

Environmental regulation: a value-theoretic and class-based analysis

Andriana Vlachou*

Following a value-theoretic and class-based approach, it is argued in this paper that ecological problems are inseparably linked to the process of extracting surplus value in capitalism and, owing to their adverse impacts, instigate struggles over the appropriation of nature. These struggles fought within and outside the state by competing agents shape environmental regulation. In particular, taxes, permits, command-and-control measures, and subsidies affect prices, profits and rents and have class and other social implications. Evidence of current environmental regulation shows that it takes place under the great influence of capitalist concerns.

Key words: Value, Class, Environmental policies, Capitalism
JEL classifications: H2, P1, Q2, Q3

1. Introduction

Most Marxists agree that transformations wrought in nature by capitalism are inseparably linked to the process of the extraction and appropriation of surplus value from wage labour.¹ In particular, environmental problems are perceived as rooted in the historical patterns of capitalist development, which has resulted in increased energy use and related pollution, deforestation, changing land use, changing climate conditions, and so forth. However, many Marxists often ignore or dismiss environmental regulation on the grounds that it is shaped on capital's terms and/or that it is an external and artificial barrier to capital, which sooner or later will be demolished by it.² Such assertions, however, are not supported by elaborate analyses of environmental regulation and its effects on capitalist production. Notwithstanding this theoretical deficiency, any project directed at bringing about social change in capitalism, especially those aiming at its eco-socialist transformation, should be grounded in an

Manuscript received 2 April 2001; final version received 26 November 2003.

Address for correspondence: Andriana Vlachou, Department of Economics, Athens University of Economics and Business, 76 Patission Street, Athens 104 34, Greece; email Vlachou@aub.gr.

* Department of Economics, Athens University of Economics and Business. I should like to thank the reviewers of this journal for helpful comments and suggestions. I should also like to give particular thanks to Anwar Shaikh and Richard Wolff for reading earlier versions of this paper and making a number of helpful comments and criticisms.

¹ For Marxist accounts of the relationship between nature and capitalism see O'Connor (1988, 1998), Harvey (1993, 1996), Leff (1995), Benton (1996), Burkett (1999), Vlachou (2002).

² See, for example, Burkett (1999, p. 98).

understanding of the determinants of environmental regulation and change in contemporary capitalist societies.

The major objective of this paper is to theorise environmental regulation and change in capitalism from a value-theoretic and class-based perspective. The following section draws on previous work (Vlachou, 2002, 2000B, 1994, 1993) and provides a discussion of the importance of natural resources and conditions for capitalist production in terms of value, prices and rents. It also presents, in brief, a theoretical framework for the intervention of the capitalist state in the appropriation of nature. In the third section, specific environmental policies such as taxes, permits, command and control measures, and subsidies are discussed. In particular, their economic rationale, their design, implementation and effects are related to value-theory categories and class aspects of capitalism. In addition, evidence for actual environmental policy and change in capitalism is presented. By critically engaging with arguments and evidence that appeared in the environmental economics and business literature, we are able to develop a new interpretation of environmental regulation, challenging the dominant account. Some concluding remarks are offered in the final section.

2. A value-theoretic and class-based approach

Pollution and natural resource depletion are the outcome of many diverse processes that take place within capitalist society and interact with each other and with nature. Among them, the production, appropriation and distribution of surplus labour —i.e., *the class process*—plays an important role in shaping the appropriation of nature in capitalist societies. Capitalist firms¹ need natural resources and conditions (such as temperature and sunlight) to be available in requisite quantities and qualities, and, if priced, at prices which make profit possible. In particular, land, minerals, water, clean air, and other natural resources and conditions constitute elements of *constant capital* in capitalist production. They also sustain human life and, for that matter, they provide elements which are parts of *variable capital*. I have argued in detail elsewhere (Vlachou, 2002) that value theory in its fully developed and concrete form of prices and rents, as developed by Marx in volumes I and III of *Capital*, is capable of explaining ecological constraints to capitalist production and processes developed in reaction to them.

The sources of wealth are nature and labour. Natural resources and conditions are sustained by processes that are not reproducible by (capitalist) production proper. The theory of value refers only to produced commodities and emphasises the importance of social labour for the reproduction of a human society. In those instances where natural resources are extracted as commodities, their scarcity (shaped historically and socially) tends to increase the socially necessary time for their production, i.e., it directly affects their value. When natural conditions and resources are not commodified, they affect the value of commodities through their impact on *labour productivity*. Following Marx (1991), the value of a commodity is determined by the *regulating conditions* of production which are the *normal* conditions for industry and the *least favourable* natural conditions for primary sectors. In particular, the value of

¹ The terms ‘capitalist firms’, ‘capitals’, and ‘capitalist production processes’ are interchangeably used in this paper.

industrial commodities is determined by the labour time, which is socially necessary to produce the commodity under normal conditions. Environmental aspects are included in the normal conditions of production in industry and thus participate in the determination of value. Furthermore, changes in the normal natural conditions of production result in changes in the value of industrial commodities. When increased pollution, for example, becomes part of the normal conditions for a particular industrial sector, it will register as an increase in the value of the commodity, if the socially necessary labour time to produce the commodity increases. On the other hand, differences in environmental quality, given the norm, result in reduced or surplus profits, which might be appropriated as *differential rents* by the owners of better lands on the basis of their power to exclude producing capitalists in industry from using the lands (Vlachou, 2000B, 2002).

The value of primary commodities is regulated by the total labour time needed to produce the commodity in the least favourable natural conditions. As capitalist production expands, the scarcity of lands of better quality will follow, *ceteris paribus*, and will result in an increase in the value of primary commodities, all other things being equal. When demand is unchanging, and as long as an equilibrium of demand and supply has to be maintained, competition across sectors will give rise to prices of production high enough to put forward the socially necessary quantity of primary commodities. In particular, prices of production will include the cost of production and the profit estimated by applying the equalised rate of profit throughout the economy on capital advanced. When the worst land in use and the capital applied to it are virtually unchanging, differences in the quality of land/natural resources and in the amount of capital applied to it affect the distribution of surplus value in the primary sectors through the creation of surplus or reduced profits which can be appropriated as differential rents by the landlords. Competition among capitalists to get access to the most favourable natural resources and conditions enables landlords to appropriate all surplus profits at the limit as ground rent. Capitalists will remain in the sphere so long as they enjoy the normal average profit.

Many problems of pollution appear in the case of free access to the environment. Polluting capitals 'freely' appropriate nature as a depository for their waste discharges, that is they may create negative 'externalities' at the expense of other capitals' profitability and/or workers' welfare. Pollution may also increase the socially necessary labour time to produce other commodities because embodied or living labour may be needed, for example, under the regulating conditions of production to clean up damages caused by pollution. Significantly then, the cost of externalities does not vanish from the economy but is simply dislocated. Moreover, free access to natural resources *in situ*, like fishing grounds, can give rise to the exhaustion of the resource if the harvesting rate overshoots the rate of growth of the population (Vlachou, 2000B, 2002).

In short, when increased pollution and scarcity become part of the conditions of production of regulating capitals in a particular sector, they increase the price of production of the commodity produced, given the average economy-wide profit rate, and change the structure of differential rents, *ceteris paribus*. Changes in prices and differential rents affect, in turn, profits, wages and other class payments. On the one hand, in those instances where the real wage is virtually unchanging, increased prices of production raise the cost of constant and variable capital of production in other

sectors and tend to reduce other sectors' profitability, all other things being equal. On the other hand, however, increased prices of production result in reducing real wages, in instances when wages are undergoing change.

Various conflicts, tensions and changes can be set off between offenders and various victims of natural degradation (capitalists, landlords, workers, local residents and so forth) because of these negative impacts of environmental degradation and scarcity on profitability, income and life conditions. I have argued elsewhere (Vlachou, 2000B), that these multiple struggles give rise to environmental regulation and change in contemporary capitalism.

In particular, the *inter-capitalist struggle* or *competition* among capitals plays an important role in the shaping of environmental regulation. Inspired by Marx's (1991, Vol. I) analysis of the role of capitalist competition in shaping work-time legislation, the capitalist class is conceived in this study as many capitals in competition with each other over the extraction and realisation of surplus value, and their conditions of existence, including access to nature (Vlachou, 2003–4).¹ In other words, 'capital as a whole' is a divided and contradictory entity. In particular, different capitals do not only experience different effects from pollution and resource depletion but also different effects from environmental policies. As a result, different capitalists take different positions regarding the importance of certain environmental problems and the appropriate solutions for them. On the one hand, there are many capitalist firms that are adversely affected by pollution. Air pollution and soil contamination, for example, have negative effects on agricultural production and on renewable resources, such as forests, while water pollution adversely affects firms that use water for production purposes. As a result, many individual capitalists in industrial, primary goods and service sectors experience reductions in their profits and tend to confront polluting capitalists to make them control their emissions. They may also turn to the state and demand the establishment of pollution regulatory institutions and mechanisms that would make polluters 'internalise' the environmental costs they create.

On the other hand, polluting capitalists, found in many industrial and primary sectors, tend to resist pollution control measures, especially policies affecting them on an individual or local basis, arguing that these measures will increase their costs and worsen their competitive position. This was the case, for example, with the car industry in the US and in Japan in the early 1970s when air pollution regulations on car emissions were debated. Major car-makers argued that regulation would require large price increases for cars, reduce demand, cause unemployment, and result in a considerable negative impact on the national economy (Vlachou, 2000B). However, recent reports and studies suggest that a different perception of the relationship between the environment, competitiveness and profitability is slowly emerging (Porter and van der Linde, 1995A, 1995B; Hart, 1997; Magretta, 1997; Lovins *et al.*, 1999; Reinhardt, 1999). Several capitalist firms are beginning to view environmental issues as *an opportunity for entry, change and growth* as international competitiveness is now

¹ Marxists conceptualise competition very differently from neoclassical economists (Clifton, 1977; Shaikh, 1980, 1982; Semmler, 1982). Competition, or the lack of it, cannot be determined simply in terms of corporate size, the number of firms in a market or in terms of the power to control prices or quantities. Competition is the inter-capitalist struggle over the production, appropriation and distribution of surplus value in capitalism and it takes many forms such as innovation, diversification, price competition, advertising, and so forth.

understood to be a dynamic process, based on innovation. Pollution and resource depletion problems and regulation may signal to firms inefficiencies in the use of resources, so that a properly designed environmental regulation can trigger innovation, which may, in part or in full, offset the costs of complying with it. Innovation offsets cannot only lower the net cost of meeting environmental regulations, but can even lead to absolute advantages over firms in foreign countries not subject to similar regulations (Porter and van der Linde, 1995A, 1995B). Hence reactions ranging from total resistance, to participating in the shaping, to embracing environmental regulation fully, are contingent on the concrete conditions of capitalist competition and the position of polluting firms and pollution-suffering firms in it (as well as on the struggle between capitalists and the labour and environmental movements discussed below). Which one of these tendencies becomes dominant in the case of particular environmental problems is historically determined and can not be decided in abstract terms.

When faced with depleting resources of high quality, capitalists in industrial and primary sectors take actions to restore their reduced profitability resulting from rising resource prices. They may struggle against the workers, other capitalists, landlords and/or consumers, often through the mediation of the state, attempting to pass on to them the cost increases and keep their profit rate intact. Significantly, they may also engage in restructuring their activities, developing new products and processes in order to conserve or substitute these costly resources. In these businesses, the concept of *sustainability* has been coined not to represent the need for preserving nature for future generations in some abstract, all-embracing sense (as provided, for instance, by the World Commission on Environment and Development, 1987), but to promote forcefully profitable ideas of radical change through new technology. R. Shapiro, the former chairman and CEO of Monsanto Company, for example, maintains that by using information technology and biotechnology, one can increase productivity without abusing nature (Magretta, 1997). Significantly, for Shapiro, 'far from being a soft issue grounded in emotion or ethics, sustainable development involves cold, rational business logic' (*ibid.*, p. 81).

The key argument for the ecological modernisation of capitalist firms is then that there is money in it for business. In other words, the ecological restructuring of capitalist firms is a class-embedded process. The ecological restructuring and the extraction and appropriation of surplus value are mutually constitutive. As such, however, ecological restructuring not only emerges from, but it is also limited by, the many tensions and contradictions of capitalism. For example, in the process of dealing with certain environmental risks, scientific and technical advances adopted by capitalist firms may create new ones. Moreover, ecological modernisation and the shaping of regulation may become another arena of capitalist competition. Internationally competitive firms may be much better able to modernise in ecologically compatible ways, and thus they may advance their position on a global scale at the expense of less competitive firms, instigating in the process a strong opposition to environmental regulations on the part of the latter. As a result of its many contradictions, ecological restructuring may or may not be successful in securing the natural conditions and processes that are necessary for capitalism's existence. However, even in the case where the arrival of ecological sustainability in capitalism is possible, it is not expected to reverse the class nature of the system and its many negative effects on

working people. In particular, the ecological restructuring of capitalist firms offers no promises for environmental and social justice. Green capitalism is still expected to be capitalism (Vlachou, 2000B).

Policies for the appropriation of nature are also shaped by *the struggles waged by the working people* expressed or organised in various political forms such as labour and environmental movements and political parties (Doyle and McEachern, 1998; Vlachou, 2000B). Working people struggle to protect their conditions of life threatened by pollution. Considerable evidence on the class and racial impacts of pollution has been provided by the social justice movement in the USA (Bullard, 1990, 1993). Following an 'efficient location strategy', hazardous waste and noxious facilities are located in areas with low property values and rents, that is, in areas where people of low income and colour (i.e. negro, Asian, etc) live, forced by their impoverished conditions. For example, a 1994 study by the Center of Policy Alternatives found that commercial hazardous waste and noxious facilities in the USA were even more likely to be located in low-income and minority communities in the years close to the study than in 1980, despite growing national attention to the issue (Tietenberg, 1996, p. 489). A similar siting analysis may lead capitalists to select areas in less developed countries (probably inhabited by the poor and the disadvantaged) for depositing hazardous waste or for locating heavily polluting activities. Montague (1998) argues that Philadelphia, USA, has been following such a practice for years. Resisting this logic, the environmental justice movement sets the survival of the humans, especially the poor and marginalised, at the centre of the ecological struggles (Harvey, 1996).

In particular, working people may struggle to protect their conditions of life and standards of living against the significant negative effects of pollution. These adverse effects often result in increased medical costs, absence from work, declines in productivity and even premature death. Certain wage goods (housing, heating, lighting, etc.) may also become more expensive owing to increased pollution and resource depletion. These serious negative effects may encourage working people to struggle against offenders to protect and preserve nature. In particular, workers may turn against their employers, demanding wage increases to meet living cost increases owing to environmental degradation and resource depletion. People may also turn to the state to set environmental and health safety regulations.

However, working people might take diverse and some times opposing positions on environmental issues. In particular, in certain instances they may not oppose polluting capitalists and not support environmental state policies when they are expected to result in loss of jobs and in local or regional economic slowdown. Such instances, however, may indicate the limits of environmentalism to inspire workers when class aspects are ignored rather than an inherent negative tendency of workers towards environmental protection. Gould *et al.* (1996) presented evidence of the limited public participation in pollution control schemes resulting from the disadvantaged economic position of local residents.

One of the earliest, most powerful and successful mass movements concerned with health and environmental hazards occurred in Japan in the 1960s (Miyamoto, 1991; Ui, 1992). In recent years, there have also been the repeated protests of a broad coalition of movements at the WTO meetings, the UN world conferences and at the EU summits. In these campaigns, demands for sustainability, environmental justice, distributive justice, human rights and so forth, are strongly voiced (Vlachou, 2000B).

Since these campaigns involve a wide range of forces in civil society—whose perceptions and interests are mediated and shaped by cultural, political and economic processes and institutions—they are ideologically diverse, fragmented and often contradictory.

The *state* may be called upon to mediate access to nature.¹ In particular, the state becomes engaged in identifying the ‘appropriate’ level of environmental protection. Furthermore, in order to achieve the desired level of protection, the state establishes different types of regulation. The state actually becomes the site of different struggles over access to nature and has to answer many conflicting demands made upon it, not only by capitalists but also by non-capitalist producers, labour and other social groups. Consequently, state policies tend sometimes to accommodate and at other times to restrict the access to nature of certain class and non-class agents. For years after the devastation of WWII, the Japanese state, for example, was reluctant to establish any safety and environmental regulations and was thus aligned with offending industrial companies, only to change position in the early 1970s under the pressure of the citizens movement (Ui, 1992).

In particular, the state can impose *emission standards* on the amount of the pollutant an individual source is allowed to emit. It can alternatively impose *taxes* on emissions or auction emission *permits* that the users have to pay or hold in order to pollute the environment. *Subsidies* can also be used to achieve reductions in pollution at the level of individual firms. In the cases of taxes and auctioned permits, the state captures rents and may remove the natural ‘advantages’ and surplus profits away from polluting (or resource-depleting) capitalists. However, these rents are conveyed to offending capitalists when permits are freely allocated to them by the state. The similarities and differences of these instruments in their capacity to achieve the desired level of environmental protection are discussed in the next section.

Environmental regulation by the state may apply only to certain capitals in a sector situated in particular highly polluted localities or regions. It may not then affect the conditions of production of regulating capitals in the whole sector which determine the values (and prices of production) of the commodities produced. In this case, environmental policies affect the profitability of certain firms which may try to adjust to the new environmental requirements, often asking for exceptions or subsidies, or may, after all, decide to move out of these pollution-congested areas.

In other cases, however, state policies may affect the conditions of production of the regulating capitals in the sector. The socially necessary labour, which is used by the regulating capitals in order to comply with the regulation (abatement costs), takes part in the determination of the value and price of production of commodities, while the advanced abatement capital also earns the average rate of profit. Beyond the level of abatement, regulating capitals may be required to pay taxes or permit charges for their uncontrolled emissions, which increases the market prices of the relevant commodities above their prices of production. In this case, the cost of regulation and adjustment is first financed by the many capitalists who buy environmentally regulated commodities, such as energy, in order to use them as elements of constant capital. Moreover, when real wages are virtually unchanging, increased wage goods prices owing to

¹ The state is in general considered as securing conditions of existence for capitalism. For discussions of the economic and social processes performed by the capitalist state, see, for example, de Brunhoff (1978), Resnick and Wolff (1987), Bryan (1995) and Vlachou (2000B).

environmental regulation raises the cost of variable capital to many capitalists. These effects imply that the cost of environmental regulation is diffused to many capitalists throughout the economy and, other things being equal, it can have generalised negative effects on capitalist profits, accumulation and growth. Here lies an important reason why environmental regulation may give rise to broad resistance in the capitalist class. To the extent, however, that the real wage is reduced in tandem with the increased prices of wage goods, the cost of environmental regulation regarding the variable capital is financed by the workers. This, in turn, implies a successful class struggle of capital against labour. Moreover, these are moments of *redistribution* of portions of surplus value already extracted and appropriated by capitalists, and/or of wages to the state; they can give rise to many tensions and conflicts over the level of environmental protection, the instruments used to achieve it and over the use of environmental rents extracted by the state. As a result of its complex shaping and effects, concrete regulation tends to make headway in some periods and to have setbacks in others; it will also tend to generate or reinforce various *contradictions* in the workings of capitalism (Vlachou, 2000B, 2002).

Summarising, environmental regulation, theorised from a value-theoretic and class-based perspective in this paper, becomes embedded in the economic, political and cultural organisation of capitalism and is thus shaped and assessed within this particular societal setting. Different environmental policies have different effects on individual production processes, and on certain classes or segments of them. Consequently, one important way to evaluate specific environmental policies is to discuss their economic and environmental implications for certain classes and the mediating state. From this standpoint, the often proposed evaluative criteria—efficiency, flexibility, effectiveness, equity and enforcement requirements—as well as the weights assigned to each one of them in the choice over instruments of environmental protection, are not considered as socially or ethically neutral. Their class situatedness is investigated as they may pre-empt the demands of certain antagonistic classes or social groups.

The *efficiency* criterion implies that environmental policies should lead individual polluting capitalists to reduce pollution to the optimal or desirable level with the lowest possible costs to them, by deploying abatement technology, substituting a massively polluting production technology with a less polluting one, using less polluting fuels, and so forth. This control cost minimisation is important, first of all, to individual polluting capitals, especially when pollution control expenditures have not yet become part of the normal capital in the sector and they are thus financed from their own profits. However, when environmental regulation applies to regulating capitals and thus affects the market prices of commodities, cost minimisation in complying with it is of concern to many capitals, far beyond polluting ones.

Flexibility allows for some degree of freedom to capitals in deciding over adjustments. Regulations that mandate pollution technologies and do not focus on the pollution outcome, for example, are not usually welcome by capitalist firms as they tend to limit, according to the business side, the firm's options for improvements and innovations in pollution control and product development. The *environmental effectiveness* of state policies in achieving a certain level of pollution reduction or of health safety is significant to pollution-suffering capitals and people. When pollution affects the cost of constant and variable capital of regulating capitals in several sectors,

environmental effectiveness becomes important to all capitals that buy commodities affected by pollution.

The distribution of costs and benefits of environmental protection, i.e., the *equity* issue, involves the question of how environmental policies reassign 'property rights' over nature and affect the distribution of income among classes or segments of classes.¹ Hence, both polluters and the victims of pollution are heavily engaged in influencing the design and implementation of environmental policies. Polluting capitals tend to resist any change in the 'existing distribution of property rights' which have enabled them to behave as 'free riders'. Working people tend to resist environmental policies that have a regressive impact on income distribution.

The high *monitoring and enforcement* costs of specific forms of regulation tend to make them less attractive (Malik, 1992; Heyes, 1998). In cases of non-point source pollution emissions, for example, where the monitoring and enforcement costs are very high, the state might choose direct controls, such as technological restrictions over taxes and permits, or it might choose a mixed scheme. Significantly, firms may also prefer direct controls over economic instruments when the high monitoring and enforcement costs result in a low probability of detection and thus to small costs of non-compliance for them.

In conclusion, building upon a particular dialectical perspective (see Resnick and Wolff, 1987; Vlachou, 1993, 1994), the value-theoretic and class-based analysis followed in this section has revealed how pollution and the depletion of natural resources affect values, prices and rents, and signal ecological problems to economic agents in a capitalist economy. Moreover, it makes it possible to theorise environmental regulation as the outcome of class and other social struggles fought by various affected agents within and outside the state in order to solve or contain the negative impacts of ecological problems. It can also help us in investigating the political economy of specific state policies for environmental protection, to which we turn next.

3. State policies for environmental protection

As already mentioned, environmental policies may take the concrete form of direct administrative controls, taxes on emissions or products, subsidies based on controlled pollution or on abatement technology, and marketable emission permits or allocations that assign property rights to their holders. Other economic instruments that may be used are deposit–refund systems, performance bonds and liability payments; these measures resemble the workings of emission or product taxes. In addition, public projects may be undertaken by the government to prevent further environmental destruction or to restore environmental quality, providing environmental education, enhancing knowledge and developing technology related to environmental protection,

¹ Property relations (private, state, communal) for Marx (1991) and Marxists take a historically specific character, which is conducive to the surplus extracting process that prevails in a certain era. The private property of capitalists, in particular, came into being through offensive and fierce historical processes, which deprived workers of means of production (including land), and it thrives and advances upon the capitalist extraction of surplus value. The destruction of open access natural resources in capitalism (in the midst of the private property relations) implies the unrestricted private appropriation of these resources. Limitations to this 'liberty' ('property rights') of capitalists are implied in all forms of environmental policy, and, more significantly, are the result of various class and social struggles, that is they are contested and historical relative in character.

human health, and so forth. Since different environmental policies have different effects on individual production processes, certain classes (or portions of them) may either resist or support specific types of policy during the process of establishing and enforcing them. We now turn to the evaluation of the major environmental instruments in order to reveal not only their environmental efficacy but also their attractiveness in class terms. In this discourse, we consider critically several arguments and evidence produced by neoclassical economic and business studies. However, looking at them from the standpoint of a value-theoretic and class-based approach, which differs significantly from the standpoint of neoclassical economists in terms of concepts, reasoning and conclusions, we are able to produce a different and better (we believe) interpretation of environmental regulation. This analysis also reveals possibilities for revolutionary interventions by the ecological and labour movements in the contemporary struggles over environmental regulation.

3.1 *Assessing policy instruments*

On the basis of economic efficiency, taxes and marketable permits appear to have an advantage over other instruments.¹ In particular, emission taxes and marketable permits are, in principle, preferable to polluting capitals since they allow them greater flexibility in complying with regulation in a cost-efficient way. Polluting firms that face a given tax per unit of pollution emitted or a permits system, choose the level of pollution reduction in order to minimise the total costs of compliance, consisting of abatement costs and tax/permits paid for uncontrolled emissions. When faced with a constant tax or a given permit price, polluters are expected to control pollution up to the level where pollution control cost are less than the tax or the permit charge that should be alternatively paid per unit of uncontrolled emissions. Since polluters face different abatement technologies and costs, polluters with a low cost per unit of abatement will tend to control more than polluters with a high cost of abatement, thus minimising the aggregate cost of a certain level of abatement. This outcome is targeted by the overseeing state through setting the tax rate or designing the permits system. In the case of SO₂ control in the US, for example, the permits system adopted allowed utilities with very different unit abatement costs, because of differences in the ages of plants and their proximity to sources of low-sulphur coal, to reduce emissions in a cost-effective way as both scrubbing and fuel-switching were feasible options (Stavins, 1998).

The state might prefer taxes since they bring revenues; this applies to permits as well, when they are auctioned. As mentioned in the second section, taxes and the prices of auctioned permits are actually rent payments to the state for letting firms have access to the carrying capacity of the environment or for allowing them to harvest natural resources *in situ*. There is, however, a tense struggle between state regulators and polluting firms or primary commodity companies over the determination of pollution reduction levels or harvesting rates, which would also affect the level of unit taxes and the prices of permits, i.e., the appropriated scarcity rents. This tension between the state and the firms can be eased by using the revenues raised from environmental taxes or permits to reduce other taxes on business or to finance

¹ Support for this argument have been provided by Baumol and Oates (1971, 1979, 1988); Montgomery (1972); Bohm and Russell (1985); Helm and Pearce (1990); Hahn (1989); Tietenberg (1978, 1990, 1996); Hanley, *et al.* (1997); Helm (1998).

business subsidies for pollution abatement, state pollution abatement and resource conservation projects. For example, in several European countries, such as Austria, Denmark and Sweden, taxes on energy or on energy-related emissions have been imposed in combination with reimbursement schemes that recycle revenues back to affected industries, especially the energy intensive ones (Ekins and Speck, 1999). The tension can also be resolved by 'grandfathering' permits, that is, by the free initial allocation of permits to the firms, allowing them to appropriate rents. Grandfathering reduces firms' opposition to economic instruments; taxes and auctioned permits tend to impose upon them not only abatement costs but also charges on uncontrolled emissions. Free initial allocation has been the actual case with the use of permits in the USA (Hanley *et al.*, 1997, pp. 136–37; Stavins, 1998, p. 75; Stavins, 2000, p. 35).

In the case of pollution taxes, the regulatory state agency has to collect the appropriate information about the different abatement costs and the levels of pollution emissions by source in order to design the proper level of tax to achieve the desired level of pollution reduction. This is a difficult and costly task for the state since most of the necessary information is in the hands of polluting firms which have a vested interest in not revealing it to the regulator. One advantage of the permits system over emissions taxes is that it allows the environmental state agency to have direct control over the quantity of pollution, i.e., it increases the probability of environmental effectiveness, while the exchange of permits leads to the cost-minimising allocation of pollution abatement among the offending firms. It also saves the environmental authority information costs in performing its 'landlord role', because it does not require the state to have on its part knowledge of the abatement cost. Information costs are now incurred by the firms themselves, not by the state.

There seems to be some further differences between taxes and permits in terms of their impact on different segments of polluting capitals and on the state. The permit system may be more environmentally effective than emissions taxes in certain cases. Permit prices respond directly to changing market conditions. But emission taxes are not usually index-linked in the case of inflation so that the real tax rate (adjusted for inflation) may decline in a certain period. Similarly, the effectiveness of the tax also declines as long as the tax rates do not adjust in line with the rate of economic growth and resulting pollution. Another appealing (to capitals) attribute of permits is that it allows leasing as a way of transition to a new regime of more stringent controls for polluting firms that are about-to-retire older plants and shift to new ones, as is the case for utilities (Tietenberg, 1990, p. 29). However, high transaction costs preclude or reduce the trading of permits and thus reduce the cost effectiveness of the permit system (Stavins, 1995; Baumol and Oates, 1988). Large-scale polluters, however, might still prefer the permit system because they do not face high overall transaction costs and may economise in compliance costs, especially if the initial distribution of permits is free of charge. Freely allocated permits may give rise to entry barriers, since new entrants must purchase permits from existing holders (Hahn, 1984; Stavins, 1998). Moreover, large-scale polluters, by controlling a significant number of permits, may restrict output and thus advance their position in the sector—a similar argument first raised for direct controls by Buchanan and Tullock (1975) is discussed below. On the other hand, many small or medium-sized polluting capitals may strive against the permit system as search costs, market imperfections and strategic behaviour may lead to very high abatement costs for them.

The competitive position of otherwise similar firms tends to be protected in the case of taxes or permits imposed on uniformly mixed pollutants, at least in a static world, since all polluting firms incur either taxes/permit costs or abatement costs, or both. In a dynamic setting, taxes and permits allow cost savings for capitals in the face of new less costly and more effective abatement technologies; for that matter, they encourage the development of more effective and cheaper pollution control technologies (Malueg, 1989; Milliman and Prince, 1989; Hanley *et al.*, 1997). Schmalensee *et al.* (1998, pp. 64–5), for example, argue that the acid rain programme in the US which adopted a permits system, induced some innovation which contributed to the reduction in allowance prices and to the over-compliance with SO₂ emissions reductions. Further evidence that environmental policies have assisted in bringing about innovations which lower the total costs of a product and/or improve its quality, thus increasing competitiveness, is presented later in this section. In Europe, however, fears of the competitiveness impacts of environmental taxes have been strong. As a result, most countries that introduced environmental taxes have accompanied them with tax exemptions or reimbursement schemes for vulnerable firms or sectors (Ekins and Speck, 1999).

Direct administrative controls, often called command-and-control measures, instruct capitalist firms to reduce pollution to a certain level. Consequently, firms, in search of least cost options to comply with pollution standards, have an incentive to adopt new pollution abating technologies. Direct controls, however, are often proclaimed as a costly option for achieving a certain level of environmental protection. This is on several grounds. It is argued that the regulators usually set uniform percentage pollution reductions from current levels for all polluters, not allowing for advantage to be taken of the abatement cost differentials across polluters. Alternatively, they may focus on pollution control technologies, not outcomes, thus restricting firms' flexibility. They may not employ well-defined phase-in periods tied to industry's investment cycles either, resulting again in higher pollution control costs. The fear of a stricter future regulation, once new least-cost abatement technologies are introduced, may deter firms from developing and adopting innovations. Along these lines, Tietenberg provides surveys of empirical neoclassical studies that compare the costs of environmental policies under direct administrative controls with their least-cost levels, and he finds them significantly higher (Tietenberg, 1985, ch.3, 1990, 1996). Nevertheless, direct controls are considered indispensable as state policy instruments in the case of health hazards, pollution emergencies and unpredictable environmental conditions that may cause significant damage. In these cases, direct controls can have an immediate and certain effect on pollution reduction, while emission tax and permits systems are designed to produce a gradual adjustment to a reduced pollution regime.

Owing to their lesser interference with firms' decision-making, one would expect that firms would prefer taxes and permits over direct controls. However, as Baumol and Oates first remarked, business managers had often revealed in the past a determined, and sometimes bitter, opposition to fiscal methods of environmental control (Baumol and Oates, 1979, p. 241). One reason for this opposition may be that the enforcement of direct controls allows a certain amount of leeway; the polluter may be able to negotiate with the regulatory agency or take its case to the courts, where it may find an easy escape as the low fines charged for violations of prohibition indicate.

Another significant reason explaining polluting firms' preferences for command and control methods is that in this case they incur only the abatement costs and avoid the costs associated with taxes or permit purchases paid on uncontrolled pollution, that is, the full external costs (Stavins, 1998). An additional argument for firms' preference for direct controls was provided by Buchanan and Tullock (1975) and approvingly mentioned by Baumol and Oates (1979, pp. 241–2). The authors argue that, while emissions taxes will normally cause some reduction in profits, direct controls may even increase the profitability of certain capitals. If direct controls effectively limit outputs and the entry of new firms into polluting industries, environmental measures may succeed in restricting production. The result is, in effect, they argue, a legal cartel which, by enforcing scarcity, increases both prices and profits.

Subsidies can take the form of grants, low-interest loans, tax allowances, accelerated depreciation, and rewards per unit of emissions controlled from some initial baseline pollution level. At the level of individual capitals, a subsidy per unit of pollution reduction will produce the same level of control as the tax and permits systems. However, unit subsidies for reductions in emissions may increase the profits of a polluting enterprise that would be unprofitable under a tax. In this way, they may keep it in business and may also increase firms' entry, resulting in an increase in emissions in the sector (Polinsky, 1979; Baumol and Oates, 1988). This is why marginal polluting capitals will strive for subsidies. On the other hand, pollution victims and the mediating state tend to oppose subsidies on the grounds of their questionable environmental effectiveness. Sometimes, competitive polluting firms in the sector also tend to oppose subsidies in an effort to advance their competitive position further in the sector at the expense of their weak rivals. Given the neoliberal policies to limit the state, subsidies also raise important questions regarding the source of their finance. Recycling revenues from environmental tax or permits systems back to vulnerable polluters in terms of competitiveness, as is the case today in many European countries, runs counter to the logic of using these measures to internalise external costs and of giving the appropriate economic signals to polluters, while at the same time it raises important equity issues.

Capitalists and working people who suffer from pollution oppose subsidies on equity grounds. Polluting capitalists have profited at the expense of pollution victims so that the latter tend to resist the financing of pollution abatement by taxes paid by them through price increases. Similarly, recycling environmental tax revenues back to polluters is actually a subsidy to polluters while the tax burden is passed along to buyers through price increases, giving rise to equity objections by the latter. A non-differentiated application of state rules and policies to economic units is important for the legitimisation of capitalism and its income distribution, and it is usually secured by the Constitution at the level of the nation-state. Accordingly, the Organization for Economic Cooperation and Development (OECD) and the European Union (EU), have adopted the 'Polluter Pays Principle' as a general rule guiding environmental policy on similar grounds (see, for example, OECD, 1989, p. 27). In this way, polluters bear the costs of environmental protection, at least in part, depending on the elasticity of demand and supply of their products which will affect how much of this cost will be passed along to buyers.

However, polluting firms that would be unprofitable under tax may also find that their employees (who are afraid of losing an important source of local jobs) are on their

side on this issue. Such conflicts may give rise to a subsidy programme. In these cases, however, subsidies have been strongly questioned in international forums by competing capitals and their supporting national governments as indirect or concealed protection against capitalist competition. Rajah and Smith argue, for example, that the major reason for the adoption of the 'Polluter Pays Principle', which limits subsidies in environmental policy, was to restrict protectionism in the 'guise of environmental policy' (Rajah and Smith, 1993, p. 50).¹

In recent years, there has been a debate in several OECD countries over a *double dividend* of environmental improvement and reduced unemployment to be gained through a shift in taxation from taxes on labour to taxes on pollution and energy. In particular, it is argued from the standpoint of neoclassical models of labour markets that the revenues from environmental taxes can be used in a revenue-neutral context to reduce non-wage related labour costs, such as employers' social security contributions, in order to give incentives to firms to reduce pollution and create new jobs (OECD, 2000; Speck and Ekins, 2000).² Such recycling schemes have been actually introduced in 1996 as part of 'the Dutch small energy users' tax'; tax revenues are recycled back to business through a reduction in employer's non-wage labour costs and corporate tax (European Environment Agency, 1996, p. 37). In the UK, a waste tax was introduced in 1996 and an energy tax scheduled for implementation in 2001. The revenues are mainly used for the reduction of the social security contributions that the employers pay (Speck and Ekins, 2000, p. 17). In Germany, the recent increase in the tax rates of energy products and the introduction of a new electricity tax are combined with a reduction in the social security contributions paid by employers and employees. However, such a policy is presented as less effective in maintaining employment since part of the revenue is used to reduce workers' contributions to social security (and, for that matter, other labour income taxes) so that the labour costs to employers are not reduced as much as in the case of UK (*ibid.*).

Most of these schemes are obviously (or are intended to be) a combined policy of environmental taxes and employment subsidies to businesses, rather than significant cuts in labour taxes. From a Marxist standpoint, they appear, on the one hand, to be ways to ease the fears of the business side of the negative impacts of environmental taxes on firms' international competitiveness (mentioned above) by recycling tax revenues in the form of employment subsidies. On the other hand, it is an effort to gain the support of labour who might resist such recycling, by promising new jobs and, in particular cases, some reduction in employees' social security contributions.

Taxes, permits, subsidies and command-and-control measures are also established to secure the availability of natural resources for capitalist production. Other things being equal, as the higher quality or easily accessible resource bases are being used up, the prices of natural resource commodities will increase. The cost for capitals using natural resource commodities will tend to rise, giving incentives to capitalist firms to use a substitute, to develop resource-saving technologies, recycle old scrap, and so

¹ However, the authors also argue that subsidies (and for that matter, permit grandfathering) are a more promising instrument to control international pollution, since they lead to smaller changes in the pattern of trade than environmental taxes (Rajah and Smith, 1993).

² However, several doubts have been cast, even by neoclassical economists, as to whether such schemes can have an important impact in protecting competitiveness and creating new jobs for labour. See, for example, OECD (2000), and Speck and Ekins (2000).

forth. This tendency is reinforced by state policies. In the case of the very critical energy resources, for example, the state often helps the long-run transition to renewable energy sources by financing research and development projects and subsidising the market penetration of these resources; it may also levy differentiated tax rates on fossil fuels in order to foster a desirable pattern of substitution by renewables.

In the case of open-access resources like fisheries, state policies aiming at avoiding overuse and extinction take the form of direct controls (limiting fishing time and fishing areas, prohibiting the use of certain types of fishing boats and nets, etc.) and of economic instruments (taxes and transferable fishing quotas). Direct controls have been proved by orthodox studies to be cost inefficient; on the other hand, quotas are not only considered more efficient but can also increase the income of fisherman if the government would initially allocate them free of charge (Pindyck, 1978; Fisher, 1981; Conrad and Clark, 1987; OECD, 1999).

3.2 Environmental policy in practice: the emerging change

Various detailed environmental regulations have been established in many countries in the last three decades. These include ambient air and water quality standards; command and control measures for toxic substances and hazardous wastes; emissions standards on cars; taxes and permit systems for air and water pollutants; disposal charges and refundable deposits for solid waste; taxes on newly extracted resources and use of the resulting revenues to subsidise the recycling industry; administrative measures on fisheries, forestry and water resources as well as taxes and transferable quotas, and so forth (see, for example, Hahn, 1989; OECD, 1989, 1997, 1999; Tietenberg, 1990, 1996; Stavins 2000; Portney, 2000; Freeman, 2000; Sigman, 2000; Macauley and Walls, 2000; Hanley *et al.*, 1997; European Environment Agency, 1995, 1996; Leveque, 1996; Swedish Environmental Protection Agency, 1997; Ekins and Speck, 1999).

Environmental policy was overwhelmingly based on direct administrative controls in the 1960s and 1970s. The often suggested reasons why it proved difficult to introduce economic instruments in those years were related to competitiveness, equity and justice, and to the institutional structure and incentives of environmental national agencies (European Environment Agency, 1996; Helm, 1998; Tietenberg, 1994; Stavins, 2000). In the last two decades, economic instruments have been gradually introduced. In particular, emissions permit systems were first initiated in the US with the aim of providing more flexibility in meeting environmental quality goals and also of promoting cost-efficiency. In Western Europe, on the other hand, although there are a few permit systems operating on a small scale, most countries have introduced emissions and product taxes to achieve similar goals. Revenues from these taxes have been often earmarked for specific environmental purposes or for the development and maintenance of public road networks (Tietenberg, 1996; European Environment Agency, 1995, 1996; OECD, 1999; Hanley *et al.*, 1997; Speck and Ekins, 2000).¹

¹ It is interesting to note that the revenues of environmentally related taxes for 21 OECD member countries represented in 1995 just over 2.5% of GDP, and a slightly below 7% of the total tax revenues in these countries, estimated as an arithmetic average. The most important tax-bases are the use of unleaded petrol (40%) and the use of motor vehicles (20%) represented by annual taxes on the use of passenger cars (OECD, 1999, pp. 59, 61).

Interestingly, a survey conducted in OECD countries in 1998/1999 indicated that the majority of countries use subsidies for environmental protection to support activities in the fields of air and water pollution control, waste management, noise reduction measures and to develop clean technologies (OECD, 1999, pp. 49–55).

Evaluations of environmental policies are limited in number and are mainly offered by neoclassical economists (see, for example, OECD, 1997, 1999; Portney and Stavins, 2000). They conclude that command-and-control has a poor performance in terms of cost effectiveness and innovation. On the other hand, almost all economic instruments operate as a supplement to an existing framework of command-and-control measures (OECD, 1999, p. 96). Both tax and permit systems have shown some effectiveness in reducing pollution and depletion; however, in many cases they did not have the anticipated impact on innovation and the structure of production. The often mentioned reasons for this outcome are the lack of stringency and shortcomings in the design and enforcement of environmental policy (Stavins, 2000; European Environment Agency, 1996; Helm, 1998; OECD, 1999; Tietenberg, 1996; Hanley *et al.*, 1997). In many cases, taxes or direct pollution restrictions have not been high enough to be environmentally effective owing to competitiveness concerns voiced strongly by the affected industries and to expected regressive income impacts (Ekins and Speck, 1999; OECD, 1999). Examples of particularly effective taxes, according to the European Environment Agency (1996), are those on Swedish air pollution, on Dutch water pollution, and the NO_x charge and tax differentiation schemes for vehicle fuels in Sweden. The Swedish NO_x charge, for example, is reported to have triggered a 50% reduction in NO_x emissions and to have accelerated innovations in combustion technologies between 1990 and 1992. The charge paid by combustion power plants was redistributed among emitters in proportion to their share in total energy output (OECD, 1999, p. 18). The sulphur dioxide allowance trading in the US, which began in 1995, is also considered as a very successful programme and is proposed as a model for future environmental regulation (Stavins, 1998; Schmalensee *et al.*, 1998).

Studies investigating the distributive effects of environmental policies are quite limited and mainly neoclassical in their persuasion. A number of them have concluded that the income distribution of both benefits and costs of environmental policies is or will be regressive (Robison, 1985; Gianessi *et al.*, 1979; Dorfman and Snow, 1975; Pearson and Smith, 1991). In particular, the literature on the use of economic instruments in industrialised countries to reduce greenhouse emissions, summarised by the Intergovernmental Panel on Climate Change (IPCC, 1996, pp. 419–21), has provided evidence that the distributional impacts of these measures will be regressive, although less regressive relative to lifetime income or expenditures than to annual income. Such evidence compounds the issues of social justice raised in the first place by the regressive character of environmental pollution.

It is argued that several factors may combine to produce the regressive tendency of environmental regulation. First, although the benefits of environmental policies accrue to industrialised urban areas where the poor usually live, improved environmental conditions make these sites more attractive and drive up rents and the prices of land and houses, thereby offsetting the benefits for the low-income renters and even displacing them (Baumol and Oates, 1988). In addition, as has been mentioned above, environmental policies change the structure of prices of commodities when

abatement costs and taxes apply to regulating capitals and result in higher prices. In particular, many polluting activities are associated with basic wage goods of inelastic demand. In these cases, high tax rates, for example, are needed in order to have a reduction in the level of pollution. However, high taxes on basic wage goods have substantial income effects on workers and other low-income earners as expenditure on heating, lighting, transportation and so forth, accounts for a larger fraction of their income than that of higher-income groups (see also Helm, 1998, p. 12). Moreover, the loss of jobs which might occur during the process of adjustment of firms to the new environmental regime will mainly hit wage earners. Increases in money wages and state compensatory or mitigating measures for labour may prove difficult to introduce as part of the same environmental policy package in the current climate of neo-liberalism.¹ Regressive environmental policies are then, from a value theoretic perspective, a way to finance the reduction in pollution by cutting real wages and employment, which parallels the regressive incidence of pollution in the first place. However, whether this tendency will be successful or not depends, in the end, on the struggle waged by working people to counteract it.

Environmental policies also have implications for the free access of capitalists to natural conditions and resources. In practice, the industry has often acted as if its current claims on the environment, without any emission reductions, represented a 'property right', as Hahn has noted, in the case of air pollution regulation in the US (Hahn, 1989, p. 110). There has been indeed evidence of an intense struggle over the restriction of 'property rights' on the part of polluting firms. In particular, the industry accepted taxes or charges both in Europe and in the US only when the 'recycling' of revenues back to it was promised by way of constructing treatment plants and subsidising the industry to install equipment in order to reduce water or air pollution (*ibid.*, p. 109; European Environment Agency, 1996, p. 37). Significantly, the 'grandfathering' of permits to existing firms based on current levels of pollution by source indicates that all permit programmes in the US placed great importance on preserving the status quo of 'property rights' over nature, as Hahn has already indicated (1989, p. 109).

Environmental regulation not only is the result of complex social processes but also interacts, in turn, with several other aspects of social formation to generate environmental change in capitalism. In particular, individual capitalists are in the first place confronted with changes in market prices, profits and rents as a result of intensified pollution and depletion and thus forced to take them into account in their decision-making. The combined influences of these economic phenomena, cultural and political change, and of environmental regulation seem to give incentives to individual capitalists to search for new growth potentials that will protect the environment insofar as this is integrated into the business thinking, i.e., into the appropriation of the maximum possible surplus value. As a result, new business opportunities may improve not only environmental quality and conserve natural resources, but also enhance profitability and advance the competitive position of firms

¹ Actually, cases of measures to avoid a regressive burden of environmental policies on low-income earners are very limited. One such an example is the Dutch energy tax. In this case, a tax-free threshold of energy use was introduced for households; moreover, a tax relief was instituted such that an average user in each of four income groups will be made no worse off from the tax (European Environmental Agency, 1996, p. 37).

internationally (Porter and van der Linde, 1995A, 1995B; Hart, 1997; Lovins *et al.*, 1999; Reinhardt, 1999).

Reinhardt, for example, discusses several cases where environmental investments deliver positive returns or reduce risks for firms. He argues that individual companies may use environmental product differentiation that offers greater environmental benefits or impose smaller environmental costs than those of their competitors, to advance their position. Product differentiation may raise the firm's costs but it may also enable it to command higher prices, or capture additional market share, or both (Reinhardt, 1999, p.150). Ciba Specialty Chemicals, a Swiss manufacturer of textile dyes, was successful in differentiating products environmentally. It has introduced dyes that fix more readily to the fabric and therefore require less salt. Its customers (textile manufacturers) have benefited by the reduced costs for salt, lower treatment costs for used water to be released into rivers and streams, and easier quality control. Ciba can charge a higher price for its higher-quality dyes (*ibid.*, pp.150–1). Another way that firms may integrate the environment into business thinking, according to Reinhardt, is to set private standards—often in collaboration with similarly positioned companies within an industry—or to convince the government to create regulations that favour their product over their competitors. This has actually been the case for the chemical industry, which found itself under great pressure after the 1984 fatal toxic gas leak from a chemical plant in India and decided to set private standards (*ibid.*, pp.152–4). A third possibility for certain firms is to redesign processes and products in order to improve their environmental performance and, at the same time, cut costs. DuPont, for example, takes back much of its polyester industrial film and recycles it into new film. At the same time, it keeps improving it to make it stronger and thinner. As a result, the company reduces the material it uses and reduces the unit cost of its polyester film (Lovins *et al.*, 1999, p. 153). For many firms, environmental improvements are integrated into business as part of their risk management and, as such, can be a source of competitive advantage. They appear as a potential for insurance against regulatory difficulties, sour community relations, business interruptions, and related cost shocks (Reinhardt, 1999; Hart, 1997).

Finally, in the process of adjustment to environmental pressures, some companies may even be able to make such radical changes in their products or processes as to enable them first to enjoy an 'early-mover advantage' in domestic and international markets and then to redefine the terms of production and competition in the industry. Scandinavian pulp and paper producers have been leaders in introducing new environmentally friendly production processes. As a result, Scandinavian pulp and paper equipment suppliers, such as Kamyr, have advanced their international position in selling innovative bleaching equipment. The development of low-emission diesel engines for trucks, buses and other vehicles by Cummins Engine in response to environmental regulations in USA gave the company a competitive advantage in the international market (Porter and van der Linde, 1995B, pp. 104–5). In Japan, following the establishment of emissions standards in the early 1970s, the car industry was able to make advances in fuel efficiency and pollution abatement technology and to develop the best compact cars in the world (Miyamoto, 1991, p. 86).

Possibilities of significant restructuring often develop in circumstances of intense competitive pressure and/or strict regulatory requirements. As a response to its deteriorating competitive position, Xerox, for example, restructured so that rather

than selling office equipment, it retains the responsibility for disposal of the equipment. Moreover, it takes back its products when they are rendered obsolete by new technology, disassembles them in order to rebuild them by incorporating new technology, and resells them at the same price as new machines. With this 'environmental leadership model' initiated in 1990, it has been able to reduce costs and waste (Reinhardt, 1999).

In conclusion, the evidence from the business literature shows that several capitalist firms introduce environmental improvements as part of their broader profit-enhancing restructuring. On the other hand, in several cases the establishment of environmental policy and adjustments have been steadily challenged by opposing capitalist firms. For instance, international conflicts over global warming have still not allowed the establishment of an effective policy to mitigate climate change (Vlachou, 2000A). In addition, limitations and setbacks in the restructuring of capitalism are also evidenced. For example, the case of Monsanto and other genetically modified crops companies reveals the many problems that have arisen from the hasty and unsafe path of change and development in biotechnology which the industry followed and which led it to a significant setback (see Vlachou, 2000B). These limitations and opposite tendencies are grounded, in my opinion, in the many contradictions that capitalism tends to create at all levels of society. They are embedded in the class nature of the system and render the process of sustainable development in capitalism uncertain (Vlachou, 2000B). Moreover, and most importantly, the currently emerging environmental regulation and change exhibits a quite limited influence of working peoples' movements.

4. Concluding remarks

Environmental regulation is the outcome of class, environmental and other social struggles fought by various affected agents within and outside the state in order to resolve or contain the negative impacts of environmental degradation. Moreover, since particular environmental policies have different effects on the various involved parties, certain individual firms or sectors, the environmental and/or labour movements, and whole countries may either resist or support them during the process of establishing and enforcing them. The greening of capitalism is thus a contradictory process and as such it is unstable and uncertain in its ecological outcomes.

The evaluation of specific environmental policies from a class standpoint developed in this study, reveals for the worker-citizens' movements instances and possibilities for revolutionary interventions in order to protect and to improve (one hopes) their natural conditions of life under capitalism. However, a concise survey of environmental policy as it occurs in practice indicates the great influence of capitalist concerns in current policy. Capitalist firms have attained free initial allocation of permits, extensive exemptions from environmental taxes or revenue recycling, and subsidies. In contrast, the poor and the underprivileged not only suffer greater harm from environmental degradation than do the wealthy and the privileged, but also incur the regressive impacts of environmental regulation. Both these aspects tend to imply that the current environmental regulation and change takes place at the expense of working people. This class-bias captures in turn the present vulnerable position of labour and other social movements—which stand fragmented and disorganised, and thus politically ineffectual.

On the one hand, this state of affairs will tend to reinforce the divisions between workers and environmentalists and to undermine the possibility of an alliance between them to affect social change towards an ecologically and socially defensible post-capitalist society. On the other hand, however, the many shared unpleasant and oppressive experiences of life in present-day global capitalism create the basis for a collective awakening and search for certain common interests between socialists and ecologists. The analysis of this paper suggests that the policy towards nature needs to be part of a wider project that will aim at transforming the economic, technological, institutional and cultural aspects of contemporary capitalist societies, and hence their appropriation of nature. Environmental goals cannot and should not be dissociated from the class-conditioned institutions and values of capitalism. Specific environmental objectives and policies should be integrated and evaluated within a broad transformative project. Socialists and ecologists need to seek to develop a shared vision of such a social transformation in order to challenge the undesirable ecological and social effects of capitalism effectively.

Bibliography

- Baumol, W. J. and Oates, W. E. 1971. The use of standards and prices for protection of the environment, *Swedish Journal of Economics*, vol. 73, March, 42–54
- Baumol, W. J. and Oates, W. E. 1979. *Economics, Environmental Policy and the Quality of Life*, Englewood Cliffs, Prentice Hall
- Baumol, W. J. and Oates, W. E. 1988. *The Theory of Environmental Policy*, Cambridge, Cambridge University Press
- Benton, T. 1996. *The Greening of Marxism*, New York, The Guilford Press
- Bohm, P. and Russell, C. 1985. Comparative analysis of alternative policy instruments, Vol.1, pp. 395–400, in Kneese A. V. and Sweeney H. L. (eds), *Handbook of Natural Resource and Energy Economics*, Oxford, Elsevier Science Publishers
- Bryan, D. 1995. *The Chase Across the Globe: International Accumulation and the Contradictions of Nation States*, Oxford, Westview Press
- Buchanan, J. and Tullock, G. 1975. Profits and political response: Direct controls versus taxes, *American Economic Review*, vol. 65, March, 139–47
- Bullard, R. 1990. *Dumping in Dixie: Race, class, and Environmental Quality*, Boulder, CO, Westview Press
- Bullard, R. (ed.) 1993. *Confronting Environmental Racism: Voices from the Grassroots*, Boston, South End Press
- Burkett, P. 1999. *Marx and Nature: A Red and Green Perspective*, New York, St. Martin's Press
- Clifton, J. 1977. Competition and the evolution of the capitalist mode of production, *Cambridge Journal of Economics*, vol. 1, 137–51
- Conrad, J. M. and Clark C. W. 1987. *Natural Resource Economics*, Cambridge, Cambridge University Press
- De Brunhoff, S. 1978. *The State, Capital and Economic Policy*, London, Pluto Press
- Doyle, T. and McEachern, D. 1998. *Environment and Politics*, London, Routledge
- Dorfman, N. S. and Snow, A. 1975. Who will pay for the pollution control? The distribution by income of the burden of the National Environmental Protection Program, *National Tax Journal*, vol. 28, March, 101–15
- Ekins, P. and Speck, S. 1999. Competitiveness and exemptions from environmental taxes in Europe, *Environmental and Resource Economics*, vol. 13, 369–96
- European Environment Agency 1995. *Environment in the European Union 1995*, Luxembourg, Office for Official Publications of the European Communities

- European Environment Agency 1996. *Environmental Taxes: Implementation and Environmental Effectiveness*, Luxembourg, Office for Official Publications of the European Communities
- Fisher, A. 1981. *Resource and Environmental Economics*, Cambridge, Cambridge University Press
- Freeman III, M. A. 2000. Water pollution policy, pp. 170–213, in Portney P. R. and Stavins R. N. (eds), *Public Policies for Environmental Protection*, Washington, DC, Resources for the Future
- Gianessi, L., Peskin, H. and Linda, R. 1979. The distributional effects of uniform air pollution policy in the United States, *Quarterly Journal of Economics*, vol. 93, May, 281–301
- Gould, A. K., Schnaiberg, A. and Weinberg, A. S. (1996) *Local Environmental Struggles: Citizen Activism in the Treadmill of Production*, New York, Cambridge University Press
- Hahn, R. W. 1984. Market power and transferable property rights, *Quarterly Journal of Economics*, vol. 99, 753–65
- Hahn, R. 1989. Economic prescriptions for environmental problems: How the patient followed the doctor's orders, *Journal of Economic Perspectives*, vol. 3, no. 2, 95–114
- Hanley, N., Shorgen, J. S. and White, B. 1997. *Environmental Economics in Theory and Practice*, London, Macmillan Press
- Hart, S. 1997. Beyond greening: Strategies for a sustainable world, *Harvard Business Review*, vol. 75, January–February, 66–76
- Harvey, D. 1993. The nature of environment: the dialectics of social and environmental change, *Socialist Register*, vol. 29, 1–51
- Harvey, D. 1996. *Justice, Nature & the Geography of Difference*, London, Blackwell
- Helm, D. 1998. The assessment: environmental policy—objectives, instruments, and institutions, *Oxford Review of Economic Policy*, vol. 14, no. 4, 1–19
- Helm, D. and Pearce, D. 1990. Assessment: economic policy towards the environment, *Oxford Review of Economic Policy*, vol. 6, no. 1, 1–16
- Heyes, A. 1998. Making things stick: enforcement and compliance, *Oxford Review of Economic Policy*, vol. 14, no. 4, 50–63
- Intergovernmental Panel on Climate Change (IPCC) 1996. *Climate Change 1995—Economic and Social Dimensions of Climate Change*, Vol. 3, Cambridge, Cambridge University Press
- Leff, F. 1995. *Green Production: Toward an Environmental Rationality*, New York, The Guilford Press
- Leveque, F. 1996. *Environmental Policy in Europe*, Cheltenham, UK, Edward Elgar
- Lovins, A., Lovins, H. and Hawken, P. 1999. A road map for natural capitalism, *Harvard Business Review*, vol. 75, May–June, 145–58
- Macauley, M. K. and Walls, M. A. 2000. Solid waste policy, pp. 261–86, in Portney P. R. and Stavins R. N. (eds), *Public Policies for Environmental Protection*, Washington, DC, Resources for the Future
- Magretta, J. 1997. Growth through global sustainability: an interview with Monsanto's CEO, Robert B. Shapiro, *Harvard Business Review*, vol. 75, January–February, 79–88
- Malueg, D. A. 1989. Emission credit trading and the incentive to adopt new pollution abatement technology, *Journal of Environmental Economics and Management*, vol. 16, 52–7
- Malik, A. S. 1992. Enforcement cost and the choice of instrument for controlling pollution, *Economic Inquiry*, vol. 30, 714–21
- Marx, K. 1991. *Capital: A Critique of Political Economy*, New York, Penguin Books
- Milliman, S. R. and Prince, R. 1989. Firm incentive to promote technological change in pollution control, *Journal of Environmental Economics and Management*, vol. 17, 247–65
- Miyamoto, K. 1991. Japanese environmental policies since World War II, *Capitalism, Nature, Socialism*, vol. 2, no. 2, 71–100
- Montague, P. (1998) Philadelphia dumps on the poor, *Rachel's Environment & Health News*, #595, April 23, available at <http://www.rachel.org/bulletin/>, 1–6 (last accessed on 13 December 2002)
- Montgomery, W. D. 1972. Markets in licenses and efficient pollution control, *Journal of Economic Theory*, vol. 5, 395–418

- O'Connor, J. 1988. Capitalism, nature, socialism, *Capitalism, Nature, Socialism*, vol. 1, 11–38
- O'Connor, J. 1998. *Natural Causes: Essays in Ecological Marxism*, New York, NY, Guilford Press
- Organization for Economic Co-operation and Development (OECD) 1989. *Economic Instruments for Environmental Protection*, Paris, OECD
- Organization for Economic Co-operation and Development (OECD) 1997. *Evaluating Economic Instruments for Environmental Policy*, Paris, OECD
- Organization for Economic Co-operation and Development (OECD) 1999. *Economic Instruments for Pollution Control and Natural Resource Management in OECD Countries, Environmental Protection*, Paris, OECD
- Organization for Economic Co-operation and Development (OECD) 2000. *Greening the Tax Mixes in OECD Countries: A Preliminary Assessment*, Paris, OECD
- Pearson, M. and Smith, S. 1991. *The European Carbon Tax: an Assessment of the European Commission's Proposals*, London, Institute of Fiscal Studies
- Pindyck, R. S. 1978. The optimal exploration and production of nonrenewable resources, *Journal of Political Economy*, vol. 86, no. 5, 841–62
- Polinsky, A. M. 1979. Notes on the symmetry of taxes and subsidies in pollution control, *Canadian Journal of Economics*, vol. 12, 75–83
- Porter, M. E. and van der Linde, C. 1995A. Green and competitive: ending the stalemate, *Harvard Business Review*, vol. 73, no. 5, 120–34
- Porter, M. E. and van der Linde, C. 1995B. Toward a new conception of the environment-competitiveness relationship, *Journal of Economic Perspectives*, vol. 9, no. 4, 97–118
- Portney, P. R. 2000. Air pollution policy, pp. 77–123, in Portney, P. R. and Stavins, P. R. (eds), *Public Policies for Environmental Protection*, Washington, DC, Resources for the Future
- Portney, P. R. and Stavins, P. R. (eds) 2000. *Public Policies for Environmental Protection*, Washington, DC, Resources for the Future
- Rajah, N. and Smith, S. 1993. Taxes, tax expenditure, and environmental regulation, *Oxford Review of Economic Policy*, vol. 9, no. 4, 41–65
- Reinhardt, F. 1999. Bringing the environment down to earth, *Harvard Business Review*, vol. 77, July–August, 149–57
- Resnick, S. and Wolff, R. 1987. *Knowledge and Class: A Marxist Critique of Political Economy*, Chicago, University of Chicago Press
- Robison, D. 1985. Who pays for industrial pollution abatement?, *Review of Economics and Statistics*, vol. 67, November, 702–06
- Schmalensee, R., Joskow, P., Ellerman, A. D., Montero, J. P. and Bailey, E. M. 1998. An interim evaluation of sulfur dioxide emissions trading, *Journal of Economic Perspectives*, vol. 12, no. 3, 53–68
- Semmler, W. 1982. Theories of competition and monopoly, *Capital and Class*, vol. 12, Winter, 91–116
- Shaikh, A. 1980. Marxian competition versus perfect competition: Further comments on the so-called choice of technique, *Cambridge Journal of Economics*, vol. 4, 75–83
- Shaikh, A. 1982. Neo-Ricardian economics: a wealth of algebra, a poverty of theory, *Review of Radical Political Economics*, vol. 14, no. 2, 67–83
- Sigman, H. 2000. Hazardous waste and toxic substance policies, pp. 215–59, in Portney, P. R. and Stavins, R. N. (eds), *Public Policies for Environmental Protection*, Washington, DC, Resources for the Future
- Speck, S. and Ekins, P. 2000. Recent trends in the application of economic instruments in EU member states plus Norway and Switzerland and an overview of economic instruments in Central and Eastern Europe, Report to DG Environment, European Commission (<http://www.europe.eu.int/environment/>, accessed on 20 September 2001)
- Stavins, R. 1995. Transactions costs and tradeable permits, *Journal of Environmental Economics and Management*, vol. 29, no. 2, 133–48
- Stavins, R. 1998. What can we learn from the grand policy experiment? Lessons from SO₂ allowance trading, *Journal of Economic Perspectives*, vol. 12, no. 3, 69–88

- Stavins, R. 2000. Market-based environmental policies, pp. 31–76, in Portney, P. R. and Stavins, R. N. (eds), *Public Policies for Environmental Protection*, Washington, DC, Resources for the Future
- Swedish Environmental Protection Agency. 1997. *Environmental Taxes in Sweden*, Stockholm
- The World Commission on Environment and Development 1987. *Our Common Future*, Oxford, Oxford University Press
- Tietenberg, T. 1978. Spatially differentiated air pollutant emission charges: An economic and legal analysis, *Land Economics*, vol. 54, no. 3, 265–77
- Tietenberg, T. 1985. *Emission Trading: An Exercise in Reforming Pollution Policy*, Washington, DC, Resources for the Future
- Tietenberg, T. 1990. Economic instruments for environmental regulation, *Oxford Review of Economic Policy*, vol. 6, no 1, 17–33
- Tietenberg, T. 1996. *Environmental and Natural Resource Economics*, New York, Harper Collins Publishers
- Ui, J. (ed.) 1992. *Industrial Pollution in Japan*, Tokyo, The United Nations University
- Vlachou, A. 1993. The contradictory interaction of capitalism and nature, *Capitalism, Nature, Socialism*, vol. 4, March, 102–08 (Reprinted in Benton, T. (ed.) *The Greening of Marxism*, New York, The Guilford Press)
- Vlachou, A. 1994. Reflections on the ecological critiques and reconstructions of Marxism, *Rethinking Marxism*, vol. 7, no. 3, 112–28
- Vlachou, A. 2000A. The economics of global warming: A critical assessment, *Rethinking Marxism*, vol. 12, no. 4, 90–116
- Vlachou, A. 2000B. The shaping of environmental policies, Paper presented at the 4th International Conference of *Rethinking Marxism* on ‘Marxism 2000’, University of Massachusetts at Amherst, MA, 21–24 September 2000, forthcoming in *Review of International Political Economy*
- Vlachou, A. 2002. Nature and value theory, *Science & Society*, vol. 66, no. 2, 169–201
- Vlachou, A. 2003–4. Nature and value theory: a reply, *Science & Society*, vol. 67, no. 4, 468–80.