

Can green taxes save the environment?

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<http://www.dsp.org.au/site/?q=node/85>

Ecological Marxism maintains that the root cause of the environmental crisis is the insuppressible growth dynamic of capitalism and that environmental sustainability can only be met by democratic socialist planning.

This is certainly not the outlook of most environmentalists today. They, along with the majority currents of most green parties, believe that one or other kind of green capitalism can reconcile economy and environment. As noted in the Preface, over the last decade environmentalists have expressed this viewpoint in a raft of pro-market books.

Yet embracing capitalism — no matter how green the vision put forward — saddles pro-market environmentalists with a difficult case for the defence. They have to explain exactly how a system that has consumed more resources and energy in the last 50 years than all previous human civilisation can be made to stabilise and then reduce its rate of resource depletion and pollution emission. How can this monstrously wasteful, poisonous and unequal economic system *actually* be made to introduce the technologies, consumption patterns and radical income redistribution without which all talk of sustainability is a sick joke?

Inevitably, one course of treatment plays a major role in all the different green capitalist cures on offer — green taxes or ecotaxation. Such taxes trace back to the work of A. C. Pigou, the father of conventional environmental economics.¹⁷² This offshoot of orthodox economics analyses the environmental crisis as due to the "natural capital" of the environment being treated as a free or underpriced good. In this way the cost to society of an economic activity like logging (its "social marginal cost") diverges from its cost to the logging company (its "private marginal cost").¹⁷³

The solution is to "get the price signals right": to impose some kind of green tax¹⁷⁴ which pushes private marginal cost up to social marginal cost. The polluter or resource depleter will now operate at a level which is acceptable to "society" and the cost of the "negative externality" in question (unsustainable logging practices) will have been "internalised" in the offending firm's cost structure. Therefore, if governments impose high enough eco-taxes on a broad enough scale, business as a whole will convert its operations to sustainable technology and production fast enough to turn the tide of environmental decline.

It's a measure of the intensity of the pressure for a solution that such taxes, which in the 1970s were very minor tools of environmental management, are being advanced in the 1990s as *the major driving force* of the "sustainability transition". According to environmental tax expert David Malin Roodman:

Like the gradual emergence of modern taxes on income, wages, and sales about a century ago, a great wave in the history of taxation is on the horizon. If it rises to its full potential — the elimination of environmentally destructive subsidies and the imposition of taxes and permit charges that reflect full environmental costs — it will create a trillion-dollar swing in the global tax burden in favour of environmental protection.¹⁷⁵

Lester Brown agrees:

We have a policy instrument, largely unused, for building an environmentally sustainable economy — namely tax policy. Governments now rely heavily on personal and corporate taxes for revenue, but these discourage constructive activities, such as work and savings. Meanwhile, taxes on environmentally destructive activities are typically negligible or nonexistent. The challenge is to restructure the existing tax system, decreasing the taxes on such constructive activities as work and savings and increasing the taxes on destructive activities, such as carbon emissions or the generation of toxic waste.¹⁷⁶

This rapid move from minor sub-discipline to new orthodoxy reproduces the speedy acceptance of the work of John Maynard Keynes in the 1930s. Just as Keynes provided anxious capitalist governments under siege from socialism and communism with the justification for public sector deficit spending against unemployment, so "environmental economics" and ecotaxation equip their descendants with a rudimentary first aid kit for treating the symptoms of our epoch's great crisis.

Ecotaxation is the centrepiece of the US President's Council of Sustainable Development's 1996 document *Sustainable America: A New Consensus for Prosperity, Opportunity and a Healthy Environment*.¹⁷⁷ It envisages a new tax regime based on shifting the tax burden from labour to waste, and so winning a "double dividend" of reduced pollution and increased employment. Exactly the same outlook is contained in a 1993

white paper of the European Union.¹⁷⁸ In it, European Commission ex-president Jacques Delors states that current models of development tend to "over-consume nature" and "under-consume people". The answer is a green taxation system: one that would reverse the trend to suck resources into the economy and squeeze people out of it.

The number and range of green taxes has increased rapidly in the 1990s, to the point that Timothy O'Riordan, the editor of a recent book of essays called *Ecotaxation*, can remark that it they are "now irreversibly part of the modern political and economic scene".¹⁷⁹ Yet how much existing eco-taxes are really driven by the desire to make the "sustainability transition" is open to question. O'Riordan comments that:

... ecotaxation is a concept and a practice whose time has come. The reasons lie more with the prevailing spirit of letting markets work, no matter how imperfect, of encouraging deregulation generally, and of taxing by means other than striking at income and savings, than with a will to move towards sustainable development. The spectre of an uncontrollable welfare state and an increasingly costly ageing population adds to the drive to shift the burden of social payments on to individuals according to need and to means.¹⁸⁰

So ecotaxation has a role to play in neo-liberal "tax reform", but can it really push the private profit system any significant distance towards sustainability? A recent and complete expression of confidence comes in the latest report to the Club of Rome, *Factor Four: Doubling Wealth, Halving Resource Use*, by Ernst von Weizsäcker, Amory B. Lovins and L. Hunter Lovins. The authors argue that a reorganisation of taxes and the rules governing markets can stimulate private investment in resource-efficient, non-polluting technologies with the potential to double wealth creation at the same time as halving resource usage — a "factor four" increase in efficiency. This would not only lay to rest the spectre of resource depletion raised in *Limits to Growth* (the first Club of Rome report) it would also go a long way to fulfilling the main projections of Agenda 21, the program of sustainability adopted at the Rio Earth Summit.

The picture becomes all the more rosy when "leapfrogging" is taken into account: newly industrialising countries will simply jump over older generations of polluting technology presently in operation and adopt leading-edge clean and green techniques.

Embodying these technologies in the world's capital stock will certainly require a massive reform of what are seen as "market distortions", but this reform can be achieved without overturning the existing system of capitalism. The *Factor Four* authors write:

The idea that much of the answer to unsustainable market activity is sustainable market activity may offend both those on the right who don't see why what they're doing is unsustainable, and those on the left who think markets and profits can't be used for good ends. If so, that may be the price of pragmatism. For abundant experience now emerging in diverse societies suggests a bonanza of market-based institutional innovations no less important than the technological innovations just described ... *Perhaps the trouble with eco-capitalism is not that it has been tried and found wanting, but that it has not yet really been tried.*¹⁸¹

Factor Four spells out a by now common chain of argument, which has four links:¹⁸²

Link 1. The key to sustainability is to make the technologies that will underpin it profitable while making polluting and resource-inefficient technologies progressively less profitable.

Link 2. This is economically feasible because, to take a key sector like energy as an example:

- fuel prices correlate negatively with fuel consumption (we observe a high, if long-term, price elasticity);¹⁸³
- energy prices appear to correlate positively with economic performance, not negatively as conventional wisdom from the industrial lobby suggests: that is, cheap-energy economies tend to be wasteful and uncompetitive while dear-energy economies tend to be ingenious, innovative and highly competitive;
- higher resource prices are justified as a means of internalising external costs; and, best of all,
- a fourfold increase of resource productivity is technologically available and often cost-effective, so that no loss of well being must be feared from rising resource prices.¹⁸⁴

Link 3. On the basis of existing experience with green taxes and economic modelling:

End-user real prices for energy and primary resources should increase by around five per cent annually for a period at least of some 20 years, preferably 40 years or more ... the annual signal should be so mild that no capital destruction would result and that technological progress in average resource productivity can outweigh the price increase, thus leaving constant the annual average expenditures for energy and resources

... Nonetheless, the same signal would be tremendously strong for technology development. Knowing that energy and resource prices will steadily go up by five per cent per annum for a very long period of time would serve as an extremely powerful motivation for managers and engineers to work on the efficiency revolution. Suddenly you would find hundreds of businesspeople snooping around for bonanza opportunities ...¹⁸⁵

Link 4. If we inject the productivity gains accruing from the introduction of these resource-efficient technologies into a "systems dynamic" model¹⁸⁶ of likely global developments in population growth, industrial production, raw materials usage and environmental pollution:

A moderately optimistic development is obtained for the two per cent [productivity] gains assumption, and a truly attractive scenario [of rising food and industrial production and living standards matched by a falling rate of raw material usage and pollution] emerges from the four per cent gains assumption.¹⁸⁷

Quod Erat Demonstrandum. The intelligent and flexible application of green taxes and charges at the micro-level will bring about the macro-result of global sustainable development via the accelerated introduction of environmental technologies.

Economic modelling supports this line of argument.¹⁸⁸ Typical was a 1994 exercise commissioned by the European Commission, which modelled three scenarios for the six largest European economies — a "reference scenario" based on environment policy already agreed, a "policy-in-the-pipeline" scenario incorporating all environment proposals that had been the subject of an EC directive, and an "integrated scenario" based on using ecotaxation and other measures to internalise environmental costs.

For 13 areas of environmental damage, the results showed that there would be an improvement between 1990 and 2010 in only three under the business-as-usual scenario, six if policy-in-the pipeline applied, but in 10 if the ecotaxation package were implemented. In this last case there would also be an increase of 2.2 million jobs if the income from the eco-taxes were fully recycled to business as a cut in their social security contributions. Nor would these gains come at the cost of lower growth. Indeed, under the integrated scenario growth by 2010 would be one per cent higher than otherwise.¹⁸⁹

Is such a "win-win" scenario realistic? At face value two trends seem to make it feasible. Certain eco-taxes have been successful (see Box 2) and in many cases the cost for business of adapting to them has not been as great as initially feared.¹⁹⁰

Certainly, green taxes (and, equivalently, the removal of anti-environmental subsidies, estimated at \$650 billion a year at least for the world economy¹⁹¹) can cut back pollution and resource depletion — if five conditions can all be broadly met.

- Tax rates are high enough (or, in the case of tradeable permits, the number of permits low enough) to meet targetted cuts in resource use or pollution *per unit of output*.¹⁹²
- The cuts achieved in resource use or pollution emission per unit of output aren't offset by any increase in *total* resource use or pollution emission;
- Resource-depleting and polluting activities aren't shifted outside the area where the tax applies;
- The funds raised are large enough, when combined with funds from other sources, to finance sufficient investment in sustainable technology across all industry, as well as funding the budget needed for cleaning up pollution and accumulated environmental degradation;
- A strong enough alliance in support of the taxes is built, as was *not* the case with the 1994 UK domestic fuel tax, which had to be withdrawn because of popular protests, nor Clinton's 1993 energy tax proposal, which was torpedoed by corporate opposition, but has been possible in Denmark where social democratic governments have enjoyed the support of the left wing Enhedslisten (Red-Green Lists) for their green taxation legislation.

Can these conditions generally be met under today's capitalism? What follows is a survey of experience to date. While the evidence is considered in the same order as the five conditions just stated, the key interconnections among the various elements are also drawn out.

What tax rate?

Every tax has to be set at a rate and given a basis (weight, value etc). This starts off as a more or less difficult technical problem — even before the potential winners and losers from the tax come into the picture. Yet

working out the likely environmental impact of a given rate of green tax is no simple business. For example, a carbon tax on coal would be expected to lead to some combination of increased use of fossil fuels with a lower carbon content (oil and natural gas), a switch to non-carbon energy sources (nuclear or renewables) and increased investment in energy conservation.

Potential margins of error are huge, starting with the reaction of the taxed capitalist firm to the tax. Will it decide to pay and carry on polluting at the old rate or introduce some form of abatement (and to what degree?). The end result will depend on how the tax affects prices, and how prices affect the demand for alternative fuels and energy conservation, keeping in mind that changes in demand will in turn affect the price of all forms of energy — often in a very volatile way — and that historical evidence of these relationships doesn't provide a sure guide to future behaviour.

A 1991 UK study found that the rate of carbon tax needed to obtain a 20 per cent reduction in emissions — only one third of that needed to stabilise atmospheric carbon dioxide levels — ranged from 171 per cent to 23 per cent for coal, 134 per cent to 18 per cent for oil and 65 per cent to 9 per cent for oil, depending on varying but realistic assumptions about the impact of price change on demand.¹⁹³

Or again, UK Treasury officials who appeared before the House of Lords' Select Committee on Sustainable Development had to concede that they "were not 100 per cent certain" about the response in car-driving behaviour that would result from increases in petrol excise tax.¹⁹⁴

An "energy modelling forum" carried out by Stanford University in 1990 injected an \$80 carbon tax into 14 different economic models, and came up with a change in carbon dioxide emissions of between -35 and +20 per cent! US economist William Nordhaus calculates that uncertainty about the degree and impact of global warming means that the "optimal" tax rate has to double.¹⁹⁵

An apparently surer method of reaching a given reduction target is to use tradeable permits, which fix the amount of the resource that is to be used or pollution emitted and then allow permits equal to this total to be traded. But how is the market asset (the right to pollute) to be distributed at the outset? Should it be distributed equally among the "players", auctioned off, sold at a set price or distributed according to a more or less complicated rule?

When the US began its tradeable permit program for sulphur dioxide in 1990, existing polluters were given the right to pollute at or near existing emission levels, being sheltered by a device known as "grandfathering", by which permits are distributed in proportion to current pollution emissions and the oldest and dirtiest industries are preserved from having to pay "too much" for their right to pollute.

However, precisely because it remains hostage to the profitability of the most polluting, grandfathering can actually *slow down* the introduction of cleaner technologies by reducing the cost advantage for those that are thinking of building new facilities which embody the latest innovations.¹⁹⁶ Predictability is bought at the price of a lesser impact on pollution.

What lies behind the difficulty in establishing "the" optimal level of a green tax is the thorny question of how to establish "social marginal cost", and whether, indeed, this concept can be expressed in numbers. For while setting a rate for a particular green tax doesn't require establishing a precise value for the "externality" that it is designed to address, and implementation of the tax can proceed by trial and error, market-based decision-making over the environment cannot take place unless *some* values are assigned to environmental costs and benefits. Yet the very concept of "valuing environmental services" is fraught with problems, both of principle and in practice. We look at these issues in the section "Can 'social marginal cost' be established?" (See page 165.)

Box 2 shows the best achievements green taxation can boast to date. Recent OECD summaries of experience with environmental taxation in OECD countries¹⁹⁷ have revealed significant environmental improvement in only a few cases, confirming the findings of a 1989 study by Robert Hahn.¹⁹⁸ There is no mystery here; for no private firm or industry is going to take lying down a tax set to meet a target rate of reduction in resource depletion and pollution that excessively undermines profits. Tax rates simply have to be set within a band that keeps the bulk of companies in business and allows them to turn their investment towards more resource-efficient and less polluting equipment at their own pace.

Some recent examples of ecotaxation

- The **Dutch** tax system for reducing industrial pollution of rivers and lakes has helped cut heavy metal emissions into the country's waterways by between 83 and 97 per cent. 5.1 per cent of government revenue now comes from green taxes.
- Both **Singapore** and the **US** met their targets for reducing CFCs by auctioning off limited and declining numbers of permits for producing the chemicals.
- In 1991 **Sweden** reduced total income tax by \$1.65 billion (1.4 per cent of the total tax take) while imposing a tax on sulphur dioxide of \$3050 per ton, followed by a tax on carbon dioxide of \$120 per ton in 1995. A Swedish tax on the sulphur content of diesel fuel boosted the share of "clean" diesel in total diesel consumption tenfold in 18 months. A similar scheme targetted at nitrogen oxides reduced their emissions by 44 per cent between 1990 and 1993. Another success story has been the reduction in sulphur dioxide emissions through a system that reimburses a sulphur tax to producers in proportion to the quantity of sulphur they remove via end-of-pipe technologies.
- When **Indonesia** eliminated pesticide subsidies in rice production pesticide applications fell from 4.5 to 2.2 applications a year.
- Between 1988 and 1991 **British Colombia** Hydro raised the share of the most efficient industrial motors in mining and pulp-and-paper plants from 3 per cent to 60 per cent through a rebate scheme.
- In **Denmark** high landfill taxes have boosted building waste reuse from 12 to 82 per cent in eight years and high deposits for refillable glass bottles have boosted return rates to 98-99 per cent. Similar deposit-refund systems have achieved 80-100 per cent return of waste packaging and used containers in other OECD countries. Four per cent of government revenue comes from green taxation.
- In **Britain** lead emissions fell by 70 per cent in the decade to 1990 because of the widening gap between leaded and unleaded petrol.
- Pollution tax codes are also well-developed in the former bureaucratically planned economies of Eastern Europe as well as China, where they developed out of the previous approach of using fines to enforce environmental standards (at least in theory). In Poland revenue from these fines amounts to one per cent of total tax receipts. There are fewer examples from the developing world; the elimination of pesticide subsidies in Indonesia and ranching subsidies in Brazil are often mentioned as tax policies that have helped the environment in those countries.

Examples taken from David Malin Roodman, "Harnessing the Market for the Environment", *State of the World 1996*, Earthscan, London, pp. 168-88 and Gary Gardner and Payal Sampat, "Forging a Sustainable Materials Economy", in *State of the World 1999*, p. 56, Frances Cairncross, *op.cit.*, p. 64, Theodore Panayatou, "The Economics of Environmental Degradation: Problems, Causes and Responses", in *The Earthscan Reader in Environmental Economics*, Earthscan, London, 1992, p. 359. Other examples are summarised in T.H. Tietenberg, "Economic Instruments for Environmental Regulation", in *ibid.*, p. 275 and Timothy O'Riordan (ed.), *Eco-taxation*, throughout.

Detailed information is also available on various web pages on green taxation, such as the Environmental Tax Program Web Site at <<http://solstice.crest.org/sustainable/etp/>>, the Centre for Economic Justice's Green Tax Shift site at <<http://www.progress.org/banneker/shift.html#green>> and the Wuppertal Bulletin on Ecological Tax Reform at <<http://www.wuppertal-forum.de/wuppertal-bulletin/>>.

The recent debate in Britain over the rate to apply for a landfill tax tells this story clearly enough. While Friends of the Earth proposed a tax of £30 (\$48) a tonne of waste in order to provide a strong recycling incentive, the Advisory Committee on Business and the Environment proposed a rate beginning at £8 (\$12.80) a tonne and rising to £12 (\$19) a tonne after two years. Yet, according to a 1993 Coopers and Lybrand report, even a £20 (\$32) a tonne tax would lead to only 12 per cent recycling, although there would be a greater shift to incineration. The tax rates finally levied were £7(\$11.20) a tonne for standard waste and £2 (\$3.20) a tonne for "inactive" waste which would not cause pollution. According to one sober assessment, "there is some evidence to suggest that the tax will not achieve its aims, particularly in the minimisation and recycling of domestic waste".¹⁹⁹

What success stories there are fall into two basic categories: those where polluting technology was already on the way out, like chlorofluorocarbons (CFCs) and sulphur dioxide, and those where consumers could readily change their spending behaviour. In both cases substitutes were available or coming on line. For example, when a tax differentiation between three categories of diesel fuel was introduced in Sweden in 1991, it led to "clean" diesel's share of the market rising from one to 60 per cent within two years.²⁰⁰

At the other end of the scale, the fees paid under British Colombia's "sustainability fund" are capped so that total income doesn't exceed \$15 million. As a result "the current fee structure has changed behaviour only on the margin" and "most permittees lowered their discharges only in response to a number of regulations introduced by government over the past five years".²⁰¹

The conditions for success for a green tax simply don't apply to the world's major polluting and resource-devouring industries. Here eco-taxes that would make a difference would have to hurt. For example, an eco-tax which aimed at "internalising the externalities" of the US car industry would involve removing subsidies ranging, according to one 1993 study, between \$380 billion and \$660 billion a year — roughly between seven and 12 per cent of national product, or \$1500 and \$2700 for every man, woman and child.²⁰²

That's because, according to G. Tyler Miller:

In the United States one of every six dollars spent and one of every six non-farm jobs are connected to the automobile or related industries such as oil, steel, rubber, plastics, automobile services and highway construction. This industrial complex accounts for 20 per cent of the annual GNP and provides about 18 per cent of all federal taxes.²⁰³

A recent Danish study of the level of tax needed to fully "internalise the externalities" of passenger car use came up with a real cost of driving a car of 70 cents a kilometre, only seven cents of which related to owning the car and 63 cents of which related to driving it. Assuming the car was driven 200,000 kilometres over 10 years, then covering external costs would require a vehicle tax of \$4000 and a fuel price of \$5 a litre!²⁰⁴

If the US chemical industry were forced to pay the cost of destroying all the toxic chemicals it now discharges into the environment, the annual cost (in 1986 figures) would be \$20 billion, 7.5 times its yearly after-tax profit of \$2.6 billion.²⁰⁵

Clearly, designing green taxes and tradeable pollution permits is no more a technical exercise than designing any tax. How such decisions will be made will have everything to do with the relative strength of the contending parties — in the case of a carbon tax, the oil multinationals, the energy-dependent big corporations, the governments that represent them, the Organisation of Petroleum Exporting Countries (OPEC), non-OPEC oil-exporters and the rest of the countries of the South.

Here the fight to reach agreed targets and an international permit system for tackling global warming has been instructive. The consensus of the 2500 scientists who make up the Intergovernmental Panel on Climate Change (IPCC) is that the Earth's average temperature will rise between 0.8 and 3.5°C during the next century, causing rising sea levels, severe storms, increasing desertification and epidemics. To halt this trend greenhouse gas emissions *have to be cut rapidly by between 60 and 80 per cent and stabilised at that level*.

Yet, only by the 1995 Berlin Conference of the Parties to the Rio global warming convention (COP1) was the US government forced to accept the *concept* of greenhouse gas reduction targets. By 1997, at Kyoto (COP3) the US, which emits 23 per cent of all greenhouse gases, proposed a global emissions reduction target of a mere five per cent below 1990 levels by 2012. The final agreement was for an average global cut of 5.2 per cent.

Even this token target is proving very difficult to translate into reality. At the Buenos Aires Conference of the Parties (COP4) there was no agreement on why the targets for the industrialised groups of countries were so inadequate. Big greenhouse gas emitters like the US blamed non-participating countries like Russia, and newly industrialising countries blamed industrialised economies for their poor efforts to date. The "review of adequacy", aimed at establishing what long-term level of greenhouse gases was sustainable, simply didn't take place.

While the Clinton administration finally signed the Kyoto agreement at Buenos Aires it made no serious commitment on reducing greenhouse gases due to electricity generation, and none at all on those due to road transport. So while Rio's global warming convention still has a roadmap and a process, *it falls further and further behind where it needs to be*.

In 1991 ecotaxation expert Scott Barrett had already noted:

While it is difficult to compare the estimates from one study with those of another, the qualitative story is pretty clear. To lower carbon dioxide emissions very substantially would require a large carbon tax — larger, certainly, than the taxes already implemented, or for which there exist firm proposals.²⁰⁶

Jean-Philippe Barde, the principal administrator of the OECD's Environmental Directorate agrees:

We are in a "grey" area where most existing environmental taxes, including carbon taxes, are still fairly small. If we want environmental taxes to be really effective and efficient, their level must increase significantly. Carbon taxes are a case in point: in OECD countries, even a moderate carbon tax of \$50 per tonne of carbon would raise approximately \$150 billion (based on 1990 carbon emissions) — i.e., about 2.5 per cent of the total OECD tax revenue. Stabilising carbon dioxide emissions at 1990 levels by the year 2050 would necessitate much higher taxes. Clearly, such tax levels would imply significant economic effects and restructuring, even in a revenue-neutral perspective. The prospects for significant increases in eco-taxes are far from clear for the time being.²⁰⁷

Similar impossible choices would confront a government that wanted to force privatised water supply companies to cover the costs of maintaining and repairing Britain's watersheds and rivers:

There is little prospect of any government, however committed to the long-term sustainability of the water environment, agreeing to implement an abstraction-charging [payment for water removal] scheme which even approximates to the prescriptions for efficiency. If long-run river-flow enhancement costs were employed as the charging base, abstractors in the southern and eastern parts of England would face charges at least 10-20 times higher than the present, and in some areas an increase approaching 100-fold would be likely.²⁰⁸

As the *New York Times* reported before Kyoto:

Many experts believe that it is already too late to avoid serious climactic disruption, that the task ahead is one of keeping it from becoming truly catastrophic. The reason, [they] say, is that the world's economic and political systems cannot depart from business as usual rapidly enough.²⁰⁹

These facts of life cannot be conjured away with the *Factor Four* argument that national capitalist economies with higher energy prices tend to be more efficient or that their proposed green tax rate increase would be "imperceptible". First, the role of high energy prices in making Japan and Switzerland more efficient economies than the US (if this is still true) begs the question as to how much, if at all, this is due to higher energy prices and whether every economy would benefit from having higher energy prices foisted upon them.

Second, even if it could be proved that "the economy" stood to gain from higher energy prices, this would not hold for many of the economy's most important individual capitalists. In an economic universe of excess capacity and massive downward pressure on costs, energy-dependent big corporations will move heaven and earth to ensure no green tax undermines their global competitive position. As McKinsey consultants Noah Walley and Bradley Whitehead wrote in the *Harvard Business Review*:

While tough environmental standards may yield significant positive results for the economy as a whole, individual companies will actually be battling increasingly complex environmental problems at a much higher cost than before ... Companies are already beginning to question their public commitment to the environment, especially since such costly obligations often come at a time when many companies are undergoing dramatic expense restructurings and layoffs.²¹⁰

The green tax utopians, like the *Factor Four* authors, bedazzled by the *long-run* benefits to the economy that their models often show, forget that competing capitalists operate, and mostly have to operate, in the short run: they cannot sacrifice their concrete immediate interest to the imaginary general good of "the economy".

Thus, it was the Ford Motor Company which in 1990 induced the governor of California to veto a fuel economy incentive system that had already been passed by the state legislature and it was a cabal of the major US manufacturers and energy producers which, in the most expensive lobbying effort ever, successfully squelched Clinton's 1993 proposal for a very mild energy tax. Similarly:

Within the European Union, the proposal for a community-wide carbon-energy tax, designed to be the centre-piece of EU climate policy, was also weakened by excluding energy-intensive industries and making the tax conditional upon the adoption of similar measures by industrial competitors such as Japan and the US. The weakening of the tax is explained by a potent combination of concerns over competitiveness, heightened

amid global recession, and some of the fiercest lobbying ever seen against an EU proposal by the fossil fuel industries.²¹¹

Sometimes targets for green taxes do get determined a bit realistically and the consequences, in the real world of profit-making, speak volumes. For instance:

One of the most innovative tax initiatives to date appeared in the heavily polluted state of Louisiana in 1991. The state government began grading petrochemical and other companies on a scale of 50 to 100, based on their history of compliance with environmental laws, the number of people they employed for the amount of pollution they generated, and related factors. Companies with low scores lost up to half the standard tax deduction for new investment. In the first year, 12 firms agreed to cut toxic emissions enough to lower the state's total by 8.2 per cent. Many of the pollution reduction plans cost the companies more than they earned in tax credits, showing that the fear of a tarnished public image was giving the tax system added kick.²¹²

Despite the modest reduction in total emissions achieved, this tax was so irritating to big business in Louisiana that it campaigned to have it repealed. The tax was removed from the statute book in 1992.

What impact have resource efficiency gains had on total resource depletion and pollution?

The next issue to assess is whether gains in resource efficiency (whether due to green taxes or not) have been offset by an increase in total resource usage or pollution emission.

Telling here is the consistent failure of the advanced industrial countries to meet targets for reducing smog-causing nitrogen oxide emissions. Because nitrogen oxides largely come from cars, rising fuel taxes and increased fuel efficiency have failed to offset the increase in total emissions, which continued to rise from 1988 to 1994, even as sulphur dioxide emissions declined slightly.²¹³ Increased fuel efficiency went into increased overall consumption — in cars constructed (two for every new-born child!) and kilometres driven.

Despite energy efficiency in the advanced industrial world roughly doubling since 1970 world energy production continues to rise inexorably. The World Energy Council (WEC) projects increases in energy demand between 1990 and 2020 of between 30 and 98 per cent, with the 30 per cent figure derived from what it calls its "ecologically driven" scenario.

[This] assumes a very high annual improvement in energy efficiency, a massive transfer of energy-efficient technology to those nations without it, and, consequently a very low increase in energy demand among developing countries over the next 30 years. In addition, this scenario presumes an accelerated switch to natural gas and renewable energy sources.²¹⁴

Clearly, the impact of a 30 per cent increase in energy generation on global warming will depend critically on the rate of uptake of non-traditional renewable energy technologies (solar heating, photovoltaic, wind, geothermal and tidal). This is increasing rapidly, but from a very low base. Less than two per cent of global energy comes from such sources and a detailed study by the WEC projects they will contribute less than four per cent by 2020 if current rates of implementation continue.²¹⁵

In California, the site of many of *Factor Four's* examples of the most imaginative uses of green taxes, energy use overall has *increased* since the early 1980s, even though there has been "modestly decreased electricity use per capita".²¹⁶ A US study of households whose homes were insulated in 1982 found that 49 per cent of them did not use less energy as a result.²¹⁷

The same trend holds for toxics. The latest US EPA report states:

American industry continues to generate more toxic waste each year. In 1995, industrial companies covered by the report generated 35 billion pounds of toxic waste, three per cent more than the previous year and seven per cent more than in 1991. Some 2.2 billion pounds of these toxic chemicals were released into the air, land and water in 1995. Moreover, manufacturers' reliance on deep injection wells to dispose of toxic chemicals — a cheap way of dumping wastes on site which poses potential hazards to underground drinking water supplies — jumped nearly 20 per cent (an additional 24.5 million pounds). Furthermore, according to a 1991 report by the National Academy of Sciences, it is estimated that American business annually produces some 4.5 billion tonnes of hazardous waste, *an amount equal to 48,000 pounds (or 100 pounds daily) of hazardous waste for every man, woman and child in the United States.* (Emphasis added.)²¹⁸

Even 3M Corporation, which with its "Pollution Prevention Pays" (3P) plan is trumpeted as the US pioneer in corporate pollution prevention, while claiming a reduction in pollutants released of 33,000 tonnes a year

between 1975 and 1989, actually increased its total output of pollution because of increases in overall production.²¹⁹

None of this is surprising. Total growth always potentially offsets efficiency gains unless the goal of a green tax is the *definitive elimination* of the pollutant from the environment. While some level of pollution is allowed to enter the environment the intended reduction can always be negated and *the more expansionary the dynamic of the economic system, the greater the likelihood of this result*.

Capitalism is *nothing* if not expansionary. Once existing markets become saturated the rate of return on investment inevitably falls. This dictates permanent creation of new "needs", the unending stimulation of acquisitiveness and planned obsolescence — all driving ongoing expansion of the scale of production and ever-rising resource usage and pollution. Any interruption to this process can only take the form of an economic crisis. So, whatever the gains made at a local level, green taxes face a permanent uphill struggle to keep resource use efficiency growth ahead of total resource use growth.

The *Factor Four* authors are aware of this reality, conceding that "shrinking turnover may repel rather than attract capital that is seeking profitable investment". They reply:

Some of the efficiency gains are indeed achieved by doing away with nonsensical turnover. But that would not in itself mean that capital cannot be interested. After all, it was the business world itself which moved from the old-fashioned obsession with turnover to the lean and profitable firm, recognising that what matters is not the top line (total revenue) but the bottom line (net profit). More important, the better part of the examples [given in the opening chapters of *Factor Four*] are fully compatible with market expansion — to meet the needs of thousands of millions of people under conditions of limited resources.²²⁰

Why?

If global economic growth averages three per cent annually, resource productivity would have to increase at an annual rate above three per cent if we were to win the race. Given the proven potential in many sectors for productivity gains above 300 per cent (which is the percentage meaning of a factor of four), annual increases of 4-5 per cent would not seem an unrealistic hope, and in various times and places have already been achieved ...²²¹

Yet concede, for argument's sake, the *Factor Four* case that there is some nice profit to be made in meeting demand for a new generation of refrigerators embodying energy efficiency gains of at least 300 per cent. But operations for private profit can't stop there. To keep profits flowing, consumers have to be convinced to buy the following generation of energy-efficient refrigerators and for this whole process — involving recycling and scrapping the first generation and installing the next generation — to remain ecologically sustainable the resource efficiency gain has to be large enough to produce declining resource usage and pollution at each round.

At the same time, the more energy-efficient technology becomes, the smaller will be the proportion of energy cost in the total cost, and the less important such cost will be in the consumer's decision to buy.

Moreover, if succeeding generations of refrigerators don't achieve the energy gains necessary to continue reducing their overall impact on energy usage, *they will still have to be sold*. The manufacturers can't abstain from profit-making simply because their rate of resource productivity gain is falling after its initial leap forward. And if the rate of return in refrigerators isn't high enough capital will turn to other product lines, polluting or not and the organised and relentless pressure of the "sales effort" will fight any slackening of consumption.

There is, at the very least, no *prima facie* reason to agree that "progress in efficiency is likely to speed up and ultimately to exceed all potential market expansion for commodities"²²² and to continue to do so, as it must if the "win-win result" of stable profit rates and declining resource use are to go together. This is true even if we concede that there is a logjam of energy and resource efficient prototype products and processes *presently* awaiting a green tax regime to attract trillions of dollars of investment.

There's certainly no evidence for it in trends to date. While we should certainly always be wary of the vice of extrapolation, it's surely significant that since the 1980s oil crisis no gain in energy efficiency has gone into reduced total energy usage. For example, between 1980 and 1994 energy efficiency for the OECD countries, as measured by GDP output per kilogram of oil equivalent, more than doubled — from \$2.4 to \$5.5 — while per capita energy use rose from 4339 to 4503 kilograms over the same period.²²³

In fact, the increase in Japanese energy efficiency between 1980 and 1994 *facilitated* an increase in energy use. Businesses as a whole reacted to increases in oil prices by more than tripling energy efficiency between 1980 and 1994 at the same time as *increasing* commercial energy use from 2972 to 3825 kilograms per capita and with it greenhouse gas emissions. Between 1990 and 1996 these rose by 13 per cent, even as German and UK emissions stabilised. At the same time carbon emissions in developing countries were 44 per cent above 1990 levels and 71 per cent above 1986 levels.²²⁴

Similar trends have emerged in US consumption of cars, houses, plastics in cars, bottles and cans, lead batteries, car tyres and mobile phones.²²⁵ For Western Europe over the past 25 years material and energy efficiency has improved greatly.

Typically, however, these gains have been more than outstripped by absolute increases in consumption. For instance, the efficiency of building services (lighting, heating, cooling equipment) is increasing by about one per cent per year, but the quantity of energy consumed for these purposes is increasing by two per cent per year. The technical efficiency of the car improves by 1 to 1.5 per cent per year, but this is outstripped by growth in travel (2 to 2.5 per cent per year) and the upgrading of vehicle power (0.5 per cent per year). As a result of these types of trends, European energy consumption has increased by 40 per cent since 1970. The extent of built-up land has doubled, and so on.²²⁶

Indeed, taking capitalism since 1900, the only force to date that has been able to stop the exponential growth of materials use and pollution has been *recession*.²²⁷ For example, the catastrophic collapse of the Russian economy between 1990 and 1996 saw carbon emissions simultaneously fall by 30 per cent.

If we look at the history of the industrialisation of nations, it has certainly been true that each newly industrialising economy has been more efficient than its predecessors because of the "leap-frogging" impact of new technology. However, this heightened resource efficiency has *in no case* been reflected in lower rates of resource usage and pollution output for a given rate of growth. Rather the universal pattern is that the newly industrialising capitalist economy exploits the advantage of newer technology to grow more rapidly and with greater overall through-put of natural resources. Such is the experience of the "miracle" economies of South Korea and Taiwan, which made the journey to full industrialisation more quickly — and at greater cost to the environment — than all their predecessors.

Enthusiasts for the new eco-efficient technologies, like the *Factor Four* authors, really can't afford to face these realities. They dream of a wholesale renewal of capital stock involving energy-efficient buildings, closed-loop industrial production and rapidly increasing application of renewable energy, but they can't answer such simple questions as: Could capitalism really survive if it made articles that lasted for 100 years and abandoned its relentless pressure to force up consumption (and/or military spending)? If the obsession with turnover is "nonsensical" why does every capitalist firm persist with it?

The world car industry is a case in point. While at home environmental concerns have compelled the Big Three car producers (Ford, GM and Chrysler) to accept some increases in domestic fuel taxes and they boast about their Supercar project (which is aimed at reaching fuel efficiency of three litres per 100 kilometres and producing half the carbon dioxide as today's models), in Eastern Europe they are behind the push to prune back the region's extensive railway network and build more motorways.

Eastern Europe has become a huge market for second-hand cars from richer Western countries. The car fleet is expanding at an annual rate of 10 per cent and the largest Western investments in the east (including the World Bank's) have gone into car production and highway infrastructure. In 1991 the *Financial Times* celebrated the possibility of the old "communist" world providing a "Potential Market of 420M" cars (there are presently 501 million cars *worldwide*).²²⁸

Hilary F. French describes the global situation for the automobile multinationals:

The major multinational automobile companies, for example, *plagued by saturated markets in the industrial world*, are salivating over the "emerging markets" of Asia, Eastern Europe, and Latin America. Some three quarters of the auto factories projected to be built over the next three years are expected to be in emerging markets. European, Japanese, US and South Korean companies are competing aggressively to build these plants. General Motors recently sank some \$2.2 billion into a "four-plant strategy" to build nearly identical plants simultaneously in Argentina, China, Poland and Thailand. And nine of the world's major automakers — including Ford, General Motors and Mercedes-Benz — have set up shop in India in just the last few years. If these countries develop auto-centric transportation systems along the lines of the US model, the

consequences for local air pollution, climate change and food security will be serious indeed. (Emphasis added.)²²⁹

What green tax regime could conceivably arrest the spread of the ongoing ecological catastrophe that is the motor car, the "commodity that is eating the world", which as a provider of mobility has been compared to "using a chainsaw to cut butter"?²³⁰ Does anyone seriously suggest that the multinational car corporations — overwhelmed with excess capacity and in many cases operating on paper-thin margins — can suspend their century-long push to convert everyone into a car-owner, or their entrenched hostility to public transport, just because our planet is choking to death? At the same time as General Motors talks greenwash at home its cars for the Chinese market will not even have catalytic converters.²³¹

If we take global warming, it's not surprising that eco-tax enthusiasts like the Worldwatch Institute's Christopher Slavin and Seth Dunn can point to only one energy tax regime that has actually reduced carbon emissions. This is the Dutch carbon tax, which has the least exemptions of all existing energy taxes and in 1996 was cutting carbon emissions in that country by two per cent a year.²³² However, even that tax had weaknesses that are touched on later.

Green tax evasion

Like any tax an eco-tax must be enforceable. This was an easy affair, for instance, in the US oil industry where the amount of lead in petrol could be readily monitored. It has been reasonably easy with CFCs, where production of the pollutant is restricted to a small number of companies and outlets. Yet, even while CFC production has practically been eliminated in the advanced industrial world, a thriving black market for Russian-produced CFCs still challenges the policing arrangements established under the 1987 Montreal protocol.

In the case of lead in petrol the trading permit regime that operated among US petrol refineries produced savings to refiners of about \$228 million as they moved to meet Environmental Protection Agency targets for phasing lead out of petrol. However:

Given the success of this market in promoting cost savings over a period in which lead was being produced, it is important to understand why the market was successful. The lead market had two important features, which distinguish it from other markets in environmental credits. The first was that the amount of lead in gasoline could be easily monitored with the existing regulatory apparatus. The second was that the program was implemented after agreement had been reached about basic environmental goals. In particular, there was already widespread agreement that lead was to be phased out in gasoline. This suggests that the success in lead trading may not be easily transferred to other applications in which monitoring is a problem, or environmental goals are poorly defined.²³³

As already noted, successful environmental taxes also depend on the existence of a stable relationship between the tax base and pollution, but relationships that appear stable can become highly unstable once a tax is introduced and the targets look for ways to avoid its impact. For example, a household refuse system in Norway which required householders to get rid of their garbage in special sacks that had to be bought backfired because householders either overfilled the sacks or dumped their refuse illegally. There are also fears that the UK landfill tax will produce an epidemic of uncontrollable "fly-tipping".

The fishing industry provides a particularly stark example of enforcement failure. In 1992 it was estimated that up to 80 per cent of fish sold in New Zealand passed through the black market, evading the permit system. According to a 1993 Greenpeace report on the world tuna industry:

Literally hundreds, if not thousands, of fishing ships operate without any monitoring or control at all. They use flags of convenience to avoid regulations, or change their names to avoid inspection ... The vessels are able to move from ocean to ocean very quickly when necessary, mixing tuna caught in different regions and using different methods. For example, a boat can fill most of its hold with tuna caught in areas where there are no observers and control, and then "launder" its catch by a brief trip to the eastern Pacific, where there are inspectors and controls ... Once the tuna arrives in port, it is further mixed with tuna from other ships, coming from other areas. By this point, buyers have an enormous choice of tuna, caught in different areas by different ships, and reliably identifying where and how the tuna was caught is almost impossible.²³⁴

Where environmental laws are strong on paper but unenforced (the former "communist" countries) or simply weaker (the underdeveloped world) capital will always be tempted to flow out of its existing centres of

operation in search of a better rate of return, typified by the lines of *maquiladora* (assembly) plants on the Mexican side of the super-polluted US-Mexican border.

In the city of Mexicali, near the California border, more than a quarter of the factory operators surveyed in the late 1980s said that Mexico's lax environmental enforcement influenced their decision to be there and a 1995 report found that roughly a quarter of *maquiladora* hazardous waste — some 44 tonnes daily — could not be accounted for, presumably because it is dumped in ditches.²³⁵

While some claim that there is no convincing evidence of large-scale capital flight to "pollution havens" so far,²³⁶ it's clear that in a world economy marked by increasing capital mobility, any tax which cuts into profits past a certain point must drive investment abroad, especially where new plant is concerned.

For example, in its submission in the discussion over the UK landfill tax, the Confederation of British Industry, representing big business, laid great stress on the need to maintain international competitiveness, emphasising as well that the tax should not reduce Britain's "natural advantage" over other European countries in still having land suitable for landfill.²³⁷

In the absence of any ability to enforce uniform green taxes internationally, the degree to which national economies can afford such taxes becomes constrained by the competition from economies with lower (or no) green tax burdens. So those economies that have gone furthest in adopting energy and other green taxes — the Scandinavian countries and the Netherlands — grant exemptions for uses that most affects the cost structures of their major industries, like electricity generation and use (Sweden and Denmark), natural gas use (Norway and Netherlands) and domestic and overseas transport fuels (Finland and Norway). The Danish government is presently demanding that Germany increase its taxes on petroleum and diesel to reduce the temptation on energy-dependent Danish companies to cross over the Danish-German border.²³⁸

Factor Four devotes half a chapter to the issue of green tax evasion, and this inevitably draws attention to the environmental havoc wreaked by unequal exchange between the imperialist centres and the underdeveloped world:

When the Ivory Coast in the two decades following independence sacrificed much of its natural treasures to the production of cash crops and other export commodities, the young nation became a hero of the international banking community. Here was a country "taking off", enjoying a stable currency (linked to the French franc) and a "stable" political climate. Well, soon enough, the party was over. What has remained are skyscrapers, fancy hotels and an élite habituated to Western consumption styles, but otherwise widespread destitution, a devastated natural environment and political instability. Neighbouring Ghana, the current darling of the international financial institutions, is going down the same track. The Solomon Islands, much smaller than Ghana and the Ivory Coast, destroyed their forests at such a rate that even the IMF became nervous and admonished the country to adopt a more cautious pace.²³⁹

Perhaps the World Trade Organisation could calculate annual global externalities associated with each product and have these paid for by those who benefit most from the fact that they are "not reflected in social marginal cost" — the advanced industrial economies? Not if the banana trade is anything to go by. When a European network of NGOs worked with banana producers to reform the European banana-importing regime in favour of bananas produced in a "fair" and sustainable way, the proposal was blocked by the European Commission: such a reform would have been contrary to current WTO rules which forbid discrimination on the basis of the way products have been produced.²⁴⁰ In 1998 the WTO itself ruled against a US law forbidding the importation of shrimp caught without a device protecting endangered sea turtles.²⁴¹

And what about the position of economies that have imposed energy taxes unilaterally? Are they able to impose compensating tariffs on imports produced without energy taxes ("border tax adjustments"), in order to protect themselves from competition? The WTO rules are unclear.²⁴²

None of this is surprising. The basic goal of the WTO is to deregulate international trade in the interests of multinational corporations. To accomplish that goal, all WTO agreements spell out what governments can't do under pain of severe sanction. The only WTO agreement that doesn't take this form is that concerning Intellectual Property Rights (IPR), which *requires* all signatories to pass national legislation entrenching protection of capital's patent rights.²⁴³

Theoretically, it would be possible to create a more stringent global green tax regime if there were world institutions capable of enforcing them. Under such a "green Keynesian" set-up, economies that won "unfair

advantage" through breaking agreed standards would be punished and countries with socially and environmentally benign policies rewarded.

However this global Keynesian "state":

... is in the hands of big capital in general and finance capital in particular. Hence, with the exception of G7's attempts to lower interest rates and stimulate demand in countries with export surpluses (especially Japan), the "global state" follows an anti-Keynesian policy, one that forces individual capitals and whole countries to cut costs, increase efficiency, and lower government spending respectively, without a second thought about the effects of this policy on capital overproduction on a global scale — of the type Karl Marx identified long ago — not to speak of the dangers of bitter trade wars, creative forms of beggar-my-neighbour policies, growing social decay, political instability, and regional trading blocs. Put another way, there is no global parliament to pass minimum wage laws and protective legislation, no World Ministries of Labour or Social Welfare, no World Ministry of Environment, no legitimate power spreading Keynesian economic literacy on an international scale ... The prospects of global regulation today, organised in a truly cooperative spirit, are as poor as those of national regulation during the crisis of the 1890s, namely, zero.²⁴⁴

Such is capitalism today: *a world system of competing national capitalist powers in which the advanced capitalist nations (the "centre") exploit, and distort the development of, the South (the "periphery")*. Within it those countries that are trying to claw their way out of underdevelopment are compelled to undercut each other for the status of preferred raw material suppliers, sub-contractors and assemblers to the big multinational corporations based in the imperialist Triad of the US, Western Europe and Japan.

The world price of a commodity like tropical timber is simply too low (90 per cent of the value of tropical timber accrues to consumer countries) for the burden of even minimal environmental taxes to be endured for very long. In this connection decisions like the 1998 Indonesian government move to cut its export tax on timber from 200 to 30 per cent in the wake of the 1997 Asian economic crisis says more than a dozen essays on ecotaxation.

Who pays?

This issue is directly linked to that of green tax evasion, for if the polluter doesn't pay through evading a green tax, someone else will. The "polluter pays" principle has been on the books of bodies like the OECD and European Commission since 1972, albeit in a watered-down version that basically makes the polluter responsible for pollution produced after the date of adoption of the principle. Yet polluters can often offload some or all of the cost of a green tax onto other parties — consumers, communities or entire countries.

For instance, a \$100-per-ton carbon tax in the US would use up on average 3.7 per cent of the spending budget of the poorest 10 per cent of households, but only 2.3 per cent among the richest 10 per cent.²⁴⁵ A 1991 British study predicted that a \$10 per barrel (seven cents a litre) carbon tax would reduce overall household consumption by 6.5 per cent while cutting the consumption of the poorest 20 per cent of households by 10 per cent.²⁴⁶

The poor also pay environmentally:

The very first pollution trade made under the 1990 Clean Air Act allows plants belonging to the Tennessee Valley Authority (TVA) and Pittsburgh's Duquesne Light to increase their sulphur dioxide emissions. These allowances were bought from Wisconsin Power & Light, which can afford to operate without them. Is it any surprise that in the counties surrounding the TVA plants the minority population is proportionately seven times larger than in Wisconsin? That the percentage of people living in poverty is nearly twice as high?

There are no simple ways to locate the point at which a pollution market can fairly be said to be "properly designed". The Clean Air Act had hardly come into effect when Long Island Lighting sold pollution rights to AMAX Energy of Indianapolis. AMAX passes them along to utilities as incentives to use its high-sulphur coal. The utilities, burning that coal, will send acidic plumes that drift over the Adirondack Mountains, an area the Clean Air Act was specifically intended to protect.²⁴⁷

The 1990 California "feebate" scheme to rebate cars with higher than normal fuel efficiency and impose a fee on less-than-efficient models wouldn't have just caught the Ferraris and Lamborghinis. The biggest impact would have been on working families with no choice but to drive their old Fords to and from work and the supermarket. The same objection holds for the vehicle-miles-of-travel (VMT) fee of three cents a kilometre proposed for Southern California and for road pricing systems that squeeze poorer drivers off the tollways.

The most dramatic recent illustration has been the ability of Britain's private water companies to increase water and sewerage provision costs under the guise of passing on the cost of maintaining and improving watersheds and equipment. Between 1989 and 1995 real price rises averaged 39 per cent for water and 37 per cent for sewerage, with the result that in some areas pensioners and single parents living on social welfare were paying as much as *nine per cent* of their income for these services.²⁴⁸

Champions of such taxes are always quick to point out that some of the revenue gained can always be devoted to compensating those upon whom the cost most falls, but it's difficult to find any examples in the real world. This is not only because it's hard to draw dividing lines between those who are "worse off" and everyone else, it's also because compensation will tend to undermine the environmental purpose of the tax (for instance, to force people to consume less energy).

Clearly, green taxes, like their traditional cousins, inevitably reflect or intensify the inequalities of the economies within which they are applied. If the 1994 UK proposal of an eight per cent hike in value-added tax on domestic fuel had not been defeated by the political outcry, some seven million households — Britain has the worst-insulated housing stock in Europe — wouldn't have been able to afford to keep warm in winter.

In Alaska a tradeable permits system that was designed to restrict the depletion of haddock soon drove the smaller fishers, including those Indians for whom haddock fishing provided subsistence, out of business and into a sub-contractor status for the large fishing companies.²⁴⁹

It's also hard to avoid the conclusion that some green taxes are directly designed by central governments to undermine the ability of local (and often more radical) authorities to implement their program. As applied by the Tory government of John Major the UK landfill tax fits squarely into this category. It was estimated to have cost local councils £150 million in 1997-8, with only £30 of this being recycled as cuts to employment and social security charges.

In the South green taxes deepen class divides even more. The majority of water permits issued under a Chilean scheme ended up in the hands of the rich farmers. Little wonder that at the sixth session of the Commission on Sustainable Development in early 1998:

There was a spirited exchange of views on the desirability of full-cost pricing of water. Some participants stressed that water was primarily a social good and that full-cost pricing would be socially inequitable, particularly in developing countries. Others emphasised that movement towards full-cost pricing, with provisions for meeting basic needs, was an essential mechanism to promote the efficient use of limited water supplies and to mobilise resources to finance the extension of drinking water and sanitation infrastructure.²⁵⁰

Moves to remove environmentally damaging subsidies can also, if regarded as the sole or even main treatment for resource depletion or pollution, undermine the position of the poorer producers. For example, in many Third World countries irrigation is typically supplied free-of-charge or at a very low fee, a procedure that promotes water wastage on a huge scale. However, moving to full cost pricing would ruin many producers.

Already, where water markets exist, double exploitation of the resource *and* the poorest users can result.

In India's southern state of Tamil Nadu, well-owners pump groundwater, sometimes with the benefit of subsidised electricity, and sell it to intermediaries who in turn sell it to poor households lacking a piped water supply. The poor thus gain access to water, but may pay as much as 10 times more for it than wealthier households connected to the public water system.²⁵¹

The international trade in toxic waste provides graphic confirmation of the devastating results of green tax evasion. The advanced capitalist world produces 90 per cent of the world's annual output of 400 million tonnes of hazardous waste. It is almost impossible to keep track of these wastes but experts reckon that at least 30 million tonnes cross national borders, with a high percentage going to poorer countries. *As green taxes on these wastes have climbed in countries like the US (up to about \$250 a ton), African countries have been willing to accept shipments for as low as \$2.50 a ton in order to get their hands on foreign exchange.*²⁵²

Just as damning is the ability of Dutch environment policy, regarded as the most advanced in Europe, to operate by exporting its burden of pollution:

The emission of various polluting substances has decreased during the past few years although economic growth has continuously increased. The most important exceptions, however, are carbon dioxide emissions, mainly from growing transport intensity, and waste. These failures of policy are obvious.

What is hidden and therefore not discussed within Dutch society is that during the ten years between 1985 and 1995, the use of primary (newly produced) metals increased very substantially with a range of environmental impacts in the Netherlands and abroad, particularly in developing countries ... So within the Netherlands the environment may be cleaner, with some important exceptions, but the total Dutch environmental burden on the planet is increasing. Gains in pollution control are being overtaken by volume growth, mainly associated with resource and land consumption.²⁵³

What happens to a global eco-tax proposal that *would* be fair? Consider the eminently just scheme of Indian environmentalists Anil Agarwal and Sunita Narain made at Rio — to base the initial allocation of tradeable permits in greenhouse gases on the basis of population.²⁵⁴ India and China would then get the lion's share and the advanced industrial economies, responsible for 75 per cent of emissions, would have to purchase a lot of permits from the South, settling some of the ecological debt accrued through a century of carbon dioxide generation. The wealth transfer to the South could be anywhere between \$480 billion and \$1 trillion, depending on the tax model adopted — equitable but an idle fantasy in today's world.

Would green taxes raise sufficient income to fund needed environment budgets?

Green tax economists engage in permanent debate about the "power" of a tax needed to achieve a given cut in resource use or pollution. Yet there is general agreement on one issue — these taxes should be made "revenue-neutral" by introducing offsetting cuts in taxes on wages, profits and employers' social security contributions.

However, if the overall tax take remains unaltered then the introduction of green taxes leaves unaddressed a central reason for the ongoing environmental crisis — *the totally inadequate level of government expenditure on environmental clean-up and protection*. Moreover, inasmuch as the taxes are successful in reducing pollution and resource depletion they will supply less and less funds to the treasury (and, potentially, to the environment budget). Everything will then depend on whether green taxes have pushed private industry toward non-polluting and resource-efficient technologies on a sufficiently large scale.

The heart of the problem is that there is no unambiguous "double dividend" of sufficient size to be had from the imposition of a green tax. A tax that works effectively against pollution will put less revenue in the coffers (as with the Swedish sulphur tax²⁵⁵) and a green tax that can be a stable source of income (and hence potentially replace other, less "efficient", taxes) won't be effective enough against pollution. Such is the case with a carbon tax, which, according to some models, could in theory collect up to 10 per cent of world product²⁵⁶ before cutting back carbon dioxide emissions fast enough to forestall global warming.

Thus, one edge of the "double-edged sword" of ecotaxation is always blunter than the other. Paul Ekins summarises the experience of the Nordic countries with carbon taxes:

Tax rates have tended to be increased and some new taxes have been introduced, especially by Denmark. *It is hard to know how environmentally effective the taxes have been*. Where the tax rates have been increased, but the revenues have not by the same amount, it is possible that the taxes' incentive effects are working — for instance, lubrication oil in Norway. Similarly, where revenues have increased more than taxes, then the incentive effect would appear to be weak — for instance, air pollution in France. (Emphasis added.)²⁵⁷

The OECD itself has admitted that the shift to ecotaxation may be useful cover for pursuing other taxation objectives. It says of Swedish environmental taxes:

It seems fair to say that, without the opportunity offered by the need felt to reduce income taxes, while keeping the total volume intact, environmental taxes would not have been introduced to the extent that is now the case.²⁵⁸

According to David Malin Roodman "more fully taxing pollution could raise more than \$1 trillion worldwide, which could be used to cut taxes on wages and profits by up to 15 per cent".²⁵⁹ Yet this \$1 trillion income, even if politically achievable, would not necessarily be accompanied by a sufficiently rapid reduction in pollution nor lead to any increase in public expenditure on environmental conversion and clean-up.

The *Factor Four* authors don't address these issues. In their book, "government" is synonymous with bureaucracy, inertia and high-cost solutions. The unaddressed assumption is that once correctly designed green taxes have been set in place those "hundreds of businesspeople snooping around for bonanza opportunities" will be sufficient to reverse the spiral of environmental degradation and introduce a virtuous circle of competition in green products and production methods.

Even on the extremely hopeful assumption that the present lobby of polluters wouldn't have the political clout to stop the introduction of a revenue-neutral green tax of the scope required, the adequacy of the total tax take for the job of, say, helping fund renewable energy conversion is never seriously addressed.

However, it's been clear, at least since Rio, that seriously getting to grips with environmental degradation demands massive expenditure on clean-up, technology conversion and improving resource efficiency well beyond the scope of any green tax system.

Whenever environmentalists, economists and the odd concerned politician seriously address the issue the analogies are always of World War II efforts, the Marshall Plan, the Manhattan Project and the Apollo space programs — massive emergency mobilisations of government funds to beat a powerful and menacing enemy.²⁶⁰

Not surprisingly, one of the loudest laments of Earth Summit +5 was that the funds that Agenda 21 outlined as necessary to fund its (inadequate) program — \$561.1 billion a year including 0.7 per cent of GDP from the advanced industrial countries — are nowhere to be found: indeed since Rio official aid from the advanced industrial countries to the South has *fallen*, from 0.32 to 0.27 per cent of GDP (\$59 billion in 1995).²⁶¹

Even if this 0.7 per cent were forthcoming, it would return to the South only a fraction of what it loses each year to the North in repayments on its accumulated debt burden and the expatriation of the assets of its ruling elites. Between 1982 and 1990, in debt service alone, the advanced capitalist economies received \$418 billion more from the Third World than the Third World received in aid.

Again, the clean-up cost of a *regional* environmental disaster like the US-Mexican border is reckoned at \$8 billion, but the North American Development Bank, set up under the North American Free Trade Agreement (NAFTA) to fund such projects, started with a total capital of \$112 million.²⁶²

On a national scale the Dutch National Environmental Policy Plan is along with Denmark's and Switzerland's Energy 2000 plans the most advanced in the world, but still aims to cut greenhouse gas emissions by only five per cent by 2000. To achieve this goal annual subsidies to public transportation were recently raised to \$5.7 *billion* (1.6 per cent of GDP) and fully ten per cent of the surface transportation budget goes to bicycle facilities. Natural gas and renewable energy use are to be increased and the energy efficiency of buildings and appliances improved. (Petrol and cars are already heavily taxed.)²⁶³ To implement the still inadequate Dutch plan would require total government spending on the environment to rise to three or four per cent of GDP. (For the OECD countries spending on environmental protection typically runs at between 1.5 and 2 per cent of GDP, with Australia at a shameful 0.8 per cent.)²⁶⁴

In 1971 Barry Commoner estimated that the cost of converting ecologically faulty technology along ecologically sound lines would require that "most of the nation's resources for investment would need to be engaged in the task of ecological reconstruction for at least a generation".²⁶⁵ Spanish environmentalist Joaquín Araujo more recently confirmed the order of magnitude of Commoner's estimate. Spending needed to make serious and rapid inroads into agricultural and industrial recycling, conversion to solar and other renewables, water conservation, reforestation, shifting to ecologically sound agriculture and expanding public transport would have to run at 15 per cent of GDP a year, between 75 and 100 per cent of total investment spending for an average OECD country.²⁶⁶ In terms of global production we are talking of sums in the order of \$4-5 trillion — four to five times Roodman's figure of potential global green tax revenue.

How are green taxes that are acceptable to business even remotely likely to bring such sums into being, especially when national economies are engaged in a "race to the bottom" in company tax rates? The tax rates needed would be so steep as to reproduce on a global scale the quandary of the US petroleum industry for which full compliance with the Clean Air Act would have cost refineries \$37 billion, *\$6 billion more than the book value of the entire industry*.²⁶⁷

Those who have approached such issues as global warming in precisely the opposite direction as the *Factor Four* authors — *first* calculating the cost of reversing trends and *then* the tax rate implied — reach the same sort of conclusion. For instance, Thomas Schelling writes of the economics of global warming:

A carbon tax sufficient to make a big dent in the greenhouse problem would have to be roughly equivalent at least to a dollar per gallon motor fuel, and for the United States alone such a tax on coal, petroleum and natural gas would currently yield close to half a trillion dollars per year in revenue. No greenhouse taxing agency is going to collect a trillion dollars per year in revenue; and no treaty requiring the United States to

levy internal carbon taxation, keeping the proceeds, would be ratified by the Senate. Reduce the tax by an order of magnitude and it becomes imaginable, but then it becomes trivial as greenhouse policy.

Schelling who, as far as one can judge, is no friend of "big government", concludes that the only feasible plan of attack on greenhouse is a repeat of the Marshall Plan for European reconstruction after the Second World War. This involved expenditure of around 1.5 per cent of US GDP and five per cent of European GDP in its first year alone.²⁶⁸

Competition and discount rates

It's obvious that capitalism is an economy made up of competing capitalists, for whom green taxes will, depending on their cost structure, be more or less tolerable. Any specific green tax proposal will always tend to create winners and losers among them. Is it possible, through some carefully designed green tax regime, to harmonise competing and conflicting interests? The *Factor Four* authors look at office building stock, "a system of incentives and institutional structures to make buildings use about ten times as much energy as they should do, be less healthful and comfortable than they should be, and cost more to build than they should do".²⁶⁹

Yet they claim that it is possible, by paying designers and architects on the basis of energy saved rather than a percentage of total building cost, to produce integrated resource-efficient design. However:

Even if we solve all those problems, we'll still have more than 20 other parties to the building process who still have their own perverse incentives. Any of these parties can be a show-stopper. Thus, making markets work properly to produce cost-effective buildings is an unusually complex institutional problem requiring sustained and concentrated attention by practitioners, their professional societies, their regulators, other public-policy bodies and other market actors.²⁷⁰

Thus regulators testing whether buildings are actually meeting designed energy-efficiency projections will clash with builders under pressures to cut corners (and who may have "gone out of business" by the time any failure to meet standards is established). Financiers whose need for a quick return on investment predisposes them to install lower-cost, less energy efficient equipment will conflict with future lessees who demand an environment in which "their" workers can work more efficiently.

The reality the *Factor Four* authors never quite address is that to get capitalists to invest in a particular project the rate of return can't deviate too much from some industry standard "hurdle rate" (say 15 per cent) without the shareholders getting restless. Yet to operate different industrial activities in an environmentally benign way, that is, one that takes account of the differing rhythms of various ecological cycles, *requires* that the rate of return be able to vary. (Of course, a planned economy pursuing environmental objectives can allow for this, even to the point of fully subsidising some activities, like public transport.)

Trying to strongarm the "market" into operating in the interest of the environment also presents particular difficulty when assessing which discount rate to use in evaluating competing investment projects.²⁷¹ The way discount rates are typically set disadvantages renewable technologies because these more often than not have a high initial capital cost and low running costs whereas fossil fuel based systems have a lower initial capital cost and high running costs. One study made for Western Australia's Renewable Energy Advisory Council showed how sensitive the cost of power generated by a solar electric power station was to the discount rate adopted. A 4 per cent discount rate yielded a power cost of 12.3 cents a kilowatt-hour; 8 per cent gave 17.1 cents a kilowatt-hour; 15 per cent gave 26.8 cents; and at 30 per cent it reached 49.7 cents.²⁷²

The pressure for an acceptable rate of return on capital invested, internalised in the discount rates most typically used — by capitalist governments as well as private firms — thus tips the "playing field" against environmentally sustainable investments that will benefit future generations. In the words of US economist Shimon Awerbuch:

For such long-lived benefit streams, the application of the private discount rate may incorrectly allocate resources since this rate is based on the time preferences of *individual, finite-lived, investors*. But society ... continues in perpetuity. This suggests the need to derive a discount rate for projects with long-lived benefit streams, which reflect society's time preferences.²⁷³

It follows that for a company which has sunk billions of dollars in a polluting technology and may even have covered the costs of the investment, it will be "rational" to continue using this capital stock and to suppress, if possible, new technology altogether and to lobby governments not to favour its development. This, in a nutshell, is the story of the very slow uptake of solar thermal and photovoltaic energy, which still receives far

less in US federal subsidies than nuclear fusion.²⁷⁴ It is also why it was "rational" — it maximised "net present value" — for whaling companies to hunt the species to near extinction.

For the economy as a whole, it is simply not possible under generalised market production to derive a "social" discount rate that would guide the rate of resource depletion towards some presumed "optimum". The very concept of "society's time preferences" implies some *social decision* that reflects the best possible compromise between the competing demands of environmental health and development. Such a decision can only be reached in a social context where *all the most important economic decisions are made socially* — rather than via the monetary policies imposed by the central banks of competing capitalist economies.

Can 'social marginal cost' be established?

As we have already seen, the entire wisdom of environmental economics consists in saying that some environmental impacts and services fall outside the influence of markets or are only partially reflected in them. Hence more resource depletion and pollution take place than would occur if markets fully captured costs. The solution lies in making users of underpriced or free "environmental services" pay their "true value".

This can be achieved in two ways. Firstly, by creating markets where none exist (for example, by selling rights to fish, withdraw water or to emit sulphur dioxide). This is the most "natural" process for the market, for it allows buying, selling and profit-making to continue with minimal government interference. Trade in what was once plentiful generates business in formerly free goods, like pure water or the bottled fresh air on offer in Mexico City.

The second approach is to estimate the values of "environmental services" through a range of valuation techniques so that they can be taken into account in decision-making. In this way "external effects" can be "internalised". However, since "environmental services" cannot, in general, be bought and sold, only artificial (proxy) prices can be established. As already established, any tax rates set on this basis are at best using remote substitutes for prices.

In both cases the expansion of the market (even in theory) implies not only the inclusion within it of inputs and products that once stood outside it, but the extension of the *principle* of monetary valuation to elements of nature that stood outside the market system. For example, agricultural genetic resources and the function of forests as carbon dioxide sinks have stood outside the market and been socially very valuable but lacked any market valuation.

The valuation techniques of environmental economics are sometimes useful in those cases where costs and benefits are clearly delineated and in exposing the *general magnitude* of damage done to the environment and "free gifts" provided by it. Such was the case when an extensive Australian survey revealed that the environmental value to the Australian people of the country's magnificent Kakadu National Park was many times greater than any conceivable revenue from mining in the region. However, the more intangible and pervasive the "externality" under consideration the larger the margin of error in the various valuation techniques used and more random and arbitrary any final figure settled upon.

For one thing, the typical valuation techniques used by conventional environmental economics (such as surveys of a target group's "willingness to pay" or "willingness to accept payment" to preserve, say, wilderness from development) are totally sensitive to whom the "target group" is. Valuation becomes critically dependent upon such factors as the income of those surveyed, the discount rate applied to the consumption of future generations (who cannot participate in the evaluation process), the value of past transfers made and damage done before a market existed and the actual state of scientific, especially ecological, knowledge.

How, for example, to set a price on such an "externality" as the damage done by global sulphur dioxide and carbon dioxide emissions since the industrial revolution? How to establish a net value for plutonium (whose military "benefit" was, incidentally, included in the cost-benefit analyses of the first British nuclear reactors) when it will last for hundreds of generations? What is the annual value of "environmental services" supplied to humanity every year by the Amazon? What is the value of a life?

Take, indeed, life itself: it is literally worth less in the Third World. The 1989 decision of the Supreme Court of India on compensation for the damage caused by the accident at Union Carbide's pesticide plant at Bhopal, with thousands of dead and wounded, was calmly accepted by the international environmental bureaucracy. The appeal against the decision, on the grounds that the compensation proposed was very low, posed the

question of the degree to which the evaluation of externalities depends on geography and social class. For the compensation paid was less than for the 1989 *Exxon Valdez* disaster in which there was no loss of human life. In the words of Spanish ecologist Joan Martínez-Alier:

Union Carbide would have been ruined by the damages and compensation it would have had to pay if the Bhopal accident had occurred in a North Atlantic country or if the case had been heard in the United States and if the court had used ... North Atlantic value scales for human life.²⁷⁵

By the same token, the poor sell the environment cheap. Martínez-Alier cites the example of Costa Rica's National Institute for Biodiversity (INBio), which has an agreement with the multinational pharmaceutical company Merck to sell genetic resources (plants, insects and micro-organisms) from that country's native forests. He comments:

Of course, the agreement implies recognition of Costa Rican sovereignty over the country's genetic (in this case forest) resources, but on the other hand the agreement does not guarantee that traditional ecological knowledge and the conservation of biodiversity will of themselves be able to compete with other, more profitable, forms of land use. The agreement (whose exact terms are secret) envisages that Merck will pay something more than one million dollars over two years in exchange for exclusive rights to information on samples of chemical extracts prepared by INBio from a large protected area in Costa Rica, and that there should be a royalty payment based on the profits of any commercial products Merck might develop. Unless there are other, more expensive, forms of conservation, legal regulation and a forestry police presence paid for by the Costa Rican authorities, as well as some interest on the part of the local population in conservation, then the small financial incentive paid by Merck will be insufficient to stop deforestation and genetic erosion.²⁷⁶

Here is the real meaning of the notorious 1992 circular "Between You and Me", issued by Lawrence Summers (now US Treasury Secretary) when he was chief economist at the World Bank and in which he suggested that the World Bank should be encouraging more migration of polluting industries to the Third World. Given his assumptions, Summers' conclusions were entirely correct. First, if the costs of pollution are measured by loss of earnings through death and injury, then "I think the logic behind dumping a load of toxic waste in the lowest-wage country is impeccable and we should face up to that". Second, the costs of pollution rise disproportionately as it grows, so "underpopulated countries in Africa are vastly underpolluted, their air quality is probably vastly inefficiently low [in pollutants] compared to Los Angeles or Mexico City". Lastly, since people value a clean environment more as their incomes rise, it is surely more efficient to avoid dumping carcinogens "in a country where people survive to get prostate cancer than in a country where under-five mortality is 200 per thousand".²⁷⁷

The core of the problem lies not in Summers' argumentation but the fundamental postulate that a price label can be attached to environmental "goods" as if to any other commodity. However, abandon the assumptions and it becomes clear, again in the words of Martínez-Alier, that:

Conventional environmental economics ... is useless as an instrument of environmental management, because the concept of "externalities" merely hides the inability to put a value on social costs that are shifted to other social groupings or to future generations.²⁷⁸

Whatever externalities can be reasonably valued are "awash in a sea of externalities that defy valuation".

Here we reach the fundamental reason why ecotaxation fails. It is based on countering *only one* of the main anti-environmental features of capitalism (its tendency to use the environment as a free good or a sewer). But orthodox environmental economics is blind to the three other tendencies inherent in capitalist production that are inimical to the environment — its tendency to make the only lasting connection between things the "cash nexus", its structuring as a network of separate firms whose own individual "rational" economic behaviour may conflict with overall rationality at the social and environmental level, and its irrepressible growth dynamic.

A drop in the (polluted) ocean

A dispassionate look at green taxes tells us that the best they can achieve is the same impact as some regulatory "command-and-control" measure, but at less expense. In the rare event that the polluter is exposed to sufficient competition, some of the cost-savings *may* be passed on to consumers. And they might, provided there is sufficient pressure on industry, allow for a greater reduction in pollution for a given anti-pollution

budget and increase the chance that any targets (if they exist) will be reached.²⁷⁹ *But, as we have seen, this is as nothing compared to the treatment needed if we are to make inroads into the crisis.*

David Malin Roodman acknowledges:

Tax and permit systems are promising medicine, but are neither cure-alls nor free of side effects. Drivers will not respond to a gasoline tax by driving less, for example, unless good zoning laws and mass transit systems provide them with alternative means of getting to shopping and work. And pensioners living on fixed incomes, who lack the funds to invest in energy conservation, could have their living standards diminished by higher oil or electricity prices.²⁸⁰

Roodman is actually conceding a lot more than may be immediately apparent. For if "drivers" won't drive less in response to an energy tax unless there are attractive and competitive public transport systems then the present pattern of rising global nitrogen oxides emissions is *simply set to continue*, particularly as car-centred transportation spreads to the newly industrialising world.

Green tax supporters like to point to the success of taxes and emission quotas applied under the Montreal Protocol against CFCs²⁸¹ as an example of what they can achieve. However, they only played a bit part in a story that is full of instructive lessons.

First, there was the inevitable ten-year phase in which the main manufacturers of CFCs, DuPont and Imperial Chemical Industries (ICI), denied that there was any connection between their product and ozone depletion, spending large sums on greenwash, attempting to discredit ozone scientists and suspending all research into CFC alternatives.²⁸²

Next, the phasing out of CFCs was facilitated by transition to a substitute technology developed by the chemical industry itself — hydrochlorofluorocarbons (HCFCs) which still contain chlorine, still damage the ozone layer and are also greenhouse gases.

Further, while global CFC production is down by 76 per cent from its 1988 peak, black market CFCs are still being produced in Russia (which failed to meet its 1996 reduction target) and other cash-desperate countries, developing countries' consumption of CFCs and halons has risen by a third from 1986, and the fund to finance the phasing out of their CFC production stands at only \$455 million, well short of the \$5 billion needed, according to one informed estimate.²⁸³

Finally, the undoubted gains on the ozone front haven't changed the fact that full recovery of the ozone layer isn't expected until 2050, and that in the intervening years ozone loss will actually increase over populated and agriculturally abundant areas. Nor is a "final solution" guaranteed. Industrialising countries do not have to phase out CFCs until 2010 and their rate of consumption is increasing. Moreover, evidence is now emerging that the increased levels of radiation passing through the ozone holes may be damaging the DNA of plants and animals and affecting the entire food chain.²⁸⁴

Even this very partial success has been an exception to the rule. As we have seen green tax *proposals* typically fall between two stools, being too low to make sufficient inroads into, say, carbon dioxide emissions and too high to be acceptable to business (and, in some cases, the mass of ordinary people).²⁸⁵

The green tax that typically *gets implemented* after the "stakeholders" have had their say leaves business with the space to improve its operations at its own pace and to pass any extra costs onto its consumers, while having a minor effect on pollution and resource usage. But taxes that are sufficiently powerful to cut back pollution or resource depletion, not a nightmare to monitor and administer, not destructive of competitiveness, not too unsaleable politically, not easy to evade and able to generate sufficiently broad support are rare indeed.

That's because the eco-tax treatment is based on a false diagnosis of the disease. The problem for the global environment today is not so much that sustainable production methods and technology don't carry with them "competitive advantage" for private business that might convert to them under the pressure of green taxes. As is obvious from the hunt for new market opportunities there are already niche markets for "clean, green" production, especially across the advanced capitalist world. *However, unsustainable production methods, dangerous and polluting product, cheap labour and oppressive working conditions are immensely more profitable.* Comparative advantage in the vast majority of production is still to be gained in the way first noted by Karl Marx:

Capitalist production ... only develops the techniques and the degree of combination of the social process of production by simultaneously undermining the original sources of all wealth — the soil and the worker.²⁸⁶

The core contradiction between capitalism and the environment is not that capitalists *in general* treat the environment as a free good and as a sewer but that it *gives the biggest reward* to those who *most* treat it in this way. They're the most successful "profit maximisers", the best exploiters of those "factors of production", labour and nature, and hence the best placed to expand and devour the competition. The history of any successful multinational, say Rio Tinto, provides ample confirmation.

That's why some 230 special processing and export zones, notorious for pollution and low wages, are in operation around the world in around 70 countries and employ about 44 million workers.²⁸⁷ Against them we can set only one major industrial zone operating on the principles of sustainable industrial ecology — Kalundborg in Denmark. It's also why hundreds of new chemicals come onto the market each year before any testing of their long-term effects has been done or is even possible.

Yes, Iceland is planning to convert totally to renewable energy by 2020, Denmark aims to have half its energy needs supplied by wind within a decade, and aspiring "energy Microsofts" are sniffing for profits in fuel cells, wind turbines and photovoltaics.²⁸⁸ But so overwhelming and immediate is the global climate crisis that leading climate scientists are demanding an effort equivalent to spending on the Cold War arms race *now*.²⁸⁹

This urgent environmental imperative clashes directly with capital's two most pressing needs — to wring whatever profit it can from existing plant and equipment, polluting or not, and to defend the source of its next wave of superprofits — the technological rents from new products, processes and knowledge — many of which are also far from being "clean and green".

On this last issue, we recall that the "intellectual property rights" (IPR) in biotechnology of the agribusiness multinationals like Cargill Seeds provoked violent discussion at Rio,²⁹⁰ with the US rejecting any idea that environmentally sustainable technologies should be made available at anything other than commercial rates. The Uruguay Round of the General Agreement on Tariffs and Trade tightened its IPR clauses by granting current patent holders, usually multinational companies, virtual monopoly rights on biotechnology. As already noted, WTO members are obliged to pass national legislation protecting the rights of IPR holders, in the vast majority of cases the multinational firms which account for most of the world's research and development spending.

Today all the major statements from the Commission for Sustainable Development reaffirm the sanctity of IPR and agree with the World Business Council for Sustainable Development that "the protection of the patent rights of the developer is essential" even as they stress the need for an increased rate of transfer of environmentally benign technology to the developing world. But the assessment at Rio +5 was:

Although no concrete data are available, there is overall recognition that the level of technology and technology-related investments from public and private sources in developed countries directed towards developing countries has not, in general, been realised as envisaged at UNCED [United Nations Conference on Environment and Development].²⁹¹

What, then, does all this mean for the *Factor Four* authors' central argument (sufficient green taxes at the micro-level will produce macro-level sustainability)?

The heart of the matter is that *there is no sovereign regulating institution* within capitalism that can guarantee that any resource efficiency increases will go into *reducing* overall resource use and waste, when competition drives the system in the opposite direction. If the capitalists could control their competition and agree on a parcelling out of the profits, then green taxes would certainly have a better chance of working. But then capitalism wouldn't be capitalism.

Therefore, because the end result of increased efficiency is at best *indeterminate*, there is no way that the *Factor Four* authors' exercise of plugging a two or four per cent efficiency increase into a macroeconomic model can yield any reliable predictions whatsoever. The façade of science conceals a method that is little more than chicanery.

None of this means that green taxes (or, preferably, taxing the polluters and removing their subsidies) don't have some role to play in the struggle against environmental degradation. But the central role they are given in environmental reformism (and the economic programs of many Green parties) strengthens a dangerous and

irrational illusion — that our systemic environmental crisis will yield to technocratic fiddling often based on misleadingly precise valuations of "externalities".

Some environmentalists argue — given continuing business suspicion of green taxes — that they present environmentalism with a useful opportunity to "make the polluter pay". Yet, while the position to adopt on any given green tax proposal will always involve a concrete case-by-case assessment of costs and benefits, ecotaxation as a general approach still leaves the greatest decision-making power over environmental quality in the hands of those with the greatest economic power.

Confronted with green taxes, corporation boards, not workers, citizens or environmentalists, decide on whether to pollute or clean up. And, to the degree that the market, "corrected" by a green tax, is viewed as the main instrument for winning sustainability, the whole issue of the environment becomes depoliticised. Environmental protest, action and debate take a back seat as existing social relations and the fundamental legitimacy of the market are reconfirmed.

At bottom, ecology and economy are incommensurable. In the words of ecological economist William Kapp:

Giving monetary values and applying a discount rate (which one?) to future utilities and disutilities in order to express their capitalised present value, may give us a precise monetary calculation, *but it doesn't rescue us from the dilemma of choice nor from the fact that we are taking risks with human health and survival.* For this reason, I am inclined to think that the attempt to measure social costs and benefits simply in monetary or market terms is doomed to failure. Social costs and benefits have to be considered as an extra-market phenomenon; they bring pain or gain to society as a whole; they are heterogeneous and cannot be quantitatively compared to each other and to others, not even in principle.²⁹²

This truth is the reflection in theory of the fundamental incompatibility between the laws of reproduction of the biosphere and the expansionary dynamic of capitalism itself. The longer capitalism lasts, the greater its ruinous impact on the environment, the greater the number and size of the "externalities" which its instruments of technocratic, managerial environmentalism will be called upon to solve, and the greater the gap between disease and treatment will become. In the words of Jorge Riechmann, "entrusting the ecological fate of our planet to market forces amounts to a collective suicide".²⁹³

Lastly, if we look at those polluting industries that have effectively been eliminated, green taxes have had nothing to do with the matter. DDT was eliminated in the US by being banned. And the US nuclear power industry has been stalled because environmental concern over the horrendous associated hazards escalated its costs by as much as tenfold. One example was the Shoreham, Long Island, nuclear power plant. The original cost estimate of \$503 million had become \$5.3 billion on completion, and it never saw service because of the impossibility of evacuating the nearby population in case of a serious accident. And, as for lead in petrol:

Hidden in the otherwise dismal data on air-pollution emission trends, we can find concrete evidence that the strategy of prevention can actually achieve [an] astounding result. In 1970 US vehicular transportation emitted 180,000 tonnes of lead into the air; by 1994 emissions had decreased by 99 per cent, to 1600 tonnes. This was achieved while vehicular transportation — a major economic activity — increased by 50 per cent, as measured by fuel consumption ... This too-rare miracle was accomplished by a well-known industrial practice: the technology of production was altered, albeit at the behest of the government.²⁹⁴

In such cases the problem was solved not through the roundabout application of green taxes of dubious impact, but by going straight to the source of the environmental problem — and getting rid of it. And that is the only approach that will turn the tide of environmental destruction.

Can socialism do better?

The argument so far confirms that capitalism will continue to have a very difficult time proving that it has the answers to our environment crisis. But is the socialist case any more credible? Why isn't the deadly environmental record of the departed and departing "state socialism" of the former Soviet Union, Eastern Europe and China proof that socialism's environmental crisis is just as systemic and inevitable as capitalism's?²⁹⁵ Why should we give any credence to the socialist claim that only economic planning resting on socialist democracy can hope to save the environment?

The most environmentally damning feature of bureaucratically planned economies was their general inefficiency compared to the advanced capitalist West. As a result their products carried an "ecological rucksack" many times heavier than that of their Western equivalents. The fact, too, that these economies were "resource-constrained" — that is, produced to capacity and piled up huge stocks of inputs and final products

"just in case" — has led many economists to theorise that planned economy must sooner or later become an obstacle to further productivity growth. Therefore, planned economy must necessarily block any possibility of sustainable development.

This theorem overlooks the fact that the wellsprings of productivity growth are a *combination* of three elements: the stage of development of science and technology, the extent to which these are applied to production and the degree to which the mass of working people are *engaged and interested in* making this evolving economic apparatus work to its potential.

In addition, Marxists like Harry Bravermann and environmentalists like Barry Commoner long ago pointed out that the nature and pace of technology development is no class-neutral *datum* — something automatically brought into life by the state of scientific knowledge. It is constrained by the basic imperatives of the prevailing economic system, under capitalism being typically moulded by the need to control the labour process and produce the class of output that will yield highest unit profit.

Technological development is also determined by how much is spent on it. For example, capitalist technology development is greatly shaped by the fact that state research and development budgets for environmentally benign technology are either stagnant or falling while two-thirds of the world's scientists are doing work for the military. The internal research of the corporations is driven by the need to find products that will produce monopoly superprofits (like grains that last one season or crops that depend on being drenched in one particular company's pesticide).

Nor does "planning" exist in a social vacuum. Only through the participation and full empowerment of an environmentally aware people can a planned economy realise its potential as a healer of past environmental wounds and provide a framework for sustainability. Remove the vital ingredient of democracy and decisions on all the vital issues of technology and development become the domain of an unaccountable bureaucracy and mass alienation rapidly takes root. Such was the socio-economic lesson of the Soviet "stagnation period" (1969-89). By contrast — and this has been the formative experience for many environmentalists over the past decade — the methods of capitalist eco-reformism can bring better results.

The failure of the planned economies of Eastern Europe to go over from the "extensive" development model of the early Five Year Plans to an efficient "intensive" economy — the precondition for attacking the burgeoning environmental crisis — was due to the alienation of the workers, the conservatism of economic managers, the excessively low wage (which encouraged the flogging of old polluting machinery instead of investment in new) and the *non-application* of developments in science and technology, in turn mostly due to bureaucratic fear of failure.

It was also due to the triumph under Stalinism of the following view of socialist construction, which trampled Soviet ecological thinking (the most advanced in the world during the 1920s) under foot:

Let the fragile green breast of Siberia be dressed in the cement armour of cities, armed with the stone muzzles of factory chimneys, and girded with iron belts of railroads. Let the taiga be burned and felled, let the steppes be trampled ... Only in cement and iron can the fraternal union of all peoples, the iron brotherhood of all mankind, be forged.²⁹⁶

All this goes to show that the environmental crisis in the former Soviet Union and Eastern Europe was *not* due to the *intrinsic* features of a society in transition to socialism — social ownership of the major means of production and economic planning. Rather, the Stalinist counterrevolution that began in the late 1920s meant that planned, socialised economy was blocked from working to anything like its full potential.

That's because the socialist revolution equips society with the key weapons for the war against resource depletion and pollution by removing the vested interests of the private capitalists. How does this work?

Firstly, social ownership of major industry and the finance sector enables the implementation of emergency plans of large-scale environmental repair. By eliminating all the contradictory interests of competing capitalists — which make environmentally effective green taxation such a rarity — it enables policy to be directed straight at the sources of resource depletion and pollution.

Secondly, resources presently squandered on the luxury consumption of the rich can be redirected, helping fund the vast increase needed in spending on environmental repair and conversion.

Thirdly, the elimination of such a critical underpinning of capitalism as the business secret and patent rights allows the most environmentally benign technology to be applied *across the board*, instead of being jealously guarded as one or two companies' fount of super profits.

Fourthly, it empowers the environmental movement, presently dispersed and fragmented, to concentrate its energies in a permanent and organised crusade against environmental degradation.

Lastly, in the underdeveloped countries, it opens the way to large-scale land reform, which is the precondition for relieving the environmental pressure superficially due to "rural overpopulation".

In the short run the most important element is the explosion of popular energy that a revolution brings. Indeed, even working life in the advanced capitalist economies provides glimpses of the potential for harnessing people's latent commitment to the environment. Imagine if social conditions allowed examples like this to become a general and natural feature of working life:

When the United Steelworkers engaged in a cooperative program with Republic Engineered Steel called Project 80, employees suggested about 1000 cost-saving and environmental improvements in the first 20 months. About half of these have since been implemented, resulting in savings of about \$45 million. The single largest saving, more than \$3.5 million, resulted from suggestions for improvements in the recycling of steel scrap. Another huge saving resulted from more efficient use of water, as a group of workers found a way to reduce water used in the heat-treating process. Water consumption dropped 80 per cent, from more than nine million gallons per month in 1991 to less than two million two years later, saving close to \$50,000 per year.²⁹⁷

US industry is certainly well aware of the benefit to its profits of workers' knowledge of where such plums might be picked. In 1981, Dow Chemical, one of the world's greatest polluters, began a contest in its Louisiana division to find capital projects costing less than \$200,000 with payback times of less than a year. In 1982, the contest yielded 27 projects and continues with more projects backed each year. In 1989, 64 projects costing \$7.5 million saved the company \$37 million in the first year and every year thereafter.

Probably the most advanced attempt to harness workers' creativity to the cause of environmentally and socially useful production was the Lucas Aerospace Combined Shop Stewards Committee plan. Instead of the "defence" hardware which was the firm's staple, the Lucas shop stewards developed such projects as solar power and wind generators, heat exchangers, a road-rail vehicle, a hybrid petrol-electric car and an airship using jump jets to avoid helium waste. The production processes developed did not waste raw materials, were labour-intensive, were non-hierarchical and non-alienating, required discussions with the final consumers, and were designed to break down the divisions between skilled and unskilled jobs.²⁹⁸

From a global perspective the potential gains in energy efficiency and resource usage in an economy where the collective intelligence and interest of the real producers is engaged and harnessed is immense. For example, Amory Lovins, in a classic 1981 study, calculated that a world populated by eight billion people could, with "best practice" energy use, be industrialised to the West German level while cutting total energy use to a third.

Lovins argues that the best mechanism to achieve this is the environmentally rejigged market of the type outlined in *Factor Four* but the patent naivete of this position doesn't take away from the fact that there is an enormous unused human potential waiting to be drawn into the job of saving the ecosphere. The question is: how best to summon it into life?

The 1979 Nicaraguan revolution, led by the Sandinistas but crushed through the US-backed war of the *contras* 10 years later, is the best recent illustration of how this is to be done. Box 3, based on a recent article of Daniel Faber,²⁹⁹ provides a short summary of its achievements in the environmental field, which were partially based on a critical analysis of Soviet shortcomings. In Faber's words:

One of the lessons provided by the legacy of the former Soviet Union and other Eastern European countries is that any socialist society which institutes social *ownership* of the means of production without establishing systems of genuine democratic social *control* by the people is doomed to be a political and ecological failure. Characterised by top-down systems of party/bureaucratic rules which sever links with both people and nature, really existing state socialist societies resorted to what was in effect a rightist politics of commandism ... [T]he Nicaraguan revolution would have to promote new forms of democratic state planning and administration which increased the power of the people themselves to exercise control over the major political, social and economic institutions in society.³⁰⁰

In the longer run, social control of technological development allows planned conversion to the foundations of sustainability. It would permit, to take one very insidious example, the elimination of chlorine-based production, which does not occur in nature, is poisoning our ecosphere and which grew "not so much by creating new industries as by taking over existing forms of production ... It grew through a virulent form of industrial imperialism."³⁰¹

Environmental achievements of the Nicaraguan revolution

Agrarian Reform: On the basis of its 1984 Agrarian Reform, which gave poor peasants more than 10 times the land they had owned before the revolution, IRENA (the Nicaraguan Institute for Natural Resources and the Environment) began a series of campaigns to address problems of deforestation, erosion and fertility loss in the country's major watersheds. These included the building of 4220 torrent-regulating dykes and the restoration of 202,500 hectares of tropical dry forest and farmland in the degraded Pacific highlands.

Under this programme the Western Erosion Control Project planted some 3000 trees daily over a two-year period, creating 1192 kilometres of windbreaks in the region's cotton-growing areas. At the same time the rate of deforestation was cut from 1009 square kilometres a year in the late 1970s (the highest in the Central American region) to 500 square kilometres by 1985 (among the region's lowest). This was because the agrarian reform lifted the pressure on tropical rainforests from landless peasants in search of subsistence farming plots.

Wildlife Protection: Before 1979 Nicaragua was a Central American leader in the hunting and export of rare and endangered species. After the revolution, because the Sandinistas nationalised the country's import/export banks, IRENA was able to implement an effective ban on the export of endangered species. Most exemplary was the Sea Turtle Conservation Campaign, in which local communities participated in the sustainable management of their own marine resources.

Energy and Appropriate Technology: One of the chief causes of habitat destruction and deforestation was the peasantry's lack of access to alternative energy sources to wood, which accounted for over half the country's energy output. In response CITA (the Centre for Appropriate Technology Research) launched a series of renewable energy projects, covering windmills, hand-pumps, biogas and more efficient wood stoves.

On a larger scale, as part of a project to reduce the country's dependence on oil imports INE (the Nicaraguan Energy Institute) initiated geothermal projects (based on the country's volcanoes) as well as a series of hydroelectrical and biomass projects based on sugar cane waste.

Pest management: Nicaragua before the revolution was drenched in DDT, with hundreds of workers dying each year from pesticide poisoning and mother's milk showing up to 45 times the World Health Organisation's "safe" limit. Between 1979 and 1982 the Sandinistas banned the use of eight of the world's 12 most dangerous pesticides and generalised a UN program in non-chemical Integrated Pest Management. As a result by 1982 pesticide imports by volume had fallen by 45 per cent and by 1985 the IPM program had expanded to cover 45 per cent of the cotton crop, the largest such program in Central, and possibly Latin, America. Daniel Faber comments:

"Nicaragua's IPM program became exemplary of the integral role performed by revolutionary ecology in the process of social transformation. First, IPM promoted greater national independence. Since the science was "home grown", the IPM program dramatically lessened the country's dependence on millions of dollars in expensive chemical imports from multinational corporations, thereby freeing up scarce foreign exchange for the building of schools, health clinics, environmental restoration, and other programmes designed to improve the lives of the popular classes. Secondly, IPM promoted social and environmental justice by improving environmental quality and worker/public health. Thirdly, IPM contributed to a new sustainable development model. By overcoming the dynamics of the pesticide treadmill the IPM program better enabled Nicaragua to overcome many of the major ecological and economic contradictions which periodically plague export agriculture in the Third World. Finally, IPM technology promoted greater ecological democracy in that the successful application of the science required democratic state planning, including the close cooperation of coalitions within the Labour Ministry, workers' associations and unions, the Health Ministry, environmentalists, national and international scientists and doctors, the Agricultural Ministry and growers' associations, and other non-governmental organisations. As such, these efforts to safeguard environmental and human health while increasing economic productivity made the Sandinista government's pesticide policy a model for 'productive conservation' for the entire Third World." (*Op. cit.*, p. 68)

If Cuba, even under the pressure of the criminal US economic blockade, can become a world leader in biotechnology and "green medicine", then the application of even half the research and development effort that is producing the latest in lethal weaponry would rapidly open up "soft technology paths" in all industrial and agricultural sectors.

In the Cuban case the collapse of the old "socialist bloc" threw into crisis the "classical model" of conventional modern agriculture — based on extensive monocultures and a high degree of mechanisation and fertiliser and pesticide use — because all these inputs were obtained at subsidised prices from former Soviet bloc economies. However, because Cuba had built up a stock of scientific knowledge and a well-developed agricultural research infrastructure, it was able, in desperate circumstances, to undertake what is essentially the largest conversion from conventional agriculture to organic or semi-organic farming that the world has ever seen.

This was made possible by the investment of an estimated \$12 billion in the 1980s in developing "human capital" and infrastructure in biotechnology, health sciences, computer hardware and software and robotics, an investment partially driven by a developing disillusionment with a model of agriculture that was generating growing pesticide resistance and soil erosion.³⁰²

Cuba gives a glimpse of the enormous potential of socialist methods:

In 1987 the Institutes of Botany and Zoology merged to form the Institute of Ecology and Systematics of the Cuban Academy of Sciences, and the first international symposium on these topics was held in Havana in 1988. Ecology was now a respected and legitimate branch of biology with public visibility.

Ecologists are able to promote their program through several channels. In the laboratories and institutions charged with pest control they adopt their own research plans in assemblies of the collective. Ecologists also address themselves through the mass organisations (the union, women's federation,³⁰³ student organisations) and the Communist Youth and Communist Party.³⁰⁴ They write for the popular press, work with amateur innovators' groups, and are increasingly seeking a role in the training of agricultural technicians. As individuals, some ecologists have been elected to the Assemblies of People's Power, the legislative bodies at the municipal, provincial and national levels.

There is thus a growing ecological movement in Cuba. But it is not an ecological movement in the sense of those in Europe or North America. It is not a distinct political movement such as the Greens, nor is it an opposition movement confronting a resistant government and corporations, nor is it yet an "official" movement of the sort set up by governments to say yes. Cuban ecology activists are political, committed revolutionaries who see their struggles for ecologically sound policies as part of the duty of communists in building a new society with its own relation to nature.³⁰⁵ The working method of the Cuban ecologists is educational, at the levels of society as a whole, government, and the party. In their view, ignorance, developmentalism, and economic urgency are their main adversaries. But the problem is not the lack of channels for expression but the resistance of opposing ideas. In the absence of greed as a major interest to overcome, discussions are not confrontational.³⁰⁶

This is the social essence of the alternative to the false dilemma of end-of-the-pipe regulation or green taxes that supposedly drive "entrepreneurial creativity". Public ownership of the key means of production combined with political power in the hands of an environmentally aware working people, offers the possibility of drawing on the stifled creativity, not of a handful of entrepreneurs, but of the vast mass of the population.

How then can the instruments of democratic socialist planning specifically tackle the job of building sustainability?

First, in a post-capitalist democracy the struggle to harmonise the still conflicting demands of growth and the environment is conducted on a *social* playing field — the institutions of working-class democracy, workers' collectives, scientific institutions, media and governing organs. Through the politics of their debates and struggles (which of course will always rely on *some* element of economic valuation) a more accurate measure of the social value of the environment can be established and an *overall* development plan implemented that is compatible with environmental restoration and preservation.

The establishment of full social control over production decisions also sets the right context for decision-making on the issues that almost totally exhaust mainstream environmental discussion, namely the relative

virtues of market-based and regulatory instruments. A post-capitalist society that leaves some space for the market will, for example, be free to decide the extent to which it should use environmental taxes and charges.

It also allows the best use of techniques like full cost accounting, cost-benefit analysis, cradle-to-grave accounting and input-output analysis, often so open to abuse and so sensitive to initial assumptions (or too revealing about the full range of costs involved with capitalist production). Under planned economy there is also greater latitude for choosing a discount rate that will induce the producing units to switch over to renewable energy more rapidly than might otherwise have been the case.

(Given the present embattled position of post-capitalist societies — and the tenuous position of countries like Cuba and Vietnam which retain some degree of revolutionary democracy — the value of such resources as tropical rainforest as an ecosystem compared to its value as timber for export will continue to present difficult, inescapable choices with which many environmentalists will disagree. Cuba's flirtation with nuclear power is a case in point.)

Secondly, one of the powerful anti-environmental pressures operating in "state socialism" was the need of the bureaucracy, which had no intention of setting an example of austere living itself, to provide the population with distracting "bread and circuses" — a "socialist" consumerism that sadly mimicked the West's. However, the greater people's real control of economic and environmental decision-making — the lower the degree of social alienation — the less will be the pressure for consumerism, especially in those economies which can already readily meet basic human needs.

Thirdly, a post-capitalist society will also be able to apply the precautionary principle. Our knowledge of how ecosystems work is still limited, and the possibility of unwitting environmental damage and loss is great. At the same time, because any effective program of environmental conversion will involve a radical change in the scale and nature of consumption as well as the closing down of environmentally unsustainable industry and agriculture, the transition phase to sustainability will require conscious restraint from an environmentally aware population.

Such restraint is impossible to achieve in capitalist society — where the rule of profit-making creates extremes of wealth and poverty on an expanding scale — without coercion by the capitalist state. Its ethic of individualism and consumerism clashes directly with any sense of environmental responsibility, as shown in the reaction to price rises introduced by Britain's newly privatised water companies:

A substantial proportion of customers associate these price rises with privatisation, the enhanced profitability of the water companies, dividend payment to shareholders and directors' salaries. The capital investments undertaken by the companies and improvements in some aspects of customer service are at best imperfectly perceived. Customer attitudes towards the water industry have undoubtedly changed; they are less willing to accept what they see as system failures, are less prepared to cooperate with the companies in reducing consumption during drought periods, and are increasingly resistant to the notion that the companies should be able to restrict their usage by imposing hosepipe bans. Such attitude changes were clearly seen over the dry, hot summer of 1995; many customers reacted with hostility to the idea that their increased demands were to blame for shortages and they saw it as the function of commercial companies to meet all legitimate supply requirements (including garden watering).³⁰⁷

Fourth, a society ruled by democratic socialist planning will be able to establish an "economic Plimsoll line" marking the sustainable *scale of production*. Once people, through their elected representatives, can compare the costs of different scales of production, the best scale possible can be decided and the disastrous "giantism" of typical Soviet production units avoided. It will also be possible to pay full attention to the imperatives of bioregional and local production. Decentralisation and the gradual overcoming of the difference between the city and countryside will likewise become increasingly feasible.

Richard Levins draws out the link between right-scale technology and social regime in the case of Cuban agriculture:

The gentler the technology, the more site specific it has to be. The adaptation of a technology suited to every microsite is beyond the capacity of even the most affluent extension service. Rather, the technology has to be developed on the farm through a collaboration of the farmers who have a detailed, intimate, local knowledge of their own circumstances and the off-farm scientists who can provide the general, theoretically based and abstract knowledge that requires some distancing from the particular. This interaction is only possible when the parties meet on terms of equality and mutual respect. In class-divided societies this is extremely difficult

to achieve. In Cuba, the fact that many of the agricultural scientists come from peasant backgrounds makes it easier.³⁰⁸

In such a context of post-capitalist democracy the "Ecology of the Poor", symbolised by such figures as the Amazon's Chico Mendes and Mexico's Zapatistas, can attain its fullest influence, as a tradition imparting precious environmental knowledge and skills.

All this goes to underline one reality: that social ownership of the major means of production and democratic decision-making is the only way of running society that is compatible with an environment which is itself ever increasingly social. It is the only road to a "steady state", sustainable economy.

Levins sums up his experience:

... of a socialist economy in which there is no profit-oriented chemical industry pushing pesticides, and in which the conscious goal of planning is a better, more abundant and healthier life. Difficulties arise when intermediate goals toward these ends take on a life of their own, become the measure of an enterprise's contribution to society, and seem to conflict with the long-term goals. Although socialism is all too obviously no guarantee that intermediate goals will not obstruct ecological wisdom, it does practically eliminate vested economic interest in perpetuating harmful practices. Therefore, a debate over technological directions is only an argument, a confrontation of opposing beliefs, but not a confrontation of opposing interests.

This gives a different feel to argument even against stubborn ignorance. It makes strong argument effective and makes convincing the other party more important than the simple exercise of power. It also affects the style of struggle, which starts from the premise of comrades struggling with each other for a shared goal and is more educational than oppositional ... The debate also takes place within a theoretical commitment to Marxism with its emphasis on the historical contingency of science and technology, the importance of looking at the whole, the recognition of complexity, process and contradiction. This provides the tools for challenging technocratic developmentalist assumptions.

At a time when ecological issues are becoming major political concerns throughout the world, the Cuban struggle should be watched closely and actively supported. The different texture of the struggle in Cuba from that in capitalist countries reveals the intensely political character of human ecology. *Its victories under difficult circumstances show just a little of the potential of socialism and of Marxism in negotiating a new relation with nature.* If allowed to continue its socialist development, Cuba may yet become a world ecological power as well as a medical one.³⁰⁹

In short, the only possible "sustainability transition" is that which can be carried out by an environmentally aware people in control of their own destiny.

Notes

172 A. C. Pigou, *The Economics of Welfare*, Macmillan, London, 1932.

173 For a succinct summary see David Pearce (ed.), *Blueprint 2: Greening the World Economy*, Earthscan, London, 1991, pp. 1-3.

174 Green taxes, or eco-taxes, come in many shapes and sizes. There are effluent charges and licenses, resource and environment user fees; fines for polluters; rebates; "feebates" which use funds collected from those operating below a given environmental standard to reward those operating better than standard; and tradable emission permits. A general distinction should be made between green taxes, which are designed to reduce pollution and resource depletion to some degree, and charges, whose aim is restricted to raising sufficient funds to cover the administration of particular programs.

175 David Malin Roodman, "Harnessing the Market for the Environment", in Lester R. Brown et al, *State of the World 1996*, Earthscan Publications, London, 1996, p. 169.

176 Lester R. Brown and Jennifer Mitchell, "Building a New Economy", in *State of the World 1998*, Earthscan, London, 1998, p. 181.

177 US President's Council on Sustainable Development, *Sustainable America: A New Consensus for Prosperity, Opportunity and a Healthy Environment*, US Government Printing Office, Washington, DC, 1996.

178 European Commission, *Growth, Competitiveness, Employment: the Challenges and Way Forward into the 21st Century*, Bulletin of the European Communities, Supplement 6/93, European Commission, Brussels. Cited in David Gee, "Economic Tax Reform in Europe: Opportunities and Obstacles", in Timothy O'Riordan (ed.), *Ecotaxation*, Earthscan, London, 1997.

179 Timothy O'Riordan (ed.), *op. cit.*, p. 325.

180 *Op. cit.*, p. 326.

181 Ernst von Weizsäcker, Amory B. Lovins and L. Hunter Lovins, *op. cit.*, p. 144 (emphasis added).

182 See also WBMG, *Tax Reform for Sustainable Development: Roundtable Discussions*, WBMG Environmental Communications, London, 1995.

183 That is, the higher the price of fuel the less it is consumed.

184 Ernst von Weizsäcker, Amory B. Lovins and L. Hunter Lovins, *op. cit.*, p.202.

185 *Op. cit.*, p. 204.

186 See Denis Meadows, Donella Meadows and Jurgen Randers, *Beyond the Limits: Confronting Global Collapse, Envisioning a Sustainable Future*, Post Mills VT, Chelsea Green, 1992.

187 Ernst von Weizsäcker, Amory B. Lovins and L. Hunter Lovins, *op. cit.*, p. 268.

188 Since 1992 there have been over a dozen studies on the likely effects of shifting parts of the tax burden from "people to things".

189 Paul Ekins, "On the Dividends from Environmental Taxation", in Timothy O'Riordan (ed.), *op. cit.*, pp. 151-155.

190 David Malin Roodman, *State of the World 1999*, p.180.

191 David Malin Roodman, *op.cit.*, p.171.

192 When a green tax is struck, the rate per unit of resource depleted or pollution emitted is fixed, and the actual impact on the quantity of the resource used or pollution emitted allowed to vary. With a tradable permit, the quantity of the resource used or pollution permitted is fixed and the price of meeting this target varies.

193 Scott Barrett, "Global Warming: Economics of a Carbon Tax", in David Pearce (ed.), *op. cit.*, p. 40. See also David Pearce, "Economics and the Global Environmental Challenge", in *The Earthscan Reader in*

- Environmental Economics*, pp. 401-2 and the 1995 Danish Board of Technology seminar on green taxes, available on <<http://www.ing.dk/tekraad/udgiv/963/963all.htm>>.
- 194 Timothy O'Riordan, *op. cit.*, p. 77.
- 195 Paul Ekins, *op. cit.*, in Timothy O'Riordan, *op. cit.*, p. 131 and p. 151.
- 196 T. H. Tietenberg, *op. cit.*, pp. 275-276.
- 197 OECD, *Environment and Taxation: the Case of the Netherlands, Sweden and the United States*, OECD, Paris, 1994. See summary on <<http://www.rec.org/REC/Publications/PaperSeries/Paper1/experience1.html>>.
- 198 Robert W. Hahn, "Economic Prescriptions for Environmental Problems: How the Patient Followed the Doctor's Orders", *Journal of Economic Perspectives*, 1989, vol. 3, no. 2, pp. 95-114.
- 199 Jane Powell and Amelia Craighill, "The UK Landfill Tax", in Timothy O'Riordan (ed.), *op. cit.*, pp. 304-320.
- 200 Jean-Philippe Barde, "Environmental Taxation: Experience in OECD Countries", in Timothy O'Riordan, *op. cit.*, p. 236.
- 201 Jon O'Riordan, "The British Colombia Sustainability Fund", in Timothy O'Riordan, *op. cit.*, p.p. 322-323.
- 202 John Millar and John Moffet, *The Price of Mobility: Uncovering the Hidden Costs of Transportation*, Natural Resources Defense Council, 1993.
- 203 G. Tyler Miller, *Living in the Environment*, Wadsworth, Belmont, California, p. 201.
- 204 Bent Sørensen, "Impacts of Energy Use", in Mark Diesendorf and Clive Hamilton (eds.), *Human Ecology, Human Economy*, Allen and Unwin, Sydney, 1997, pp. 259-265.
- 205 Figures from Barry Commoner, *op. cit.*, pp. 89-90.
- 206 Scott Barrett, *op. cit.*, p. 40.
- 207 Jean-Philippe Barde, *op. cit.*, p. 243 (writing in a personal capacity).
- 208 Judith Rees, "Toward Implementation Realities", in Timothy O'Riordan (ed.), *op. cit.*, p. 298.
- 209 *New York Times*, November 3, 1997.
- 210 Noah Walley and Bradley Whitehead, "It's Not Easy Being Green", *Harvard Business Review*, May-June 1994, pp. 46-52.
- 211 Peter Newell, "A Changing Landscape of Diplomatic Conflict: The Politics of Climate Change Post-Rio", in Felix Dodds (ed.), *op. cit.*, p. 40.
- 212 David Malin Roodman, *op. cit.*, p. 178.
- 213 See Lester R. Brown et al, *Vital Signs 1997-1998*, pp. 60-61.
- 214 World Resources Institute, *World Resources 1996-97*, Oxford University Press, Oxford, 1996, p. 281.
- 215 *Ibid.*, p. 279.
- 216 Ernst von Weizsäcker, Amory B. Lovins and L. Hunter Lovins, *op. cit.*, p. 200.
- 217 Francis Cairncross, *op. cit.*, p. 132.
- 218 Daniel Faber, *op. cit.*, p. 21.
- 219 Tom Athanasiou, *op. cit.*, pp. 236-237.
- 220 Ernst von Weizsäcker, Amory B. Lovins and L. Hunter Lovins, *op. cit.*, p. 139.
- 221 *Op. cit.*, p.142.
- 222 *Ibid.*, p. 208.
- 223 United Nations Development Program, *Human Development Report 1997*, Table 42, p. 219.
- 224 See Christopher Flavin and Seth Dunn, *op. cit.*, p. 115.

- 225 Gary Gardner and Payal Sampat, *op. cit.*, p. 51 and Lester R. Brown and Christopher Flavin *State of the World 1999*, p. 21.
- 226 Michael Carley and Philippe Spapens, *op. cit.*, p. 108.
- 227 Gary Gardner and Payal Sampat, *op. cit.*, p. 45 and Michael Carley and Philippe Spapens, *op. cit.*, p. 32.
- 228 Tom Athanasiou, *op. cit.*, p. 139.
- 229 Hilary F. French, *op. cit.*, p. 157.
- 230 According to the approach to measuring ecological impact pioneered by Friedrich Schmidt-Bleek, known as Material Impact Per Service (MIPS), manufacturing the average car requires more than 1520 tonnes to be moved in the processes of metal mining, refining, shipping, plastics and glass manufacturing and car assembly. See Ernst von Weizsäcker, Amory B. Lovins and L. Hunter Lovins, *op. cit.*, pp. 237-45.
- 231 *Vital Signs 1998-1999*, p. 86.
- 232 *Op. cit.*, p. 119.
- 233 Robert W. Hahn, *op. cit.*, p. 106.
- 234 Cited in Tom Athanasiou, *op. cit.*, p. 178.
- 235 Hilary F. French, "Assessing Private Capital Flows to Developing Countries", in *State of the World 1998*, pp. 157 and 166.
- 236 See J. M. Dean, "Trade and the Environment: a Survey of the Literature", in P. Low (ed.), *International Trade and the Environment*, World Bank Discussion paper 159, World Bank, Washington, 1992.
- 237 Jane Powell and Amelia Craighill, *op. cit.*, p. 314.
- 238 Christopher Flavin and Seth Dunn, *op. cit.* p. 119.
- 239 Ernst von Weizsäcker, Amory B. Lovins and L. Hunter Lovins, *op. cit.*, p. 283.
- 240 Caroline LeQuesne and Charles Arden Clarke, "Trade and Sustainable Development", in Felix Dodds (ed.), *op. cit.*, p. 177.
- 241 David Malin Roodman, *op. cit.*, p. 177. Anne Platt McGinn, "Charting a New Course for Oceans", in *State of the World 1999*, p. 92.
- 242 Jean-Philippe Barde, *op. cit.*, p. 242.
- 243 Steven Shrybman, *An Environment Guide to the World Trade Organisation*, 1997, available on <<http://www.sierraclub.ca/national/trade-env/env-guide-wto.html>>.
- 244 James O'Connor, "Is Sustainable Capitalism Possible?", in Martin O'Connor (ed.), *Is Capitalism Sustainable: Political Economy and the Politics of Ecology*, Guilford, New York, 1994.
- 245 James Poterba, "Tax Policy to Combat Global Warming: On Designing a Carbon Tax," in Rudiger Dornbusch and James Poterba (eds.), *Global Warming: Economic Policy Responses*, MIT Press, Cambridge, Massachusetts, 1991.
- 246 M. Pearson and S. Smith, *The European Carbon Tax: An Assessment of the European Commissions*, The Institute of Fiscal Studies, London, 1991.
- 247 Tom Athanasiou, *op. cit.*, pp. 274-275.
- 248 Judith Rees, *op. cit.*, p. 289.
- 249 Peter Weber, "Protecting Ocean Fisheries and Jobs", in Lester R. Brown (ed.), *State of the World 1995*, Earthscan, London 1995, pp. 32-3.
- 250 United Nations, Commission on Sustainable Development, "Chairman's summary of the high-level segment of the sixth session", paragraph 22.
- 251 Peter Weber, *op. cit.*, p. 57.
- 252 Aaron Sachs, "Upholding Human Rights and Environmental Justice", in Lester R. Brown (ed.), *State of the World 1996*, p. 144.

- 253 Michael Carley and Philippe Spapens, *op. cit.*, pp. 59-60.
- 254 Anil Agarwal and Sunita Narain, *Global Warming in an Unequal World: a Case of Environmental Colonialism*, Centre for Science and Development, New Delhi, 1991.
- 255 Swedish Ministry of the Environment, *The Swedish Experience: Taxes and Changes in Environmental Policy*, Ministry of the Environment, Stockholm, 1994.
- 256 J. Whalley and R. Wigle, "The International Incidence of Carbon Taxes", in R. Dornbusch and J. Poterba (eds.), *Global Warming: Economic Policy Responses*, MIT Press, Cambridge, Massachusetts, 1991, pp. 233-263.
- 257 Paul Ekins, *op. cit.*, p. 156.
- 258 OECD, *Environment and Taxation: the Cases of the Netherlands, Sweden and the United States*, OECD, Paris, 1994, p.57.
- 259 David Malin Roodman, Worldwatch Institute media release on "Getting the Signals Right: Tax Reform to Protect the Environment and the Economy", 10 May 1997.
- 260 See Al Gore, *Earth in the Balance: Ecology and Human Spirit*, Houghton Mifflin, London, 1992.
- 261 *Vital Signs 1997-1998*, pp. 108-109.
- 262 Tom Athanasiou, *op. cit.*, p. 191.
- 263 Christopher Flavin, "Facing Up to the Risks of Climate Change", in Lester R. Brown (ed.), *op. cit.*, p. 33.
- 264 *OECD Environmental Data, Compendium 1997*, OECD, Paris, 1997.
- 265 Barry Commoner, *op. cit.*, p. 285.
- 266 Joaquín Araujo, "Environmental employment", *El País Sunday Supplement*, 4 December 1994, cited in Jorge Riechmann and Francisco Fernández Buey, *Trabajar sin Destruir: Trabajadores, Sindicatos y Ecologismo*, Ediciones HOAC, Madrid, 1998, p. 222.
- 267 Noah Walley and Bradley Whitehead, *op. cit.* p. 50.
- 268 Thomas C. Schelling, "Some Economics of Global Warming", *American Economic Review*, Volume 83, Number 1, March 1992, pp. 1-11.
- 269 Ernst von Weizsäcker, Amory B. Lovins and L. Hunter Lovins, *op. cit.*, p. 178.
- 270 *Ibid.*, p. 182.
- 271 The discount rate is the percentage amount by which we reduce the value of a flow of income between two time periods, by convention usually a year. If a dollar earned in one year is reckoned to be worth 95 cents today, the discount rate is said to be five per cent (actually 5.26 per cent, according to the discounting formula $\{1/(1 + r)\} = 0.95$, where r is the discount rate). Usually, the discount rate used is the *real* discount rate, which reflects anticipated inflation. The higher the discount rate, the lower the value of future income in present terms. High discount rates also favour faster resource depletion, for the obvious reason that future income is valued less than income today. The greater the poverty of a society, the greater the pressure of subsistence, the higher the rate of discount that is being applied. The rule expressing the relation between the discount (or interest) rate and the rate of depletion of a resource is known as the Gray-Hotelling rule. See any text on cost-benefit analysis for a fuller explanation.
- 272 Gavin Gilchrist, *op. cit.*, pp. 56-57.
- 273 Cited in Gavin Gilchrist, *op. cit.*, p. 57.
- 274 Solar energy accounts for less than 0.5 per cent of the power generated in the US today, instead of the two to five per cent projected in the late 1970s. And, despite recent increases in the uptake of renewable energy, such sources still account for less than one per cent of global energy output. See *State of the World 1998*, p. 116.
- 275 J. Martínez-Alier, *De la Economía Ecológica al Ecologismo Popular*, p. 41 (translated from Spanish).

- 276 *Op. cit.*, p. 136. Other telling examples cited by Martínez-Alier come from Ecuador. For instance, indigenous Amazonian people are suing Texaco in the Federal Court of New York for deforestation and the destruction of their community life caused by that company's extraction of one billion barrels of oil between the early 1970s and 1990. Yet, while damages sought amount to \$1.5 billion, the Ecuadorian government is looking to settle a damages agreement at around \$15 million.
- 277 Frances Cairncross, *op. cit.*, p. 28.
- 278 J. Martínez-Alier, *Ecological Economics*, Basil Blackwell, Oxford, p. xiv.
- 279 A 1986 study of emissions permit trading by R. Hahn and G. Hester found that there was a sizeable (\$12 billion dollar) saving for companies operating under the US Clean Air Act but "insignificant environmental quality impact". See Lewis Owen and Tim Unwin (eds.), *Environmental Management: Readings and Case Studies*, Blackwell, Oxford, 1997, p. 403.
- 280 *Op. cit.*
- 281 The full name is the Montreal Protocol on Substances That Deplete the Ozone Layer, signed in September 1987.
- 282 Sharon Beder, *op. cit.*, pp. 114-115.
- 283 See Rene Bowser, "History of the Montreal Protocol's Ozone Fund", *Analysis and Perspective*, Bureau of National Affairs, Washington, 20 November, 1991, p. 637. Cited in Tom Anastasiou, *op. cit.*, p. 65. The CFC Multilateral Fund, a joint initiative of the World Bank and various UN agencies, has allocated \$695 million to projects in 111 developing countries to speed CFC phase-out.
- 284 Michael Carley and Philippe Spapens, *op. cit.*, p. 20.
- 285 A recent example is the 1997 proposal of the Australia Institute whose proposed \$A23 per ton carbon tax, permitting the elimination of payroll tax, would reduce carbon dioxide emissions by a totally inadequate 11.7 per cent in the short run and be "closer to 40 per cent" only by 2010 — assuming the modelling is accurate. At the same time it would produce immediate price rises of around seven per cent for petrol, 17 per cent for gas and 21 per cent for electricity (Clive Hamilton, Tor Hundloe and John Quiggin, *Ecological Tax Reform in Australia*, The Australia Institute, Discussion Paper Number 10, April 1997.)
- 286 Karl Marx, *Capital*, Vol. 1., Penguin Books, Harmondsworth, 1981, pp.637-638.
- 287 Jason Abbott, "Export Processing Zones and the Developing World", *Contemporary Review*, Vol. 270, No. 1576 (1997).
- 288 Christopher Flavin and Seth Dunn, "Reinventing the Energy System", in Lester R. Brown et al (eds.) *State of the World 1999*, pp. 31-4.
- 289 Martin I. Hoffert et al., "Energy Implications of Future Stabilisation of Atmospheric Carbon Dioxide Content", *Nature*, 29 October 1998.
- 290 The Biodiversity Convention "was originally proposed as a measure to preserve plant and animal life. But the real issue quickly became the exact opposite: how living organisms could be commercially exploited, and who should have patent rights. The treaty that was finally agreed was more about commerce than about conservation." David Lascelles and Christina Lamb, "A Game of Missed Opportunities", *Financial Times*, June 15, 1992, p. 14, cited in Tom Athanasiou, *op. cit.*, p. 205.
- 291 Report of the Secretary-General, CSD, "Overall Progress Achieved Since UNCED", UN, 7-25 April 1997, paragraph 106.
- 292 William Kapp, *Social Costs, Economic Development, and Environmental Disruption*, University Press of America, London, 1983, p. 49 (emphasis added).
- 293 Jorge Riechmann and Francisco Fernández Buey, *op. cit.*, pp. 17-18.
- 294 Barry Commoner, interviewed by *Scientific American*, June 23, 1997. See <<http://www.sciam.com>>.
- 295 The environmental crisis in the former Soviet Union and Eastern Europe is analysed in Chapter 2, Part 4. However, we should be careful not to be swept away by claims of Western superiority here. Tom Athanasiou notes: "The terms of the standard East-West comparisons are badly misleading. Poland and Slovakia are about as 'developed' as Turkey or Iran, and the Czech Republic and Hungary compare more fairly to Greece

or Mexico than to the United States or Britain. This doesn't let the east off the hook for the damage its managers have done, but it does recast the issue: Greece, Turkey, and Mexico are no shining models of environment management. And if 'the West' is taken as a whole — to include its service areas in Latin America, Africa and Southeast Asia — is it still so certain that its ecological record is superior in every way to that of the old East bloc?" *Op. cit.*, page 124.

296 Address of V. Zazunbrin to the First Congress of Soviet Writers in 1926, cited in Martin Cock and Bill Hopwood, *Global Warming: Socialism and the Environment*, Militant Publications, Guildford, 1996, p. 150.

297 Commission on Sustainable Development, Sixth Session, 20 April to 1 May 1998, background paper 14, "Trade Unions", paragraph 17.

298 "The Lucas plan was rejected by all elements of the British establishment, including management, conservative trade unionists (one *complaining* that it would change British society!), academic 'leaders' and most of the Labour Government, whose initial encouragement was sustained by only a few, like Tony Benn. This is unsurprising since it was revolutionary, proposing industrial restructuring in the interests of labour; redefining wealth by rediscovering William Morris' definition ('working cheerfully at producing the things we all genuinely want'); redefining, therefore, economic rationality; challenging labour vanguardist views that average workers can do little more than to describe their grievances; reasserting working people's right to associate (across unions); exposing the hidden values behind seemingly neutral, technical, 'rational' management and challenging its right to manage, at least without accountability to workers: as Lucas workers at Shipley are reported to have said: 'In our experience management is not a skill or craft. It is a command relationship, a habit picked up at public school, in the church or from the army. And we can well do without it'. — David Pepper, *Eco-socialism*, Routledge, London and New York, 1993, page 239.

299 Daniel Faber, "La Liberación del Medio Ambiente: The Rise and Fall of Revolutionary Ecology in Nicaragua, 1979-1999", in *Capitalism, Nature, Socialism*, Issue 37, (Volume 10, Number 1), pp. 45-80.

300 Daniel Faber, *op. cit.*, p. 58.

301 Barry Commoner, quoted in Peter Montague, *Rachel's Hazardous Waste News*, Number 390, 1994.

302 For a detailed account see Peter Rosset and Medea Benjamin, *The Greening of the Revolution*, Ocean Press, Australia, 1994.

303 Women are prominent in the leadership of Cuban science and have played an active role in the development of agroecology. The president of the Academy of Sciences, the director of the Institute of Ecology and Systematics, half the department heads in the institute, the director of the citrus experiment station and several of its leaders are women (author's note).

304 I once attended a meeting of biologists called by a local party group to discuss what to present at a national meeting on ecology and development. They were concerned about prejudices among economists who tend to dismiss ecological arguments as "idealistic", and were developing the counter-argument that it is the height of idealism to imagine that we can make a plan and nature will have to obey (author's note).

305 Some struggles will be more difficult than others. For example, the desire of government to promote tourism for foreign exchange is encouraging development plans along the coast which could ruin the offshore cays. The dependence on imported oil makes arguments about nuclear energy more difficult. The economic role of sugar and its institutionalisation in a separate ministry will make the shift to multipurpose farming more traumatic (author's note).

306 Richard Levins, "The Struggle for Ecological Agriculture in Cuba", *Capitalism, Nature, Socialism* No. 5, October 1990, pp. 125-126.

307 Judith Rees, *op. cit.*, p. 289

308 Richard Levins, *op. cit.*, p. 138.

309 Richard Levins, *op. cit.*, page 140 (emphasis added).