency 2008). The extraction, transport, processing and delivery of fossil fuel deposits, unevenly distributed around the world, have led to irreversible environmental impacts spread throughout the world. The widespread occurrence of oil spills, leaks, blowouts, and fires have damaged fisheries, farms, oceans, and marine life. Petrochemicals, derived from oil, have not only proven to be toxic pollutants but have added tonnes and tonnes of durable waste through the creation of plastics. There is also the unequalled land waste and contamination problem arising from coal mining, combustion and slag disposal (Blumberg and Gottlieb 1989; Cohen 2009; Tiwary 2001).

New technologies of the twentieth century added further impetus to energy use and adverse environmental outcomes (Commoner 1972). The humble chainsaw revolutionised logging and pulping and, in the process, cleared tropical forests. Rail transport led to the demolition of forests needed to construct railway-cars and tracks before other materials became widely available. The advent of the car propelled the oil industry's growth to meet fuel needs, its manufacture stimulated metals and rubber production with attendant air, land and water impacts, and its use had significant spatial implications through the construction of roads as well as causing many deaths. Nuclear energy is equally lethal but in the 1950s symbolised 'vigour and modernity' (McNeil 2001: 312). Its anticipated development has, however, not been realised with a significant loss of public acceptability following the most significant civilian accident in 1986 at Chernobyl compounded by some nuclear wastes being deadly for thousands of years (Greenpeace International 2007; Thomas 2008). Environmental consequences and risks have also been boosted by the new technology of genetic modification

which has impacted on pest control, fertilisers, recycling, sewage modification and animal cloning (Pretty 2001).

The substantial environmental change provoked by the twentieth century spread of these technological changes and fossil fuel use was compounded by three significant economic changes. The spread of industrialisation escalated resource use and pollution with falls in energy intensity (the ratio of energy use to GDP) eclipsed by the overall expansion of the scale of industry. The production norms of Fordism (Taylorism plus mechanisation), throughout the 1940s to 1970s, led to productivity and wage gains converting mass production into mass consumption and fomenting monumental changes to family, gender and intergenerational relations which, in turn, sparked ecological changes (McNeil 2001: 318).

Finally, falling transport costs, information technology, and the growth of global financial markets drove greater economic integration across the world in the final decades of the twentieth century from the 1980s onward. One repercussion was the commodification of nature (such as elephant ivory, ostrich feathers, and beaver fur) which could not rely on supply through reproduction leading to serious threats of species extinction (Reeve 2002). Greater integration into an international trading system also led to the transformation of ecologies to meet world demand. Rainforests and wilderness, across many continents, have been converted to beef cattle ranches, rubber and coffee or cocoa plantations, or to plant crops for illegal trades such as cocaine and other drugs (Laurance 1999). The growth of global financial markets has also seen a surge in 'conditional' lending from international institutions, such as the World Bank and Asian Development Bank, for energy and infrastructure projects in less developed countries with a strong emphasis on political and economic criteria but little concern for ecological considerations (Bacon and Besant-Jones 2001; Thomas, Hall and Corral 2004).

Air and water pollution, deforestation, desertification, soil erosion, biodiversity loss and global warming dominate the ecological legacy from the conjunction of twentieth century capitalism's widespread use of fossil fuels, technological change, industrialisation, mass production and mass consumption, and globalisation. "Capitalism's pressures for unremitting economic growth hold as permanent hostage the flora and fauna, the air, the soil, and the water of the planet" (Dowd 2004: 2). This is capitalism's relation to nature. Capitalism requires nature as an indefinite resource and condition of production (O'Connor 1998; Peck and Tickell 1994). But the drive to accumulate causes environmental destruction imposing costs, to maintain or repair these natural conditions of production, which threaten profitability and thus ongoing accumulation. Costs range from soil degradation causing lower land productivity to those incurred from political compromises to overcome community demands for loss of environmental amenity e.g. sewerage ocean discharge impacting on recreational amenity.

O'Connor (1998) deems these costs to form part of the second contradiction of capitalism, the possibility of an economic crisis from the supply-side i.e. from an undermining of the conditions of production.[1] Nature is one of three natural and social conditions necessary for capitalist production, the other two being the built environment and human labourpower

[1] The first contradiction is the tendency for a demand-side crisis given capital's drive to increase profits from greater production with less labour but the corollary occurs of reduced consumption from labour leading to lower profits. This 'two contradictions' framework of capitalism's tendencies to erode its own natural and social conditions of production and overproduction of commodities relative to market has generated considerable debate (For example, see: Burkett 2006; Foster 2002; Lippitt 2005).

(*ibid)*. The prospect of an economic crisis caused by the costs of environmental degradation is for discussion elsewhere. More salient for the purposes of this discussion is the response of twentieth century capitalism to its degradation of the environment.

2.2 The response of capitalism: Environmental managerialism

Environmental and ecological concerns started to be heard more loudly from the 1960s (Lippitt 2005; McNeil 2001). Environmental movements sprang up, green parties entered politics, governments established national and local agencies to 'protect the environment', and companies, particularly oil and chemical, sought to establish 'green' credentials. Capitalism put on "an environmentally friendly face" (Dryzek 1994: 177). In the industrialised world, changes became apparent with the cleaning up of industrial waste water, reductions in sulphur dioxide emissions, and the abolition of leaded petrol (McNeil 2001). New ways of regulating mineral extraction, water supply and waste disposal were introduced, marketable property rights over forests, fisheries and water sources were created along with, to name just a few, land use planning, wetlands mitigation banking, emissions permits, fishing catch quotas, green consumerism, 'clean' technologies, environmental audits, environmental management systems, legal liability for oil spills, charges for effluent or emissions, and banning of DDT (Cohen 2009; Gibbs 1996, 2006; Gibbs, Jonas and While 2002; Lippitt 2005; Redclift 1988).

These actions are exemplars of the different 'techniques' of environmental managerialism initiated by capitalism to 'manage' the environment (Redclift 1988). The overwhelming method inherent to these techniques is to focus on the manifest problem with each being treated as if a commodity instead of dealing more holistically with the cause or context of environmental degradation. Furthermore, markets are regarded as the optimal means to solve environmental problems and thus the environment is being envisaged in economic not ecological terms (Drummond *et al* 1995; O'Connor 1994b; Rees 1992). A further response by capitalism, which accelerated as the new millennium approached, was to shift the arena for discussion and action on environmental problems. The focus moved from problems essentially local in their impact, where the effects are relatively obvious and remedial measures had become established, to those which threaten major disruption to the world environment such as climate change (Gibbs and Healy 1997). This 'scale and impact' shift has been marked by unprecedented efforts at international collaboration accompanied by a growing body of scientific evidence, a marked reconfiguring of the concept of sustainability and the introduction of schemes which facilitate accumulation in the name of greenhouse gas abatement.

Supranational institutions have been created to spearhead the integration of economic and environmental policies, counter advocacy of a 'no-growth' policy and promote economic growth as mandatory for environmental improvement. The establishment of the United Nations (UN) World Commission on Environment and Development, the widespread dissemination of its 1987 publication *Our Common Future* (commonly referred to as the Bruntland Report), its organisation of the 1992 Rio de Janerio Earth Summit to gain endorsement by 178 governments of a 'global framework', and the subsequent establishment of the UN Commission on Sustainable Development, exemplify this approach.

Other significant actions have been the United Nations Framework Convention on Climate Change which led to the 1997 Kyoto Protocol, an international agreement by thirty-seven industrialised countries and the European Union to reduce greenhouse gas emissions,

the establishment of the Intergovernmental Panel on Climate Change (IPCC) and the commissioning by the British Government of the 2006 Stern Review on the economics of climate change. These latter actions reinforced the hegemony of supranational institutions promoting a global agenda of economic and environmental integration.

Concurrently, there has been a growing body of scientific evidence about the scale, intensity and long-term implications of the ecological degradation caused by capitalism's voraciousness, particularly in terms of global warming (Hansen 2006). Although still a somewhat contested terrain, the evidence presented in recent UN and IPCC publications along with the Stern Review and the film *An Inconvenient Truth* has meshed with recent political changes resulting in climate change becoming an accepted institution (O'Hara 2009). Climate change has become the hallmark of contemporary environmental concern and particularly that caused by greenhouse gas emissions from capitalism's inexorable use of non-renewable fossil fuels for energy. This has led to the development of markets to trade carbon and renewable energy sources, and their promotion as the most appropriate mechanisms to deal with this environmental challenge. These mechanisms, however, overwhelmingly facilitate capital accumulation under the guise of reducing greenhouse gas emissions (Jones 2009; Lohmann 2006; Matthews and Paterson 2005).

The actions of supranational institutions and market mechanisms ostensibly designed to deal with emissions have been underpinned by the concept of sustainable development being "transformed, stripped of its critical content, and reconfigured" (Carruthers 2001: 93) to match the priorities and policies of neoliberal capitalism. Previously its polar opposite, sustainable development has become virtually synonymous with sustained economic growth.

The notion of a socially-just and ecologically-sustainable society gained currency throughout the 1970s as an alternative model, particularly for less developed countries. The quest for a sustainable alternative was grounded in formulations of grassroots and bottom-up development, low-impact development, and local control over the use of local resources emphasising equity, self-reliance and basic needs. This "comparatively marginalized, genuinely radical idea" (*ibid:* 98) was totally transformed for mainstream adoption by the "conflation of 'sustainability' (the ecological problem) with 'development' (the economic problem) (Paton 2008: 94) and the UN World Commission on Environment and Development played a lead role in its popularisation. Continual economic growth was promoted and accepted as axiomatic to sustainable development which would be achieved by industrialised countries opening up markets, increasing development aid, leaving private enterprise and partnerships to do the rest (von Frantzius 2004).

Thus the environment came to be reconceptualised as an economic not an ecological problem and a 'recast' sustainability was adopted as a commonly accepted policy goal. Sustainability, understood in the sense of the Bruntland report as inter-generational justice which is sufficiently ambiguous to have the widest palatability, is considered to be in everyone's interest. As James O'Connor (1998: 234) observed "Who in their right mind would be against "sustainability"?" given its practical and moral connotations. But this appropriation of sustainability means the imperatives of capital accumulation determine contemporary environmental priorities. The environmental challenge is viewed through an economic prism with the emphasis on "reducing the environmental impact of each unit of economic activity" (Gibbs and Healy 1997: 195) purely through market measures but legitimising certain levels of environmental impact (Gibbs 1996). This is incompatible with the notion of sustainable

development achieving distributive and inter-generational equity, and all economic activities resulting in the

> sustainable use of renewable natural resources, protection of ecosystem features and functions, preservation of biological diversity, a level of harmful emissions remaining below critical (assimilative) thresholds, and avoidance of irreversible damage to the environment and nature (Mulder and van den Bergh 2001: 111)

through policies framed around co-ordination, co-operation and democratic involvement (Gibbs 1996).

2.3 Mainstream economics and the economic-environment interaction

Until the late 1960s, the interaction of the environment and economic activity was by and large ignored by economists. Environmental costs, overwhelmingly perceived in the form of pollution and resource depletion, were virtually 'banished' from the realm of analysis and treated as externalities (Commoner 1972; Daly *et al* 1989; Lippitt 2005; Victor 1980).[2]

As environmental concerns became 'louder', mainstream neoclassical economics responded in a couple of ways. The economics of natural resources, pioneered by Malthus and Jevons in the 19th century, re-emerged through a spate of publications discussing the optimal use of renewable and non-renewable resources, and common property problems. Another strand of analysis to develop was environmental economics which revived the Pigovian idea of using taxes to correct for market failure ('taxing the emitter') and considered different market structures and policy responses. The tradition to become known as ecological economics also started to emerge with a number of publications focusing on resource exhaustion and pollution imposing limits to growth although mainstream approaches were evident with this strand from the outset despite explicit opposition (Røpke 2004; Söderbaum 2008; Spash 2009; Vant 2005).

The nascent division between the analytical strands of environmental economics and resource economics became entrenched in mainstream neoclassical economics, throughout the 1970s and 1980s, although both strands embraced the methodology of welfare economics (allocative efficiency through Pareto optimality).[3] Resource economics became "highly mathematically formalized" (Røpke 2004: 302) and two issues preoccupied environmental economics – valuation of the costs and benefits of pollution control and environmental amenity; and, the design and choice of policy instruments. Prominent neoclassical economists, such as Solow and Stiglitz, also attacked the notion of resource scarcity limiting long-term

[2] Two notable exceptions were Pigou, in the 1920s, and three decades later, Kapp. Both were of the view that market failure caused environmental problems and required government intervention. Pigou developed the idea of using taxes and subsidies to correct for market failure. Kapp was notable for his empirical evidence that the social costs of pollution and resource depletion were not 'minor and exceptional' but characteristic of a market economy (Hahnel and Sheeran 2009; Røpke 2004; Vant 2005).

[3] The core concept of welfare economics (microeconomic theory) is Pareto optimality. Free, competitive markets allocate resources and distribute income most efficiently because they will tend towards a (Pareto) optimal situation which occurs when no change can improve the position of one individual (as judged by herself) without a negative impact on the position of another individual (as judged by that individual).

economic growth, arguing that the speed of technological change would ensure sufficient replacement of natural resources with man-made capital to sustain growth (Vatn 2005).[4]

Preoccupation with valuing the costs and benefits of pollution control and environmental amenity has seen cost-benefit analysis increasingly utilised to simulate market (monetary) values for the economic cost of interactions with the environment. The monetary values ascribed to the externalities of production are used as proxies for the appropriate level of environmental charges or taxes to 'atone' for environmental damage. Two particular techniques have become commonly used to simulate these values. The first is contingent valuation which estimates the willingness of individuals (producers or consumers) to pay for the right to use, or protect from damage, an environmental amenity or resource. The second technique, and most commonly used to value environmental amenities that affect the price of residential properties, is hedonic pricing which estimates the effects of environmental changes on other markets. Another aspect critical to cost-benefit analysis is the rate chosen to 'discount' or convert future cost and benefits to present values.

Monetary valuation, using these techniques of cost-benefit analysis, has become a cornerstone of mainstream environmental economics (Mulder *et al* 2001; Victor 1980). More significantly, these techniques provide the analytical basis for recent influential climate change reviews such as that for the UK Government by Stern (2007) and the Australian review by Garnaut (2008). A largely overlooked fact is that the Stern Review undertook three tasks: an assessment of the likely costs of climate change with no change to policies (using an integrated assessment model (IAM))[5]; an estimate of the costs and benefits of various emission levels (using cost-benefit analysis)[6]; and an evaluation of policy options based on outcomes of the first two analyses. The Stern Review was the "first such [cost-benefit] analysis to be issued with the imprimatur of a major government" (Cole 2007: 2) closely followed by Garnaut (2008). The latter's use of cost-benefit analysis, as a decision-making tool, is presented – albeit somewhat naively – as the first chapter.

As monetary valuation has become increasingly embedded in environmental economics and the 'economics of climate change', there has been a noticeable shift in the preferred policy instruments advocated by mainstream environmental economics.

The externalities of resource depletion and pollution had been generally regarded as 'minor and exceptional' to be treated by direct government intervention through command-and-control measures such as the imposition of output quotas or standards for inputs, technology or emissions (Mulder *et al* 2001). This attitude changed as environmental concerns gained wider public exposure, and as neoliberalism gained political ascendancy.[7] Although not

[4] Stiglitz's position has moved somewhat since this time as evidenced, for example, by his contributions as an author to the second assessment report by the Intergovernmental Panel on Climate Change (1995).

[5] The use of IAMs, mathematical representations to interface socioeconomic and biophysical processes, for simulation of climate change has rapidly grown since the early 1990s and notably their discussion in the second assessment report of the Intergovernmental Panel on Climate Change (1995) (Parson *et al* 1997).

[6] One aspect to attract considerable criticism was the discounting approach used (Cole; 2007 Quiggin 2008).

[7] Neoliberalism rests on a belief in markets, competition, individual responsibility and social conservatism. Virtually all economic and social problems are seen as having a market solution. The market is considered to be the most efficient method to determine the allocation of economic

quite acknowledging that environmental externalities, rather than being the exception, are pervasive, persistent and growing in importance, the dominant preferred policy approach of environmental economics has moved to one of 'internalising' the externalities through the imposition of economic incentives (market-based measures). These policy measures are designed to directly impact on the costs and benefits for individuals through charges, taxes, subsidies or tradeable permits. According to the underlying logic, these incentives induce behavioural change leading to a more efficient allocation of resources (Stavins 2003). By treating environmental issues as goods supplied and demanded in a market, a 'correct price' of the externality is created by placing an environmental charge on the cause of the externality (Metcalf 2009), e.g. the coal-fired electricity generation plant which emits greenhouse gases. If market participants pay the 'correct price', externalities will be reduced, not eliminated, to some 'optimum' level of pollution control. Thus "the power of the market can be harnessed ... for the achievement of environmental goals" (Tietenberg 1994: 316) which is considered to be far more efficient than direct government intervention. Despite being the "for economists, the obvious choice" (Metcalf 2009: 6) and part of the US 'environmental policy landscape' for more than 20 years, market-based instruments have not "always performed as anticipated" (Stavins 2003: 416).

The shift in preferred policy solutions has meant that, as the debate about growth and resource scarcity moved to long-term sustainability as noted earlier, the mainstream neoclassical economics position requires two conditions for sustained growth. The 'substitutability' argument of replacing natural with human-made capital has remained and another condition has been added: all externalities of production need to be internalised i.e. there needs to be 'correcting' price signals for the full costs of resource use.

In summary, the focus of mainstream environmental economics is the allocation of scarce resources, and optimal welfare. The interpretation of environmental degradation – in the form of resource depletion and pollution – as an allocation problem means that the analytical context of mainstream neoclassical economics treats environmental problems as negative externalities arising from market failure. This less than optimal market outcome can be 'corrected', according to the mainstream's logic, with the imposition of economic incentives which will reduce externalities (they become cost-prohibitive) and thus some optimum level of environmental control will occur. Thus environmental issues are treated by mainstream neoclassical economics as goods supplied and demanded in a market, as a resource allocation problem not as a constituent part of the evolving process of accumulation.

A further feature of neoclassical environmental economics is its treatment of the economy and the environment as two unrelated spheres where the extent of interaction is "mainly along defined points such as mines, fishing grounds and so on" (Vatn 2005: 247). Similarly, the use of resources in economic activity is treated distinctly as 'resource economics' and not explicitly linked to the pollution arising from economic activity which is treated separately as 'environmental economics'. This means that "the internal dynamics of the economy is emphasized much more than ... interrelationships with the environment" (*ibid*) because "the environment is subordinated to the dynamic of capitalist economic processes (Rosewarne 1993: 65).[8]

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resources. And, as a corollary, the role of the state is to ensure the effective operation of markets not by active intervention but through regulation and promotion of conditions for profitability.

[8] Söderbaum (1992) suggests that mainstream economics was not developed primarily to deal with environmental problems so alternative paradigms should be considered. The point is not why a

Environmental issues are embedded within capitalism. Yet mainstream neoclassical economics does not consider the ways in which the capitalist economic system affects the environment. Instead, the environment is perceived as being just like other goods, as commodities that can be defined, sold and replaced.

3 What does *régulation* theory offer?

Régulation theory seeks to explain the long run changes in capitalist economies which characterise distinctive phases or trajectories of economic growth, the dimensions of capitalist development and the forms of crisis that can occur (Boyer 1988; Dunford 2000; Esser *et al* 1989; Jessop 2001a, 2001b; Kotz 1990; Mazier 1982; Moulaert *et al* 1989; Noël 1987; Tickell *et al* 1992). Its genesis may have been hastened by the 1970s economic crisis but it is more than a theory of economic crisis (Lipietz 1987a).

Although generally regarded as a macroeconomic theory, *régulation* theory is not limited in its application to a particular discipline or topic of study (Jessop 1997a, 2001b). It also has been applied to meso-economic analysis focusing upon large sectors of productive activity (e.g. Allaire *et al* 2002; Chester 2007; Cooke 1992; Kenney *et al* 1989; Moulaert *et al* 1992). *Régulationists* have, however, been criticised for paying scant attention to environmental issues which Lipietz (2002), the most prominent ecological r*égulationist,* acknowledges. His contributions in turn have been criticised for dealing superficially with ecological issues and bias allegedly because of his close ties to the French political party *Les Verts* (Becker and Raza 1999; Jäger and Raza 2001). These criticisms, on both counts, overlook the steady stream of contributions from the 'radical geographers' who have sought to shed insights on the economic-environment relation using r*égulation* theory (For example, see: Angel 2000; Baurdiel *et al* 2002; Bridge 2008; Drummond *et al* 1995; Gibbs 1996, 2006; Gibbs *et al* 1997, 2002; Peck 2000; Peck *et al* 1992, 1994; Tickell *et al* 1992, 1995).

The substantive nature of the criticisms levelled against the *régulationists* is addressed below. But, in order to understand these criticisms, we need an understanding of the conceptual framework of *régulation* theory which is outlined in the next section.

3.1 The object of régulation

The two core concepts of *régulation* theory - regime of accumulation and mode of *régulation* - are underpinned by a Marxian view of capitalism where the mode of production is structured around two fundamental conflictual, contradictory and unequal social relations: the commodity (monetary) relation and the wage relation (Lipietz 1988a). The process of accumulation, by which capitalism is reproduced and expanded over time, must ensure the maintenance and reproduction of these fundamental social relations otherwise crises will occur, that is, "*ruptures* in the continuous reproduction of social relations" (Aglietta 1979: 19, original emphasis).

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paradigm was developed but the usefulness of the conceptual framework to explain the economic-environment reality which he does address in his 2008 book *Understanding sustainability economics.*

"The notion of social relations points to the regularity and repetitiveness of certain practices" (Lipietz 1988b: 14-15). This suggests that certain conditions, 'regularities', are essential to ensure the existence of these social relations. This does not mean that qualitative and quantitative change, within these social relations, does not occur over time. It does mean that certain core elements - invariant aspects - are sustained over time and their inherent contradictions are contained partially for a time whilst their historical form and precise articulation will continually alter over longer periods ensuring the dominance of capitalism (Boyer 1988: 70; 1990: 37) This 'invariant reproduction', 'contradiction containment' and 'historical representation' requires a set of regularities which defines a core concept of *régulation* theory, the *regime of accumulation.* These regularities refer to the distinctive regular social and economic patterns that support and sustain accumulation between structural crises, ensuring its stabilization over a long period (Boyer *et al* 2002b; Lipietz 1986b). A particular combination of production and consumption, reproduced over the long term, is essentially defined by these regular social and economic patterns (Jessop 1988, 2001b; Lipietz 1986b, 1987b; Tickell *et al* 1992).

Three accumulation regimes have been identified since the mid-nineteenth century to the 1970s, each showing a long boom and then a period of decline, stagnation and crisis although the causes of the downswing are different in each case. These accumulation regimes are: extensive accumulation, intensive accumulation *without* mass consumption and intensive accumulation *with* mass consumption (Boyer 1988; Lipietz 1986a, 1987b). Since the 1970s economic crisis there has been much debate as to the nature of the current regime of accumulation (Clarke 1988; Gordon 1988; Harvey 1989; Schoenberger 1988). A protracted crisis or a new regime of accumulation is not at issue for this paper. The more important point is this: a regime of accumulation describes a period of relatively stable capitalist development, a period in which patterns of economic and social regularities ensure the reproduction of the fundamental social relations of capitalism, social relations "whose invariant aspects can only be reproduced through continual alterations of their forms and precise articulations" (Boyer 1990: 37). Moreover, these regularities can be explained by analysing an accumulation regime's institutional (or structural) forms which are "any kind of codification of one or several fundamental social relations" (*ibid*).

The concrete expression or "materialization of the regime of accumulation ... [takes] the form of norms, habits, laws, regulating networks and so on" (Lipietz 1986b: 19) and forms the theory's second core concept, the *mode of régulation* which coheres particular periods of accumulation by reproducing fundamental social relations through a *conjunction* of institutional forms (Boyer 1988, 1990). In other words, the mode of *régulation* governs, guides, supports and secures an accumulation regime by reducing, containing, and mediating (i.e. regulating) the inherent conflicts of social relations (Aglietta 1979, 1998; Brenner *et al* 1991; Broomhill 2001; Dunford 1990; Jessop 1988, 1990, 1992, 2001a; Lipietz 1987b; Tickell *et al* 1992; 1995).

Institutional forms may work in one of three ways: as laws, rules and regulations; a compromise or negotiated outcome; or, a common value system or representations (Boyer 1990; Boyer *et al* 2002b). Five institutional forms comprise the mode of *régulation*. These are:

- *monetary and credit relationships* – these relationships define how separate economic units will interact and will be influenced by national and international financial systems;

- *wage-labour nexus* – the relationship between capital and labour, management and employees and broadly covers all aspects of work organisation and the standard of living of wage-earners;
- *form of competition* – how relations between firms are organised, how units of accumulation relate to each other;
- *position within the international regime* – the nature of trade, investment, monetary and political arrangements that link firms, national economies and the international system; and
- *form of the state* - the institutionalised compromise between capital and labour, forms of state intervention, and economic policy.

A hierarchy or dominance of particular institutional forms has been found to characterise different modes of *régulation* in addition to the ongoing metamorphosis of each institutional form (Boyer *et al* 2002b).

The mode of *régulation* contains and controls "within tolerable limits … [but] cannot prevent all disequilibria" (Destanne de Bernis 1988) because the inherent tensions and contradictions of social relations will never totally disappear. Consequently, crises can occur if these disequilibria are not ameliorated in some way. Different types of crises have been identified and although there is no general consensus on the names or categorisation of crisis, there is common agreement that the nature of the mode of *régulation* will not ensure stabilisation for an indefinite period leading to a crisis.

The combination of an accumulation regime and a mode of *régulation* defines a *mode of development* (Boyer 1990; Brenner *et al* 1991). The period post World War II, of intensive accumulation with mass consumption accompanied by a monopoly mode of *régulation*, is commonly referred to throughout the literature as 'Fordism'. Although the debate continues about the constituent parts of the mode of development since the 1970s crisis, 'post-Fordism' has become the nomenclature for the current period.

In summary, capitalism requires the ongoing reproduction of its fundamental unequal social relations otherwise crises occur. *Régulationist* analysis has revealed a periodisation of capitalism as new forms of accumulation have evolved creating different combinations of production and consumption norms. Each stage of capitalism has been found to have distinctive regular social and economic patterns which have materialised as a distinct conjunction of the institutional forms comprising the mode of *régulation.* It is this evolving mode – this evolving set of institutional forms both individually and in conjunction – which has ensured the conditions for ongoing capitalist accumulation. The mode is not fixed or immutable because its constituent elements constantly change to ensure its ongoing capacity to reproduce and maintain capitalism's social relations, to "secure the compatibility of social conflicts with the requirements of the accumulation process" (Baurdiel *et al* 2002: 108-09).

3.2 The economic-environment relation

We noted earlier that environmental degradation has escalated with the evolution of capitalism. We also noted the change in energy regimes over time, the shifting arena to discuss environmental issues, and the increasing dominance of market-based solutions as policy responses. Can the mode of *régulation* provide insights into the economic-environment

relation, the current environmental challenge and the prospects for sustainable development? If it can, why has sustainable development and the environment more generally not infiltrated the range of topics which *régulationists* have addressed to date? We will first deal with this latter conundrum, the key to which lies in the very conceptual framework, genesis and evolution of *régulation* theory.

First, as we know, *régulationists* explain the processes and dimensions of capitalism, its growth, reproduction and reasons for crisis by analysing the pattern of economic and social regularities which materialise in the institutional forms comprising the mode of *régulation*. The inherent conflict arising from the social relations of the mode of production is contained – although not indefinitely - by these institutional forms which may work in a number of ways. Thus *régulationist* analysis is heavily focused on the evolving nature of these institutional forms which support and secure accumulation.

Each institutional form may include compromises between socio-economic groups "when none of the forces present manages to dominate the opposing forces sufficiently to enable it to impose its own interests entirely" (Boyer *et al* 2002a: 340). One example is the creation of rules, rights and obligations for creditors. Other examples are the adoption of limits for water usage with breach penalties, local development planning rules and charges for waste collection. These compromises impose discipline in relation to an institution through which behaviour is adapted but which subsequently grow into an object of increasing tension. More importantly, the institutionalised compromises of capitalism only exist between human beings in relation to that which "unify or set them in opposition to one another" (Lipietz 2002: 224). Thus *régulationists* reject the notion of institutionalised compromises with the environment and consequently, have focused on explaining the institutional forms to understand the constructed context of capitalism. It is this preoccupation of analytical focus with the 'constructed context' which helps us understand the lack of attention to the environment not Lipietz's (2002: 223) superficial and simplistic claim of few *régulationists* having been environmentalists.

A second reason for a 'sustainability and environmental' gap in the body of *régulationist* work is found in the genesis and evolution of the theory. With the advent of the 1970s economic crisis "there was a need to understand why things no longer worked, a need which first required an understanding of what had previously worked, and why" (Lipietz 1988b: 14). A "schema for the analysis of crises" (Destanne de Bernis 1988: 45) was derived from which emerged a periodisation of capitalist development. Another major impetus to the theory's development came with Aglietta's 1976 publication, *Régulation et crises du capitalisme*, which developed consumption and production norms to explain why capitalist economies sometimes function well and why, on other occasions, they experience crisis. Early studies, adopting and developing Aglietta's concepts, focused on forms of crisis whereas subsequent research looked at specific aspects or characteristics of crisis such as inflation, wage relations, state expenditure, the nature of the state, international trade and finance, the debt crisis, developing countries and the rise of a new international division of labour. *Régulationists* sought the reasons for the crisis of Fordism and framed solutions to overcome those causes which were not found to encompass some rupture in the economic-environment relation (Lipietz 2002). Hence it is understandable that the environment did not feature given the primary object of *régulationist* inquiry.

Subsequently the theory's core concepts have been refined and its application empirically extended to national economies other than France and the US, to analyses at the

micro and meso level, and to different spatial scales (Jessop 1997a). This development and extension has led to four observations of particular relevance to this discussion. First, the 'most developed, highest energy consumer countries with the highest carbon emissions' regard environmental protection as an obstacle to growth and development. Second, embryonic forms of ecological *régulation* are evident but instability in the approach to ecological issues will prevail until these forms are more developed and entrenched. Third, the economic-environment relation may act as a constraint on growth and development after a crisis. Fourth, development models which promote individual autonomy and social interaction are more environmentally favourable although some *régulationists* advocate pollution-free models over those that minimise or ameliorate its effects (Lipietz 1997; 2002).

These observations signal a number of important aspects. The environmental consequences of an accumulation regime are becoming more evident from *régulationist* analysis, despite the environment not occupying the analytical centre stage. The environment-economic relation is becoming far more explicit to the dynamics of post-Fordist capitalism evidenced by changes within the mode of *régulation*. Given its role vis-à-vis the process of accumulation, changes within the mode indicate some sort of threat or impediment to accumulation to which responses within the mode are seeking to alleviate or eliminate.

Sustainability and the environment may not have been the primary object of early *régulationist* analysis for the reasons outlined. Yet these reasons do not preclude such an analysis. Two particular contributions have proposed ways to break this impasse.

Becker *et al* (1999) posit that the *régulationist* conceptual framework requires the addition of a sixth institutional form, the 'ecological constraint', to explain capitalism's economic-environment relation. Nature's reification (commodification), transformation and destruction by human action – driven by the accumulation imperative - has led to such a complexity of ecological *régulation* that, they contend, demands it 'not be subsumed' within any of the mode's five institutional forms. They do not, however, reveal this complexity. Nor do they demonstrate the inadequacy of the mode's institutional forms, or their conjunction, to explain the dynamics of nature's relation to capitalism thus warranting an expansion of the conceptual framework. They do concede that "a systematic analysis of the interaction between the ecological constraint and the other structural forms ... has yet to be developed" (*ibid:* 11).

Endeavouring to build on past studies and lay the foundation for a *régulationist* "theoretical construct of the environment", Zuindeau (2007: 282) suggests that the economic-environment relation may take three forms - a general form; a general capitalist form; and, a form specific to each phase of capitalism or regime of accumulation. He further proposes three expressions of the 'particular form' of the economic-environment relation in terms of impact on the environment, methods to manage environmental problems and impact of the environment on economic activities. A further typology is proposed for environmental management methods (method of treatment, responsibility, nature of instruments used). It is this latter typology from which Zuindeau seeks to demonstrate, more by anecdote than analysis (he makes 'no claim to an exhaustive empirical investigation'), that different regimes of accumulation display different economic-environment relations which "will be influenced by the content and development of institutional forms" (*ibid:* 287) i.e. the mode of *régulation*. It is this latter point which is probably the most critical of Zuindeau's contribution although he is oblivious being far more intent on demonstrating 'institutional complementarity' with the economic-environment relation displayed by different accumulation regimes.

His effort to illustrate complementarity is marred on a number of counts.[9] First, complementarity is considered solely in terms of the interaction between an individual institutional form and the economic-environment relation. The impact of the conjunction of institutional forms comprising the mode of *régulation* is not considered yet we know that it is this very conjunction which legitimates – and reinforces - the ability of the mode to guide, secure and sustain the process of accumulation.

Second, mention is made of complementarity between the economic-environment relation and the three institutional forms of competition, the form of the state and the international position. The wage-labour nexus and the monetary constraint are not mentioned. Does this mean that these institutional forms have no association or interaction with the economic-environment relation? What does this mean given the dominance of the wage-labour nexus during Fordism and the ascendancy of the monetary regime and competition during the post-Fordist regime? Apart from confirming that Zuindeau does not consider the conjunction of institutional forms within the mode, this leads to a third point. *Régulationist* analyses have shown a hierarchy or dominance of particular institutional forms to characterise different modes of *régulation* (Boyer *et al* 2002b). Zuindeau is silent on whether some institutional forms have stronger forms of complementarity than others to the economic-environment relation.

Finally, and most significantly, is the meaning and use of 'complementarity'. Zuindeau clearly uses this term to mean the influence exerted on the economic-environment relation "by the content and development of institutional forms" (*op cit).* Complementarity refers to a state of being complementary, an interrelation of reciprocity where one thing depends or supplements the other. To complement often refers to forming a complete or balanced whole, or making up what is lacking in another. Common synonyms include balance, set off, harmonise, match, go together or accompaniment. To complement does not suggest negative notions of detraction, antagonism, impediment, constraint, dilution or dissipation. Zuindeau's choice of the term is deliberate. It is not something lost in translation or clumsy expression given his citation of the work of others including "the concept of complementary institutions is based on multilateral reinforcement mechanisms between institutional arrangements: each one, by its *existence, permits or facilitates the existence of the others*" (Amable 2000: 656 Cited by Zuindeau 1999: 287, my emphasis). This statement is a direct reference to complementarity between the mode's institutional forms with which we have no issue (given the established importance of the conjunction of the institutional forms comprising the mode). However, Zuindeau's extension is to suggest "there exists an institutional complementarity between this [sic] particular form of the relation to the environment and the five institutional forms recognised by *régulation* theory" (*ibid*). Two particular dilemmas are posed by this extension.

First, direct references to institutional complementarity between the mode of *régulation* and the economic-environment relation ascribe to this relation the status of an institutional form equivalent to those inherent to the mode. Is it? Is the economic-environment relation a codification, as we saw earlier, of one or more fundamental social relations of capitalism to reduce, contain, mediate, and thus regulate the inherent conflicts of

[9] It should be acknowledged that Zuindeau's contribution makes no claim to be exhaustive. Its discussion, however, is heavily skewed towards his environment methods typology will little reference to 'impact on or from the environment'. His contribution is also marked by a tendency to conflate the two core concepts of *régulation* theory not recognising their different levels of abstraction.

those social relations through laws, rules, regulations, compromises, negotiated outcomes, a common value system or representations? The question of the economic-environment relation being a core social relation of capitalism has generated considerable debate.[10] The economic-environment relation as an institution is not questioned. It is a well-established feature of economic activity which is strongly exemplified by the environment's 'tap and sink' role given capitalism's high reliance on extracting natural resources to satisfy a seemingly insatiable energy appetite and the 'dumping' of production externalities from smaller scale disamenities (such as excessive noise, traffic congestion and pollution of local waterways) to environmental destruction of much larger proportions (such as global warming, soil erosion, deforestation, desertification, species extinction).

But is the economic-environment relation a codification of a social relation *particular* to capitalism? That is the more contentious issue despite the consensus about this relation discussed earlier. The evolution of capitalism has placed increasing pressures on the environment, neoliberal capitalism has progressively applied forms of commodification as a solution to environmental problems, and the concept of sustainability has been re-configured to validate the holy grail of economic growth. Pre-capitalist forms of the economic-environment relation have also been observed which Zuindeau notes. These conclusions clearly signal that:

- the economic-environment relation of capitalism is subject to some form of ongoing metamorphosis as occurs with each of the mode's instititutional forms; and
- there is increasing evidence over time of ecological *régulation,* within the overall mode of *régulation,* directed at mediating, controlling, containing and thus regulating environmental issues.

The historical form and precise articulation of the fundamental social relations of capitalism, we noted earlier, will continually alter as certain core aspects – invariant aspects – are sustained and their inherent contradictions contained for a time. This invariant reproduction, contradiction containment and historical representation requires a set of regularities to ensure the process of accumulation, and the materialisation of that set of regularities we know is the mode of *régulation.* The economic-environmental relation has historical representation. It also has contradiction containment evidenced by the heightened prevalence of ecological *régulation*. But what are its invariant aspects upon which capitalism requires its reproduction?

The second dilemma concerns the use of the term 'complementarity' which, by its very meaning, asserts that the existence of the economic-environment relation is not fully realised without reference to the mode and the converse, the existence of the mode of *régulation* is not complete without the economic-environment relation. Both aspects of this point are very contestable. It is my contention that the mode of *régulation* does *not* give existence per se to the economic-environment relation. Rather, it gives *definition to* - not complements - the nature, scope and form of this relation and, as such, explains some of the mode's complexity. How?

We know that the mode of *régulation* supports and secures the regime of accumulation by ensuring reproduction of the conflictual unequal social relations of capitalism

[10] For example, see: Bauriedl *et al* 2002; Becker *et al* 1999; Burkett 2006; Foster 2002; Lipietz 1996; O'Connor, J. 1998; O'Connor, M. 1994a; Lipietz 2000; and the six responses to Lipietz in the June 2000 issue of *Capitalism, Nature, Socialism* along with his rejoinder.

and hence, is constantly seeking to avoid a crisis. It does this through the conjunction of five instititutional forms, the constituent elements of which we have seen, particularly in the post-Fordist era, include ecological *régulation* – a range of actions and policies primarily initiated by the state to deal with the environmental degradation caused by the accumulation process (i.e. environmental managerialism). These actions and policies are clear indicators of the nature, scope and form of the economic-environment relation because they are directed at removal or alleviation of impediments to ongoing accumulation exemplified by various forms of environmental degradation. They are evidence of the *type and form* of interaction between the economic system and environment: for example, the trading schemes to purportedly reduce greenhouse gas emissions which have reached epidemic proportions due to capitalism's thirst for energy from non-renewable fossil fuels; the environmental impact assessments commonly conducted for new infrastructure projects and used to negotiate compromises for projects to proceed; the fishing quotas imposed to allegedly ensure species survival but also maintain economic activity; the legislation imposing penalties for large scale oil spills (but not preventing or prohibiting); and, local land use planning and development regulations which legitimate certain levels of environmental damage from the erection of buildings and vehicle access to national parks and ocean beaches. Albeit a handful, but all these examples characterise, delineate, describe and thus define aspects of the contemporary capitalist economic-environment relation. Consequently, the term 'complementarity' does not adequately depict the form of interaction between the economic-environment relation and the mode of *régulation.*

Despite the weakness in Zuindeau's argument, along with those of Becker and Raza, both contributions provide some valuable and insightful comments about the nature of the economic-environment relation, namely: the accumulation process not only depends on the exploitation of labour but also nature as 'a tap and sink'; certain accumulation strategies require specific forms of access to specific forms of nature which will require specific forms of ecological *régulation*; the relation between ecological *régulation* and the mode's five institutional forms with vary depending on the regime of accumulation; and capitalism's relationship with nature is governed by the imperative of accumulation.

These conclusions and the foregoing discussion about the economic-environment relation provide, I contend, the framework of an analytical method for empirical investigation which requires the identification of four elements:

(1) the social and historical origins of the economic-environment relation, its collective actors and spatial implications;

(2) the constituent elements that define the economic-environment relation found within each institutional form of the overall mode of *régulation*, and the relationship between ecological *régulation* and the macro mode;

(3) the environment's place in the accumulation regime and macroeconomic relationships; and

(4) the drivers or points which cause transformations of the economic-environment relation and the overall economic system.

This method signals two levels of analysis. The first analysis required is of each institutional form comprising the macro mode of *régulation.* The focus of the second analysis is the impact of each macro institutional form on, and reflection within, the economic-

environment relation. This approach is necessary because the changing nature of the economic-environment relation can only be understood by reference to the macro mode of *régulation*. Each institutional form comprising the macro mode requires analysis before proceeding to assess the impact of each, and their conjunction, on the economic-environment relation. A 'economic-environment analysis' against all five macro forms enables clear conclusions to be drawn as to the nature of any particular institutional arrangements which define the economic-environment relation, ensure its functioning and explain if ecological *régulation* is akin to a sectoral or territorial mode of *régulation.* The five-dimensional grid is not enough to explain the economic-environment dynamic. It can only be explained within the context of the mode of *régulation*. Thus, if it is found that not all five macro forms are reflected within ecological *régulation*, this can only add further insight into our understanding of the dynamic of the economic-environment relation.

This analytical schema and approach is analogous to that adopted for *régulationist* sector-based studies (Chester 2007: 64-70). There is, however, a critical difference. The environment is not subsumed, like a sector, within the economic system and thus, the economic-environment relation or ecological *régulation* will not mirror or replicate the macro mode as does sector *régulation.* Ecological *régulation,* and the economic-environment relation, nevertheless can only be understood in terms of the overall prevailing mode of *régulation*

The analytical method posited does not presuppose the nature or form of the economic-environment relation nor if any one institutional form (e.g. the state, competition, international position) is particularly influential. It does not focus on monetary valuation of environmental effects nor *ad hoc* market-based solutions as does mainstream neoclassical economics. The proposed method does focus on the dynamics of capitalism over time to explain the impact on the environment. Thus, it is contended that this method will yield a new depth of understanding about the dynamics of the contemporary economic-environment relation, the sources of change and the forms in which change occurs. It is only against this context that the prospects for sustainable development can be determined, critical to which is the underlying definition.

The appropriation of sustainability to validate the ongoing pursuit of profit was noted earlier vis-à-vis the alternative model of a socially-just and ecologically-sustainable society. Sustainable development, although an intuitively rational idea and often conceived as a broadly accepted policy goal, is a concept of polysemic qualities having multiple ambiguous and contradictory meanings reflecting disciplinary biases, different paradigms and ideological disputes (O'Connor 1998; Redclift 1988, 1992a, 1992b). There is, however, one essential aspect which unequivocally divides all meanings into one of two distinctive categories – if the changes required to achieve the desired state of sustainable development are *within* the context of existing institutions and social structures or, require the *transformation* of social structures, modes of economic development, ethics and values (Angel 2000).[11]

Capitalism's resilience to date - despite its contradictory tendencies to erode its own natural and social conditions of production, and overproduction of commodities relative to

[11] This distinction should not be confused with the neoclassical notion of 'weak' sustainability (indefinite economic growth occurs if total capital stock is maintained even if natural capital declines) and the ecological economists position of 'strong' sustainability (growth is constrained by a non-declining stock of natural capital). Both notions equate sustainable development with sustainable capitalism (Burkett 2005).

market - is due to the mode of *régulation.* The mode's role is to contain and manage capitalism's contradictions to secure accumulation and prevent a crisis. Consequently, sustainable development that requires transformation, not adjustment, of existing structures and institutions challenges the mode of *régulation* and hence, challenges the essence of capitalism, the process of accumulation. The notion that sustainability requires the overthrow of capitalism is 'somewhat outmoded' (Dickens 1992: 7). Thus the prospects for sustainability are limited to those "within the reflexive progression of capitalism and the conflict and struggles which sustain and renew the dynamism of capitalist accumulation" (Drummond *et al* 1995: 62). These prospects can only be determined through an in-depth understanding of capitalism's economic-environment relation which, it is contended, can be empirically investigated by using the proposed 4-point *régulationist* method.

4 Concluding comments

Environmental problems are a direct result of the structural relations between the economic system and nature. The economic system's interaction with the environment materialises in the extraction of energy and matter as well as the dissemination of residuals from the productive process into the environment. As capitalism has evolved, the speed of economic growth has accelerated and so too has capitalism's dependence on nature as a 'tap and sink' causing widespread ecological degradation. Policies, more *ad hoc* than part of holistic strategies, to purportedly alleviate and retard some forms of environmental destruction have not averted ongoing destruction.

If we are to explain the changing nature of the economic-environment relation, an understanding is needed of the dynamics of capitalism over time. Different phases of capitalism have had different impacts on the environment and responded differently to environmental problems. The latter has been exemplified by the growing dominance of market-based policy measures, the global and national reviews of the economics of climate change based upon cost-benefit analyses, and the role played by supranational institutions.

Mainstream neoclassical economics has displayed an innate inability to elucidate the interaction of the capitalist economic system with the environment because it treats each as virtually independent of the other, and environmental issues as externalities arising from market failure to be treated with market-based measures intended to induce behavioural change. This is the analytical focus for mainstream environmental economics.

Régulation theory, on the other hand, provides an alternative analytical context the focus of which is the dimensions, dynamics and crises of capitalism. The change over time in capitalist economies is evidenced through analysis of the mode of *régulation* which coheres particular periods of accumulation by containing and mediating the unequal conflictual social relations which define capitalism. The economic-environment relation is not a social relation peculiar to capitalism but the constituent elements of the mode include ecological *régulation* – the range of policies, actions, arrangements and norms to deal with environmental degradation but not impede accumulation such as market-based mechanisms and supranational institutions. Thus, the constituent institutional forms of the mode of *régulation* - which embody ecological *régulation* - and their conjunction within the mode, define the scope and form of interaction between the capitalist economic system and the environment relation.

Consequently, the mode of *régulation* provides the context to understand capitalism's economic-environment relation and its evolving nature. This is starkly illustrated by the morphing of the mode of *régulation* dominant throughout the Keynesian-Fordist era, as we have seen with its environmental managerialist command-and-control measures, to its contemporary neoliberal form with market-based measures as environmental pressures have become more intense (Chester 2008).

These "theoretical propositions mentioned here call for elements of validation which are certainly more specific and more complete than the few illustrations that have been considered here" (Zuindeau 2007: 288). To that end, a 4-point method and 2-level analysis for empirical investigation has been posited which, I contend, will shed considerable insight on the character of the evolving nature of the economic-environment relation and the challenge to accumulation posed by sustainable development.

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